Visualising Plastic Ocean Pollution:

Designing Waste Ontologies

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PHD THESIS

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D E C L A R A T I O N

I, Katarina Dimitrijevic, hereby declare that this thesis and the works presented in it are entirely my own. Where I have consulted others' works and practice, this is always clearly stated and referenced.

Signed:

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Date: November 2022

D E D I C A T I O N S

Water is life.

To all my relations in the past, present and future.

Haux, Haux!

My research calls designers and non-designers to become creative prosumers and gentle eco-centric warriors, and to nurture compassion and practise with care.

I dedicate this PhD thesis to my son, Kai Jovan Spears. He is the sole motivation in my research journey because I genuinely desire to bestow new generations with more than just a burden of planetary dystopia and renew awareness for Earth's stewardship.

A C K N O W L E D G E M E N T S

My praxical explorations would not exist without the support I have received from my family and architectural practice, Inspace Interiors, which I ran from 1998 to 2010 in Johannesburg, in the Republic of South Africa (RSA). This background provided the initial support for my departure from South Africa, from the commercial interior design professional practice into the uncharted and speculative waters of academic practice in the form of my MRes in Design at Goldsmiths, University of London, from 2011 to 2013, and my PhD research from 2014 to 2021.

I want to extend gratitude to the University of the Creative Arts (UCA), where I held the post of subject leader for the MA Contemporary Jewellery and MA Design courses from 2013 to 2016, for granting me the creative residency funds for the ‘Designedisposal Seminar’ and ‘XMass Tree’ re-use installation. Many thanks to the seminar guest speakers, Professor Martin Charter and Scott Keller from the Centre for Sustainable Design (CfSD), and Noel Hatch, research and design manager at Kent County Council. I also offer thanks to the kitchen staff of UCA Rochester campus for re-directing all of their used milk bottles towards the project for half a year, and to Medway Council’s waste management team for lending four large bins over a year to collect and store the precious plastic waste at the campus.

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Deep gratitude goes to the editors, Richard Ek and Nils Johansson, of the Department of Service Management and Service Studies at Lund University in Sweden, and to Cambridge Scholars Publishing for granting me permission to use the entire text and images of Chapter Eight of *Perspectives on Waste from the Social Sciences and Humanities: Opening the Bin* (Dimitrijevic, 2020, pp.136–157) in this thesis.

Finally, thank you to Steve Keirl and Dr Mathilda Tham, my primary supervisor, for their academic support, comradeship and supervision over my past eight years in the Design department at Goldsmiths, University of London. Thank you all with all my heart.

ABSTRACT

It is challenging to comprehend the extent of oceanic plastic pollution because of the sea depth and currents. This PhD by practice in design uses marine scientific findings and data on plastic waste recycling extrapolation to support an argument that the oceans are the world's largest mismanaged landfill. As the sea's landfill is not visible, the research applied various approaches to making invisible plastic waste present. Through Higher Education (HE) action-based workshops, research participants were invited to experience ocean plastics in ways designed to challenge perceptions. The HE action-based research co-created an aesthetically positive waste response and new experiential values that re-shaped the thinking of participants. Through a co-design approach with design students, research created meaningful connections with long-lasting plastic resources and re-imagined plastic pollution as oceanic species.

This PhD thesis research comprises a series of three practice-based projects. First, HE-based waste symposium engagements facilitate landfill dialogue and promote plastic reuse. Second, HE participatory workshops enabled the visualisation of oceanic plastic pollution through making installations. Third, the research explored plastic pollution using craft expositions and participated in a sailing expedition. The PhD interventions promoted positive change through hands-on reuse tactics with plastic packaging, raising environmental and oceanic landfill awareness, and acknowledging that this may not lead to changes in stakeholders' behaviour.

Through the design agency–praxis, the research draws on recent works in speculative design in formulating experiential design futures and design fictions. These PhD thesis contributions funnelled visual strategy insights from three practice-based interventions into two experiential scenarios – future-based climate fiction narratives. The first future scenario unpacked the responses of HE design workshop stakeholders and proposed informal global services and design-led packaging solutions. The second fiction scenario is a visionary post-anthropocentric future that visually re-imagined the planetary plastic pollution changes through intersections of research and praxis.

This participatory research re-imagining with plastic waste and visualising the complexity of plastic pollution contributes further to knowledge relating to design research in three clustered domains. First, various HE learning tools for oceanic environmental awareness and waste reuse were developed. Second, the research designed an innovative methodology that expands praxis vocabulary and forms a new eco-centric compendium through workshop interventions and waste aesthetic approaches. Lastly, through practice-based participatory action and speculative agency, the research uniquely constructs a socio-material narrative with plastic things making new interdisciplinary connections and design relations to nature.

The PhD promoted hands-on plastic reuse and new perceptions of plastic waste in HE design education, connecting to discard study, marine science and feminist thinking. A co-creation design approach raised transformative environmental awareness and promoted novel waste aesthetic and design language towards engaged relationships with plastic pollution.

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Research Timeline 2014–2022

Thesis Structure and Practice Development	Action, Evaluation, Analysis, Reflection	Action, Design Methods to Gather and Generate Data	Literature Review	Timeline MPhil/PhD part-time
Evaluate format and stakeholders	Survey analytical data and identify methods	Designtransposal workshops 1–3	Search/survey relevant waste material/data	MPhil/ Years I–3 2014/16
Evaluate format and stakeholders	Possible DIY/DIWO strategies	Two international conference papers presented	Build bibliography and case studies	MPhil/ Years 2–3 2015/16
Outline thesis structure	Apply green design series DIY/DIWO	Apply blue design series PAR/DIWO	Mapping of key references	MPhil/ Years 2–3 2015/16
Refine claim and backing towards argument/s	Evaluate strategies and stakeholders	Fourth international workshop papers and online papers presented	Critical review of key references	MPhil/ Years 3–4 2016/17
Progress through MPhil to PhD transfer in 2018	Evaluate and reflect outcomes from selected methods	Mapping research methods, visualising pollution, visualising research	Update literature review and critical view structure	PhD/ Years 4–5 2017/18
Finalise structure of thesis and theoretical literature review	Analysis of green design engagements and blue design series	Evaluating and summarising project outcomes	Developments towards the argument/s and publications	PhD/ Years 4–5 2017/18
Finalise argument for 2050 scenario	Final analysis of research outcomes	Sail Britain east coast expedition in October 2018	Sail Britain and RCA exhibition in October 2018	PhD/ Years 5–6 2018/19
Raw Labs Group Exhibition in September 2019	Publication of two book chapters' in 2019	Reflections and conclusions for 2150 scenario	Final analysis of research outcomes	Years 5–6 2018/19
Retrospective ethical approval in 2020	Publication of third book chapter in 2020	Update vocabulary and compendium index	Revise, collate, and conclude 2020	Years 6–7 2019/20
Revise, collate and conclude 2021	Revise, collate and conclude 2022	Pass with minor amendments in April 2022	Final amendments submission July 2022	Years 7–8 2021/22

Table 1. MPhil/PhD Research Timeline.

PART ONE

‘Plastic objects are the cultural archaeology of our time, spun and exchanged on the global lubrication of currency to be transported on the conveyor belt of the ocean. These objects form a portrait of global late-capitalist consumer society, mirroring our desires, wishes, hubris and ingenuity.’

— Pam Longobardi, 2014, p. 174.

CHAPTER ONE: INTRODUCTION

1.0 Introduction

In this introductory section, it is essential to highlight the experiences and motivators behind the inception of my research praxis, based in the UK, before becoming entangled in this complex plastic and planetary narrative. I previously spent two decades living in the RSA, where I ran a professional architectural practice – Inspace Interiors (1998–2010). These experiences played a significant role in forming the current design research synergy coupled with plastic waste.

In South Africa, as an HE lecturer or group leader, I was actively involved in community engagement programmes. Community engagement initially started through the interior architecture department at the University of Pretoria (2002–2005). The community engagement initiative continued while I was the head of the interior design department at Greenside Design Center (GDC) (2005–2010). There, I had the opportunity to incept and co-lead socially embedded waste-centric student-led projects, which changed my professional and personal worldview.

A Soshanguve township community programme ignited my community engagement path with the University of Pretoria, later inspiring the design student engagement project that added design value to rural craftwork in Limpopo province. After these two projects, I led the multi-disciplinary undergraduate design student group, which represented the African continent under the GDC banner and contributed to the Educational Future Scenarios exhibition for the first INDEX event – Design to Improve Life – in 2005. It was a privilege to be one of the seven global design institutions to be hosted by the Danish Design School

and to be invited to participate and present to the ‘ConTact’-themed installation at the Future Scenarios exhibition in Copenhagen, Denmark (Fig. 1-1).

Fig. 1-1. ConTact, 2005. GDC for INDEX. ‘ConTact’ triptych posters (top) and ‘ConTact’ installation (bottom). Mixed media: acrylic, cardboard, vinyl. Dimensions: 650 x 650 x 1680 mm. Future Scenarios exhibition, Copenhagen, Denmark.

Inspired by participation in INDEX 2005, the GDC formed the experimental educational community engagement named the 10% Programme. In 2010, the 10% Programme was awarded first prize by the International Federation for Interior Architects. The 10% Programme initiative devotes 10% of the college’s annual teaching and learning time to community-based and social design intervention projects. For three weeks each year, the studio was transformed into

a research laboratory for undergraduate students and lecturers to address specific communities' needs.

Fig. 1-2. 10% Project, 2009–2010. 'Cool Trash' and 'Play Trash' groups, led by Katarina Dimitrijevic, GDC, Johannesburg, RSA.

My waste-centric group was one of five community-engagement projects making up the 10% Programme. I devised and co-led the interdisciplinary waste groups 'Trash' (2008), 'Cool Trash' (2009; Fig. 1-2), and 'Play Trash' (2010; Fig. 1-2). These HE community-based engagements with various upcycled materials directed my UK-based praxis and PhD research orientation towards a waste topic with single-use plastic packaging.

For clarity, the term 'upcycle', coined by Kay (1994) and used by McDonough and Braungart (2002; 2013) is a 'neologism that has been defined as the process of retaining the high quality and value of materials and products in an open-loop…cycle' (Sung et al., 2019, p. 2). However, reuse of plastic packaging as a primary source of 'reflective conversation with materials' (Schön, 1984) in this PhD does not have the typical characteristics of upcycling, carried out in an

industrial setting and with the resulting items for sale (Fisher and Shipton, 2010, p. IX).

Thus, in this PhD, I apply reuse as a term associated with my praxical do-it-yourself (DIY) and do-it-with-others (DIWO) research techniques with ‘positive waste’ (Kennedy, 2008, p. 9). I integrate reuse of plastic packaging in my DIY cli-fi visualisations, art installations and DIWO participatory HE design engagements visualising plastic ocean pollution. In the Section 1.1, I present the influence of my praxical works in this PhD’s entanglement with plastic things.

1.1 Research Praxis

> ‘Urban plastic trash is my study, a thing of desire and production material.’
>
> — Katarina Dimitrijevic, 2013, p. 50.

Fig. 1-3. Snowflake and Queen, 2013. (2012). Photo of bricolage. *Snowflake* (left) and *Springbok Queen* (right). Mixed plastics: PET yoghurt pot, bottle tops, HDPE. Handmade in London, UK.

This section introduces my research praxis KraalD, the abbreviation for KraalDesignedisposal (Section 2.1), devised and instigated in 2011. This praxis became the research vehicle for my MRes in Design at Goldsmiths University of London (2011–2013). KraalD stands for a transformative socio-material narrative that strives to probe, interact and negotiate micro-spaces of disposal resistance with plastic things.

For clarity, in this thesis, I use the term ‘praxis’ (Section 5.1) to denote design-oriented participatory action research (Section 5.2) and to define my praxis paradigm holon (see Fig. 5-29, located in Section 5.1). I explore oceanic spatial representations (Section 5.4) through ‘experiential scenarios’ (Candy, 2010; Section 6.5) as an applied method in this action research methodology (Sections 5.1–5.4). My ‘research as praxis’ (Lather, 1986) is influenced by radical ‘social and creative imaginary’ (Section 5.3), new materiality, critical design (Sections 4.0–4.2) and theoretical eco-feminist notions (Sections 4.3–4.4): see ‘Research Methodology’ in Chapter Four and ‘Research Methods’ in Chapter Five.

My past praxical exploration for my MRes in Design revolved around ‘Designedisposal’ aesthetics and vocabulary, promoting upcycling and reuse of single-use plastics. The ‘Designedisposal’ term I coined in 2011 probes design production’s dormant relations to a disposal hierarchy (Section 3.6) and describes my HE waste advocacy and reuse tactics with plastics (Section 2.1). For example, my early works photo bricolage (Fig. 1-3) depicts ‘Designedisposal’ aesthetics (Section 6.2) and reuse through making festive decorations from self-disposed yoghurt bottles (*Snowflake*; Fig. 1-3, left) and upcycled light wall-fittings transformed from my cleaning and washing product bottles (*Springbok Queen*; Fig. 1-3, right).

This PhD research builds on the pre-existing body of work from KraalD (2011–2013), including exhibitions and participatory engagements. Over the last eleven years, I had multiple opportunities to engage with the wider public in the UK. An early example is the 2012 exhibition at the Jeannie Avent Gallery in East Dulwich, London, *CitySelf Anima* (Fig. 1-4, left). This solo exhibition was followed by the

2013 *Thirst* prosumer installation created for an event by Eco Tales, a London-based eco-activist group, at the Twickenham Riverside at Orleans House Gallery (Fig. 1-4, right). I reused the *Thirst* installation for a week-long event in London for the site-specific group's outdoor exhibition at the Kingston Sculpture Park in 2013.

Fig. 1-4. CitySelf Anima, 2013. (2012). Photo of bricolage. *CitySelf Anima*, Jeannie Avent Gallery, East Dulwich, London (left). *Thirst*, prosumer installation for Eco Tales Festival, London (right); photo image, Karl Groupe, 2013.

'Alternative jargon' (see Section 6.1) and 'Designedisposal aesthetics' (Section 6.2) are existing conceptual tools carried over in my PhD research. Both research methods (DIWO and DIY) conceptualise plastic pollution and promote participation making with plastics. I use the DIY visualising method as a

metaphorical lens (see Section 6.5 and Chapter Nine) and the DIWO method as the conversational framework in design workshops (see Section 6.4 and Chapter Eight).

As the PhD research has transformed – as a result of the influence of many new global changes and my realisations over the last eight years – so has the over a decade-old praxis. Initially, my hands-on work was influenced by South African community engagement heroes (Dimitrijevic, 2013), the DIY social movement and 'indigenous re-use' (Fisher, 2010, p.167), which I curated in the *KraalD Pinterest* boards depository, see (Fig. 11-89, located in Section 11.2).

Halfway through my hands-on research, I was influenced by architectural and artistic Spanish collective Basurama's (2001–present) 'reflections of trash' (Basurama, 2014) and Stewart Walker's praxical re-use explorations and his contribution to the waste and design theory and practice of design for sustainability (Walker, 2012; 2014).

As my current influencers, my practice-based projects link to a 'two case' study method (Section 6.6), illuminating a waste issue by juxtaposing two selected cases. The first case is feminist landfill and maintenance artist Mierle Laderman Ukeles (1969; 1979; 2017): Section 6.6.1 and Chapter Seven. The second case is design researcher, discard studies and feminist environmental science activist Max Liboiron (2005; 2012; 2014; CLEAR, 2020): Section 6.6.2 and Chapters Eight and Nine. Section 1.2 then visually unpacks and informs the reader of the scope of the overall projects in this PhD thesis.

1.2 Practice-based Projects Overview

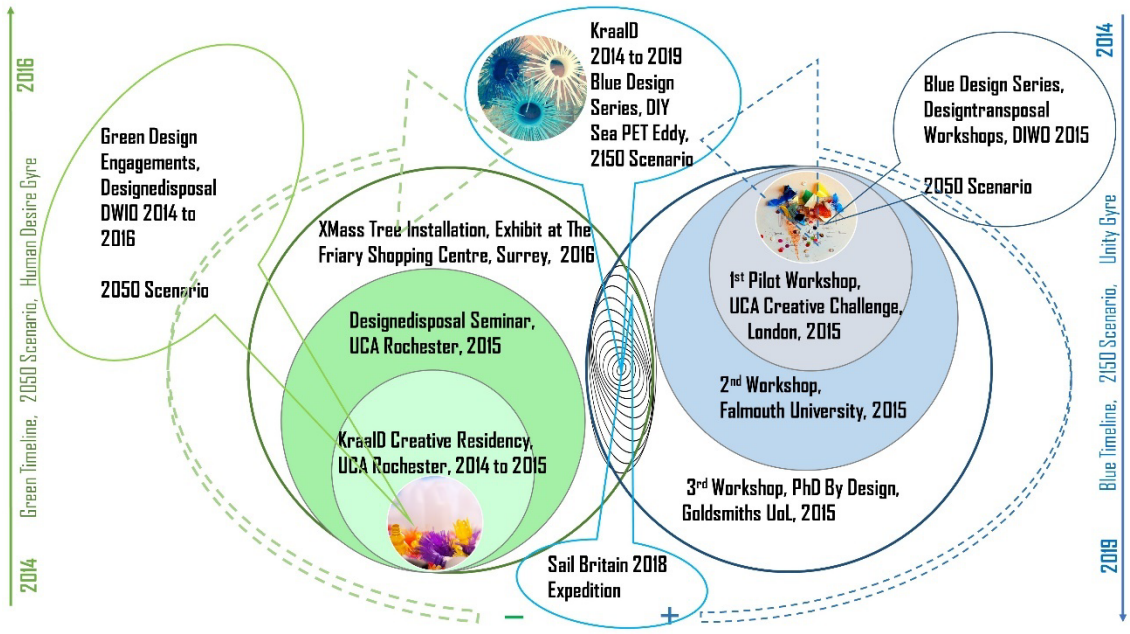


Fig. 1-5. Practice-based Projects Overview Diagram 2014–2019. Green design engagements (left) and blue design series (top and right), DIWO and DIY mode.

This section gives an overall picture of the practice-based projects. The main body of this PhD consists of two colour-coded streams (green for Chapter Seven and blue for Chapters Eight and Nine). My design research involves visualising, speculating and sensing stakeholders' responses to the ambiguous topic of plastic disposal and pollution. Through craft and art trash aesthetics (Section 6.2), I promote and explore aspects of reuse that are dormant in the contemporary waste management hierarchy (Section 3.6) and, here, multi-disciplinary combined with scientific findings on marine pollution (Sections 3.5–3.5.2).

Figure 1.5, the *Practice-based Projects Overview Diagram* 2014–2019, visually unpacks the 'Designedisposal' platform, which has branched out from the green

of the land (Chapter Seven) into the blue waterways of the ocean (Chapters Eight and Nine), creating a new visual strategy (Section 6.5) and expanding my existing vocabulary with the conceptual term ‘Designtransposal’ (Section 2.1 and Section 6.1).

For clarity, the ‘Designtransposal’ strategy creatively narrates the social and material life of mismanaged plastic discarded in oceans. Here, an emancipatory ‘state of being transposed’ (Braidotti, 2006; Section 4.3) is adjoined with design thinking, and visually and in-text exploring the ‘complex multiplicities’ (Ibid., 2006) of plastic waste entanglement: see Chapters Eight and Nine.

This PhD research follows the oceanic trail of discarded plastic things-in-motion – moved by currents and conceptually hoarded in the two research-themed conical gyres and two blue eddies (Fig. 1-5). For clarity, this research references two types of gyre – the geographical (Section 3.5.1) and the conceptual (Section 8.0). In Section 1.2, I conceptually and visually refer to ‘A Vision’ for Yeats’ 1937 explanation of gyres, which appeared in his wife’s dream as two oppositional cones – ‘one within the other, turning in opposite directions’ – historically sustaining similar patterns in time (Yeats, 2015, pp. 9–12). The project’s overview diagram (Fig. 1-5) represents the ’horizontal sectional view of the two cones. The left ‘discordia gyre’ cone explores waste management regimes with plastic (Fig. 1-5: the left, green timeline). The second ‘concordia gyre’ cone visualises ocean mismanaged plastic pollution (Fig. 1-5: the right, blue timeline).

My PhD projects (see Fig. 1-5) funnel into two ‘experiential scenarios’ (Candy, 2010; Section 6.5). The first DIWO participatory (Section 5.2) ‘2050 Scenario’ is

placed in the twenty-first century timeline and unpacks narrative for substitution options for plastic packaging and new plastics toxicity production policy, and also evaluates climate change risks brought by HE design stakeholders' insights and mappings (see Chapter Eight (Fig. 8-72, located in Section 8.4)).

The second DYI cli-fi scenario – the '2150 Scenario' – is cast in the twenty-second century's timeline. '2150 Scenario' is a visionary tale that visually re-imagines (Castoriadis, 1993; 1997; Section 5.3) established oceanic conditions that do not support most of the flora and fauna we know of and consume today (Ward, 2007). Instead, the '2150 Scenario' envisions a non-anthropocentric future through a jellyfish bloom art installation that thrives in highly acidic oceanic waters (see Chapter Nine (Fig. 9-83, located in Section 9.4)).

I work closely with plastic things (Fisher and Shipton, 2010), designed into the praxis-led socio-material narrative. Using a 'socio-material narrative' (Orlikowski, 2007), I intend to tell the 'super-wicked' (Levin et al., 2007) problematic story of plastic waste full of geological and environmental events (Zalasiewicz, 2008; Zettler et al., 2015) and find a temporary space (Section 5.4) mediated through HE participatory craft-making and material-led conversations (Section 6.4). Ultimately, I support change – from perceiving plastic waste as an undesired material externality to forging new 'positive waste' (Kennedy, 2008) aesthetics and relations with plastic things (Fig. 1-5) (see practice-based Chapters Seven, Eight and Nine). Section 1.3 lists my research aims and objectives.

1.3 Research Aims and Objectives

Main Research Question: How can design research in dialogue with marine social science and eco-feminist thinking prompt new ways to re-imagine socio-material change and conceptualise, visualise and re-vocalise plastic waste and oceanic pollution? See Chapter Four, Section 4.5. See new Chapter Two and Chapter Three, Chapter Four and Part Three.	**Sub-research Question 1:** How can a small design practice's engagement with disposed plastics temporarily re-connect the presently fragmented waste management services with the UK's local communities and Higher Education (HE) stakeholders? See Chapter Four, Section 4.5. SBQ: Focus on the exploration of 'Designedisposal' tactics in Chapter Seven.	**Sub-research Question 2**: What are the latent emotional aspects of stakeholders' relations and values towards consumption, plastic waste and marine pollution? See Chapter Four, Section 4.5. SBQ: Interprets through action new 'Designtransposal' visual strategies in Chapter Eight (Sections 8.2–8.3) and Chapter Nine (Section 9.0).
Aim: To contribute with participatory approaches towards a deeper engagement with waste and advocate for oceanic plastic pollution awareness in the context of HE. See DIWO practice Chapters Seven and Eight. **Aim**: To create multi-disciplinary perspectives of marine plastic pollution using positive waste aesthetics, conceptual vocabulary and innovative visual strategies. See DIWO practice Chapter Eight and DIY Chapter Nine.		
Objective: First, I explore how the waste and pollution topic can generate HE participatory engagement, promoting the notion of the ocean as the largest **mismanaged landfill.** See DIWO practice Chapters Seven and Eight.	**Objective**: Second, to develop sustainable learning methods for spatial representations through DIY and DIWO craft techniques **with positive waste.** See DIWO practice Chapters Seven and Eight and DIY Chapter Nine.	**Objective**: Third, to promote waste and environmental awareness, generating concepts and vocabulary voicing new materiality perspectives and **'non-human others' worldviews.** See DIWO practice Chapters Seven and Eight and DIY Chapter Nine.

Table. 2. Research Aims and Objectives. Main research question and sub-research questions.

This section unpacks two aims and three objectives (see Table 2). My PhD research initially conceptualises and re-imagines urban landfill (mis)management and plastic disposal systems (Chapter Seven). Applying existing 'Designedisposal' activist tactics leads to the 'Designtransposal'' visual strategy, which vocalises new terms (Chapter Two). The DIWO participatory workshops

visualise oceanic plastic pollution (Chapter Eight), and, in Chapter Nine, I re-imagine the vibrant materiality of plastic discard funnelled into the cli-fi future vision (Section 9.4) influenced by eco-feminist thinking and 'new materiality' (Chapter Four). For the reader unfamiliar with some terms, such as climate science fiction, see Section 2.1 – 'Vocabulary and Compendium Index'.

I advocate a change to single-use plastic use and disposal while promoting – through my research praxis – 'new materiality' values with HE design stakeholders' co-designing relations with plastic waste. I do this by exploring the positive aspects of plastic waste through reuse practices and designing waste ontologies. As a result of the broad scope of the enquiry, I had two aims supporting my main research question and two sub-questions (Chapter Four, Section 4.5):

- To contribute to participatory approaches towards a deeper engagement with waste and advocate for oceanic plastic pollution awareness in the context of HE.

- To create multi-disciplinary perspectives on marine plastic pollution using positive waste aesthetics, conceptual vocabulary and innovative visual strategies.

These two multi-faceted aims incorporate three objectives for the research development and participatory engagement (Table 2). First, I explore how the waste and pollution topic can generate HE participatory engagement, promoting the notion of the ocean as the largest mismanaged landfill (Chapters Seven and Eight).

For example, I incepted and led HE design-based waste-centric events (Chapter Seven) and participatory eco-centric design workshop engagements (Chapter Eight) using DIY and DIWO tools interchangeably. I am designing a socio-material narrative in the complex global context. The first objective's link in the field review section, entitled 'Plastic Packaging Growth' (Section 3.4.1) forms the theme for the 'HE Creative Residency' at the UCA (Section 7.1). The plastic narrative migrates from managed waste disposal to mismanaged oceanic discard and continues in the section about the North Atlantic Gyre and garbage patch (Section 3.5.1). The garbage patch became the 'metaphorical lens' (Candy, 2010; Section 6.5) for three HE 'Designtransposal' visualising plastic pollution engagement workshops (Section 8.2). See Table 2.

Second, the research develops sustainable learning methods for spatial representations through DIY and DIWO craft techniques with positive waste (Chapter Six), applying existing 'Designedisposal' activist tactics (Chapter Seven) in metaphorical participatory visualisations of the Anthropocene (Chapter Eight). I continue to explore wet spaces in my DIY 'Sea PET' land art series and participate in the art and science plastic pollution sailing expedition and group exhibitions (Chapter Nine). See Table 2.

Third, the research seeks to promote waste and environmental awareness, generating concepts and vocabulary voicing 'new materiality' perspectives and the worldviews of 'non-human others'. The term 'non-human others' is borrowed from the Puig de la Bellacasa (2017) and means outside human worlds. For example, I developed a conceptual term to 'gaze in' (Section 2.1) into oceanic space and as a method to visualise pollution that is invisible to the human eye –

through the personas of ‘non-human others’ (Section 6.3). This is applied in Chapter Eight, ‘Visualising the North Atlantic Gyre Patch’ and visually perceives plastic pollution by stakeholders from the migratory point of view of the lanternfish (Dimitrijevic, 2020). See Table 2.

With and through the multiplicity of the two aims and three objectives posited, I unpack the main research question and two sub-questions (see Section 4.5). The main research question is informed by Chapter Three, ‘Literature and Field Review’, and Chapter Four, ‘Theoretical Review’, to explore gaps in knowledge and create new perspectives, awareness and engagements with plastic materiality and visualising plastic pollution (Chapter Ten, Section 10.1).

In summary, my research projects challenge status quo recycling systems, promoting reuse and waste awareness in HE design (Chapter Seven). Geographically, the landfill context has leaked into mismanaged marine space (Chapter Eight). The study has begun to identify the oceans as the most extensive living landfill, expanding its scope to understand – not just for humans – when, where, to whom, how and why plastic discard matters (Chapter Nine). Section 1.4 sets out the broad context of treating waste.

1.4 The Context of Waste Disposal

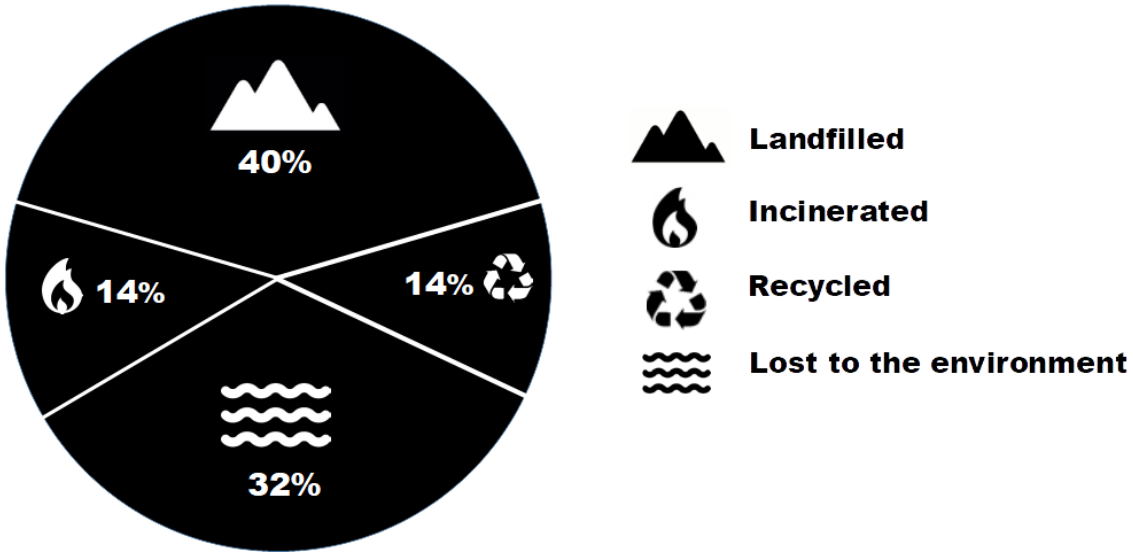


Fig. 1-6. Niels Johansson, 2021. Overview of the global (mis)management of plastic packages (World Economic Forum 2016).

This section presents an overall view of the context of waste management (disposal) and (mis)management (discard). Western society operates in a throwaway mode, with approximately 1.3 billion tonnes of solid waste generated per year (World Bank, 2012, p. VII). Johansson (2021) provides an overview pie chart of global management and (mis)management data of single-use plastic packages (see Fig. 1-6). According to the World Economic Forum (2016), 40% of plastic packaging ends up in landfill, 14% is incinerated, and 14% is recycled, leaving a staggering 32% lost to the environment and finding its way via wind and

waterways to oceans (World Economic Forum, 2016, cited in Johansson, 2021, Fig. 1). Lebreton and Andrady (2019) introduced the term 'mismanaged plastic waste' (MPW), which I use here for single-use plastic packaging lost to the environment. See Section 2.1 for a description of MPW.

However, only a small proportion of MPW comes from household waste – combined waste from businesses within the construction sector, the manufacturing industry, the service sector, forestry and agriculture is several times more (Corvellec et al., 2018, p. 7). Plastics manufacturing grew from 15 million tonnes in 1964 to 311 million tonnes in 2014, and is expected to double again over the next twenty years (Ellen MacArthur Foundation, 2017, p. 11). For the past five years, global production of virgin plastics has continued to grow because only 20% of the >300 million tonnes of plastics produced per year is recycled. The vast variety of plastic types presents a complication for the viability of recycling, and the quantity and diversity of single-use products put increasing pressure on the waste management infrastructure (Napper, Pahl, and Thompson, 2021, p. 28).

The Worldwatch Institute informs us that an average person living in Western Europe or North America consumes 100 kilograms of plastic packaging each year (Gourmelon, 2015, pp. 2–3). In 2017, Recycling of Used Plastic Limited (RECOUP) informed the public that 1,244,774 tonnes of mixed household plastic packaging in the UK ends up in landfill annually. Their *UK Household Plastics Collection Survey* reported that over 5.5 billion household plastic bottles were not recycled in 2016 – the average UK household uses nearly 500 plastic bottles a year, but only just under 290 are recovered (RECOUP, 2017, pp. 5–7).

The 2018 RECOUP report states that the organisational emphasis on plastic recycling is on communicating the need for emptying and rinsing plastic bottles and packaging with cold water. For the first time, this affirms an increasing focus on littering in our natural environment, particularly ocean litter. From the recycling feasibility point of view, asking the public to wash plastic disposal is not sustainable, regardless of whether the water used is hot or cold (RECOUP, 2017, pp. 40–42).

Globally, change towards waste disposal is taking place, and 'issues surrounding access to waste have become increasingly politicised' – in many instances, waste has become a valuable resource, driven by production of waste-based commodity frontiers (Demaria and Schindler, 2015, pp. 303–309). Governmentally promoted Energy from Waste (EfW) plays an important role in diverting waste from landfill and providing energy not using fossil fuels (DEFRA, 2018). This waste as a resource (EfW) regulation is enabled by a new energy-politics frontier that encourages the privatisation of waste management and favours highly technological methods of thermal processing, such as incineration (Alexander and Reno, 2014; Section 3.6).

Incineration of municipal solid waste (MSW) is expanding, but only in northern European countries, as a result of the high costs of operational start-up, setting up infrastructure and maintaining operations. In European countries, such as the UK and Sweden, the landfill disposal of non-recyclable plastic has become more expensive than incineration over the last decade. Thermal energy extraction is Sweden's most common method of treating household waste, followed by material recycling. However, when defining overall disposal statistics, 'if

commercial and mining waste are included, disposal is then the most common way to manage waste' (Corvellec et al., 2018, pp. 6–7).

Official figures for the UK's local authority areas reveal that over forty councils now burn more than half of all plastic, paper and household rubbish. The country burns 38.5% of all waste collected (Daily Mail, 2018). The worst council offenders are Westminster and Lewisham, in south-east London, where a staggering 82% of plastic, paper and household rubbish was burned between 2016 and 2017 (DEFRA, 2018).

On the other hand, incineration is an expensive technology that is presently evolving but still struggling to regulate the air pollutants, ash and smoke that result from the process. MSW contains at least 12% of plastic waste, which releases toxic gas pollutants when burned, including 'Dioxins, Furans, Mercury and Polychlorinated Biphenyls into the atmosphere' (Verma et al., 2015, p. 701).

In their 2018 response to public concerns regarding air quality, the Department for Environment, Food and Rural Affairs (DEFRA) stated that 'the data shows air pollution has improved significantly since 2010'. In relation to the rapid increase in the number of incineration plants in the UK, DEFRA states that 'local authorities are best placed to decide upon the technology required for handling its waste to best suit the local circumstances' (DEFRA, 2018). However, environmental grassroots activist groups – such as Zero Waste Europe, the Global Alliance for Incinerator Alternatives (GAIA) and, locally, the UK Without Incineration Network – heavily critique and oppose booming thermal waste treatment technologies. They argue that the EfW process encourages increased waste production

because of the large volumes needed to operate the incinerators – thereby undermining the recycling initiatives of local authorities and discouraging waste reduction (Bawden, 2019).

In summary, as part of the ongoing rise in manufacturing single-use plastics, high landfill taxes and waste disposal import bans are the hallmarks of the current waste management closed-loop systems crisis. Moreover, recycling allows consumption endorsement, and incineration creates invisible and long-term health hazards because burning plastics generates toxic gases that accumulate and circulate nano-plastics in the natural environment. Waste management systems (WMS) in controlled closed-loop disposal and non-controlled '(mis)managed' (Johansson, 2021, see Fig. 1-6) open-loop discard areas impose economic and environmental burdens.

In contrast to the current focus on closed-loop waste management regimes (Section 3.6), the focus in this research is on promoting open-loop reuse with single-use plastic, as 'design for re-use has the potential to increase people's awareness of the environmental impact of packaging' (Fisher and Shipton, 2010, p. 155). Open-loop reuse turns products such as plastic bottles into different products or artefacts. This is a big and challenging step away from the closed-loop recycling status quo. It is therefore vital for my research to support and participate in the socio-material change, enabling visualisation of plastic pollution and its emergence into the future. Section 1.5 explores the hermeneutics of design terminology, engaging in ontological designing through the participatory workshop and hands-on experience of the characteristics of oceanic micro-plastic waste.

1.5 Designing Waste Ontologies

‘The labeling of something as waste must always ask: waste for whom?’

— Kevin Lynch, 1990, p. 148.

Fig. 1-7. Informal urban landfill. Kent, UK.

This section explores design theory and waste ontology and introduces the terms ‘wet ontology’ and ‘positive waste’. Ontology is the philosophical study of the nature of being, a branch of metaphysics concerned with being, becoming, personal existence and the relationships between them. Design theory (Chapter Three, Section 3.2), termed a hermeneutics of design, follows the ontological critique undertaken by the German philosopher Heidegger (1889–1976), which

says that thinking is thinking about things situated in our everyday engagements (Chapter Four, Sections 4.1–4.2 and Section 6.3).

The quest to ask about being can be traced back to ancient Greek philosophers – Aristotle, Parmenides and Anaximander – who significantly influenced Heidegger's initial works (IEP, 2017). To clarify, 'ontic refers to what is, ontology refers to an enquiry of what is, while ontological refers to the condition or behaviour of what is' (Willis, 2007, p. 81). The hermeneutic circle implies a designing both of the being and of that which was designed. Design-based ontological enquiry questions the effects of what is living in artificial worlds and what is artificial. To complicate this, 'ontological designing is a way of characterising the relations between human beings and lifeworlds' (Willis, 2007, p. 93).

The term 'waste' suffers from an ontological ambiguity – often described as an excess, surplus, burden and energy resource. The word 'waste' derives from the Latin 'vastus', meaning unoccupied or desolate. As a noun, waste becomes the by-products of something, and the unusable remains materiality that is not wanted. A photo that I took in 2017 (Fig. 1-7), the *Informal Urban Landfill*, shows an example of mismanaged waste in the back gardens of low-income housing in Chatham, Kent. From the point of view of cats or birds, it is a magical woodland place. From the human perspective, however, it is an ugly area of barren and uninhabited wasteland. Often overlooked, the unregulated (mis)managed waste space is, in a sense, arid to humans but giving a plethora of life to flora and fauna (Fig. 1-7).

As a verb, waste is used with an object as an act or instance of using or expending something carelessly or for no purpose. In archaic terms, waste leads to the gradual loss or diminution of something (Cambridge Dictionary, 2017): 'The real problem is that anything and everything can become waste' (Kennedy, 2008, p. 4).

In *An Ontology of Trash, The Disposable and Its Problematic Nature* (2008), Kennedy explores the meaning of disposable objects and differentiates rubbish from waste. In articulating an ontological account of trash as a mode of violence and considering positive waste, Kennedy claims that waste results from unsettled human relations with nature: 'Waste occurs only with the subtraction of worth… Since values are our investment into things, their subtraction marks our divestment from or indifference to things' (Kennedy, 2008, p. 5; Section 3.7).

The ontologies of organisation studies have recently been influenced by cultural, linguistic and post-structural approaches that build on an idea of socially constructed realities. Fleetwood (2005, p. 197) describes the ontological discussion in organisational and management studies as ambiguous, making it difficult to get to the bottom of ontological claims and, of course, to locate the source of any ontological errors'. Changes in technological and political economy read through the waste stream perceive waste as economically unfavourable. Social sciences, however, inform us that society is also ordered and organised by the trade and re-purposing of waste (Bulkeley and Gregson, 2009, p. 931).

In 'acknowledging that waste reduction is extending the social, cultural, and economic lives of things' (Bulkeley and Gregson, 2009, p. 930), upcycling

becomes more feasible or acceptable for surplus than for excess. However, if a surplus finds no ultimate use, its disposal imposes economic and environmental burdens that are often disproportionately distributed across race, location and income clusters (Levidow and Upham, 2016; Levidow, 2017). Waste upcycling management is currently only feasible or conceivable for thermal technologies and not an active part of preventing excess (Ibid). To unpack this research argument favouring upcycling and promoting reuse, I discuss waste disposal ethics through understanding crucial socio-economic values (Hawkins, 2006) in more detail in Chapter Three, Section 3.8, 'Re-thinking Waste'.

I move the research place and space from informal landfill on the Earth to the largest unregulated landfill in the ocean. Human geographers, Steinberg and Peters (2015), propose that their 'wet ontology' approach can help in thinking 'with' the sea and assist in re-conceptualising the oceans' uncertainty (Section 5.4). The ocean is a paradoxical space, overlooked by humans who live on the land. Steinberg and Peters (2015, p. 248) extend their focus to more-than-human ocean encounters and related temporality issues, dynamism, rapidity, mobility, volume, depth, verticality, churning, drifting, flow and re-bordering.

Steinberg and Peters (2015, p. 254) highlight specific three-dimensional qualities of the sea, arguing that 'the volume of the sea shifts very differently' to a landmass. Specifically, 'liquid molecules (the sea as fluid) are looser and held further apart' (Ibid.). The sheer sea volume shifts spatially through large-scale movements facilitated by planetary winds, jet streams and extra-planetary gravitational forces (Section 3.5.1). The biota entangled with the debris in the wet places and spaces (Section 3.5.2) are in perpetual multi-directional vertical depth

motion, like air circularity. Discarded plastics accumulate in oceanic gyres, and the garbage patches are extraordinary manifestations to which I particularly relate, and visualise in depth in Part Three, Chapter Eight, ‘Designtransposal: Blue Design Series’ – DIWO and Chapter Nine, ‘Designtransposal: Sea PET’ – DIY projects.

In the context of both ‘Designedisposal’ on the land (Chapter Seven) and ‘Designtransposal’ in the ocean (Chapters Eight and Nine), plastics waste ‘is imbued with meaning that may or may not be pregiven, but is located largely within the object itself’ (Moore, 2012, p. II). Thus, I always ask the same question Lynch (1990) addressed for labelling devalued plastic trash: ‘waste for whom?’

In this research, I summarise two cli-fi narratives: the rise in sustainable single-use packaging from the (DIWO) human-centric ‘Scenario 2050’ and (DIY) ‘Scenario 2150’ depicting oceanic plastic pollution (Chapters Eight and Nine). Designing the waste ontologies process opens the imaginary oceanic gyre patch space view to design stakeholders (Section 8.0).

Following plastic discard in the ocean, implicated by aquatic social relations, means that plastic pollution represents not only death and privation but also the processes of primordial life (Sections 3.5.2 and 9.4). Plastic entanglement offers a permanent habitat to oceanic wildlife, in becoming transformed materiality and transposed into the planetary biolayer, the ‘Plastisphere’ (Section 3.5.2 and Chapter Nine).

This research therefore became a spatial and geographical plastic waste expedition that visually emphasises the multi-species relational aspects to ‘positive waste’, borrowing the term from Kennedy (2008, p. 9).

Section 1.6 discusses the significance of my research and its expanding research design boundaries.

1.6 Research Significance

This section discusses the significance of my multi-disciplinary research. This PhD research addresses 'super-wicked problems' (Levin et al., 2007, see Section 3.3). My research synergises design thinking, feminist theory and art and craft with plastic waste, reuse, marine science, discard study, geography and environmental activism, thereby forging a social path of possibilities for plastic material innovations to follow.

This research demonstrates the collaborative entanglements of scientific discourse (Allison and Bassett, 2015) and dark ecologies art (Kramvig and Pettersen, 2016, Section 3.3) with my DIY design research (Chapter Nine). For example, through applied 'Designedisposal Aesthetics', Section 6.2, I politically comment on the rise of the plastic packaging industry – Section 3.4.1 – theoretically influenced by 'new materiality' (Chapter Four). In my project engagements, I actively promote new vocabulary (Chapter Two) – 'design for re-use' – and a shift in awareness of the relationship between urban and ocean landfill (Part One to Part Three).

From a design research point of view, only in the past decade has a body of work on 'discard study' (Liboiron, 2012; 2014; Section 6.6.1) and waste ontologies (Fisher and Shipton, 2010; Walker, 2012; 2014; Basurama, 2014; Sung et al. 2019; see Section 3.1) begun to emerge. Ek and Johansson (2020) observe that disposed and discarded waste remains within a theoretical discourse in the social

and cultural domain despite its prominent everyday presence. Existing waste research sits segmented across social science, geography and waste management departments. In the humanities, to some extent, the waste topic is more present in art (Laderman Ukeles, 1969; 1979; 2017; *Out to Sea? The Plastic Garbage Project.* Museum für Gestaltung Zürich, 2009–2017) and design media discourses (Knoetze, 2013; Repessé, 2016; Liboiron, 2005; 2014) than in design (What Design Can Do, 2020; Waste2Worth Team, 2020).

This research is relevant because it seeks to map and visualise the disposal and discard of plastic waste, design waste ontologies and contribute to design research knowledge through sustainable education (Boehner, 2014; 2018; Fletcher and Tham, 2019; see Sections 3.3 and 3.1): 'In order to reduce plastic waste, education is of the utmost importance as education can change people's knowledge, attitude, and behaviours toward plastic waste management' (Chow et al., 2017, p. 127).

In one sense, my early research (Dimitrijevic, 2010) and South African HE design curriculum activism with waste – 'Trash' (2008), 'Cool Trash' (2009) and 'Play Trash' (2010; Fig. 1-2) – sit ahead of the works that follow. The curricula of most design and craft departments in HE institutions in the UK aim to prepare undergraduate and postgraduate students for professional work and design research is primarily engaged in service to industry.

The topics of waste sociality (Discard Study, 2016; 2019) and oceanic plastic pollution (Liboiron, 2012; 2015; 2020) continue to emerge. After fifty years of design activism (Wood, 2007; Tham, 2008; Fuad-Luke, 2009; Fry, 2010; Mazé,

2016; see Section 3.2), they remain positioned within a theoretical discourse in design curricula of HE institutions in the UK. The social relationship (Manzini, 2014; 2015) and ethical responsibility (Papanek, 1985) of design professions towards disposal and discard (McDonough and Braungart, 2002; 2013) remain in an embryonic stage of professional practice development – see Fig. 3-11, What Design Can Do (WDCD), *No Waste Challenge* Campaign (2020), Section 3.1.

My passion for waste activism is grounded in furthering design education engagements and responding to the Higher Education Funding Council for England (HEFCE), which strives to 'continuously improve its own impact on the environment, society and the economy' (HEFCE, 2005, p. 9).

As an example of conjoining waste, I have followed the past decade's emerging academic research gathered under the waste research platform's *Discard Study* blog. In a recent call for contributions, the waste collective self-definition for interdisciplinary 'discard study' 'stands for social, political and economic processes that render particular objects, practices and populations disposable' (Discard Study, 2019).

My PhD research anchors its contribution to an HE community through my research praxis related to 'discard study' in specific engagements with plastic waste disposal (Chapter Seven) and visualising oceanic plastic discard (Chapters Eight and Nine).

First, through participatory action research (Section 5.2), I developed waste-centric 'Designedisposal' design literacy (Chapter Two), explored through practice-based bottom-up engagements with waste (Chapter Seven). Second,

through the ‘Designtransposal’ visual strategy (Section 6.5), I connected ontological design thinking (Willis, 2007; Section 1.5 and Section 3.2), new materiality (Braidotti, 2006; Hird, 2009; Sections 4.3–4.4), re-use of plastic waste (Fisher, 2010; Sections 1.1 and 3.1) and social geography (Steinberg and Peters, 2015; Sections 1.5 and 5.4). I am designing with plastic waste (Chapter Seven) and wet waste ontologies (Chapter Eight), exploring the diverse context of marine science’ (Sections 3.5–3.5.2) and influencing two cli-fi ‘experiential scenarios’ (Candy, 2010) as outcomes (Chapters Eight and Nine).

In relation to both design research and discard study, the contribution of this PhD thesis is in its extension of the boundaries of the discipline of design, critically questioning the ‘hegemony of recycling insufficiency’ (MacBride, 2011, pp. 109–112). This research promotes reuse tactics and refines insight beyond recycling and thermal waste strategies, defined as the waste management ‘business-as-usual’ scenario.

With plastic things (Brown, 2001; 2016; 2017) and visualisation of innovative and creative modes of participatory engagement in HE with student stakeholders in undergraduate, postgraduate and graduate design departments, I use design vocabulary to bring about radical waste tactics. These promote plastic’s circularity through reuse, raising awareness of oceanic plastic pollution, in the HE context. In summary, this PhD research makes a novel design research contribution to discard study, integrating feminist theory into practice-based design research approaches and creating a waste-centric vocabulary that demonstrates visually new knowledge.

Section 1.7 gives a summary of the research outputs and published contributions and details the ethical integrity of Goldsmiths, University of London, for the PhD research action components – particularly the participatory workshops.

1.7 Research Output and Ethical Integrity

This section sets out a summary of my research outcomes. The primary outputs of my research are this PhD thesis, a vocabulary compendium, drawings, mappings, visualisations, digital and voice recordings for the workshops, installations, exhibitions and one participatory sailing expedition that I created and participated in over the past eight years under the research praxis banner. My PhD research incorporated half a dozen conference contributions, one 'Designedisposal' HE seminar event, two published book chapters and one practice book section contribution (located on p. 16, Table 1, MPhil/PhD Research Timeline 2014–2022).

For the first book chapter contribution, gratitude is extended to the co-editorial team led by Kate Fletcher, Louise St Pierre and Mathilda Tham, and to the participatory authors' working group, who all guided my 'Living Landfill' chapter in *Design and Nature: A Partnership* (2019), a book published by Earthscan from Routledge. My second chapter contribution was 'Visualising the North Atlantic Gyre Patch' in *Perspectives on Waste from the Social Sciences and the Humanities: Opening the Bin*, published by Cambridge Scholars Publishing in May 2020. I am grateful to Richard Ek and Nils Johansson, the co-editorial team from the Waste Management Department of Lund University, and special thanks go to Professor Hervé Corvellec for his valuable early editorial comments on my chapter.

The third book contribution section resulted from answering an open call for contributions published in a book – *Design Research for Change*, 2019 – edited by Paul A. Rodgers of Lancaster University. The book, funded by the AHRC, was published by Lancaster University. The KraalD CitySelf Anima was selected and presented in a section of this book.

My research conduct followed ethical guidelines and standards of integrity from Goldsmiths, University of London, identified in The Concordat to Support Research Integrity (Universities UK, 2019) and following the UKRI Policy and Guidelines on Governance of Good Research Conduct (UKRI, 2017) and Goldsmiths University of London Research Ethics and Integrity Sub-committee (REISC, 2020). As all three 'Designtransposal' workshops were held in 2015, a retrospective ethics application was submitted and approved by the Design Departmental Research Ethics and Integrity Committee in January 2020.

For every participatory workshop activity with HE stakeholders, the rights and dignity of individuals and groups were respected. All 'Designtransposal' workshop stakeholders participated voluntarily and were appropriately informed of their anonymity. The research topic was described in detail to all workshop participants through the workshop recruitment posters and introductory visual and oral presentations (Fig. 11-88, Section 11.1).

As a result of MA students' confidentiality and regulatory protections (Universities UK, 2019), Chapter Seven discusses only the open event in Section 7.2 – the 'Designedisposal Seminar' (Dimitrijevic, 2015) – and debates and depicts the behind-the-scenes processes in Section 7.3, 'XMass Tree'. In Section 7.4, I

conclude Chapter Seven's action engagements through the UCA public exhibition, which was part of a collaborative project with the recycling campaign of the Surrey Waste Partnership.

In addition, all participants were verbally informed that they could change their minds at any time and withhold their workshop engagement. In Part Three of the thesis, I address photographic anonymity and ethical issues in the three Designtransposal workshops – Sections 8.1–8.4. The Goldsmiths, University of London retrospective ethical form can be found in the appendices (Appendices, Section 11. 0 – Table 7, Research Ethics Form 2020).

1.8 Research Thesis Structure

Fig. 1-8. PhD Thesis Structure, 2022.

My PhD thesis is a structured sandwich composed of three parts and ten chapters (see Fig. 1-8). Part One consists of four chapters: Chapter One is the 'Introduction', Chapter Two, 'Vocabulary and Compendium', Chapter Three the 'Literature and Field Review', and Chapter Four the 'Theoretical Review'. Part Two comprises two chapters: Chapter Five, 'Research Methodology' and Chapter Six, 'Research Methods'.

Part Three comprises four chapters, opening with chapters detailing practical work – Chapter Seven, 'Designedisposal: Green Design Engagements', Chapter

Eight, ‘Designtransposal: Blue Design Series’ and Chapter Nine, ‘Designtransposal: Sea PET’. Finally, my PhD thesis text closes with Chapter Ten, ‘Conclusion’, followed by the bibliography and appendices (Fig. 1-8).

The ‘Introduction’ in Chapter One sets out my South African HE waste activism background and UK research as praxis influences for this PhD and visually narrates an overview of practice-based projects (Sections 1.1–1.2). Section 1.3 unpacks my research aims and objectives. Section 1.4 sets up the broadly managed waste and (mis)managed waste context, followed by an ontological design inquiry into oceanic plastic waste, ‘Designing Waste Ontologies’ (Section 1.5), which looks at Willis’ (2007) ontological design approach, Kennedy’s (2008) aspects of ‘positive waste’ and Steinberg and Peters’ (2015) wet ontology – Section 1.6. These all reveal the significance of my research, before I detail the research outputs and ethical integrity of my three action workshops – see Section 1.7. Chapter One thus provides a structural overview of the thesis document (Section 1.8).

Chapter Two – ‘Vocabulary and Compendium’ – details waste-centric terms and eco-centric concepts. Chapter Two’s ‘language-game’ (Wittgenstein, 1958; Hekman, 2010) activism became essential for the praxis’ creative imaginary and establishing its meanings through waste aesthetics and the spoken and written word. Chapter Two follows the relational way of vocalising my thinking, making and visualising with plastic things, and branching into two eddies – the green ‘Designedisposal’ engagements in Chapter Seven and the blue ‘Designtransposal’ practice-based projects in DIWO in Chapter Eight and DIY Sea PET in Chapter Nine.

Chapter Three, 'Literature and Field Review', opens with the vignette in Section 3.0 followed by three design sections – Sections 3.1–3.3. Section 3.1 – 'Green Design Evolution' – presents a historical timeline and the emergence of the professional disciplines of 'green design' (Gibson et al., 2011), 'sustainable design' (Papanek, 1985) and 'ecological design' (Fargnoli et al., 2005; Buckminster Fuller, 1963), visually juxtaposed with contemporary design activism with waste (see Fig. 3-11, *No Waste Challenge 2020*).

Section 3.2 – 'Design Research Activism and Future' – opens with a brief overview of influences in design philosophy (Willis, 2019, Fry, 2019). In this section, I specifically focus on 'design activism' (Fuad-Luke, 2009; Cetin, 2016) and 'ontological design' (Willis, 2007; 2015; Escobar, 2018), followed by critical, speculative studies and futurity (Mazé, 2016; Schalk et al., 2017; Candy and Kornet, 2019). I close this section with the hypothetical 'PlasticfulFoods' project, a speculative design project (Fig. 3-12) developed by the Waste2Worth team, held in partnership with the University of Amsterdam and Hogeschool Amsterdam (Waste2Worth, 2020). It is outside the scope of this PhD to present an exhaustive overview of design for sustainability and design activism. Here, Sections 3.1–3.2 focus on some key approaches to environmental awareness, sustainability, design activism and design research. Interdisciplinary humanities ecological advocacy is then announced in the following section.

Section 3.3 – 'The Role of Design and the Humanities in the Changing Climate' – argues that humanities and social sciences research brings better human understanding of climate change stewardship (Allison and Bassett, 2015). For

example, in humanities and design, the customary use of a multitude of visual and interdisciplinary approaches is not allowed in quantified scientific findings.

Sections 3.4–3.5.2 integrate selected quantitative plastic packaging, human growth data and environmental scientific findings on marine pollution and geography. This part consists of a group of short sub-sections. Sections 3.4–3.4.2 help situate the complex plastic waste and pollution problem discussed in Sections 3.5–3.5.2. They identify the growth in urban and human populations as one of the primary influences encouraging increased plastic manufacturing. The rise in consumption of single-use packaging links to the global issue of unregulated oceanic pollution.

Section 3.4.2 introduces the reader to dystopian environmental evidence transgressions and conservative scientific projection points. In Sections 3.5–3.5.2, I explore new scientific marine findings for plastic oceanic pollution and briefly describe the five planetary gyres and garbage patch properties. In this way, I introduce the reader to the twenty-first-century scientific discovery of the new man-induced biolayer, the ‘plastisphere’ (Section 3.5.2). Unpacked marine science evidence and geographical properties give an understanding of the contextual complexity in plastic pollution research. As a result of the broad spectrum of plastics and pollution, my study has focused only on micro-plastics, and I briefly describe the presence of nano-plastics in waterways.

The last three sections of Chapter Three (Sections 3.6–3.8) set out critical commentary on the existing waste management hierarchy, the ontology of waste and the ethics of disposability. They outline the current priority order of waste

management politics (Section 3.6), reinforcing the importance of exploring new ways of relating to 'positive waste' (Section 3.7). Section 3.8 concludes the waste and discard topic by unpacking Hawkins' (2006) waste ethics (see Fig. 1-8).

Chapter Four – the 'Theoretical Review' – presents research into socio-cultural relationships with 'new materiality' and affirms that the theoretical influence is integral to forming the praxis (Section 4.0). Theory feeds new insights into everyday practice, enhancing the personal and emotional aspects of the oceanic world, and affirming robust marine science findings. The birth of the 'plastisphere' posits a new 'wet ontology' that includes plastics in interpretative analyses towards understanding the world of 'non-human others'. Chapter Four finishes with Section 4.5 and posits my research questions.

The theoretical influences of Appadurai's (1986) 'methodological fetishism' and Brown's (2001) 'thing theory' (Sections 4.1–4.2), combined with the 'neo-materiality' of Braidotti's (2006) eco-feminist 'transpositions' (Section 4.3), and Hird's (2009) 'micro-ontologies' (Section 4.4) all play essential roles in the theory-led component of the research, forming my praxis-based post-humanist paradigm stance.

Section 4.2 examines Atzmon and Boradkar's (2017) editorial gathering in *Encountering Things*, which paired together design processes and theories of things. Further, I identify the theoretical relationships of design research with the updated 'theory of things' by Brown (2016), directly influenced by Heidegger's (1950) metaphysical concept of 'thingness'. In Section 4.3, I expand on Braidotti's (2006) 'vibrant matter' and, in Section 4.4, I expand on Hird's (2009)

considerations of Barad's (2007) scientific 'material entanglements', Latour's (1991) 'actor-network theory' and Latour's (1993) 'parliament of things' as essential factors in formulating Hird's bacterial encounters.

Section 4.5 unpacks the main research question and two sub-research questions. Section 4.5 closes Chapter Three, summarising various theoretical influences on new relationships with plastic things and 'non-human others' and opening the critical post-humanist paradigm to situate my PhD's praxical research and vocabulary. Part One therefore concludes in support of the mismanaged landfill and socio-material narrative that encounters plastic things and visually explores plastic pollution.

Part Two of this thesis consists of two chapters – Chapter Five, 'Research Methodology', and Chapter Six, 'Research Methods' – explored through various praxis-derived innovative approaches. After a visual overview in Section 5.0, Chapter Five continues with a post-humanist praxis paradigm section (Section 5.1), followed by a discussion of Lewin (1946) and Kemmis and McTaggart (2007) in 'Participatory Action Research' (Section 5.2) and a discussion of Castoriadis (1997) in representations of 'Praxis and Social Imaginary' (Section 5.3). Section 5.4 opens with 'Others Space Place', which looks through Lefebvre's (1974) spatial triad lens, enabling me to merge human-controlled spatial intersection with 'wet ontology' (Stainberg and Pieters, 2015) in exploring the oceanic world.

Chapter Six – 'Research Methods' – depicts various bespoke methods derived and approached through hands-on green 'Designedisposal' tactics and engagements and visualised through blue 'Designtransposal' strategies. Section

6.0 starts with a ‘Reflective Bricoleur’ followed by new modes of plastic-material textual representations forging ‘alternative jargon’ (Section 6.1). ‘Designedisposal aesthetics’ (Section 6.2) incorporates ‘Designedisposal’ craft tactics with single-use plastic waste.

Supporting the blue design series, Section 6.3 – ‘A Lanternfish Gaze in’ – forms a wet landfill ontology following the migration of lanternfish ‘non-human others’. The ‘Designtransposal Design Workshop’ (Section 6.4) supports the HE participatory action research. Section 6.5’s multi-layered representations of the future aid in creating visual concepts of ‘Designtransposal’ strategies and deriving two speculative future scenarios. The oceanic social imaginary is visually explored and funnelled through the ‘experiential scenarios’ metaphorical lens (Candy, 2010; Section 6.5), supporting the ontological and main research question enquiry (Section 4.5). Section 6.6 – ‘Designing Case Study’ – unpacks the selection process for two feminist case studies in closing the sixth chapter: ‘Discard Study and Pollution Activism’ – sub-section 6.6.1 – and ‘Maintenance Art and Public Repair’ – sub-section 6.6.2.

Part Three comprises four chapters, starting with three practice-based chapters (Chapters Seven, Eight and Nine). Chapter Ten sets out the thesis conclusions, followed by the bibliography and appendices.

Chapter Seven’s ‘green design engagements’ feature (DIWO) ‘Creative residency’ at the UCA, which collaborated with Kent County Council (KCC), Medway waste department and Surrey Council’s recycling campaign. Chapter Seven is ‘by practice’, meaning that its project outcomes directly relate to critique

of the MSW, a topic introduced in Section 1.4 – 'The Context of the Waste Disposal'. These HE-based hands-on participatory projects explore urban recycling, promoting re-use and ethical relations with plastic waste, a subject raised in Sections 3.6–3.8.

The opening section of Chapter Seven (Section 7.0) gives a project overview of the 'creative residency' and expands on the introductory and literature review topics relating to waste management and waste ethics. Sections 7.1–7.4 consider various research methodologies and the 'Designedisposal' research methods discussed in Chapter Six. Section 7.5 concludes the 'XMass tree' exhibition's HE-based 'green design engagements' action research project findings, offering a glimpse into plastics disposal politics through HE-based 'Designedisposal' activist experiences.

Chapter Eight follows DIWO participatory design research, which mapped and visually demonstrated plastic pollution in a hands-on approach through three 'Designtransposal' HE-based workshops (see Sections 8.1–8.4). Chapter Nine puts forward my DIY visualisations, influenced by feminist theoretical notions and environmental activism. Sections 9.1–9.4 visually narrate the oceans as landfill, through the 'Sea PET' plastics series. Chapter Ten sets out the conclusion of this thesis (see Sections 10.0–10.3).

Chapter Eight's 'by practice' work follows the 'blue design series', which visually mapped and represented ideational explorations for marine plastic pollution using DIWO and DIY approaches (see Section 8.1 – 'Visual Overview of Blue Design Series Projects'). The participatory engagements, along with various HE-based

design stakeholders, led to three ‘Designtransposal’ workshops held at various locations across the UK (see Sections 8.2–8.2.3, which unpack the ‘Designtransposal’ workshops and discuss mapping dialogue). Section 8.4 – ‘2050 Scenario’ – unpacks the first cli-fi counter-narrative set in the near future.

Section 9.0 opens the vignette to Chapter Nine, pairing latent stakeholders’ emotions with the plastic bag (Fig. 9-74, *Plastic Material Actants*), representing a toxic future/s. Chapter Nine mixed scientific and plastic waste data extrapolation, informing my land art metaphorical explorations, which conceptualised ocean plastic pollution through the DIY ‘Sea PET’ project series, shifting the human-eye-view towards the ocean world (see Section 9.1 – ‘Visual Overview of DIY Sea PET Projects’). Adriatic Sea PET installations and Sea PET ecological and plastic toxicity visualisations (see Sections 9.2–9.2.1) carried dialogue to the ‘wet ontological’ (Steinberg and Peters, 2015; Chapter Five) vertical volume spaces of the sea. Thus, expanding the spatial trialectics critique (Lefebvre, 1991; Soya,1996) and creating visual maps for the conceptual representations of my aesthetic response towards plastic pollution (see Section 5.4). Section 9.4 – ‘Vision 2150 Scenario’ – describes the cli-fi counter-narrative set in the distant future.

Chapter Ten thus comprises four sections and three sub-sections. The opening section, Section 10.0 – ‘The Literature Field Vignette’, updates on the recent discovery of a new species (Weston et al., 2020). Section 10.1 details the significance of my original research contributions. Section 10.2 unpacks the scope of the research outcomes. Sections 10.2.1–10.2.3 discuss the interdisciplinary crossovers and research contributions. Finally, Section 10.3

summarises the research outputs and conclusions, bringing this plastic socio-material narrative to a close.

CHAPTER TWO: VOCABULARY AND COMPENDIUM

2.0 The Language Game

‘Here the term “language-game” is meant to bring into prominence the fact that the *speaking* of language is part of our activity, of a form of life. And to imagine a language is to imagine a form of life. Language games, we are told, are multiple; if we don’t keep the multiplicity of language games in the view, we will tend to ask misleading questions.’

— Wittgenstein, 1958, pp. 19–24, cited in Hekman, 2010, p. 34.

Fig. 2-9. Language Game, 2020. Word cloud**.**

Section 2.0 is a short introduction section – an evocative vignette that sits before Section 2.1. My contemporary reuse tactics with plastics have led me to generate terminology representing a dynamic vocabulary and compendium of terms created before, during and after this PhD. Chapter Two stands on its own and can be read prior to the thesis chapters that follow, or can be used for cross-referencing information and for its short introductions to various terms and concepts.

Taking an exploratory approach, I am re-vocalising terms and playing a 'language game' (Wittgenstein, 1958), coupling design with 'words and things' (Barad, 2007). In coining new terms, I treat conceptual terms ontologically, 'intra-acting' with words through 'Praxis and Social Imaginary' (see Sections 4.4 and 5.3). In developing *Language Game* (Fig. 2.9), I carve out a knowledge space for 'alternative jargon' (Section 6.1), forming a design agency vocabulary and compendium of terms and concepts as an outcome (Section 2.1). However, 'the new language for codesigning is predominantly visual, as opposed to verbal' (Sanders, 2000, p. 4). This process 'requires a new culture of language of sustainability which transcends knowledge hierarchies (between disciplines, theory and practices)' (Fletcher and Tham, 2019, pp. 62–63).

Through the 'alternative jargon' (Sloterdijk,1988) method, multiplicities in designed-things-concepts are encountered and vocalised through 'plastic things' aesthetics (see Section 6.2). In re-examining Descartes' seventeenth-century dictum '*cogito, ergo sum*', I question identity and norms in relation to plastic waste through everyday disposal practices, theoretically influenced by methodological

and material fetishism (see Sections 4.1–4.2) and feminist ‘new materiality’ (see also Sections 4.3–4.4).

I therefore speak a new ‘language game’ (Wittgenstein, 1958), repeating a revised version of Descartes ‘*cogito*, *ergo sum*’ like a mantra: ‘“I” trash, therefore “We” are’ (see term explanation in Section 2.1). Section 2.1 gives a summary index of the vocabulary used and a compendium of multi-disciplinary terms and concepts used previously and in this PhD thesis.

2.1 Vocabulary and Compendium Index

A Vision Gyre: Yeats' vision of the gyre incorporates a subjective theory of the history timeline, articulated and visually represented as the double helix cone. Yeats' wife received this vision of turning gyres and cyclical birth and re-birth in a dream-like state (1921). The interlinked gyres captured the contrary motions inherent in human and historical processes, underlining the intrinsic dualism. The **'concordia gyre'**s bottom cone is the primary tincture, representing unity. The second, top cone – the **'discordia gyre'** – is the antithetical tincture, expressing human desire. As Yeats points out, the antithetical tincture 'is emotional and aesthetic, while the primary tincture is reasonable and moral' (Yeats, 1921, pp. 9–12). (Located in Part Three, Chapter Eight, Section 8.0.)

Aesthetic Response: Hillman discusses achieving psychological activism by proposing 'aesthetic response' and stating that 'people deny their aesthetic responses by closing down their senses, by anesthetizing themselves' (1996, pp. 38-44). (Located in Part One, Chapter Three, Section 3.4.2.)

Alternative Jargon: Through my 'alternative jargon' (Sloterdijk,1988) method, designed–things–concepts multiplicities are encountered and vocalised through 'joyful plastic things' (see Section 6.2). I borrow Sloterdijk's 'alternative jargon' term in support of vocalising my ''purely ontological intention''. 'Alternative jargon' stands for expressing meanings to the social and material plastics construct – i.e., using the 'Designedisposal' aesthetical tool to explore with the context and space of materials and the 'Designtransposal' strategy to allow me to evaluate my post-humanist stance visually. (Located in Part Two, Chapter Six, Section 6.1.)

Anthropocene: The geological term 'Anthropocene', coined by geographers Crutzen and Schwägerl (2011), gained popularity in twenty-first-century environmental media as a new scientific marker and eco-political statement. Etymologically, 'Anthropocene' has ancient Greek origins, as a dual word derived from 'anthropos', for man, and 'cene', meaning new. The birth of the Anthropocene provides compelling evidence that humanity's impact on Earth's spheres has pushed the planet into a new geological epoch. (Located in Part One, Chapter Three, Section 3.4.2.)

Anthropogenic: Anthropogenic litter is present in all marine habitats, from the coast to the most remote ocean points. For clarity, the term 'anthropogenic' refers to the effects of human activity, such as those that contribute to environmental pollution. Marine litter, derived from non-natural sources, is defined by the Group of Experts on the Scientific Aspects of Marine Environmental Protection (GESAMP) as 'any persistent, manufactured or processed solid material discarded, disposed of or abandoned in the marine and coastal environment' (Galgani et al., 2010). (Located in Part One, Chapter Three, Section 3.5.)

Anthropomorphism: The attribution of human characteristics or behaviour to a god, animal or object. Braidotti takes issue with deep ecology's humanisation of nature, arguing that 'deep ecology anthropomorphises the earth environment' (Braidotti, 2006, cited in Le Grange, 2018). (Located in Part One, Chapter Four, Section 4.3.)

Asterism: In astronomy, an asterism is a pattern of stars recognised in Earth's night sky. An asterism can also be a section of a constellation that refers to the traditional figuring of the whole. I introduced asterism into my MRes design research to refer to a diverse group of spectators with strongly polarised relations to waste – e.g. political, social, economic, cultural, material, ethical and aesthetical. (Located in Part One, Chapter Four, Section 4.5.)

Autotrophs: The microscopic colonies discovered include plants, algae and bacteria that manufacture their food, called 'autotrophs', which are symbiotic with the bacteria and animals that feed on them, called '**heterotrophs**'. The scientific term 'autotroph' describes an organism forming nutritional organic substances from pure inorganic materials such as carbon dioxide. Plants, algae and many bacteria are 'autotrophs' (Diffen, 2019). (Located in Part One, Chapter Three, Section 3.5.2.)

Bio-centred Egalitarianism: All entities, whether a cell, a commodity or an ecosystem, have equal value, challenging the prevailing standard of the post-anthropocentric agenda and the assertion of advanced technologies that mean 'man is the measure of all things'. The 'bio-centred egalitarianism is a philosophy of affirmative becoming, which activates a nomadic subject into sustainable processes of transformation' (Braidotti, 2006). For clarity, I interpret Braidotti's bio-centred egalitarianism as the way to define the eco-feminist environmental justice – a she-fox wake-up call for planetary and equality rights for all life. (Located in Part One, Chapter Four, Section 4.3.)

Bio-magnification is the increasing concentration of a substance, such as a toxic chemical, in the tissues of organisms at successively higher levels in a food chain: 'Over the next few thousand years, persistent organic pollutants will concentrate in the North, just as plastics will accumulate in oceans' (Liboiron, 2012). (Located in Part Two, Chapter Six, Section 6.6.1.)

Blue Design: I use the term blue design for my project series in 'engaging practically with aquatic liveliness' (Bear, 2017). (Located in Part Three, Chapter Eight, Section 8.0.)

Blue Design Action: Promotes emancipatory praxis in participating practitioners, promoting a critical consciousness that exhibits itself in political and practical action to promote change (Grundy, 1987). See 'Blue Design Action Diagram: Plan, Act, Observe and Reflect' (Fig. 5-30). I engage in action research and an appreciative enquiry platform that encourages design workshop participation, visual imagination and social innovation. (Located in Part Two, Chapter Five, Section 5.2.)

Blue Economy: 'Blue Economy' (Winder and Le Heron, 2006) breaks away from the ontological separation of 'green' land and 'blue' sea (see Bear, 2014, p. 28). (Located in Part Three, Chapter Three, Section 3.4.)

Bricolage: 'The product of the bricoleur's labour is a bricolage, a complex, dense, reflexive, collage-like creation that represents the researcher's images, understandings, and interpretations of the world' (Denzin and Lincoln, 1994). By adopting multiplicity, 'the qualitative researcher uses the set of interpretative practices and has been described as the "bricoleur"' (Gray and Malins, 2004). The 'bricoleur approach' (Denzin and Lincoln, 1994; Crouch and Pearce, 2012; de Certeau, 1984) forms a multi-disciplinary set of interpretative practices, and the research outcomes create a 'bricolage' – an emergent construction' (Gray and Malins, 2004). (Located in Part Two, Chapter Six, Section 6.0.)

Business-as-usual: Term used as an example for 'business-as-usual' practices, such as recycling regimes. (Located in Part Two, Chapter Three, Section 3.5.)

Cli-fi Scenarios: Stands for climate fiction narratives and scenarios. This PhD has two scenarios – first, the '2050 Scenario', summarised in acknowledging past accumulative twentieth-century 'physical' actions (see Section 8.4) and, second, the '2150 Scenario', which focuses on the cli-fi future of 'non-human others' (see Section 9.4). (Located in Part Three, Chapter Eight, and Chapter Nine.)

Cradle to Cradle Design: McDonough and Braungart (2002) emphasise a regenerative approach by the industry involving closing the loops, focusing on non-human species and future generations. The 'cradle to cradle design' approach furthers the notion that nature's resources could be harvested in an open-loop cycle for human needs, 'overlooking the complexities and ecological impacts of the recycling process and the limits of human control' (St Pierre, 2019). (Located in Part One, Chapter Three, Section 3.1.)

Cryosphere: The term 'cryosphere' comes from the Greek words '*krios*', meaning cold, and '*sphaira*', meaning globe or ball. The 'cryosphere' is the frozen-water part of the Earth's system, including sea ice, lake ice, river ice, snow cover, glaciers, ice caps, ice sheets, ice shelves, permafrost and seasonally frozen ground (World Meteorological Organisation, 2020). (Located in Part One, Chapter Three, Section 3.3.)

Dark Ecology: The concept of 'Dark Ecology' derives from the object-orientated ontology philosopher Timothy Morton, who wrote the 2007 book, *Ecology Without Nature: Rethinking Environmental Aesthetics*. (Located in Part One, Chapter Three, Section 3.3.)

Deep Ecology: Eco-philosophy deriving from intuitive ethical principles, holistic ecology (Smuts, 1926) and systems thinking. The founder of 'deep ecology' Naess (1973), in a seminal article, 'The Shallow and the Deep Ecology Movements', radically calls for 'biospherical egalitarianism' among all species (Roszak, 1992). (Located in Part One, Chapter Three, Section 3.4.2.)

Design for Re-use: Fisher and Shipton's (2010) book *Designing for Re-use* identifies the 'concept of social practice as the basis for designing' (Ibid., p. 5). Conclusively, 'this would mean design for re-use by designing with re-use'. (Located in Part One, Chapter Three, Section 3.1.)

Design for Social Innovation: Manzini (2014) defines the approach as 'a constellation of design initiatives geared toward making social innovation more probable, effective, long-lasting, and apt to spread'. (Located in Part One, Chapter Three, Section 3.1.)

Design for Sustainability: This field has broadened its theoretical and practical scope over the years, displaying a chronological evolution toward product innovation and environmental responsibility. (Located in Part One, Chapter Three, Section 3.1.)

Designedisposal Aesthetics: The research praxis heuristic embraces 'Designedisposal' tactics and explores the agency of trash aesthetics, and the possibility that disposed-of plastic things are treated '*sui generis*' – i.e., forming a class by itself, with unique positive qualities. (Located in Part Two, Chapter Six, Section 6.2.)

Designedisposal: Designing from and with plastic disposal. Designedisposal stands for design production-created things, such as short-lived single-use plastics made for disposal. The 'Designedisposal' neologism probes design production and disposal hierarchy relations and best describes my advocacy and reuse tactics with plastics. (Located in Part One, Chapter One, Section 1.1.)

Designtransposal: Creatively aims to narrate the social and material life of (mis)managed plastic discard. Following Rosi Braidotti, the very interconnection of plastic in nature is a sign of transposition – that is, a creative leap that produces a prolific in-between space. In this research, I adopt transposal as the '*state of being transposed*' not merely in the quantitative mode of plural multiplications, but rather in the qualitative sense of complex multiplicities (Braidotti, 2006). Here, the emancipatory 'state of being transposed' (Ibid.) is adjoined with design thinking, visually exploring the 'complex multiplicities' of plastic waste in nature. (Located in Part One, Chapter Four, Section 4.3.)

Designtransposal Strategy: This allows me to search for new modes of material representation. The concept of 'transposition' is central in creating the 'Designtransposal' visual strategy and forming the blue design series. Through visualisation of climate change, 'Designtransposal' allows me to record an act of becoming and creating concepts and practices with waste. (Located in Part One, Chapter Four, Section 4.3.)

Design Workshop: These are a popular way of co-designing with stakeholders and tackling complex socio-material rituals and difficult environmental problems through craft and design. The design workshops combine principles of 'design research through practice' (Koskinen et al., 2011), 'practice-based design research' (Vaughan, 2017) and 'practice-led design research' (Mäkelä and Nimkulrat, 2011). (Located in Part Two, Chapter Six, Section 6.4.)

Designtransposal Workshop: This is a primary method for my DIWO design workshops in a High Educational Design environment. The Designtransposal workshop is the field site for participative re-imagination, emphasising Designedisposal trash aesthetics and accumulating tacit knowledge. (Located in Part Two, Chapter Six, Section 6.4.)

Discard: A thing rejected as no longer valuable or desirable, abandonment, (mis)managed waste. For clarity, as a verb, 'discard' means to reject or throw away something as useless. (Located in Part Two, Chapter Six, Section 6.6.1.)

Discard Study: Stands for social, political and economic processes that render particular objects, practices and populations disposable (Discard Study, 2019). (Located in Part One, Chapter One, Section 1.6.)

Dispose of: A particular activity or mood or act involving throwing away, giving or selling managed waste. (Located in Part One, Chapter Three, Section 3.4.2.)

EDC: Concerning plastics, some monomers, plasticisers and additives (e.g., phthalates) are **endocrine disrupting chemicals** (EDC) that can leach from plastic packages and containers into food and beverages (Farrelly and Shaw 2017). EDCs interfere with the hormonal systems of humans and animals, causing a range of negative developmental, reproductive, neurological and immune effects (Diamanti-Kandarakis et al., 2009; Shaw, 2014, cited in Farrelly, Taffel, and Shaw, 2021). (Located in Part One, Chapter Three, Section 3.5.1.)

Eco-centric: Eco-philosophy perspective, which emphasises all living organisms and their natural environment, regardless of their perceived usefulness or importance to human beings. (Located in Part One, Chapter Three, Section 3.3.)

Ecocide: Polly Higgins, often called 'the lawyer of the Earth', provides this term's legal definition: 'Ecocide resides in excessive damage or loss of ecosystem in a given territory where the peaceful coexistence of people is seriously threatened' (Prokeinova and Blazek, 2020, p. 7). (Located in Part One, Chapter Three, Section 3.4.)

Ecological Design: St Pierre (2019) defines this approach as a mastery, which grew out of myths that humans can be entirely separate from nature and control natural systems. 'Ecological design' promotes the development of new products with a low environmental impact and represents the path designers follow to contribute to a more sustainable society (Fargnoli et al., 2005). (Located in Part One, Chapter Three, Section 3.1.)

Ecopsychology: Deep ecology influenced ecopsychology, which invites 'prescribing nature' (Hillman, 1996) in psychotherapy practice (Roszak, 1992). (Located in Part One, Chapter Three, Section 3.4.2.)

Eddy: This is a well-known term for outdoor swimmers. Eddies are not safe areas because the water flows against the current. (Located in Part One, Chapter One, Section 1.1.)

Encountering Things: From a design stance, exploring the ontological 'questions of what things are, what they do, how they relate to each other and to us' (Atzmon and Boradkar, 2017). For the first time, in *Encountering Things*, designed objects, design processes and theories of things are paired together. It is encouraging to read and acknowledge the rise of design scholarship turned toward critical materiality. (Located in Part One, Chapter Four, Section 4.2.)

Encountering Non-human Others: My encounters with the microbial strongly suggest that bacteria are the biosphere's most prevalent and prolific actants and that, through colonies, they assemble an almost countless array of allies. Most of these assemblages have nothing to do with humans – humans are unaware of Earth's vast array of microbial assemblages (Hird, 2009). (Located in Part One, Chapter Four, Section 4.4.)

Entangled Material Agencies: Also noteworthy is that the liveness of matter and all conversational cultural interactions are perceived, observed and experienced by Barad as 'entangled', although she concludes that 'entangled material agencies' are ultimately not determined by scientific measurements: 'In other worlds, reality is defined as things-in-phenomena rather than things-in-themselves' (Barad, 2007). (Located in Part One, Chapter Four, Section 4.4.)

Epimeleia Heautou: Hawkins (2006) differentiates the ethico-political aspects of waste disposability by borrowing from Foucault's (1988) ethical seminar, *Technologies of the Self*. Bringing Foucault's (1988) reflections upon the Greek '*epimeleia heautou*' notion of 'care for the self' aids Hawkins in examining the power relations of regulated daily habits (Hawkins, 2006). (Located in Part One, Chapter Three, Section 3.8.)

Eurythenes Plasticus: New species of Eurythenes from hadal depths of the Mariana Trench, Pacific Ocean (Crustacea: Amphipoda). Weston et al. (2020) discovered that crustacea species are found in the **Hadal Zone**. Sea depths of greater than 6,000 m are

usually called oceanic trenches. The new Eurythenes plasticus species found with the PET micro-plastic in their hindgut (ascending colon) affirms the body of plastics depository in all planetary realms and the growing contribution of 'literature on marine organisms ingesting plastic and microfibers' (Weston et al., 2020). (Located in Part Three, Chapter Ten, Section 10.0.)

Experiential Scenarios: Candy (2010) reflects and distils three principles for designing 'experiential scenarios', highlighting that principles do not provide rigid boundaries but serve as 'heuristic levers'. Experiential scenario encounters may occur in any medium or setting, from immersive, 'theatrical' to 'images of the future' or stand-alone 'artifacts from the future' (Ibid.). (Located in Part Two, Chapter Six, Section 6.5.)

Gaze in: My bespoke visualising method. The approach draws on the notion of becoming an animal from Deleuze and Guattari's rhizomatic ontology of 'molecular collectiveness' and encounters not between 'individuated animals' but, in contrast, focusing on being and places of water (Deleuze and Guattari, 1987). When applied to make sense of and engage with the lanternfish shoal, a 'gaze in' view symbolises wet ontology. The 'Designtransposal' workshop was used to perceive fish behaviour patterns in oceanic spaces. (Located in Part Two, Chapter Six, Section 6.3.)

Glocal: Characterised by local and global considerations (Oxford Dictionary, 2016). (Located in Part One, Chapter Three, Section 3.4.1.)

Green Design: Provides 'the centre of sustainability gravity and definitive reflection of what individuals are to become as consumers and citizens' (Gibson et al., 2011). 'Green design' approaches have evolved into others. There is a clear link between 'green design' and 'ecological design', with the former gradually evolving into the latter (Ceschin and Gaziulusoy, 2016, p.146). (Located in Part One, Chapter Three, Section 3.1.)

Gyre/s: These are large-scale systems of wind-driven surface currents caused by the Coriolis effect, a rotating system perpendicular to Earth's axis (Eriksen et al., 2016). In total, eleven gyres are described in the world's oceans and marine plastic waste research is concentrated in five of these rotating currents (Maximenko et al., 2012) – one in the Indian Ocean, two in the Atlantic Ocean and two in the Pacific Ocean (Fig. 3-18). The term 'gyre' refers to a large-scale circular feature of ocean currents spiralling around a central point – clockwise in the Northern Hemisphere and counter-clockwise in the Southern Hemisphere. (Located in Part One, Chapter Three, Section 3.5.1.)

Gyre Patch: Invisible to satellites, a higher concentration of litter or a collection of marine debris in the ocean. There are six ocean gyre patches – five active and one passive – in the Barents Sea. The NOAA describes garbage patches as large masses of ever-accumulating floating debris fields across the sea. A garbage patch is therefore an entangled biomass collecting plastic debris, and you can think of them as giant whirlpools that pull objects in. Garbage patches of varying sizes are located in each main gyre (NOAA, 2020). (Located in Part One, Chapter Three, Section 3.5.1.)

Heterotrophs: See '**autotrophs**' (Diffen, 2019). (Located in Part One, Chapter Three, Section 3.5.2.)

Holon: The Greek origin word 'holos' is in neutral gear and represents a form that is simultaneously the parthood and the whole. Holism is the 'tendency in nature to form wholes that are greater than the sum of the parts through creative evolution' (Smuts, 2013, p. 105). My ontological and epistemological enactment is visually mapped, forming

a holon. This mutational development has changed *My Praxis Paradigm: Mapping Holon Notion of Parthood Vs Whole* (Fig. 5-29, see legend: X1 to X5). (See Section 5.1.)

Hothouse Earth: The scientific findings raise alarm calls for careful consideration of a 'safe operating space for humanity' (Steffen et al., 2011; Rockström et al., 2009). Conservative scientific analysis indicates that human expansion has already 'transgressed three planetary boundaries', creating climate change, encouraging rapid biodiversity loss and disrupting the nitrogen cycle (Ibid.). If crossed, the **'Earth System'** planetary threshold could prevent stabilisation of the climate at intermediate temperature rises and cause continued warming on a **'Hothouse Earth'** pathway even as human emissions reduce (Steffen et al., 2018). (Located in Part One, Chapter Three, Section 3.4.2.) I applied the 'Hothouse Earth' term in the cli-fi '2150 Scenario' – a depollution vision under the conceptual gyre of unity. (Located in Part Three, Chapter Nine, Section 9.4.)

I and We: Both terms aid in situating the individual 'I' and collective community 'We' aspects. For example, the 'I' term explores my consumption and disposal dynamic in a local ('glocal') context. (Located in Part One, Chapter Three, Section 3.4.1.) 'We' summarises how the human community has contributed to the Anthropocene's new planetary epoch. (Located in Part One, Chapter Three, Section 3.4.2.)

'"I" trash, therefore "We" are': Re-hacking Descartes' '*cogito, ergo sum*' seventeenth-century dictum, stating 'I' trash, therefore 'We' are – where 'I' represents the standpoint of a humankind individual, global citizen, mother, plastic prosumer, design researcher and DIY maker and 'We' forms the collective human stance. (Located in Part One, Chapter Two, Section 2.0.)

Inanimism: Brown states that some objects have more agency than others because design 'breathes agency into materials' (Arvatov,1925). Design should be at the centre of the theoretical conversation, writes Brown, drawing upon Latour's (2010) critique of modernity's rational and scientific thinking, in doing so honouring the 'queer invention' of 'inanimism': 'An agency without agency constantly denied by practice' (Latour, 2010). (Located in Part One, Chapter Four, Section 4.2.)

Intra Action: Hird does her best to flatten Barad's scientific term 'intra action', which refers to ontological inseparability: '"Words" (culture) and all "things" (nature), contrasted against the term "interaction" predicated upon (ontologically) individuated entities that subsequently interact' (Hird, 2009). (Located in Part One, Chapter Four, Section 4.4.)

I/We: I conducted the research study from the different perspectives of 'I' and 'We' merged in the 'I/We' term. (See 'Alternative Jargon' Chapter Six, Section 6.1.) Consequently, through the 'I/We' lens, I am visually exploring oneself – the human 'I' existence aspects corresponding to the planetary 'We' narrative, which ties to the 'natural and cultural bacterial social intelligence' (Hird, 2009). (Located in Part Three, Chapter Nine, Section 9.3.) The 'I/We' term is inspired by the outline that 'this story focuses on "I" and the core story centres on "We"' (Tham et al., 2008).

Joyful Plastic Things: Alerts to the process of re-structuring a disposed plastic object into a valuable 'joyful plastic thing' – to visually and critically think and confront thingness through participatory making and sensing new uses and trajectories of things in nature. (Located in Part Two, Chapter Six, Section 6.2.) 'Joyful plastic things' emphasise 'positive waste' (Kennedy, 2008). (Located in Part One, Chapter Three, Section 3.7.)

Kraal: A Southern African term used for a small rural community or circular livestock enclosure. Here, the term stands for circularity of re-using things and the circular community of practice. (Located in Part One, Chapter One, Section 1.1.)

KraalD: Praxis is a socio-material narrative. 'Urban plastic trash is my study, a thing of desire and production material.' (Katarina Dimitrijevic – KraalD, 2013). (Located in Part One, Chapter One, Section 1.1.)

KraalDesignedisposal: Full name for KraalD. My praxis engaged in exploring re-use strategies and promoting plastic waste ethos and plastic pollution. (Located in Part One, Chapter One, Section 1.1.)

Language Game: Here, the term 'language game' highlights that speaking of language is part of our activity, a form of life. To imagine a language is to imagine a form of life. Language games, we are told, are multiple – if we don't keep the multiplicity of language games in view, we tend to ask misleading questions (Wittgenstein, 1958). (Located in Part One, Chapter Two, Section 2.0.)

Lanternfish: One of the largest species communities on the planet. Lanternfish follow the migrations of plankton, which serves as its primary food source. Some oceanic species use plastics as pasturage. Marine science reports many interactions between plastic debris and marine organisms. Microbial biodegradation and macrofauna grazing facilitate plastic fragmentation (Eriksen et al., 2016). (Located in Part Two, Chapter Six, Section 6.3.)

Macro-fauna: Any animal visible to the naked eye, such as the **lanternfish**. (Located in Part Two, Chapter Six, Section 6.3.)

Macro-plastics: Particles more substantial than 5 mm. Defined by GESAMP. (Located in Part One, Chapter Three, Section 3.5.2.)

Managed Waste: Part of WMSs in controlled closed-loop disposal, e.g. solid waste. (Located in Part One, Chapter Three, Section 3.6.)

Material Turn: I suggest that the 'material turn' and birth of 'new materialism' have challenged subjectivity's positioning in social science and humanities – theoretically shifting established subject–object perspectives (Joselit et al., 2016, p. 3). See a few listed phrases I borough from the various authors to mark the turn and birth. An enquiry into 'material fetishism' by Appadurai (1986). Brown's 'thing theory' (2001; 2003; 2016; 2017). Feminist 'new materialism' or 'vibrant materialism' by Braidotti (1994; 2002; 2006). 'Entangled material agencies' by Barad (2007) and 'Micro-ontologies' encounters by Hird (2009). (Located in Part One, Chapter Four, Section 4.0.)

Material Fetishism*:* Appadurai (1986) calls for the rise of 'material fetishism' in material culture. In the field, 'material fetishism' is a synergy of interpretative archaeology practice with anthropology. (Located in Part One, Chapter Four, Section 4.1.)

Methodological Fetishism: Represents diversity in the methods involved in what the Appadurai termed '"methodological fetishism" acquired to write life histories of things' (Hicks, 2010, p. 90). The practice field is rarely considered in theoretical and material culture debates. Instead, material culture studies developed in Britain as a self-conscious post-disciplinary field. Apart from hermeneutic phenomenology, there has been no interest in discussing field practice (Hicks, 2010). (Located in Part One, Chapter Four, Section 4.1.)

Micro-ontology: Hird's 'micro-ontology' examines prokaryotic bacteria's individuality, nicknamed 'social amoeba' (Hird, 2009). The *Theoretical Micro-ontology* (Fig. 4-27) mapping board represents a praxical amoeba paradigm created in mimicry of Hird's (2009) reflections on bacterial self-hood, symbiotic environment and consciousness from non-human perspectives. (Located in Part One, Chapter Four, Section 4.4.)

Micro-plastics: Particles range from 1 nm to < 5 mm. Defined by GESAMP. (Located in Part One, Chapter Three, Section 3.5.1.)

(Mis)managed Landfill: I reason that the ocean is the largest mismanaged landfill. (Located in Part Three, Chapter Seven, Section 7.5 and Chapter Eight, Section 8.4.) The introduction and Chapter Three back up this premise. (Located in Part One, Chapter One, Section 1.4 and Chapter Three, Sections 3.6–3.8.)

Mismanaged Plastic Waste: Generally, plastics in the global ecosystem are distributed between three fractions: plastics in use, post-consumer-managed plastic waste, and an MPW fraction. The latter includes urban litter (Lebreton and Andrady, 2019). (Located in Part One, Chapter One, Section 1.4.)

(Mis)managed Waste: Non-controlled '(mis)managed' waste open-loop discard areas that impose economic and environmental burdens. Johansson (2021) provides an overview pie chart of the global management and (mis)management data of single-use plastic packages (see Fig. 1-6). Following the World Economic Forum (2016), plastic packaging is reported as 40% in landfill, 32% lost to the environment, 14% incinerated and 14% recycled (World Economic Forum, 2016, cited in Johansson, 2021, Fig.1). (Located in Part One, Chapter One, Section 1.4.)

Nano-plastics: Micro-plastics subsequently degrade into nano-particles. Knowledge of nano-plastics in aquatic environments and biota is limited. Orb Media (2017) states that no unified methods exist for the reliable detection of nano-plastics in samples. (Located in Part One, Chapter Three, Section 3.5.1–3.5.2.)

Narrative or Storytelling: Brown states that 'narrative might well be understood as the fundamental medium of design' (Brown, 2017). (Located in Part One, Chapter Four, Section 4.2.)

New Materiality or Neo-materialism: In 're-examining what it means to be human', new meta-perspectives of 'new materiality' and 'neo-materialism' open up 'new understandings of the relationships and networks that exist between people, objects and non-humans' (Casella and Croucher, 2011). (Located in Part One, Chapter Four, Section 4.0.)

Nomadic Ethics: A central concept to 'nomadic ethics', exploring 'transpositions', is material embodiment, especially in bio-genetics, because this emphasises the flexibility of the genome itself (Braidotti, 2006). (Located in Part One, Chapter Four, Section 4.3.)

Non-human Centred Design Method: Peredruk (2020) delineates the emerging 'non-human centred design method' as an empathetic process of design that moves past the hierarchy of the human. (Located in Part One, Chapter Four, Section 4.3.)

Non-human Others: The term 'non-human others' is borrowed from Puig de la Bellacasa (2017) and means more than human worlds. (Located in Part One, Chapter One, Section 1.1.)

Ontological Designing: To complicate simply, 'ontological designing is a way of characterising the relations between human beings and lifeworlds' (Willis, 2007, p. 93). (Located in Part One, Chapter One, Section 1.5 and Chapter Three, Section 3.2.)

Plastic: This petroleum product claims a quarter of all extracted oil. More than this, through plastic, we began the complete permeation of oil into every facet of cultural life (Boetzkes and Pendakis, 2013). (Located in Part One, Chapter Three, Section 3.4.1.)

Plastic Fragments: Plastic fragments mechanically decompose in the ocean, shrinking in size. The transition from **macro-plastics**, the size of a plastic bottle, to **micro-plastics**, a small '**mermaid tear**' particle, to microscopic nano-plastics, best described as '**ocean smog**', happens reasonably quickly. (Located in Part One, Chapter Three, Section 3.5.2.)

Plasticful Food: An innovative speculative design project tackling the plastic pollution problem by the Waste2Worth team. The project was developed for the University of Amsterdam and Hogeschool 'New Waste Vision'. **Plasteeze** is a strip of pink pills to help the body smoothly digest the partly plastic burger. (Located in Part One, Chapter Three, Section 3.2.)

Plastic Soup: See PhD By Design, 2015, **'**Designtransposal' Workshop three, which explores and interprets the 'plastic soup' phenomenon akin to '**ocean smog**' slowly settling to the sea floor (Eriksen et al., 2016, Section 3.5.1). (Located in Part Three, Chapter Eight, Section 8.2.3.)

Plastiglomarate: For clarity, 'Plastiglomarate' – named by geologists (Corcoran et al., 2009) – announces a long-term planetary gene permutation – a 'plastic matrix', – and serves scientifically as a global marker of the Anthropocene epoch. (Located in Part One, Chapter Four, Section 4.3.)

Plastisphere: Represents a colony established just under the oceanic surface at a depth of a couple of metres. This microscopic world is full of life, existing and living on the surface of micro-plastic particles. Marine science refers to this newly formed microscopic community as the 'Plastisphere' (Zettler et al., 2013). (Located in Part One, Chapter Three, Section 3.5.2.)

Plastic Pollution: Plastics out of place are routinely referred to as pollution. As Liboiron (2016) points out, the toxicological science that labels plastics as 'pollutants' and determines the safe limits of toxicants made to appear apolitical (Farrelly, Taffel, and Shaw, 2021). All substances can be poisonous. The concentration determines whether something acts as a toxicant (Ibid.). (Located in Part One, Chapter Three, Section 3.5.1.)

Praxis: A term first used by Aristotle (384–322 BC), 'praxis' represents the art of acting upon the conditions one faces to change them. Aristotle categorised disciplines into theoretical '*theoria*', practical and technical '*praxis*' and the poetic '*poesis*'. Aristotle allocated 'praxis' as the vehicle for speculative knowledge investigation (Oxford Reference, 2020): 'For Aristotle, *praxis* is the highest and most distinctive possibility of human existence' (McNeill, 2019). (Located in Part Two, Chapter Five, Section 5.1.)

Praxis: For Castoriadis, praxis is based on prior fragmentary knowledge, although praxis derives itself and continually gives rise to new experiences: 'This is why the relations of praxis to theory, true theory correctly conceived, are infinitely tighter and

more profound than any “strictly rational” technique or practice’ (Castoriadis, 1997). (Located in Part Two, Chapter Five, Section 5.3.)

PET: Polyethylene Terephthalate plastic polymer. (Located in Part Three, Chapter Nine, Section 9.2.)

Positive Waste: Kennedy (2008) proposes ‘positive waste’ as ritualistic festive celebrations often accompany discarding acts. So how can waste containing the essence of loss and negation take on positive value? Kennedy proposes that ‘positive wasting’ can offer solutions, abundance, exuberance and nature awareness because of the care and attention to detail in everyday disposal habits. (Located in Part One, Chapter Three, Section 3.7.)

Reuse: Through PhD thesis, I promoted do-it-with-others (DIWO) and do-it-yourself (DIY) making with reused plastics. The three thesis parts are linked with re-used plastic things.

Socio-material Narrative: ‘The constitutive entanglement of the social and the material in everyday organizational life’ (Orlikowski, 2007). (Located in Part One, Chapter Three, Section 3.3.)

Super Wicked Problems: Levin et al. (2007) introduced ‘super-wicked problems’ as their contemporary response to redefine Rittel’s ‘wicked problem’. The multi-disciplinary social science team argued that ‘super wicked problems’ require greater attention and more policy interventions. (Located in Part One, Chapter Three, Section 3.3.)

Systemic Design: This is a nature-inspired approach that looks at local socio-economic actors, assets and resources to create synergistic linkages among productive processes (agricultural and industrial), natural processes and the surrounding territory (Barbero and Fassio, 2011, cited in Ceschin and Gaziulusoy, 2016). (Located in Part One, Chapter Three, Section 3.1.)

Thing: The outcome of an interaction (beyond their mutual constitution) between subject and object (Brown, 2016). (Located in Part One, Chapter Four, Section 4.2.)

Thing Theory: Brown’s (2001) ‘thing theory’ equates objects to the opaque and dirty window through which we peer to learn what we can about ourselves and the environment. Brown argues that, as a society, we confront the thingness of objects only when they stop functioning for us (Brown, 2001). (Located in Part One, Chapter Four, Section 4.1.)

Transposedness: Following Heidegger’s incisive thought and the possibility of human ‘transposedness into animal’ and questioning the spatial meaning ‘where is it that we are transposed to?’ (Heidegger, 1995, pp. 209–210). (Located in Part Two, Chapter Six, Section 6.3.)

Transpositions: A new theoretical influence arises following Braidotti (2006) – a liberating feminist notion in my research. The re-arrangement of the order of the elements, which is an act of transposition, implies that to understand complexity, one must leap in multiple directions. (Located in Part One, Chapter Four, Section 4.3.)

Ubuntu: 'I am what I am because of who we all are.' This definition of Ubuntu is offered by Liberian peace activist Leymah Roberta Gbowee, 2011. Zulu maximus for togetherness, e.g. 'I in You and You in Me.' (Located in Part One, Chapter Three, Section 3.0.)

Upcycling: This is a neologism defined as retaining the high quality and value of materials and products in an open-loop cycle (Sung et al., 2019). (Located in Part One, Chapter One, Section 1.0.)

Visualising Gyre and Gyre Patch: A visual representational 'Designtransposal' strategy and HE workshop learning tool. (Located in Part Three, Chapter Eight, Section 8.1.)

Vitalistic Materialism: Braidotti affirms that the expression of 'vitalistic materialism' is through the body, which is perceived as a living recording device – an actualised and enfleshed multi-functional and multi-expressive memory system (Braidotti, 2006). Braidotti asserts that not all bodies are human, which 'brings the practical complications linked to the critique of anthropocentrism' (Ibid.). (Located in Part One, Chapter Four, Section 4.3.)

Waste-centric: I promote sustainable and positive waste relations and concepts: see '**Designedisposal**' and 'positive waste' (Kennedy (2008). In a sustainable circular economy, waste does not exist and resources are circulated, not landfilled.

We: The multi-species planetary collective that cannot escape the long-term pollution effects in progress. (Located in Part One, Chapter Four, Section 4.4.)

Wet Ontology: I am moving the research place and space from landfill on Earth to the largest unregulated landfill in the ocean. Human geographers, Steinberg and Peters (2015), propose that their 'wet ontology' approach can help in thinking 'with' the sea and assist in reconceptualising the oceans' uncertainty. The ocean is a paradoxical space, overlooked by the humans who live on land. (Located in Part One, Chapter One, Section 1.5.)

Zoe: Braidotti strikes a welcoming alliance with the 'productive force of zoe – or life in its inhuman aspects', firmly stating that nomadic philosophies challenge the 'new perverse dualism' in embracing the return of the animal and Earth's life potency (Braidotti, 2006). The newly proposed becoming-animal axis of transformation and the trans-species solidarity become the organic brand of 'new materiality' that respects the primary force of 'life' and the generative process that is open-ended, interconnecting across previously segregated domains. (Located in Part One, Chapter Four, Section 4.3.)

Zooplankton: 'Plankton' and 'zooplankton' are at the very base of the marine food chain. The term 'plankton' refers to the smallest aquatic plants, and the term 'zooplankton' refers to the most miniature animals that float and drift in bodies of water (Racha, 2017). As an excellent example of a bio-chain, plankton is eaten by small fish, which are themselves food for larger fish, which are food for humans (Orb Media, 2017). (Located in Part One, Chapter Three, Section 3.5.2.)

CHAPTER THREE: LITERATURE AND FIELD REVIEW

3.0 Introduction to the Literature and Field Review

‘Ubuntu: I am what I am because of who we all are.’

— Ubuntu definition offered by Liberian peace activist Leymah Roberta Gbowee, 2011.

Fig. 3-10. Francois Knoetze, 2013, *Cape Mongo.* Detangling VHS, featuring Kaelo Molefe, Cape Town, RSA.

This literature and field review chapter combines various design and environmental charts, photographs and images of plastic pollution. Representations of selected interdisciplinary authors at the beginning of each short section visually support the textual commentary – for example, the

messiness of the emerging global environmental plastics pollution phenomenon and the systemic complexity of social and waste materials. As Fig. 3-10 visually suggests, the entangled nature of the topic of plastic pollution makes detanglement feel like a futile attempt to fix a broken VHS tape. On the other hand, plastic pollution affects everything and everyone on a global scale, bringing a sense of 'ubuntu' through the environmental crisis. The definition of ubuntu by Liberian peace activist Leymah Roberta Gbowee (2011) – 'I am what I am because of who we all are' – explains the Zulu motto for togetherness: 'I in You and You in Me.'

3.1 Evolution of Green Design

'This is a rare moment in history where design is empowered to tackle complex systemic challenges.'

– Alice Rawsthorn, 2021, WDCD.

'We're behaving like it's an endless party – but we're passing the check to our children.'

– Bruce Mau, 2021, WDCD.

Fig. 3-11. What Design Can Do (WDCD), 2020. *No Waste Challenge*.

The content of this section is a historical timeline partite tracing the emergence of the professional discipline of sustainable design and visually juxtaposing it with contemporary design activism using waste (see Fig. 3-11, *No Waste Challenge* at the end of this section). The section starts with a discussion of the evolution of design from 'green design' towards 'eco-design', shifting from products as the solution to innovation towards systemic thinking and speculative practices. Section 3.1 is infused with St Pierre's commentaries, which differ from broader sustainable design theories and focus on the relationship of 'design' with nature' (St Pierre, 2019, p. 92).

St Pierre (2019, p. 95) has identified that the ecological thinking of the turn of the twentieth century was a new way of looking at the world. In the 1970s, 'greens' were generally considered radicals because of their uncompromising political views about sustainability, non-violence, social justice and grassroots democracy. Sometimes greens were marginalised as 'tree-huggers' because of their affinity with the non-human world (Gibson et al., 2011, pp. 1–2). Radical design first emerged in 1971, in the form of Papanek's (1985) seminal ethical responsibility critique in *Design for the Real World*, which called for a halt in 'needless' consumer production.

The term 'green design' provided 'the centre of sustainability gravity and definitive reflection of what individuals are to become as consumers and citizens' (Gibson et al., 2011, p. 1). 'Green design' approaches have evolved into new generations. For example, there is a clear link between 'green design' (consciously designing something, taking into account its lifecycle) and 'ecological design' (an approach to developing products and services with particular consideration for

environmental impact), with the former gradually evolving into the latter (Ceschin and Gaziulusoy, 2016, p. 146).

St Pierre relates how the approach of using ecological design as mastery grew out of myths that humans can be entirely separate from nature and control natural systems (St Pierre, 2019, p. 96). 'Ecological design' promotes development of new products with a low environmental impact and nowadays represents the prominent path designers follow to seek to contribute to the development of a more sustainable society (Fargnoli et al., 2005, p. 1).

The main goal of the 'ecological design' approach consists of evaluating and improving the product's environmental performances during its design and development stages, considering its whole lifecycle (Fargnoli et al., 2005, p. 2). Following recent international environmental policies and regulations, 'ecological design' adopts the 'global perspectives' themes of the World Commission on Environment and Development (WCED, 1987, p. 43), coupled with United Nations 'Sustainable Development Goals Report' (UN, 2019). While designers are encouraged to consult alternative 'sustainable development goals' or post-humanist documents that advocate for all species, such as The Earth Charter (2000, online), particularly when designing for non-human species, this 'remains on the periphery of design awareness' (St Pierre, 2019, p. 98).

Thinker and designer Buckminster Fuller (1963) identified the relevance of Earth's environmental complexity for design (Buckminster Fuller, 1963 cited in St Pierre, 2019, p. 97). Papanek's (1985) human-centred 'concerns later expanded to a vision for holistic and spiritually grounded design' (Ibid., p. 97). The field of

'design for sustainability' has broadened its theoretical and practical scope over the years, displaying a chronological evolution towards product innovation and environmental responsibility.

In the first half of the 1990s, 'design for sustainability' primarily focuses on product level, incorporating development and consolidation of 'green design' and 'ecological design'. Ceschin and Gaziulusoy (2016) identified other approaches delineated in the late 1990s at product level, such as 'biomimicry', mimicking nature in design of forms, products and systems by using nature as a model, measure and mentor (Ibid., p.143). For example, Dewberry and Fletcher's (2001) design for the environment multi-media implementation (DEMI) project links HE sustainability and design, pioneering principles and the 'importance of design as a force for sustainability' (Ibid., p. 2).

In the early 2000s, McDonough and Braungart (2002), in their book *Cradle to Cradle*, emphasise a regenerative approach to industry and closing the loops, focusing on non-human species and future generations. McDonough and Braungart (2002) were influenced by the interdisciplinary field of industrial ecology, focusing on recycling materials, waste and 'upcycle' (Kay, 1994) industries.

McDonough and Braungart's (2002, 2013) 'cradle to cradle design' approach furthers the notion that nature's resources could be harvested in an open-loop cycle for human needs, 'overlooking the complexities and ecological impacts of the recycling process and the limits of human control' (St Pierre, 2019, p. 100). 'Cradle to cradle design' forged paths for 'emotionally durable design', a term

coined by Chapman (2005), and ‘design for sustainable behaviour’ (Cooper and Sung, 2019; Sung et al., 2019; Bhamra et al., 2011). Both approaches are still part of the interest scope of academic research (Ceschin and Gaziulusoy, 2016, p. 143).

User emotions have been an integral part of product design processes since the 1980s, preceding the time when a design argument focusing on emotions was made explicit in an ‘emotionally durable design’ domain (Overbeeke and Hekkert, 1999, cited in Demir, 2008, p. 134), explaining how emotions play an explicit role in design reflection, rationality and feeling (Chapman, 2005). Demir (2008, p. 143) discusses design toolkit approaches when users (participants) carry out the task of creative reporting, which involves making photo collages or basic creative acts such as compiling a compendium of objects, words or images that alludes to the characteristics of a particular experience, creating ‘generative tools for co-designing’ (Sanders, 2000, pp. 4–8).

Global design consulting company IDEO is an early example of a professionally successful design practice dealing with social aspects and human factors. IDEO (2003) launched ‘method cards’, which provide a compilation of several user-based research techniques. The fifty-one cards are divided into four categories: learn, look, ask and try. IDEO cards are a design toolkit on which the company has based its research activities and established an international user-based development focused on process and adaptation instead of product and solution. Demir (2008) proposes that IDEO ‘method cards’ can illuminate the emotional domain of user–product relationships (p. 143).

The ‘product-service system’ approach (PSS) (Reimet et al., 2015) brought business modelling and tactical approaches to the design profession. PSS discussions first took place in the late 1990s, but the significant boost to development of the method came in the 2000s (Ceschin and Gaziulusoy, 2016, p. 143). Following spatial and social aspects, ‘design for social innovation’ (Manzini, 2014; 2015) was initially introduced in the first half of the 2000s and is currently still being developed (Ibid., p. 143).

Manzini (2014, p. 65) defines design for social innovation as ‘a constellation of design initiatives geared toward making social innovation more probable, effective, long-lasting, and apt to spread’. Manzini (2014) has noted that the design for the social innovation process can be part of ‘top-down’ initiatives driven by experts, decision-makers and political activists, ‘bottom-up’ initiatives driven by local communities and individual citizens, or a hybrid of both approaches (Manzini, 2014 cited in Ceschin and Gaziulusoy, 2016, p. 134).

‘Systemic design’ is another nature-inspired approach that looks at local socio-economic actors, assets and resources to create synergistic linkages among productive processes (agricultural and industrial), natural processes, and surrounding areas (Barbero and Fassio, 2011, cited in Ceschin and Gaziulusoy, 2016, p. 135). Creative tools specifically developed to support designers in ‘systemic design’ projects include a visualisation tool to portray the actors, resources and material and energy flows of a given system (Ceschin and Gaziulusoy, 2016, pp. 135–136).

‘Systemic design’, alongside more traditional design skills such as visualisation and prototyping, is considered the strength of a design thinking approach in achieving social innovation (Ibid. p. 134). Hillgren et al. (2011) identify gaps in contemporary practices, particularly criticisms raised about the naiveté of ‘designers proposing superficial solutions and the high cost of design services’ (Hillgren et al., 2011 cited in Ceschin and Gaziulusoy, 2016, p. 134).

While PSS approaches and the ‘social innovation’ constellation of design initiatives have contributed to greater awareness of environmental issues in the design-related industries, the shortcomings of these approaches have also been identified. These are valid insights and form part of a broader discussion about the changes needed in professional design culture and action in sustainable design education, which go beyond addressing the designed artefact and even the system that enables it. For example, the online book *Earth Logic* (Fletcher and Tham, 2019) illustrates the need for enhanced engagement with the growth logic paradigm in design education relating to design and sustainability.

Ceschin and Gaziulusoy (2016) advise us to ‘remain socially relevant in a post-industrial era’ of intensifying social and environmental crises (Ibid., p.134). They highlight that the main limitation of ‘cradle to cradle design’ and ‘systemic design’ is that although both approaches focus on aspects of design processes, they cannot halt expanding production at its source and address the issue of reducing consumption: ‘Even if the approach is helpful to design and create local material and energy networks that are more efficient and effective, it does not affect consumer demand of products and services, i.e. it does not change consumption behaviours and habits’ (Ceschin and Gaziulusoy, 2016, pp.135–136).

Fisher and Shipton's (2010) book *Designing for Re-use* identifies the 'concept of social practice as a basis for designing' (Ibid., p. 5). *Designing for Re-use* demonstrates changing socio-material values and perspectives, particularly DIY single-use plastic packaging projects, taking bottom-up momentum into the broader design community. Conclusively, 'this would mean design for re-use by designing with re-use' (Fisher and Shipton, 2010, p. 170). 'Design for re-use' paves the way for the emergence of design activism through 'practices of protest' (Fisher, 2008). For example, see Fig. 3-11 for the global campaign poster for *No Waste Challenge,* as part of WDCD (WDCD, 2020).

In collaboration with the IKEA Foundation, the WDCD (2020) initiative called on all creatives, hackers and dreamers to submit bold solutions. WDCD campaign promotion kicked in under the slogan 'Cut waste. Cut emissions. Fight Climate Change.' One of seven renowned design thinkers on board, Bruce Mau has shared concerns about future generations paying the bill (WDCD, 2020, online).

Despite systemic constraints and solution limitations, design professions face complex problems. Culturally, we must not underestimate the impact and power of a design agency that promotes change. The following section explores design thinking and research in light of speculative design and education activist practices.

3.2 Design Research, Activism and Futures

‘We open ourselves to ontological designing, allowing it to design our thinking and to design with it.’

— Anne Marie Willis, 2007, p. 95.

‘Design can be understood as a powerful practice that takes part in giving form to the future, or, as acceptera exemplifies, a possible or preferred future. Thus, the future, or futurity, in design may expose relevant issues for design research and design anthropology concerned with “the possible”.’

— Ramia Mazé, 2016, p. 37, edited by Smith et al.

Fig. 3-12. Waste2Worth Team, 2020, *Plasticful Food*. Plasticful chips, burger, tea and Plasteeze tablets.

Section 3.2 opens with a brief overview of influences in design philosophy (Willis, 2019; Fry, 2019). This section builds on the discussion of sustainable and environmental design in previous sections, moving towards ‘design activism’. In this section, I specifically magnify the focus on ‘design activism’ (Fuad-Luke, 2009; Cetin, 2016), ‘ontological design’ (Willis, 2007; 2015; Escobar, 2018), critical and speculative studies and futurity (Mazé, 2016; Schalk et al., 2017; Candy and Kornet, 2019). I close this section with the speculative ‘Plasticful Food’ project (Fig. 3-12).

This section continues unpacking the evolution of ‘green design’, ‘sustainable design’ and ‘ecological design’ from Section 3.1. Escobar (2018), in *Designs for the Pluriverse,* examines the change brought by ‘ecological design’, which ‘suggests that sustainability is the cultural process’ (p. 44). For example, Fry (2019, pp. 280–283) argues for ‘sustainment’ and differentiates between ‘sustainment’ and ‘sustainability’, with its propensity to sustain the unsustainable – ‘business as usual’ (p. 280). The condition of sustainment is unattainable within the economic models with which we operate (p. 282). Fry (2019) calls for ‘massive cultural change’ and a larger agenda that requires far more futural and conceptually ambitious embracing of ‘sustainment’ (Ibid.). This is also a key argument of *Earth Logic* (Fletcher and Tham, 2019) in Section 3.1.

In the editorial introduction to *The Design Philosophy Reader*, Willis (2019, pp. 1–8) identifies the purpose of ‘design philosophy’ in three ways: first, in response to the ‘pervasiveness of design’; second as a state of thinking on design ‘from the inside’; and, third, as ‘the conditions of now’ (p. 1). Willis highlights the importance of philosophical exploration and expanding ‘depth of design’ and design thinking,

particularly in the ‘design research’ area of academic specialisation, which has intensified over the last three decades in design education. Willis (2019) outlines recent attempts to ‘think beyond design’ (Fry, 2019; McNeill, 2019) and highlights the difficulty of asking philosophical questions about design from a professional design stance (p. 2). While design occupies a central position in a space of systemic vastness, unsustainability and complexity, ‘the condition of now’ places design as ‘active in its creation’ (p. 3). Willis (2019) defines ‘design as the service profession services capitalism’. As capitalism is inherently exploitive, it is vital to acknowledge that this is not a moral judgement but a professional design description (p. 3). Willis argues that design needs to be a ‘thoughtful type of practice’ that allows uncompromised thinking on design – a ‘design philosophy’ (Ibid.).

Fuad-Luke (2009) introduces design activism as ‘design thinking, imagination and practice applied knowingly or unknowingly, to create a counter-narrative to generate and balance positive social, institutional, environmental and/or economic change’ (p. 27). For clarity, I place under ‘design research’ and ‘design activism’ under the term ‘sustainment’ as examples of emergent sub-disciplines. For example, ‘ontological design’ (Willis, 2007; 2019; Escobar, 2018) forms part of a group with feminist and political design futures (Schalk et al., 2017; Mazé, 2016; Tham, 2008): ‘design research by practice’ (Koskinen et al., 2011) ‘speculative design’ (Dunne and Raby, 2013; Pierce, 2015), ‘experiential design’ (Candy 2010; Candy and Dunagan, 2016), ‘metadesign’ (Wood, 2007; Tham et al., 2008) and ‘design and nature’ (St Pierre, 2019; Fletcher and Tham, 2019).

Cetin's (2016) critical analysis of 'design activism' discourse asserts that 'the outcomes of design activism are almost invisible, not only for the public audience, but even for the design community itself' (p. 388). Cetin (2016, pp. 390–392) identifies four distinct topics in design activism discourse: 'social, economic, political, and environmental issues' (p. 390). Further, he sets out a few primary strategies in 'design activism', such as 'designer initiative' (Papanek, 1985; Fisher, 2008; Fisher and Shipton, 2010), 'design in the local context' (Wood, 2007; Manzini, 2014; 2015) and 'design as politics' (Fry, 2010; Mazé, 2016).

First, I look at 'ontological re-orientation of design' (Escobar, 2018, p. 77) and 'design theory' and 'design education' development of an ontological approach to *de-sign* and destabilising orders, demanding a recentring of 'design education'. As Willis (2015, p. 70) maintains, there is a 'need to refuse discipline and transcend instrumentalism'. However, this complex task entails more than a straightforward social theory and philosophical application to the design field – hence an ontological turn: 'We open ourselves to ontological designing' (Willis, 2007, p. 95). Designers design tools, and these tools design us back. 'Design designs' is the apt and short formula given to this circularity by Anne-Marie Willis: 'we design our world, while our world acts back on us and designs us' (Willis, 2007, cited in Escobar, 2018, p. 110).

Futurity and discussions on the future have recently entered into design practices and design research. Mazé (2016) summarises that, over the past fifty years, a shift has taken place to design 'beyond the object' (Thackara, 1988) and explore 'the spirit of design' (Walker, 2012), defusing post-industrial technologies and embracing the 'innate "temporal form" of (inter)active materials, products

environments and systems' (Mazé, 2016, p. 39). Feminist Futures of Spatial Practice (Schalk et al. 2017) develops new forms of activism, expands dialogues, engages with materialisms, transforms 'ped-agogies' and projects alternatives (p. 14) through re-defining design research practice, feminist futures, new materialism, activism, dialogues, and projections (pp. 14–18).

'Experiential futures' is a family of ethnographic approaches for making futures visible, tangible, interactive and otherwise explorable in a range of modes (Candy and Kornet, 2019, p. 5). Led by practice and accompanied by a growing theoretical base, 'experiential futures' is grounded in the big-picture agenda of contributing to a 'social capacity for foresight' (Slaughter, 1996), using material and performative registers to build on the field's traditional uses of theoretical, schematic and verbal exploration (Candy, 2010, cited in Candy and Kornet, 2019).

Candy and Kornet (2019) explains how the rise of the 'experiential turn' in the early 2000s (see Candy and Dunagan, 2016, pp. 26–29) brought a change in foresight efforts to map images of the future. The 'experiential turn' has begun to articulate a full array of strategies for mediating the future systematically, prompting designers to explore futures increasingly. Candy and Kornet (2019) highlight many experiential and speculative design examples, particularly the importance of Dunne and Raby's (2013) *Speculative Everything: Design, Fiction, and Social Dreaming*. Those most relational to this research are experiential scenarios (Candy, 2010), *Designing an Experiential Scenario* (Candy and Dunagan, 2017), *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds* (Escobar, 2018), cited in Candy and Kornet

(2019, p. 4). These developments open promising avenues for attempting complex collective acts of empathy, conversation and deliberation in the public sphere (Ibid.).

The turn to experience, as a canvas for future practice, prods at a traditional over-reliance in the field on words, and corresponding under-utilisation of other media (Ramos, 2006), disclosing a transmedia landscape of alternative ways to use the future. Proponents argue that more embodied and media-rich depictions of futures can make the field more influential in shaping change (Candy, 2010; Candy and Dunagan, 2017, cited in Candy and Kornet, 2019, pp. 5–6), to enable design-driven 'circumstances or situations in which a community's collective intelligence and imagination can come forth' (Candy and Dunagan, 2017, p. 150).

Critical, conceptual and speculative notions and featuring discourses and terminologies in design research continue to be re-negotiated and re-framed. Allied with art, 'critical design' produces artefacts that debate futures (Mazé, 2016, p. 40). Mazé highlights many 'critical design' examples, but those most related to this research are 'social and politically engaged design' (Ericson and Mazé, 2011) and 'redirective designers' (Fry, 2010), which address defuturing phenomena such as climate change (Mazé, 2016, p. 38). Feminism offers optimistic outlooks on the future – feminist politics believes that things can be otherwise and that they can be changed (Söderbäck, 2012, p. 302 cited in Schalk et al., 2017, p. 16). Mazé concludes that 'relating through futures in design is a political act. It also – politically – (re)orders realities and lifeworlds through materiality' (Mazé, 2016, p. 41) and spatial temporality, opening up epistemological questions of difference on things and others.

‘Plasticful Foods’ is a speculative design project (Fig. 3-12) developed by the Waste2Worth team, partnered with the University of Amsterdam and Hogeschool Amsterdam (Waste2Worth, 2020). This design fiction project, guided by both universities’ ‘new waste vision’ began to change student and staff waste management behaviours to be more sustainable. Ellen Macarthur (2020) reports that the Plasticful Foods project addressed three sustainable development goals (SDGs), encompassing SDG 11 – sustainable cities and communities, SDG 12 – responsible production and consumption, and SDG 13 – climate action (Ellen Macarthur 2020; UN, 2019).

As with futures, the field of design is undergoing rapid transformation to better address its potential and shape change at scale (Candy and Kornet, 2019, p. 13). The Plasticful Foods project (Fig. 3-12) took scientific facts from the present day and projected them into a possible future, inviting audiences to imagine that ‘Plasticful Food’ could be a viable waste management process within the coming decade. Figure 3-12 displays a hamburger bun with a 3D printed slice of cheese, blue burger and hard tomato slices accompanied by chips and tea. In addition, a strip of pink pills called ‘Plasteeze’ helps your body smoothly digest the partly plastic burger.

Fig. 3-12 projects a vision of a possible future, as we are already consuming large amounts of micro-plastic incidentally, ‘through food chains, personal care products, contact (skin) from the soil, water or inhalation of micro-plastics in the air’ (Basri et al., 2021). Waste2Worth acknowledges that waste management procedures are not changing rapidly enough to contain the problem of global plastic pollution (Ellen Macarthur, 2020). Thus ‘eating our plastic waste may be

our only option for plastic containment in the near future' (Waste2Worth, 2020). The following section looks at the role of design and the humanities in communicating and visually mediating climate change.

3.3 Role of Design and the Humanities in the Changing Climate

‘Research in the humanities and social sciences is furthering our understanding of the socially differentiated impacts of climate change, the range of adaptation options being pursued or considered, and the support for and challenges to ongoing technical and political responses to climate change.’

Edward H. Allison and Hannah R. Bassett, 2015, p. 778.

‘Every wicked problem is a symptom of another, higher level, problem.’

— Richard Buchanan, 1992, p. 97.

Fig. 3-13. Basurama, 2014, *Inhabiting Plastic Oceans*. In Love We Trash installation, Cape Town, RSA.

The Intergovernmental Panel on Climate Change (IPCC) informs and summarises current planetary environmental complexity in the report 'Climate Change and Land' and the new scientific evaluation 'The Ocean and Cryosphere in Changing Climate' (IPCC, 2019). The term 'cryosphere' comes from the Greek words '*krios*', meaning cold, and '*sphaira*', meaning globe or ball. The 'cryosphere' is the frozen-water part of the Earth's system, including sea ice, lake ice, river ice, snow cover, glaciers, ice caps, ice sheets, ice shelves and permafrost and seasonally frozen ground (World Meteorological Organisation, 2020).

The IPCC (2019) reports the impact of climate change on oceans and waterways and highlights environmental pollution as the primary factor responsible for inducing changing conditions. Air pollution not only contributes to climate change but also makes it worse. Extraction and burning of fossil fuels raise overall temperatures, melting ice caps. Melted cold water is, in turn, thermally changing oceanic currents, thereby affecting marine flora and fauna.

A relevant environmental work for this PhD is the collaborative Sonic Acts group's 'Dark Ecology' project, which merges the humanities and environmental science. The curatorial team borrowed the concept of 'dark ecology' from the object-orientated ontology philosopher Timothy Morton, who wrote the 2007 book, *Ecology Without Nature: Re-thinking Environmental Aesthetics*. A collaborative performance by Kramvig and Pettersen affirmed scientific facts through a visual and sound land-installation project entitled 'Living Land – Below as Above', showing that 'global warming is now happening more than twice as fast in the Arctic than anywhere else in the world' (Kramvig and Pettersen, 2016, p. 132).

Mediated representations such as photographs, artworks and documentary films can significantly impact behavioural change and environmental activism (Farrelly et al., 2021, p. 15).

Marine and cryosphere changes and ‘management of oceans’ generally lag behind land protection, research and policy, which impact land and air (Bear, 2017, p. 27; Steinberg and Peters, 2015). The School of Marine and Environmental Affairs argues that humanities and social science research enables the development of better human understanding in climate change stewardship (Allison and Bassett, 2015, pp. 778–782). For example, in the humanities and design, customary use of a multitude of visual and interdisciplinary approaches is not allowed in quantified scientific findings. The current change in design professions follows the ‘side effects of rapid global change… which is being led by socio-political and environmental factors’ (Furniss, 2015, pp. 13–35). Research into contemporary design and creativity enterprise suggests that ‘the practice of design is unrecognisable’ compared to a decade ago. However, Furniss’ report questions if the design profession ‘is fit for purpose in a rapidly and radically re-figuring landscape’ (Ibid.).

Plastic debris does not recognise international boundaries, and regulations need to be enforced on an international scale (Napper, Pahl, and Thompson, 2021, p. 37). Despite solutions linked to management strategies and policies to reduce marine litter (GESAMP, 2015), marine pollution and toxic waste data findings and warnings (Jambeck et al., 2015; Takada, 2013), paradoxically, a global escalation is taking place in plastic packaging production (Ellen MacArthur Foundation, 2016).

Nevertheless, these complex political, economic and environmental influences offer a rich backdrop for exploring the plastic socio-material narrative. This is 'the constitutive entanglement of the social and the material in everyday organizational life' (Orlikowski, 2007, p. 1438). Messiness is the prelude to chronic and unresolvable conditions, and social messes are particularly resistant to pinpointing by analysis and fast resolutions. In *Wholesome Design for Wicked Problems*, Knapp (2008) advises designers to shift their action on significant global issues from 'solution to intervention'. Instead of seeking a totalitarian solution to a problem, Knapp proposes that 'one should recognize that actions occur in an ongoing process, and further actions will always be needed' (Ibid.).

Rittel and Webber (1973) were first to write about the 'wicked problem'. In terms of social policy and planning, 'wicked' has complex characteristics and can occur in any domain involving stakeholders with differing perspectives. Indeed, the social complexity of wicked problems, combined with technological complexity and vast scales, makes them impossible to govern (Ibid.).

Levin et al. (2007) introduced 'super-wicked problems' as a contemporary response to re-define Rittel's 'wicked problem'. The multi-disciplinary social science team argued that 'super-wicked problems' require considerably higher levels of attention and more policy interventions. For example, global climate change is a 'super-wicked problem'. Below are four points that characterise 'super-wicked problems':

1. 'Time is Running Out' – the current political system responds or fails to meet with policy intervention (Levin et al., 2012, pp. 6–8).

2. ‘No Central Authority’ – in the case of climate change, decision-makers within public authorities do not make or control all of the choices needed to be implemented to alleviate pressures on climate change (Ibid.).

3. ‘Those Seeking to Solve the Problem Are Also Causing It’ – every concerned person trying to reduce climate change has contributed to climate change. Everyday activities, including higher per capita emissions in industrialised countries, are major culprits (Ibid.).

4. ‘Hyperbolic Discounting’ – behavioural economists have labelled the tendency of individuals to discount the future when deliberating over some problems. Current policies can therefore irrationally discount the future (Ibid.).

Design professions draw from a plethora of experiences in dealing with complex and ubiquitous situations. Buchanan’s (1992) theoretical contribution to creative dealings with ‘wicked topics’ in design thinking employs a theory to tackle wicked issues. Buchanan explains that designers use a broad spectrum of tools – from practice-based to theory-led – for the ‘conception and planning of the artificial’ (Buchanan, 1992, p. 98).

In comparison to financial professions, design is criticised for its inability to politically influence corporate business and government in pursuit of sustainable development: ‘Designers are currently not able to effectively address contemporary environmental and social problems due to the systemic priorities of the design industry’ (Boehner, 2014, pp. 119–136). On the contrary, in acknowledging a lack of professional power to influence central governmental,

design research became strategic and speculative because of industry constraints (see Fig. 3-12). Boehner's (2014) design critique is therefore too generic because there are three design streams: professional, education and research-based. Boehner (2018) critiques (professional) design's potential for symbolic violence at a structural level, bound by the anti-ecological priorities embedded in the design industry (Micklethwaite, 2019, p. 906).

Despite the grim results of the two 2019 IPCC reports, design activists, researchers and educators confirm the importance of ecological design engagement in these 'times of uncertainty' (Furniss, 2015). Contemporary designers engaged in community and environmental stewardship are re-inventing themselves as environmental artists, social scientists and material anthropologists.

The variety of approaches applied gives design professions experience when intervening with 'wicked' and 'super-wicked' topics. As an ecological design initiative example, Basurama's (Fig. 3-13) collaborative waste research is re-shaping relations with plastic waste through environmental activism and participatory engagement – the *Inhabiting Plastic Oceans* (2014) installation uses 240 kilograms of plastic, more than 5,000 metres of duct tape and three industrial fans. The pop-up installation helps joyfully visualise single-use plastic bags. Using South African consumer dimensions, Basurama's 3x3x3 meters 'habitable sculpture cube' represents the exact number of plastic bags that a Cape Town resident takes home each year (Fig. 3-13).

The alternative epistemology of Levin et al. (2012) proposes ‘applied forward reasoning’, which suggests using various findings to create new hypotheses or conclusions concerning ‘super-wicked problems’. ‘Applied forward reasoning’ therefore supports my design research and argues that the oceans are the largest mismanaged landfill, evidenced in the forthcoming sections, Sections 3.5–3.6, by the abundance of scientific and plastics disposal data. The oceanic plastic pollution phenomenon has all four ‘super-wicked’ symptomatic characteristics required to qualify for a new fast-forward entry into twenty-first-century global climate change hazards.

First, time has run out to reverse the toxic side effects of oceanic plastic discard. Second, we need to establish a ‘Blue Economy’ (Winder and Le Heron, 2006) thinking and break away from the ontological separation of ‘green’ land and ‘blue’ sea (Bear, 2014, p. 28). Too many countries with economic borders based over waterways and no central authority results in a lack of marine protection policies. Third, ‘Those Seeking to Solve the Problem Are Also Causing It’ relates to the fact that, as we all individually consume and thus dispose of items daily, alongside rapid urban expansion and human growth, plastic production also gathers pace. Lastly, ‘Hyperbolic Discounting’ is specific to single-use plastic production growth and lagging marine policies irrationally discount the future.

Section 3.4 looks at humanity’s urban expansion and production growth, which alters the planet’s evolutionary ways.

3.4 Urban Expansion and Waste Production

> ‘For the first time in the 3.8 billion years that life has existed on Earth, one species – humanity – is altering the biological, physical and chemical features of the planet.’
>
> — David Suzuki, 2002, p. 2.

Fig. 3-14. Surfers Against Sewage, 2016, *18,720 Pink Bottles*. Washed up on a Cornwall beach, UK.

We are living in the face of human and urban expansion. For the first time in human history, the majority of the human population dwells in an urban environment. According to the United Nations’ Department of Economic and Social Affairs ‘World Population Prospects’ report (DESA, 2015), and future

statistical projections, the current world population of 7.3 billion is expected to reach 8.5 billion by 2030 and further expand to 9.7 billion in 2050 and 11.2 billion in 2100 (Ibid.). It took humanity 200,000 years to reach 1 billion and only 200 years to reach 7 billion. This rapid human growth has inevitably put more demands on the planet, requiring more urban spaces, new homes, water, food, sanitation, public services and amenities: 'Rapid human population growth exacerbates all environmental problems' (Population Matters, 2020).

Sassen, an urban sociologist, argues that the world is moving towards a much more 'flexible order, gathered in a new urban paradigm', expanded in the 'global city network' as we form a 'glocal' growing human community (2001, pp. 3–11). For clarity, 'glocal is characterised by both local and global considerations' (Oxford Dictionary, 2016). In contrast, individuals in society are becoming more aware of each other, connected through digital technologies, rapid urbanisation and war-induced migration, and united by climate change and consequential marine pollution by plastics (Surfers Against Sewage, 2016, Fig. 3-14).

In the text, I use the term 'glocal' to help situate the duality of the personal 'I' and the public 'We' aspects as a result of the perpetual mix of the 'glocal' polarity of local and global community needs, individual consumption and global production. In particular, the white elephant in the room questions the '3-97 ratio' for waste production transparency (MacBride, 2011, p. 97; Discard Studies, 2016).

For example, only 3% of MSW production is paired with 97% of industrial waste disposal contribution. The '3-97 ratio' placement highlights the complexity and acute and ongoing tension between categories of waste and their counts.

Industrial ecologists who attempt to track material waste through systems have noted that 'material consumption is analytically less tractable than energy use… Materials possess unique properties, and those properties provide value, define use, and have environmental consequences' (Wernick et al., 1996, cited in *Discard Studies*, 2016). Max Liboiron, in an online article in *Discard Studies* (2016), concluded that we have no idea of the quantity of non-household solid waste produced. It is therefore hard to take action because we do not have information to act upon. As such, MacBride advocates 'ranting and raving, communicated through democratic channels' for industrial solid waste data (MacBride, 2011, p. 176).

Global socio-economic and cultural polarisation is vital to new conditions of exponential growth, which have contributed to a new class alignment in urban areas across the world (Sassen, 2001, pp. 3–11). According to growth data in a United Nations report (DESA, 2015), 'humans are increasingly dependent on the oceans for resources and as a platform for the exchange of goods in a globalised world'. As a result of marine transport routes and currents, the beaches in Cornwall are often covered in spill-over goods that have washed ashore from shipping containers (see, for example, *18,720 Pink Bottles* in Figure 3-14).

Scientific findings call with alarm for careful consideration of a 'safe operating space for humanity' (Steffen et al., 2011; Rockström et al., 2009). Conservative scientific analysis indicates that human expansion has already 'transgressed three planetary boundaries', creating climate change, encouraging rapid biodiversity loss and disrupting the nitrogen cycle (Ibid.). Research a decade later predicts that, if crossed, the 'Earth System' planetary threshold could prevent

stabilisation of the climate at intermediate temperature rises and cause continued warming on a 'Hothouse Earth' pathway even as human emissions reduce (Steffen et al., 2018, p. 825). In conjunction with data for human population growth, ongoing scientific warnings about the environment trigger human resilience alerts for living on the new 'Hothouse Earth'.

Prokeinova and Blazek (2020) propose that 'ecocide' (Hossay, 2006) has become a fifth international crime. Ecocide is not only intentionally committed – for example, in reducing the cost of production or harming competitors in business, including in the area of waste processing (Prokeinova and Blazek, 2020, p. 7). The word 'ecocide' has been known since the 1960s. Polly Higgins, often called 'the lawyer of the Earth', provides this term's legal definition: 'Ecocide resides in excessive damage or loss of ecosystem in a given territory where the peaceful coexistence of people is seriously threatened' (Ibid., p. 8). Hossay (2006) adds the term 'unsustainable' at international level, meaning that we do not have the protection of the Earth or we have committed the international crime of 'ecocide' allowing the mass destruction of Earth.

Section 3.4.1 explores the plastic growth paradox to assist in developing an understanding of 'super-wicked problems', postulating concerns relating to the rise of plastics manufacturing and single-use packaging consumption.

3.4.1 Plastic Packaging Growth

> ‘I don’t know what we can do about the 1.5^{O}C rise in ocean temperatures, but we could do something about plastics right now.’
>
> — David Attenborough, quoted in the Ethical Corporation Report, 2017, p. 8.

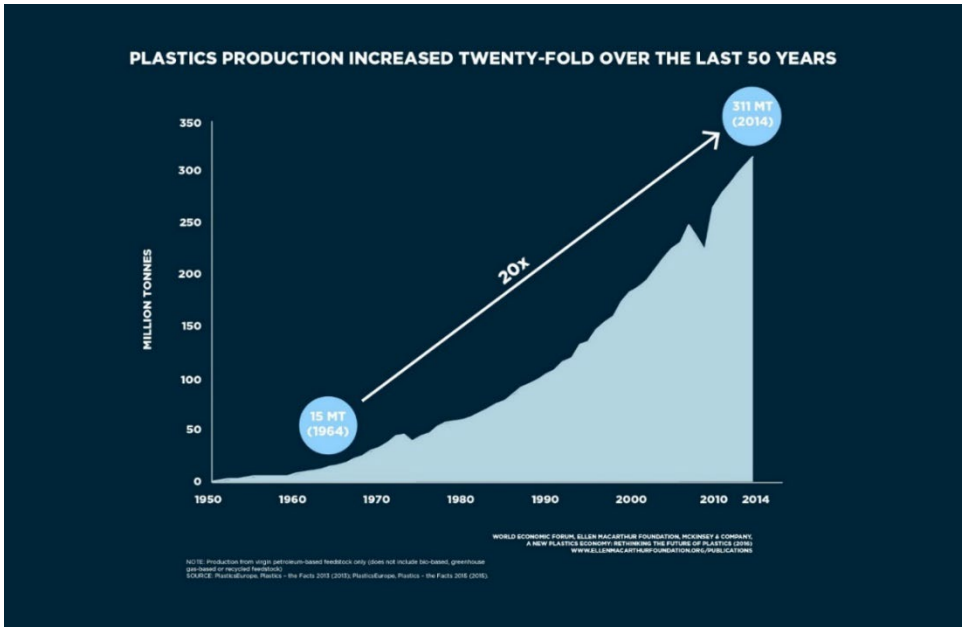


Fig. 3-15. Ellen MacArthur Foundation, 2016, New Plastics Economy Report Chart.
Source: Plastics Europe, Plastics the Facts, 2013 and 2015.

In the first decade of the twenty-first century, virgin plastic production quadrupled when compared to the whole of the previous century. Figure 3-15 shows the output from virgin petroleum feedstock only – the chart does not include data from bio-based, greenhouse gas-based or recycled feedstock (Plastics Europe, 2013, 2015).

Household collection recycling data quantified by Recycling of Used Plastics Limited (RECOUP, 2012) stated that over 1.5 million tonnes of mixed household plastic packaging ends up in landfill each year in the UK. In 2018, updated figures were presented (RECOUP, 2018, p. 4):

- 1,044,363 tonnes of plastic packaging from all sectors were declared recycled in 2017 – with over two tonnes placed on the market. This gives a recycling rate of 46.2%.

- 66% of plastics were exported, and 34% were recycled in the UK. The 527,010 tonnes of rigid plastic packaging collected for recycling from UK households made up just over 50% of the total of plastic packaging recycled.

- The remaining 1,215,637 tonnes of plastic waste were not collected for recycling and therefore went into landfill or energy recovery.

These statistics are confusing on their own. The figures from RECOUP (2012) to RECOUP (2018) show the decline in landfill depository, claiming improvement as a result of the energy recovery rise. Nevertheless, global production of virgin plastics has continued to grow for the past five years. Only 20% of the plastics produced in 300 million tonnes a year are recycled. Today, an average person living in Western Europe or North America consumes 100 kilograms of plastic packaging each year (Gourmelon, 2015).

Plastics are more than revelling in the afterlife of worthless commodities; they disclose a dimension of the global economy – namely, its integration of the

worldwide oil industry. Plastic is a petroleum product that claims a quarter of all extracted oil. Moreover, through plastics, we began to understand the complete permeation of oil into every facet of cultural life (Boetzkes and Pendakis, 2013, p. 2). Oil is the restorative material coursing through the symbolic channels of economic transactions. The plastic economy makes 'visible a stratigraphy of oil capital' (Ibid. p. 4).

A 2017 report from the Ellen MacArthur Foundation – 'The New Plastics Economy: Re-thinking the Future of Plastics and Catalysing Action' – comprehensively assessed the flow of global plastic packaging. The report found that most plastic packaging is used only once and that the value of 95% of plastic packaging material, worth $80 billion to $120 billion annually, is therefore perpetually lost to the economy. The report envisages a new approach based on creating effective after-use pathways for plastics in the global economy, drastically reducing the leakage of plastics into natural systems – particularly the oceans. It outlines steps based on a circular economy, opening a dialogue towards achieving the proposed systemic shift (Ellen MacArthur Foundation, 2017, pp. 16–28). Regarding fate and management, references to 'end of life' and 'lifecycle' in relation to plastic are misleading. There is no end of life for polymer resins, synthetic fibres, monomers and additives (Farrelly, Taffel, and Shaw, 2021, p. 13).

Without discounting the historical importance of the emergence of both Ellen MacArthur's circular economy reports, 'plastics are notorious for their unintentional releases into the environment at every stage of their lifecycles' (Farrelly, Taffel, and Shaw, 2021, p. 13). It is therefore unlikely that a circular

economy will ever be able to eliminate all of the negative externalities of the plastics currently produced, even if the volume of production is radically reduced (Ibid.).

The human community has only recently started talking about strategies and future policies for global plastics without addressing any systemic change at the petroleum production source or industrial wastage levels. For example, the report's initial analysis outlines three strategies, allocating 50% towards recycling strategies, 20% to re-use policy and 30% for innovation and re-design (Ellen MacArthur Foundation, 2017, pp. 26–29).

Plastics are lightweight, inexpensive, durable and versatile materials that bring many societal benefits, especially in healthcare, agriculture, transportation, construction and packaging (Plastics Europe, 2016). Plastics production has surged over the past fifty years, from 15 million tonnes in 1964 to 311 million tonnes in 2014, and is expected to double again over the next twenty years (Ellen MacArthur Foundation, 2017, p. 11). In 2017, the former chief executive officer (CEO) of Asda called on supermarkets to stop using plastic packaging altogether, and for the UK packaging industry and supermarkets to 'work together to turn off the tap' (Ethical Corporation Report, 2017, p. 6).

Despite the frightening evidence from various scientific and consumption sources, global single-use packaging demand and plastic packaging production statistics show these are still rising. Regardless of the durability of plastics, the main uses are in relatively short-lived applications such as packaging, which accounts for about 40% of all production. Although packaging plays an important

role in protecting food, drink and other items, thus reducing damage and wastage of products, it has also led to a rapid accumulation of persistent plastics waste (Napper, Pahl, and Thompson, 2021, p. 26).

Following Attenborough's statement (Ethical Corporation Report, 2017*,* p. 8), even if we cannot change the oceanic and climate side effects, we could each do something regarding the daily use of plastics through practising reduction and re-use. Nevertheless, it is vital to acknowledge that Liboiron (2012, p. 206) emphasises that 'one of the major scalar fallacies in environmentalism... is that systemic environmental degradation is created, and can be combated, through individual consumer choice' (cited in Farrelly, Taffel, and Shaw, 2021, p. 8).

This research endeavours to implement change at individual micro-level, making new relationships with post-consumed plastic things. I promote tactics of manual plastic re-use through human engagement and craft, advocating a counter-strategy to the WfE thermal processes and recycling packaging surplus that addresses only 3% of overall plastic disposal (see Chapter Seven).

Section 3.4.2 summarises how global plastic production and consumption have marked the new planetary epoch in the making.

3.4.2 We Made the Anthropocene

‘For millennia, humans have behaved as rebels against a superpower we call “Nature”. In the twentieth century, however, new technologies, fossil fuels and a fast-growing population resulted in a “Great Acceleration” of our own powers. Albeit clumsily, we are taking control of Nature’s realm, from climate to DNA. We, humans, are becoming the dominant force for change on Earth. A long-held religious and philosophical idea – humans as the masters of planet Earth – has turned into a stark reality. What we do now already affects the planet of the year 3000 or even 50,000.’

— Paul. J. Crutzen and Christian Schwägerl, 2011.

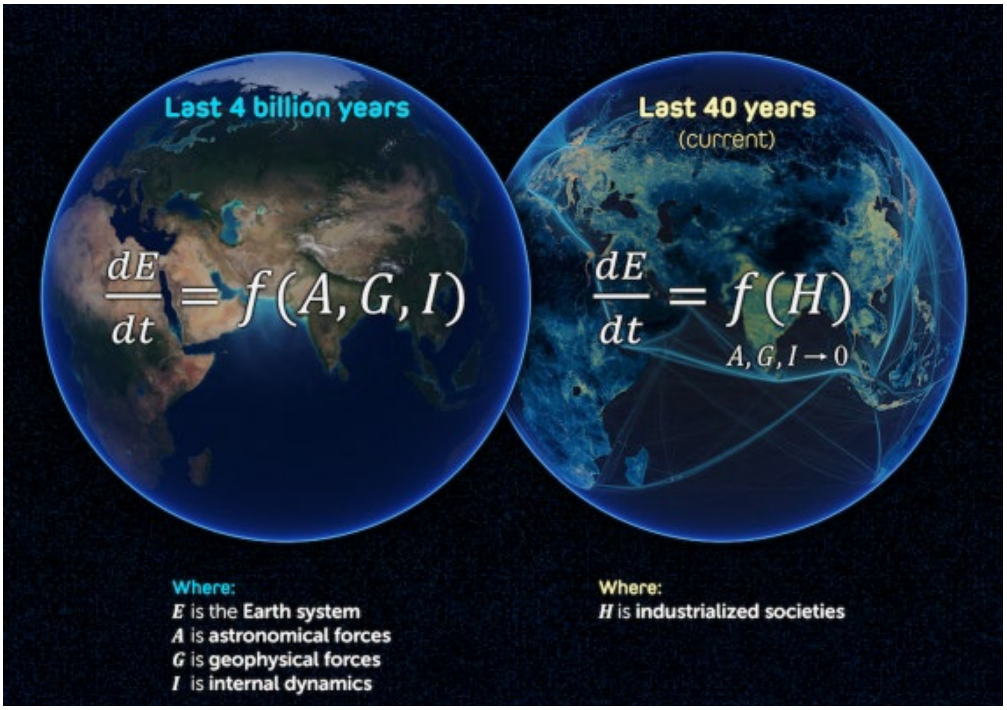


Fig. 3-16. Future Earth. Owen Gaffney and Will Steffen, 2017, *The Anthropocene Equation.*

The birth of the Anthropocene provides compelling evidence that humanity's impact on the Earth's spheres has pushed the planet into a new geological epoch. Geographers Crutzen and Schwägerl (2011) argue that we are no longer disturbing natural ecosystems. Instead, we now live in 'human systems with natural ecosystems embedded within them' (Ellis et al., 2010). The geographical term 'Anthropocene' gained popularity in twenty-first-century environmental media and news as a new scientific marker and eco-political statement. Etymologically, 'Anthropocene' is derived from ancient Greek origins, as a dual word derived from 'anthropos', which stands for man, and 'cene', meaning new. This 'new-man' term gained more attention after the Geological Society of America published an article positing the life-changing question, 'Are We Now Living in the Anthropocene?' (Zalasiewicz et al., 2008).

From a scientific perspective, the new epoch acknowledges the current human dominance of the planet's biological, physical, chemical and geological processes (Suzuki, 2002, p. 2). Long-held modernist barriers between nature and human culture are breaking down. It is no longer human survival in nature that is in question. Instead, a technologically inclined society decides what life is and what we will become. This new regime is represented by 'The Anthropocene Equation' of Gaffney and Steffen (2017).

Figure 3-16, *Future Earth,* depicts a mathematical estimate of the last forty years of the Earth under the influence of humans, through a mathematically projected rate of change. In order to reduce the risk of uncertain futures – compared to the previous Ice Age cycle – it will be necessary to change the current speed of

industrial society to approximately zero. The equation's request sounds like a utopian requirement in comparison to the selected outcomes that I list below as ongoing industrial revolution epoch markers:

- We have left a permanent marker in the sediment and glacial ice with airborne particulates such as black carbon from burning fossil fuels (Folke et al., 1996, pp. 557–575).

- We have pushed the extinction rates of flora and fauna far above the long-term average. The Earth is now on course for a sixth mass amphibian extinction that will see 75% of the planet's species extinct in the next few centuries (Ellis and Ramankutty, 2008, pp. 435–439).

- We have increased the concentrations of CO_2 in the atmosphere by 120 parts per million, leaving concentrations today at approximately 400 ppm and still rising (National Oceanic and Atmospheric Administration, NOAA, 2015).

- We have increased space waste. In the Earth's orbit, more than 170 million particles of debris are smaller than 1 cm (0.4 in), approximately 670,000 particles of debris are 1–10 cm in diameter and about 29,000 particles of debris are >10 cm (European Space Agency, ESA, 2017).

The current take–make–dispose linear economy model captures the current state of humanity's industrial progress and consumption indifference and marks its devastating side effects in nature.

The above data list of Earth's systems transgressions is the extrapolation for nurturing conversations on ecological ethics through 'matters of care' (Puig de la Bellacasa, 2017). Hillman (1996), in *Aesthetics and Politics,* asks the question, 'can there be ethics without aesthetics?' (Hillman, 1996, p. 41). Hillman discusses how to achieve psychological activism by proposing an 'aesthetic response' and stating that 'people deny their aesthetic responses by closing down their senses, by anesthetizing themselves' (Ibid. pp. 38–44).

Lovelock's (2001) scientific discovery of faint toxic residues resulting from agricultural pesticides was the basis of Carson's (1962) ecological understanding (Roszak, 1992, p. 145). Sixty years ago, the birth of the 'deep ecology' modern environmental movement, which many attribute to the pioneering book by Carson (1962), *Silent Spring*, led to a greater awareness of environmental pollution and its impact on human health. For clarity, deep ecology is an eco-philosophy deriving from intuitive ethical principles, holistic ecology (Smuts, 1926) and systems thinking. Deep ecology influenced eco-psychology, inviting 'prescribing nature' (Hillman, 1996) in psychotherapy practice (Roszak, 1992, p. 310).

Research into eco-psychology finds that 'conversations about global warming' and climate change find little or 'no place to talk about it' (Norgaard, 2011, pp. 52–57). Nevertheless, 'people do care', and, as Cohen (2001) reminds us in his work on denial,' we can feel and care intensely, yet remain silent' (Cohen, 2001, p. 9 cited in Norgaard, 201, p. 59).

Founder of 'deep ecology', Naess (1973), in a seminal article, 'The Shallow and the Deep Ecology Movements', radically calls for 'biospherical egalitarianism'

among all species (Roszak, 1992, p. 232). Many environmental organisations, the 'shallow ecologists', regard the planet as *ours* to do with as we see fit, applying managerial methods. Naess (1992) calls for the development of an 'ecological self' and sharing planetary resources in biocentric fellowship (Roszak, 1992, p. 233). Deep ecology introduces solitary meditation exercises 'in which participants are asked to imagine their way into a nonhuman identity' (Ibid. p. 245). The inspiration for meditative eco practices traces back to Leopold (1949) 'land ethic' as one of the founding statements of deep ecology. Leopold held that no one could fully understand an ecosystem until they tried to 'think like a mountain' (Ibid. p. 245).

Hillman (1996, p. 42) 'suggests that all our ethical concerns for justice and fairness, for decency, require as well an aesthetic vision'. Thus 'deep ecology' ethics calls for radical change at individual, organisational and systematic level, moving away from the Anthropocentric view and changing focus towards the planetary collective. Like Morton's (2007) 'dark ecologies' notion, the stance adopted in this research embraces an 'aesthetic response' that the point of doom has happened and that industrial growth and waste production will not halt to zero voluntarily. The present timeline position can be equated to the effect of thunder caused by lightning, although – in this case – the delay effect (e.g., the air collapse effect) will strike at the very end, after the planets roar.

The following section introduces the unregulated effects of discarded plastic waste, causing amphibian and aquatic collapse as a result of zero policy implementation for protecting and regulating the largest mismanaged landfill – the oceanic space.

3.5 Plastic Ocean Pollution

> ‘Today, there is a growing unease about the effectiveness of current pollution control measures, despite the technocratic problem-solving ethos guiding new initiatives.’
>
> — Max Liboiron, *Redefining Pollution: Plastics in the Wild*, 2012, p. 76.

Fig. 3-17. Plastics in the Ocean, 2016. Photo on the left: Doug Woodring, 2016, *Environmental Disaster at Cheung Sha Beach on Lantau Island*, Hong Kong. Image on the right: David Yanofsky, 2016, quartz composite of eight land satellites.

Anthropogenic litter is present in all marine habitats, from the coast to the most remote ocean points. For clarity, the term ‘anthropogenic’ refers to the effects caused by human activity, such as those that contribute to environmental pollution. Marine litter, derived from non-natural sources, is defined by the GESAMP as ‘any persistent, manufactured or processed solid material

discarded, disposed of or abandoned in the marine and coastal environment' (Galgani et al., 2010, cited in GESAMP, 2015, p. 9).

Plastic and metal are the most common types of litter items found on the deep sea bed. Plastics are synthetic polymers derived from petroleum oil. These are toxic pollutants spreading throughout the planet's realms. Currently, 269,000 tonnes of plastic, composed of 5.25 trillion particles, are afloat at sea (Eriksen et al., 2014, Intro). Approximately 11% of all waste is plastic, with 4.8 million to 12.7 million metric tonnes entering the ocean annually (Jambeck et al., 2015, pp. 768–769). This is already an outdated statistic because the figures increase every year, and the oceans are now accumulating the same amount of plastic per annum as was produced across the entire world in 1961.

The act of discarding has connotations of careless disposal – discard is unauthorised and unmanaged waste. Without improvements to the current waste management infrastructure, the cumulative quantity of plastic discard that could enter the ocean will 'increase by an order of magnitude by 2025' (Jambeck et al., 2015, pp. 770–771). For clarity, scientific notation of magnitude is to make large mathematical comparisons. In general, order of magnitude is the quantity of powers of 10, and n represents the order of magnitude. An increase of n orders of magnitude is the equivalent of multiplying a quantity by 10n (Wikipedia, 2019). For example, this means that, in a 'business-as-usual' scenario, by 2050, the oceans are expected to contain more plastics than fish by biomass. This estimate is based on the rising trend in the human population and current waste management processes and systems (Ellen MacArthur Foundation, 2016, p. 16).

Plastic rubbish that flows into the ocean – originating from the United States and Europe – is a consequence of urban and coastal litter rather than the mishandling of collected waste (Cassouto, 2015). In 2018, the GESAMP estimated that land-based sources account for up to 80% of the world's marine pollution, 60% to 95% of which is plastic debris. Transposed by wind, most unmanaged litter on land ultimately ends up in rivers and the ocean. Small pieces of plastic on the beach are poetically nicknamed 'mermaid tears' on the UK's coast. These 'mermaid tears' – or nurdles – are the second most common plastic litter found on local beaches, according to data from the Marine Conservation Society and reported in the Surfers Against Sewage (SAS) report 'Climate Change: A Surfer's Perspective' (SAS, 2007). Mermaid tears represent the sea crying out to the shore from the lost shipping container spill-over from the pallets of resin used to manufacture single-use plastic products.

The complex 'out of sight, out of mind' nature of marine systems lies in the ocean's depth and lack of visibility to the human eye (Steinberg and Peters, 2015). However, ongoing thermal and chemical change in ocean ecosystems has far-reaching consequences – both present and future – for all planetary life (Eriksen et al., 2014; Jambeck et al., 2015).

Visible to the 'glocal' human community are the consequences of the environmental disaster at Cheung Sha Beach on Lantau Island, Hong Kong, in 2016 (see left image in Fig. 3-17). Witnesses described the beach debris as oncoming heaps consisting of everyday items, plastic bags, single-use packaging and flip flops. The mountains of food packaging indicated that the waste had come from the mainland, probably because of the unprecedented river floods that

affected China over the winter of that year. This marine plastic pollution disaster is an excellent example of when marine protection policies fall short because borders do not bind waterways.

It is important to re-direct global attention to the ocean because marine preservation currently lags behind in implementing environmental protection policies. This 'super-wicked problem' suggests that a large-scale ocean clean-up will address the end of pipeline coastal floating debris that has not yet become entangled with ocean life or fragmented and sunk onto the sea bed. For example, Boyan Slat (2016) proposed the single global initiative, 'The Ocean Cleanup', currently financially backed by leading maritime-dredging company Royal Boskalis. Nicknamed the 'largest clean-up in history', it is located in the North Sea, 23 km off the coast of the Netherlands (Royal Boskalis Westminster, 2017).

The North Sea prototype of technological solutionism by means of 'advanced technologies to rid the world's oceans of plastic' has been criticised for its high start-up costs and a lack of research into how it will affect sea life living with plastic (The Ocean Cleanup 2018, cited in Taffel, 2021, pp. 188–190). Taffel (2021) states that The Ocean Cleanup project is misleading in two ways as floating barriers catch macro-plastics, so they cannot collect micro-plastics. Consequently, the proposed solution does nothing to remove most plastic pieces from the oceans, as the majority of oceanic plastics by count are micro-plastics (Eriksen et al. 2014 cited in Taffel, 2021, p. 189). Second, The Ocean Cleanup removes plastics only from the ocean's uppermost 1.5 metres (Taffel, 2021, p. 190).

The International Union for Conservation of Nature (IUCN) states that marine species live on, ingest or are entangled by plastic debris, which causes severe injuries, endocrine changes and deaths (IUCN, 2018). Plastics and persistent organic pollutants in marine environments have been found in deep-sea organisms, including crustaceans dwelling between 7,000 and 10,000 metres below sea level in the Kermadec and Mariana Trenches (Weston et al., 2020; Jamieson et al., 2020; Taffel, 2021).

Plastic ocean pollution threatens human health, food safety and quality, and coastal tourism, and contributes to climate change (IUCN, 2018). I close this section with Max Liboiron's words: 'in the case of plastic pollution, the ineffectiveness is stark' (Liboiron, 2012, p. 76). In particular, this refers to technocratic problem-solving, which does not ease environmental distress for many aquatic species or solve the underlying causes, only addressing acute symptoms. The question is whether these favoured types of 'techno-fix' solutions implemented at the end of the plastic stream represent a distraction from intervening with unregulated chemical additives production and petroleum distribution at its production roots.

Section 3.5.1 introduces the reader to the geographical and aquatic properties of the terms 'planetary gyre' and 'the garbage patch'. This research focuses on the less explored North Atlantic Gyre and the Sargasso Sea Patch because of their proximity to UK and European shorelines. From a migratory perspective, I track oceanic discard most relevant to my place of living and disposal.

3.5.1 The North Atlantic Gyre and Sargasso Sea Garbage Patch

> 'Taking into account a constant relation of the biomass to the local climatic and geological conditions, life occupies all the available space.'
>
> — Georges Bataille, 1991, pp. 29–30.

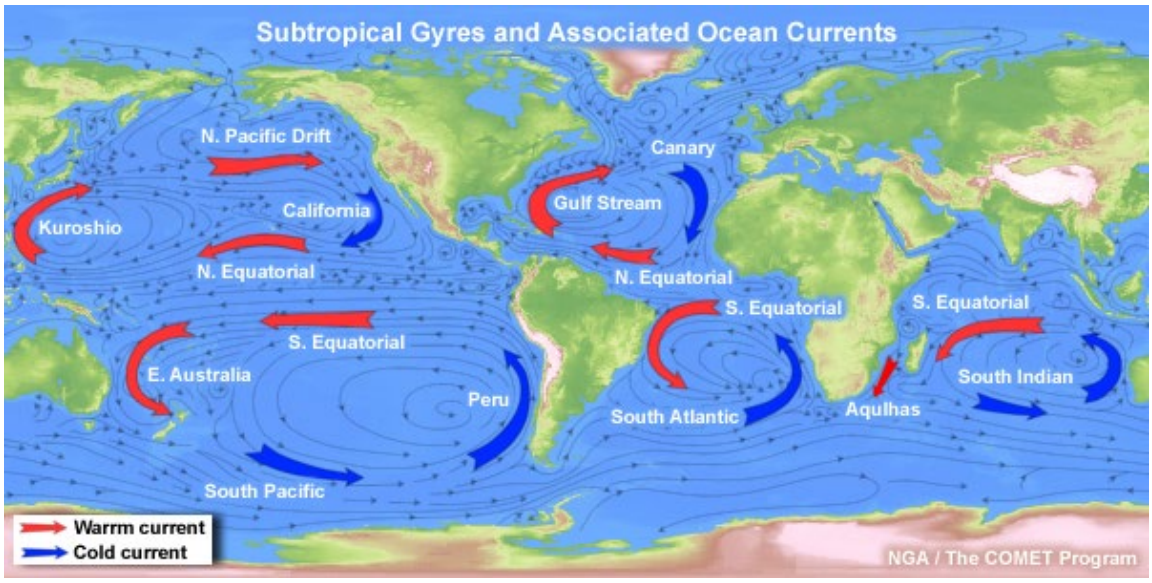


Fig. 3-18. **COMET® Programme, 2011.** *Ocean Currents: Global Upper Ocean Circulations and Sub-tropical Gyres*.

Gyres are large-scale systems of wind-driven surface currents caused by the Coriolis effect, which is a rotating system perpendicular to the Earth's axis

(Eriksen et al., 2016, Section 1.1). In total, eleven gyres have been identified in the world's oceans and oceanic plastic waste research is concentrated on five of these rotating currents (Maximenko et al., 2012, Intro) – one in the Indian Ocean, two in the Atlantic Ocean and two in the Pacific Ocean (Fig. 3-18).

The term 'gyre' refers to a large-scale circular feature made up of ocean currents that spiral around a central point – clockwise in the Northern Hemisphere and counter-clockwise in the Southern Hemisphere. The five major gyres comprise 40% of the ocean, constituting a quarter of the planet's mass (Fig. 3-18). The North Atlantic Gyre stretches across the North Atlantic from near the equator almost to Iceland, and from the east coast of North America to the west coasts of Europe and Africa (Fig. 3-18). The North Atlantic Gyre is similar to the North Pacific Gyre in that it traps anthropocentric marine debris in the North Atlantic Garbage Patch (National Geographic Encyclopaedia, 2014).

The global public's perception and awareness of this marine 'super-wicked problem' are peripheral, although rapidly growing over the last couple of years. Primary media offers information on the North Pacific Gyre but lacks a full description of the four main gyres. The press has called the North Pacific Gyre 'the eighth continent' – it was initially described as large-scale islands of floating trash. Science compares the North Pacific Gyre to a 'plastic soup' and, more recently, a 'plastic smog' slowly settling onto the sea floor (Eriksen et al., 2016, Section 7.0).

Plastic litter accumulates at the centre of primary ocean vortices, swirled by ocean currents, forming eddies that create dense areas called 'garbage patches'.

The NOAA describes garbage patches as large masses of ever-accumulating floating debris fields across the seas. A garbage patch is therefore an entangled biomass collecting plastic debris, which can be described as giant whirlpools that pull objects in. Garbage patches of varying sizes are located in each of the main gyres (NOAA, 2020). The Great North Pacific Garbage Patch is the most well-known garbage patch, discovered and brought to the media and the public by Captain Moore in 1997. However, only 30% of all plastics in the ocean are floating – the rest lies on the ocean bed.

This research focuses on floating micro-plastics in the North Atlantic Gyre, and the less explored Sargasso Sea Patch. The Sargasso Sea is the only sea with no shorelines, wholly enclosed within the North Atlantic Ocean. The sea's name comes from the Spanish word 'sargazzo', which means kelp. Kelp is a dense cluster of individual mats of robust seaweed plants. I think of kelp as the underwater forest and the Sargasso Sea's golden-yellow floating kelp (sargassum) has been dubbed the Atlantic Golden Rainforest. The cloud-like mats of sargassum provide a haven for hatchling sea turtles, baby fish and hundreds of other marine animals (Damon, 2019).

Technological solutions for cleaning up the Sargasso Sea Patch area are rather hopeless because of plastic flocks together with patches of kelp in so-called 'windrows' – long lines of brown islands floating on the water (Plastic Reef, 2010). Moreover, scientific evidence relating to the marine life that occupies gyre/patch spaces is in its infancy, and it is too early to demonstrate and explain the complex and rapid changes in the oceanic environment, species and human health. These new social marine science findings and insights pave the way for a new planetary

paradigm shift and ways to re-imagine, conceptualise and visualise plastics accumulation in nature. This section closes with the resonating affirmation from Bataille (1991) that microscopic 'life occupies all the available space' in the plastisphere.

Plastics out of place are routinely referred to as pollution. As Liboiron (2016) points out, the toxicological science that labels plastics as 'pollutants' and determines the safe limits of toxicants is made to appear apolitical (Farrelly, Taffel, and Shaw, 2021, p. 6). All substances can be poisonous. The concentration determines whether something acts as a toxicant (Ibid. p. 7). In relation to plastics, some monomers, plasticisers and additives (e.g., phthalates) are EDCs, which can leach from plastic packages and containers into food and beverages (Farrelly and Shaw, 2017, cited in Farrelly, Taffel, and Shaw, 2021, p. 7). EDCs interfere with the hormonal systems of humans and animals, causing a range of negative developmental, reproductive, neurological and immune effects (Diamanti-Kandarakis et al., 2009; Shaw, 2014, Ibid. p. 7). As the plastic fragments mechanically decompose in the ocean, they shrink in size. The transition from macro-plastics – the size of a plastic bottle – to micro-plastics – a small 'mermaid tear' particle – to microscopic nano-plastics, best described as 'ocean smog', happens reasonably quickly (Eriksen et al., 2016).

Section 3.5.2 describes the rise of the planetary phenomenon situated in all gyres and garbage patches, closely related to the formation of the biolayer occupied by microscopic life that has discovered this newly available space for living – the plastic sanctuary.

3.5.2 The Birth of the Plastisphere

> ‘Scientists have discovered a diverse multitude of microbes colonizing and thriving on flecks of plastic that have polluted the oceans – a vast new human-made flotilla of microbial communities that they have dubbed the Plastisphere.’
>
> — Woods Hole Center for Oceans and Human Health (WHCOHH), 2013.

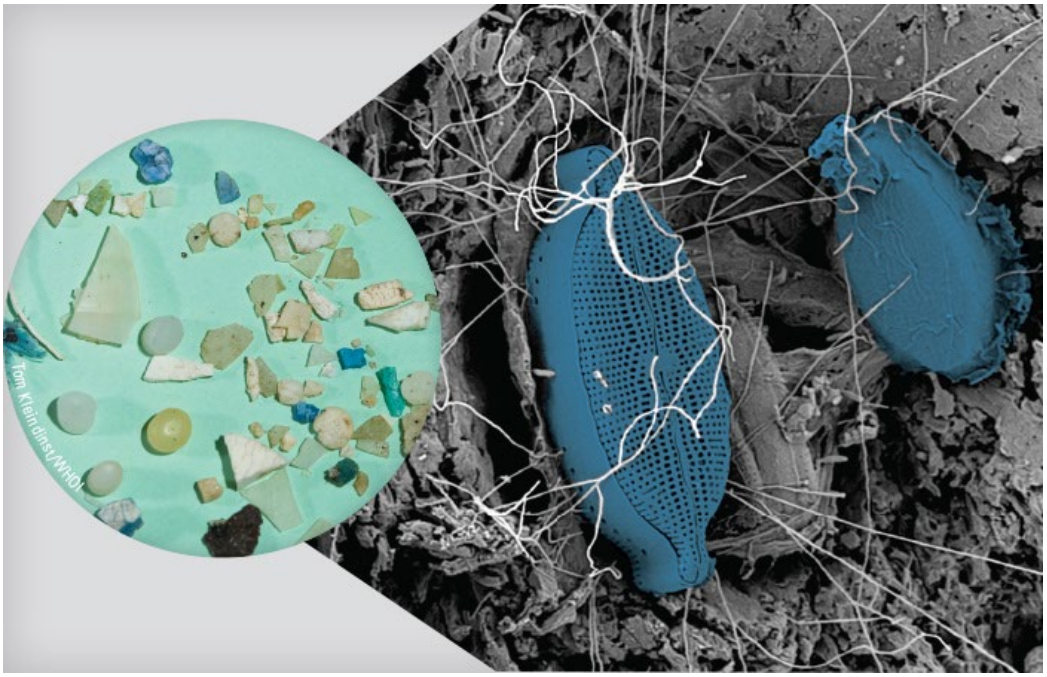


Fig. 3-19. **Plastisphere**. **Erik Zettler, Tracy Mincer and Linda Amaral-Zettler, 2013.** *Marine Biological Laboratory Microscope Image*. Sea Education Association, Woods Hole Oceanographic Center for Oceans and Human Health, USA.

The material properties of plastic are mesmerising. Plastic is beautifully colourful, translucent, durable, lightweight, flexible and resistant to moisture and degradation. Once introduced into the marine environment, plastic materials quickly fragment into smaller macro-pieces before breaking down into microscopic micro-particles. These micro-particles are slower to degrade into nano-particles, which is the form that plastic particles take when they finally settle as dust on the sea bed. Plastics go through three processes of degradation in the oceans: the first, described above, is mechanical, while the second process is chemical and the third is biological (Eriksen et al., 2016, Section 1.1).

The scientific explorations of plastics are 'interested in… how they're functioning in this ecosystem, how they're altering this ecosystem, and what's the ultimate fate of these particles in the ocean' (Zettler et al., 2013). The Woods Hole Oceanographic Center team uses electron microscopy and gene sequencing techniques and has identified at least 1,000 different bacterial cells living in oceanic micro-plastic samples, stating that many species are yet to be identified. The scanning electron microscope image in Figure 3-19 reveals blue-shaded diatoms, single-celled algae and bacteria with filamentous appendages aboard rafts of plastic debris (Fig. 3-19). The filamentous appendages are tubular or fibrous structures found on the surface of bacterial cells, which extend from the surface of the bacterial cell wall. These can have many functions, including locomotion, attachment, adhesion and assisting in genetic exchange (Easy Biology Class, 2019).

The microscopic colonies discovered include plants, algae and bacteria that manufacture their food called 'autotrophs'. These are symbiotic with the bacteria

and animals that feed on them, called ‘heterotrophs’. The scientific term ‘autotroph’ describes an organism forming nutritional organic substances from pure inorganic materials such as carbon dioxide. Plants, algaes and many bacteria are ‘autotrophs’. The term ‘heterotroph’ stands for predators that feed on ‘autotrophs’ and other organisms that establish symbiotic relationships in the colony. Humans, animals, fungi and many bacteria are ‘heterotrophs’ (Diffen, 2019).

These communities – invisible to the naked eye – exist on pieces of plastic that are hardly more prominent than the head of a pin, and they have arisen in large numbers with the explosion of plastics discarded into the oceans over the past sixty years (Zettler et al., 2013, pp. 7137–7146). Science refers to this newly formed microscopic community as the ‘plastisphere’. The new ‘plastisphere’ is best compared to the existing ‘biosphere’, which is the thin film of life around the surface of the Earth. The ‘plastisphere’ represents a colony established just under the oceanic surface at depths of a couple of metres. This microscopic world is full of life, existing and living on the surface of micro-plastic particles. Discarded human-made plastics therefore become small plastic particles, creating a new habitat that supports the development of previously non-existent microscopic life.

The final decomposition of nano-plastics from the environment takes an additional 300 to 750 years. The constant renewed presence of micro-plastics in the oceans creates a permanent food bio-chain – a link that has become part of the steady diet of various micro-organisms and, in turn, the larger fish population. At the very base of the marine food chain are the ‘plankton’ and ‘zooplankton’ species. The term ‘plankton’ refers to the smallest aquatic plants, and the term

‘zooplankton’ refers to most miniature animals that float and drift in bodies of water (Racha, 2017). As an excellent example of a bio-chain, plankton are eaten by small fish, which are themselves food for larger fish, which are food for humans (Orb Media, 2017, Chapter 4).

An Orb Media report – ‘Invisibles: The Plastics Inside Us’ – informs the public of the extensive contamination of waterways. After comprehensive global sampling and research, nano-plastics fibres were found to be present in 87% of tap water sources worldwide (Orb Media, 2017, Chapter 2). Rapid human population growth has induced and justified global plastic production in the twentieth and twenty-first centuries. Once displaced, long-life plastic materiality – designed for single-use, disposal and recycling – becomes an active biolayer, carrying the toxic signature of the ‘Anthropocene’ era. As our planetary environment undergoes radical changes, raising individual and systemic levels of human awareness of the living conditions for marine and coastal flora and fauna organisms is essential: ‘Plastics – whether they are waste or not – are inextricable parts of living systems’ (Liboiron, 2020).

This research argues that people’s perceptions and values concerning the stakeholders of all eco-spheres need to change. Macro-, micro- and nano-plastic particles are now virtually ubiquitous, present in all waterways and oceans and found in salts, glaciers and the air we breathe. Despite daily human dependence on plant and animal life as our source of air and food and their importance for overall ecological balance, our cultural representations of nature seldom focus beyond their utility or commodity value (Fig. 3-19).

Socio-materially marginalised, non-human ‘others’ are politically misrepresented, with no rights or voices to be recognised – therefore falling within the same category as waste. Section 3.6 looks at the existing waste hierarchy and disposal regimes, considering landfill, with its maximum environmental impact, as the primary post-modernist preference disposal system (Corvellec et al., 2018).

3.6 Waste Management Hierarchy

> 'Waste is inherently socio-material, shaped by waste regimes.'
>
> — Zsuzsa Gille, 2010, p. 56.

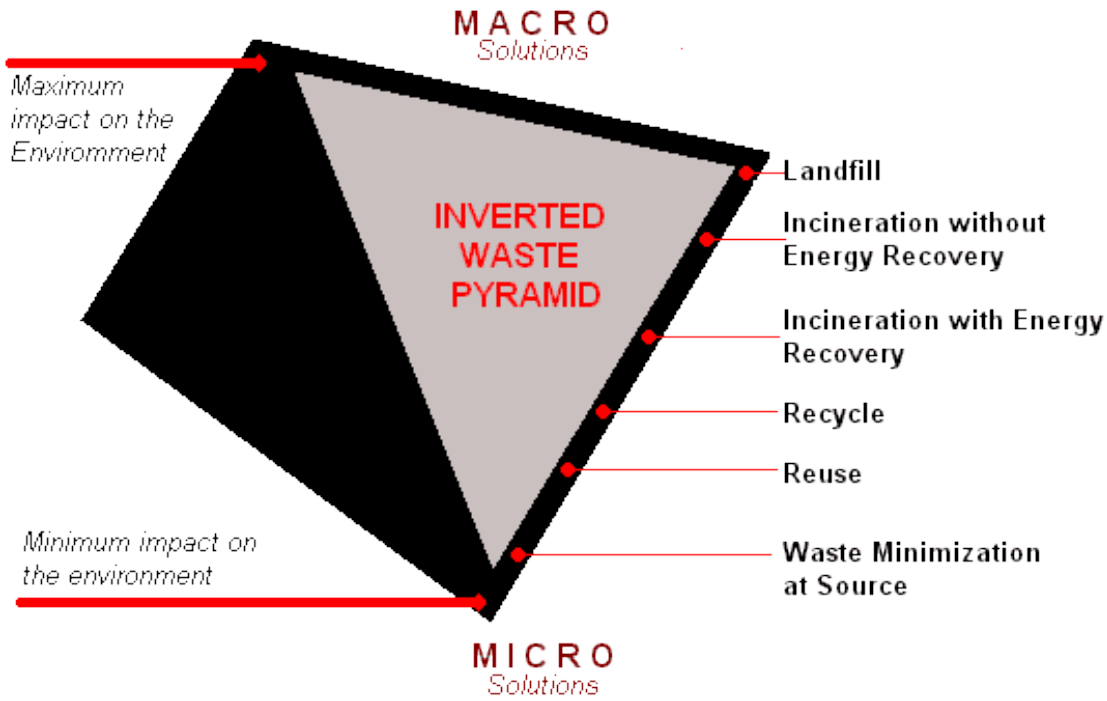


Fig. 3-20. Hari Srinivas, 2017. *The Inverted Pyramid for Solid Waste Management.*

Jaded by ontological ambiguity, waste 'shames us because it confronts us with a reflection of our own shortcomings' (Kennedy, 2008, p. 4). Waste terminology has a multiplicity of names and conditional uses – for example, garbage is perceived

as an undesired excess, a burden, a resource, a surplus or a source of livelihood (Levidow and Upham, 2016; Levidow, 2017).

In the context of WMSs, the terminology for ‘treating waste’ can have several meanings. Waste regimes (Gille, 2010) constitute various approaches and processes – designing, classifying, framing, segregating and metamorphosing waste.

Modern waste technology and treatment can have various configurations for converting waste into outputs (Alexander and Reno, 2014, pp. 335–358). Two energy-generating technologies in Britain transform waste into resources. The first and most prominent way involves heat and power incinerator technology, and the other is the biological digester process that utilises anaerobic microbes. Alexander and Reno’s (2014) summary states that it is clear that energy politics mediate the formation of technological legacies beyond the validity of specific truth claims. The incentive of landfill reduction, carefully translated through incineration technologies, reduces municipal waste volumes by up to 95% and is currently driving the urban landfill footprint towards its minimum level (DEFRA, 2018). Reduction sits on the top of the waste hierarchy pyramid, and ‘significant lip service has been paid to the need to reduce waste’ (Bulkeley and Gregson, 2009, p. 931).

New landfill taxes and Chinese ‘green fence’ legislation on importing waste has prompted the UK to change its waste management tactics radically over the past decade. In 2018, the forty-four waste incinerators across the UK burned 10.9 million tonnes of rubbish, accounting for 42% of England’s waste disposal (Ibid.).

Compared to a more-than-a-decade-old statistic, this growth showed that 9% of municipal waste in the UK was incinerated, paired with Denmark, which burned 53% of their municipal waste (‘Waste Incineration’, BBC News, 2006). The UK plans to double its incinerators over the next decade to burn more than half of its rubbish (Bawden, 2019). It is evident that ‘energy politics’ (Alexander and Reno, 2014) mediates the current (DEFRA, 2018) MSW legacy pendulum swings favouring incinerator technology.

MSW stands for the household waste collection system. Each municipal facility can have different scalings for waste volumes, geospatial flows, public goods versus their distribution and agents’ responsibility for such issues (Levidow and Upham, 2016, pp. 211–224). In mature WMSs, as in London, waste is surplus material derived from industrial manufacturing and public consumption, originating from excessive over-production or by-products. The best way to describe the weekly household waste collection process is that, after rubbish trucks remove general waste and recyclables, residual MSW is generally combusted in incinerators often configured as EfW plants (Breeze, 2014, pp. 335–352).

In establishing new relations with post-consumed plastic waste as a ‘valuable resource’ (Demaria and Schindler, 2015, pp. 303–309), I have looked at Srinivas’ (2017) ‘topsy-turvy’ chart – ‘The Inverted Pyramid for Solid Waste Management’ (Fig. 3-20). At the top of the pyramid is the ‘macro-waste solution’ with the ‘maximum impact on the environment’ – urban landfill. This ‘macro-solution’ is usually placed at the bottom of the pyramid. However, the macro ‘treating waste’

solution is the most frequently implemented solution used in solid waste management (Corvellec et al., 2018, pp. 6–7).

Between the macro- and micro-waste treatment extremes are the other means of solid waste management – incineration technology, with or without energy recovery, followed by recycling technologies and upcycling. The ‘topsy-turvy’ term used here represents the state of confusion. For example, ‘the variety of plastic types presents a complication for the viability of recycling’ (Napper, Pahl, and Thompson, 2021, p. 28).

Srinivas’ (2017) ‘topsy-turvy’ chart is placed at the bottom of the pyramid waste management ‘micro-solutions’ with the lowest environmental impact. These ‘micro-solutions’ are the least frequently implemented waste management regimes yet fit the ideal management approach because of their reduced environmental impact. Nevertheless, producing and consuming less is not a small task, and the ‘micro-solution’ in Fig. 3-20 alludes to embedded MSW systemic faults. Paradoxically, it is confusing to grasp why the most environmentally harmful waste treatment solution is most frequently implemented (Moore, 2000).

Since the late twentieth century, waste has become associated with newer organisational and management ontologies (Fleetwood, 2005), such as a toxic chemical by-product of industrial activity or the double-edged burden of the manufacturing and mining industry: ‘Capitalism is in terminal crisis because there are simply no more commodity frontiers whose transgression could fuel an expansionary phase of global capitalism’ (Moore, 2015, p. 217). Moore offers an insightful understanding of the current capitalistic system in the ‘web of life’ as ‘a

way of organizing nature', whose cyclical expansion is underpinned by the 'successive transgression of commodity frontiers' that facilitate the appropriation of hitherto non-commodified discard and plastic resources (2015, p. 2). Moore (2000) argues that capitalism could not 'sustain itself as a closed system' because the system must continuously expand to 'extend the domain of appropriation faster than the zone of exploitation' (p. 146).

The provocative 'topsy-turvy' hierarchical order of Srinivas' (2017) inverted pyramid for waste management is more relevant to this research, which promotes re-use tactics. Approached from the bottom up, the study explores micro-tactics of re-use – on the opposite side of landfill waste regimes. Accepting this inversion mandates a 'socio-material narrative' (Orlikowski, 2007) shift from the waste regimes of landfill disposal 'towards recovery, recycling, re-use and ideally reduction at the source' (Hultman and Corvellec, 2012, pp. 2413–2417).

How often do we – the members of the global consuming community – meet this ideal of re-use in everyday use? Hardly ever. It is therefore important to individually and collectively recalibrate the meanings of the value of plastic materiality – for example, starting by viewing post-consumed single-use plastic as a valuable resource. In *Intervention – Disaster Capitalism, COVID-19, and Single-Use Plastic* (2021), Johansson illustrates the increase in use of disposable items throughout society during the pandemic. Single-use items, such as personal protective equipment (PPE), made of plastic, are too easily lost to the environment (see Fig. 1-7, *Overview of the Global (Mis)management of Plastic Packages*).

However, collective resistance to plastic production and consumption needs to continue. Recycling as a strategy takes focus away from real problems, such as ever-growing production and consumption. Johansson (2021) states that 'solving a problem by targeting waste management is less controversial than addressing production and consumption', taking responsibility from business and moving it towards individuals and authorities responsible for source separation and waste management (Ibid.). From a strategic sustainability management point of view, his advice is to turn towards activism and 'alternative practices' (Corvellec et al. 2018) of care, repair and kindness and 'transform the relationship between humans and materials' (Johansson, 2021, online).

My research advocates re-use approaches and the prolonged single-use plastic lifecycle, thus re-imagining individual plastic consumption. Through re-use, I bring awareness of growing waste volumes and environmental impact as an individual and support changing the order of priority of waste hierarchy politics of recycling vs re-use towards reduction (Hultman and Corvellec, 2012).

Section 3.7 unpacks the historical overview of disposability culture as cardinal opposition to waste aesthetics ethos, calling for a capitalistic reduction of waste at the production source, and bringing attention to the essential role of waste production in modern infrastructure.

3.7 Disposable Culture and the Ontology of Trash

> ‘What is worthless or un-used for human purpose. It is a lessening of something without useful result; it is loss and abandonment, decline, separation and death. It is a spent and valueless material left after some act of production or consumption, but can also refer to any used thing: garbage, trash, litter, junk, impurity and dirt.’
>
> — Kevin Lynch, 1990, p. 146.

Fig. 3-21. Antoine Repessé, 2016, *#360 Unpacked*.

As a society, we have a tendency not to think about where waste goes because of the proximity of its daily presence and use: ‘By virtue of its sheer volume, trash now offers us the single greatest means for observing ourselves. An ontology of trash is ultimately self-exploration’ (Kennedy, 2008, p. x). Once one disrupts the circle of automated consumption and waste management services, the unseen world of things becomes an unpacked heap in your space (Fig. 3-21). The photograph *360 Unpacked* comes from a four-year project during which the photographer stopped disposing of recyclable waste and began hoarding the packaging instead. The picture portrays the 365 kilograms of waste we individually produce on average over the course of a year. Repessé (2015) allows people to understand waste through his photographic lens, aesthetically affirming that we all individually contribute to waste production. Repessé (2015) unpacks the aspects of garbage that are entirely hidden from the public’s view and understanding, ‘including the more comprehensive social, economic, political, cultural, and material systems that shape waste and wasting’ (Discard Studies, 2019).

Strasser’s (1999) *Waste and Want: A Social History of Trash* provides a historical overview of disposability and the urban recycling challenges that came with the consumerism wave of the 1950s. Packard’s (1960) *The Waste Makers* portrayed the following decade as the origin of ‘high-consumer world’ behaviour through American industry’s ‘planned obsolescence desirability’, which brought a sense of newness, excessive materialism and waste production. Strasser (1999) tracked and pre-dated the source of disposability to early modernist culture and thinking, which emphasised efficiency and cleanliness and promoted

replaceability. The appeal of disposable cups, straws and toilet paper was the answer to many urban sanitary and public health issues.

The rise in industrialisation and the expansion of the commodity market made paper, and later plastic, much more affordable for production and available to a broad consumer audience. Objects were advertised as convenient and disposable, evoking modernist asceticism and glorifying the technicality and rationality behind everyday household routines. Kennedy (2008, pp. 9–10) proposes the term ‘positive waste’ as festive ritualistic celebrations often accompany acts of discarding. So how can waste, containing the essence of loss and negation, take on positive value? Kennedy proposes that ‘positive wasting’ can offer solutions, abundance, exuberance and nature awareness as a result of care and attention to detail in everyday disposal habits.

Strasser (1999) suggested that modernist ideas were pivotal in the widespread global promotion of disposable culture. Modernism supplied through hygiene maintenance provided an ethical justification for throwaway culture, hiding landfill and recycling waste services from the public eye. In this way, in building waste management infrastructure, modernist ideology encouraged mass consumption – which meant that buying new became a marker of class distinction and status. The ability to dispose of things without concern – to make waste – was a sign of wealth (Strasser, 1999, pp. 21–109). Nevertheless, ‘trash is not a phenomenon consequent to consumption’ – its ontology shows that the ‘being of technological commodities includes, a priory, their disposal’ (Kennedy, 2008, p. xvii).

Strasser's historical waste timeline reveals a recycling economy presence long before its re-introduction in the 1960s. Strasser shows that waste circulated as a currency in the rise of industrialisation. Gradually, peddling systems of waste exchange dispersed, and informal economies were marginalised by the rise of specialised waste providers who devalued urban domestic waste and monopolised the trade (Ibid.). In a sense, throwaway culture and getting rid of things became a sign of progress, alienated from production, and the act of consumption became divorced from environmental destruction.

The article 'War on Waste? The Politics of Waste and Recycling in Post-War Britain' (Cooper, 2009) brought Scanlan's (2005) book, *On Garbage,* in which Scanlan carefully examined the role of the idea of waste in the making of modernity. In particular, Scanlan (2005) explored waste's material and intellectual productions as a product of enlightened conceptions of efficiency, productivity and 'right use'. Scanlan explained the role of waste production as a main category in the operation of modernity, 'where the useful is re-valorised by its distinction from the useless'. Waste and society are mutually constitutive because value is perpetually produced and contested (Scanlan, 2005, pp. 56–88).

In examining the waste and society loop, I travel back in time to the eighteenth-century English proverb 'waste not, want not'. The familiar maxim advises that you will keep yourself away from poverty if you do not squander your resources. Where does this saying originate? Its predecessor is the 'wilful waste brings woeful want' rule of conduct. The original unrecorded adage, which predates the first by two centuries, brings forward a dystopian message that goes way above the problem of individual hunger and wealth, and has the meaning 'reckless

extravagance leads to dire need' (Manser, 2007, p. 435). The dire warning predicts that a disaster may happen in the future. Modifying the maxim over the two centuries affirms the shift from collective wellbeing towards individual wealth and from long-term use to short-term useless values.

Kennedy (2008) explains that human extinction has always been a possibility, but extinction became a phenomenon in the twentieth century (p. 140): 'As waste, the phenomenon of human extinction implies neglect and failure…literally, the failure to be human' (p. 141). Kennedy differentiates trash from waste and examines a 'twin phenomenon of trash and human extinction, many relations, kingship and argues they are 'identical phenomena', noting that, 'both result from our negative being-in-the-world in the mode of violence' (Ibid.)

This original expression enlightens the collective 'right use' concept and reconnects the human constitutive of waste and society with the natural environment and planetary circularity: 'To understand trash, and thus also the plight of disposable world, we must become thoughtfully compassionate.' Kennedy (2008, p. 162) asserts that we must feel the violence suffered by all, yet the shame and sadness experienced will give way to hope and humility (Ibid.).

Socially nurtured habits of not wasting had died off by the late nineteenth century, and established urban health standards justified the throwaway Western culture. New disposable values took their place, carrying a lack of material appreciation into the twentieth and twenty-first centuries. Reiterating, 'there are waste things, waste lands, waste time and wasted lives' and wasted environments that the human lifestyle woefully brought (Lynch, 1990, p. 146).

Twenty-first-century science calls this dire planetary condition the geological marker of the ‘Anthropocene’. It is interesting to ask whether the twenty-first century will transform accepted slogans of freedom to consume and halt the colonising of natural resources.

Section 3.8 looks briefly at the historical increase and establishment of disposability culture, bringing attention to waste production’s essential role in modern infrastructure.

3.8 Re-thinking Plastic Waste

> ‘Re-thinking waste means re-thinking all the practices that blind us to the reality and possibilities of what remains. This is the ethico-political challenge of waste: imagining a new materialism that would transform our relations with the things that we pretend not to see.’
>
> — Gay Hawkins, 2006, p. 81.

> ‘Power is exercised through social production and social science.’
>
> — Susan Hekman, 2010, p. 54.

Fig. 3-22. ***Out to Sea? The Plastic Garbage Project.*** Museum für Gestaltung Zürich, 2009–2017.

As much as putting out the weekly rubbish on the kerb for collection may feel like an ordinary and mundane aspect of Western society, it is a well-rehearsed cultural–political state performance. The hidden acts of mature MSW systems follow a sequence of multiple services that deploy collection, transportation, storage, sorting technologies, thermal treatments and biological techniques, which frame socio-material and cultural waste value assumptions: 'Social imaginaries play a crucial role in the formation of our subjective understandings of waste and environment' (Hawkins, 2006, p. 9). Detritus, debris, garbage, litter, rubbish and trash are many synonyms for waste. When we start to examine personal waste production and bring 'positive waste' into everyday disposal rituals (Kennedy, 2008, pp. 9–10), our relations to litter are transformed, bringing about an awareness of a contribution to worldly material entanglement and creating value exchange beyond the economy of recycling.

Curated oceanic waste presented by the Museum für Gestaltung Zürich (between 2009 and 2017), exhibiting post-consumption remains and plastic waste collected from across the world, assembled into a globally touring educational exhibition (Fig. 3-22). 'Out to Sea?' marks its twenty-first-century entry with a plastic discard heap displayed as an art artefact in a museum setting. The exhibition visualises an 'archaeology of the future', displaying 'the traces of decay left by wind, water and sunlight' that have 'become legible signs of the worldwide journey made by a design object at the postponed end of its lifecycle' (Museum für Gestaltung Zürich, 2009–2017). In 2014, plastic waste was collected locally, and partners

support an interactive educational programme to raise awareness in civil society and among decision-makers (Ibid.).

'Re-thinking Plastic Waste' (Section 3.8) is commented on through Hawkins' (2006) critical disposability lens, examining the challenging ethico-political aspects of waste and waste regimes. Hawkins (2006) differentiates the ethico-political parts of waste disposability by borrowing from Foucault's (1988) ethical seminar, *Technologies of the Self*. Bringing Foucault's (1988) reflections upon the Greek '*epimeleia heautou*' notion of 'care for the self' aids Hawkins in examining the power relations of regulated daily habits (Hawkins, 2006, p. 24). Still unpacking Foucault's 'aesthetics of existence' ethical approach, Hekman (2010) asserts that the state developed 'a political rationality linked to a political technology' (p. 53): 'We can see the incising intervention of the state in the life of individuals' (Foucault, 1988, p. 160). Through implemented technologies – for example, kerb collection for recycling and waste management regimes – state power has gained 'access to individuals in their everyday behaviour' (Foucault, 1980, p. 125, cited in Hekman, 2010, p. 54).

Waste ethics further incorporates Diprose's (1994) habitat embodiment to better understand habitus with others (Hawkins, 2006, p. 25). Diprose (1994) reminds Hawkins that the Greek definition of the word 'ethos' is binary because 'ethos' is defined as character and dwelling. Conclusively, this 'gives dwelling a double meaning as both noun and verb, place and practice' (Hawkins, 2006, p. 25). Through habits, Hawkins reflects that, 'we manage the circulation of objects into and out of our lives, and re-establish the boundaries of the self' (Ibid.).

The interdisciplinary findings in this 'Literature and Field Review' chapter support this research's claim to perceive oceanic space as the largest mismanaged landfill. In nature, there is not one single thing, space or life that is not valuable or useful (Bataille, 1991). The phenomenal birth of the 'plastisphere' biolayer affirms this (Zettler et al., 2013). Hillman (1996) emphasises that the world is an aesthetic phenomenon, so the most basic reaction to being in the world is aesthetic (p. 42). That word, '*aisthesis*', originally means 'I breathe in,' like sucking in a breath when struck by beauty or horror. Our aesthetic responses are inherently related to the actual world and the primary way in which we take part in it (Ibid.).

Thus, in closing this chapter, I ask you to take a deep breath, pause, and take another. In the first breath, thank the land flora; in the second breath, thank the ocean, particularly the tiny phytoplankton plants that live on the surface. I am humbled to remind myself that my every breath of oxygen is a waste product of the photosynthesis process.

CHAPTER FOUR: THEORETICAL REVIEW

4.0 Introduction to Material Turn and New Materiality

> ‘A leap forward into the complexities and paradoxes of our times. The project of creating new concepts and practices of ethical subjectivity at the end of post-modernism, amidst the return of master narratives of genetic determinism and neoliberalism, is a challenge which projects humanity in-between a future that cannot be guaranteed and a fast rate of progress which demands one.’
>
> — Rosie Braidotti, 2006, pp. 263–264.

Fig. 4-23. Plastic Culture Nature Diptych, 2019. *Sea PET* jelly fish mobile (left) and River Medway sidewalk view (right), Kent, UK.

Chapter Four discusses the importance of the rise of the philosophical inclinations of ‘new materialism’ and the third wave of eco-feminist cartographies (Braidotti, 1994; 2002; 2006). This ‘Theoretical Review’ chapter sits after Part Two and closes with my research questions section – Section 4.5. Chapter Four is visually narrated by my prior and current digital works, allowing visual socio-material conversations about plastics to be introduced and vocalised through ‘alternative jargon’, conveying my ‘aesthetic response’ to plastic pollution inspired by ‘new materialism’. The past couple of decades have seen an emergence of a variety of critical materiality influences, and below I list a few of particular relevance to my research:

- An enquiry into ‘material fetishism’ by Appadurai (1986).
- Brown’s ‘thing theory’ (2001; 2003; 2016; 2017).
- Feminist ‘vibrant materialism’ by Braidotti (1994; 2002; 2006).
- ‘Micro-ontologies’ encounters by Hird (2009) and ‘entangled material agencies’ by Barad (2007).

I suggest that the ‘material turn’ and birth of ‘new materialism’ have challenged matter subjectivity’s positioning in social science and humanities – theoretically shifting established subject–object perspectives (Joselit et al., 2016, p. 3).

My theoretical focus is on Braidotti’s impressive literary opus, which promotes twenty-first-century feminism based on ‘vitalism’, ‘matter-realism’ and ‘nomadism’. Inspired by conceptual post-structuralism, Braidotti started using the ‘neo-materialism’ and ‘new materialism’ terms interchangeably in the second half

of the 1990s for a cultural theory that does not privilege the human side of culture or what Latour (1993) refers to as networked 'collectives' (Dolphijn and Van der Tuin, 2012, p. 93). A third feminist wave emerged in the 1990s under 'neo-materialism', giving an embodiment of differentiation within the 'material turn'. This 'new materiality' is best described by Braidotti in an interview as a movement that 'emerges as a method, a conceptual frame and a political stand, which refuses the linguistic paradigm, stressing instead the concrete yet complex materiality of bodies immersed in social relations of power' (Dolphijn and Van der Tuin, 2012, p. 21).

The 'neo-materialism' term proposes a new cultural theory that radically re-thinks subject–object duality and engages analysis within complexities, multiplicities and paradoxes inherent between human thinking and matter relations. 'Neo-materialism' focuses on what Haraway (2003) calls 'naturecultures', emphasising nature and culture – the human and the non-human. In Figure 4-23, *Plastic Culture Nature Diptych* depicts this from a materiality perspective that has a 'profound interest in the morphology of change and gives special attention to matter (materiality, processes of materialization)' (Dolphijn and Van der Tuin, 2012, p. 93).

Post-feminist material theory leaves behind the linear thinking model that most of us 'have been trained to respect and emulate' (Braidotti, 1994, p. 30). Braidotti's invention of new theoretical approaches shifts factors perceived as contemporary social and cultural crises of values into creative spaces of new possibilities. Braidotti is theoretically influenced by the Deleuzian affirmation of the 'difference and repetition' concepts, in which 'there is no identity', and in emphasising

repetition – Deleuze claims that nothing is ever the same (Deleuze, 1968). Instead, difference only comes through repetition of what we call everyday life. Braidotti's eco-feminist 'neo-materialism' approach 'becomes a political strategy that doubles up as a methodology' (Dolphijn and Van der Tuin, 2012, p. 34).

Braidotti emphasises that reality is an act of becoming, not only being. To that extent, 'nomadic figuration can instigate change and thwart stasis through creative alternatives' (Braidotti, 1994, p. 2).

The 'new materialism' movement is shifting cultural theory towards nature while acknowledging technological or – as Braidotti called it – 'the 'post-human' predicament', which entails 'much more than the definitive loss of the naturalistic paradigm' (Braidotti, 2000, p. 158). In their editorial opening, 'A Questionnaire on Materialism', Joselit et al. (2016, p. 3) characterise this new influx of 'new materiality' and 'neo-materialism' critical discourses under four characteristics:

1. Attempting to think of the reality of objects beyond human meanings and uses. This other reality is often rooted in 'thingness' or animate materiality (Ibid.).

2. Asserting that humans and objects form networks or assemblages, across which agency and even consciousness are distributed (Ibid.).

3. Shifting from epistemology, in all its relations to critique, to ontology, where the being of things is valued alongside that of people (Ibid.).

4. Situating modernity in geological time with the concept of the ‘Anthropocene’, an era defined by the destructive ecological effects of human industry (Ibid.).

What might be common to all seemingly contrasting influences is the shift from critical epistemology towards material ontology and new eco-feministic materiality, situating transgressive environmental acts of the ‘Anthropocene’ epoch. Indeed, in ‘re-examining what it means to be human’, new meta-perspectives of ‘new materiality’ and ‘neo-materialism’ open up ‘new understandings of the relationships and networks that exist between people, objects and non-humans’ (Casella and Croucher, 2011, p. 210).

In Section 4.1, I explore material sociality beyond human culture, starting with Appadurai (1986), for whom material object exchange represents an intricate part of the human world’s sociality. I embrace the notion that ‘objects are rarely meaningless or simply functional, but affect humans and emotions, reinforcing and reflecting relationships’ (Casella and Croucher, 2011, p. 210).

In this new relational way of thinking towards material culture and nature, my plastic socio-material narrative in the next section extends through material fetishism and the sociality of the ‘thing’ (Brown, 2001; 2003). In examining my material tactics, I coined the term ‘Designedisposal’ (see Chapter Two, Chapter Six and Chapter Seven), which critiques and follows in-text objects that are becoming things of importance.

4.1 Material Fetishism and Thing Theory

> ‘Is there something perverse, if not archly insistent, about complicating things with theory? Do we really need anything like thing theory the way we need narrative theory or cultural theory, queer theory or discourse theory? Why not let things alone? Let them rest somewhere else – in the balmy elsewhere beyond theory. From there, they might offer us dry ground above those swirling accounts of the subject, some place of origin unmediated by the sign, some stable alternative to the instabilities and uncertainties, the ambiguities and anxieties, forever fetishized by theory.’
>
> — Bill Brown, 2001, p. 1.

Fig. 4-24. Photography, Neil Hall, 2011. *Anarchy in the UK*, London.

Appadurai calls for the rise of ‘methodological fetishism’ in material culture – an aspiring synergy of interpretative archaeology practice with anthropology in examining the social life of things through established commodity exchange processes. In *The Social Life of Things*, Appadurai explains that ‘the circulation of things themselves, for their meanings, are inscribed in their forms, their uses, their trajectories’ (Appadurai, 1986, p. 5). A diversity existed in the methods involved in what Appadurai termed “‘methodological fetishism” acquired to write life histories of things’ (Hicks, 2010, p. 90). Field practice is rarely considered in theoretical and material culture debates. Instead, material cultures studies developed in Britain as a self-conscious post-disciplinary field. Apart from hermeneutic phenomenology, however, no interest has been apparent in discussing field practice (Hicks, 2010, p. 90).

Brown’s (2001) ‘thing theory’ equates objects to the opaque and dirty window through which we peer to learn what we can about ourselves and the environment. Brown argues that, as a society, we confront the thingness of objects only when they stop functioning for us (Brown, 2001, pp. 1–22). Through ‘thing theory’, Brown concludes that, ‘even though from a theoretical point of view human actors encode things with significance, from a methodological point of view it is the things-in-motion that illuminate their human and social context’ (2001, p. 6).

Brown’s ‘thing theory’ is a ‘material turn’ literary affair because it fetishises everyday things with theories. Brown powerfully re-animates these possible ideas through things already discarded or hidden, resting somewhere else. Brown’s theoretical critique brings awareness towards the ‘things-in-motion’ situated

within a 'methodological fetishism' that refuses to begin with a current formal truth. This cannot 'illuminate the concrete, historical circulation of things' (Brown, 2001, p. 5).

Circulation of waste is almost always associated with an undesired, unclean, ugly process. One cannot pull a heap of things out of context without disrupting the order – for example, unmanaged street discard appears to carry the hidden charge of potentially violent behaviour ignited by social and political turmoil. An excellent local example of when things have stopped functioning for us and created a temporary urban system breakdown were the civic riots in London in 2011. It took only a couple of days for public looting and rubbish to invade the streets, disrupting the 'business-as-usual' flow of systemic distribution, consumption and waste disposal management.

Anarchy in the UK (Fig. 4-24) prophetically illustrates that 'a thing is to become the privileged site of the 21st century's social and cultural resistance against the existing reduction of altruistic values' (Appadurai, 1986, p. 56). Appadurai's twentieth-century statement marks a 'thing' as the cultural change-maker that lies beyond the human socio-political realm. I therefore critically examine the importance of the theoretical turn to materiality, bringing the conception of the 'thing theory', through to 'methodological fetishism', in field practice. I visually question what, how and where my design-research participatory engagements contribute to recalibrating the meanings of plastic material values and single-use consumption notions.

In influencing this research, Appadurai's field of practice and Brown's theoretical approach provide new ways of understanding the inanimate world of plastics and the place of the human within it, encouraging me to think anew about 'Designedisposal' encounters with plastic materiality (Chapter Seven). I mapped plastics ambiguity as a topic. Plastics create a relational way of becoming with nature through the socio-material narrative that forms this research. In this sense, I explore co-making and visualising plastic things-in-motion entangled in the oceanic gyre. In this research, the 'material turn' is a constitutive element of the field of practice, involving recording my daily life and experience of plastic consumption, disposal and participatory making with post-consumed things. I follow the humanist interpretation, where 'methodological fetishism has the power to mix two classic elements of western philosophy: subject and object' (Canevacci, 2013, p. 172).

Theoretically, 'methodological fetishism' and 'thing theory' underpin the 'Designedisposal' tactics and mundane investigative material relations. In practice, the haptic 'thingness' of this abductive process is liberating from a design research standpoint because my 'joyful plastic things' offer freedom for critical participation and seemingly naïve visual narration filled with current and technological political matters (Chapter Two and Sections 6.1–6.2).

The importance of re-structuring a disposed plastic object into valuable 'positive waste' allows me to visually and critically think and confront thingness through participatory making and sensing new uses and trajectories. Praxis 'material turn' and 'thing theory' methodological synergy justified my 'Designedisposal' tactics of trash aesthetics, waste-centric vocabulary and participatory, hands-on

relational approaches, allowing me to think with things (Fig. 4-23 and Fig. 4-25). Through participatory engagements (Part Three) and new vocabulary (Chapter Two), thinking with things is tested and validated in this PhD by means of practice research.

The following section examines the relatively new theoretical contributions of design research towards Brown's (2001) 'thing theory'. Brown (2016; 2017) expanded the 'theory of things', influenced by Heidegger's (1950) philosophical 'the thing' lecture series, which is compiled in *Encountering Things* and co-edited by Atzmon and Boradkar (2017). I am exploring subject-object-thingly interactions in design research professions, and it is exciting to encounter like-minded designers (Brown, 2017) following 'thinging the world'.

4.2 Theory of Things and Design Research

> ‘What happens when thing theory encounters design?’
>
> — Bill Brown, 2017, p. 203.

Fig. 4-25. KraalD, 2013. *Thirst*. Prosumer installation, mixed media: plastic, foam and metal, London, UK.

In *Other Things* (2016), Brown took the time to reflect on and make new claims fortifying existing ‘thing theory’ with additional theoretical influences, arguing that things cannot be looked through but encountered (with). Brown unexpectedly states that a thing ‘is the outcome of an interaction (beyond their mutual constitution) between subject and object’ (2016, p. 22). According to Brown’s new

insights, subject–object relations are the daily life stories that unearth the critical and cultural meanings of things: 'Objects are what we "*looked through*", things are what we encounter' (Brown, cited in Atzmon and Boradkar, 2017, pp. 3–4).

In *Encountering Things: Design and Theories of Things* (2017), Atzmon and Boradkar explore 'new materiality' from the design and theories of things stance, highlighting the historical position of Western culture, which has categorised objects as things and bodies–objects in service to subjects. In the afterword, Brown points to Atzmon and Boradkar (2017), asserting that 'design is particularly consequential to theories about things' because tangible things are 'composites (made up of materials but also of ideas, signs, ideologies, aspirations and frustrations)' (Brown, 2017, pp. 203–209).

For the first time, in *Encountering Things*, designed objects, design processes and theories of things are paired together. It is encouraging to read about and acknowledge the rise of design scholarship turned towards critical materiality. For example, Hall (2017, pp. 35–43) suggests that one way to put theories of things to use in design criticism is to investigate failed objects (Atzmon and Boradkar, 2017, p. 9). Hall turns to Latour's (1991; 1993) networked 'collectives' and matters of fact attaining objectivity through human and non-human actors. Hall (2017) points out that we end up forfeiting vital information from the relationships between humans and the behaviour of the world of things. He concludes that fundamentally social and technological matters are not separate (Ibid.).

From a professional design stance, Dubberly (2017, pp. 153–162) observes that design practice has moved away from giving form to objects to a focus on design

thinking, shifting design practice towards an '*immaterial turn*' (Atzmon and Boradkar, 2017, pp. 13–14) and exploring ontological 'questions of what things are, what they do, how they relate to each other and to us' (Ibid., p. 1).

In this section, I focus on the afterword chapter of *Encountering Design*, where Brown (2017, pp. 203–211) posited to himself a question relating to the role of the design encounter and began to critically measure some immediate consequences of the field of design for 'that thing called theory' (Brown, 2017, p. 203). Brown lists the thematic triad of interest and contributions from the design field towards 'thing theory'. First, Brown hints in the 'Materialism and Matter' section that, for 'constructivists, design strategies can aid in completing their revolution' (Brown, 2017, pp. 204–205).

Brown observes that the 'materialism and matter' literary turn emerged in a transdisciplinary fashion, specifically acknowledging the 'new materialism' constitution inspired by reflections in *A Thousand Plateaus* (Deleuze and Guattari, 1987, p. 43). Brown borrows the metaphysical concept of 'thingness' from Heidegger's (1950) *The Thing* philosophy lectures. However, Brown finds Heidegger's thought process profound yet problematic (Brown, 2017, p. 205). Nevertheless, acknowledging the importance and influence of *The Thing* philosophy lectures. Heidegger (1950) achieves thinking beyond the 'thing' and 'that void that holds' things into a conceptual gathering, firmly stating 'the thing things' (*Das Ding Dingt*).

In his thinking process, Brown follows Heidegger's manner, letting things be in their being, staying in the 'thingly character' of the designed chair and finalising his textual materialism statement that 'the chair chairs' (2017, pp. 205–207).

Second, Brown points to the 'autonomy vs relationality' differentiation and emphasises 'how *thingness* can productively caption a kind of *relation*'. In an ontological manner, in the 'Autonomy vs. Relationality' section, Brown concludes that, like the maker, the designer has both the internalised cognitive process and bodily insights in a relational thingness. They should persist in acknowledging this during the process (Ibid.).

Brown's third point relates to the 'agency and narrativity' of vibrant matter, which nowadays is designed to assume an automated agency of objects, like the automatic car, robotic entities or drones. Brown states that some objects have more agency than others because design 'breathes agency into materials' (Arvatov,1925, cited in Brown, 2017, pp. 207–209). Design should be at the centre of the theoretical conversation, writes Brown, drawing upon Latour's (2010) critique of modernity's rational and scientific thinking and, in doing so, honouring the 'queer invention' of 'inanimism': 'An agency without agency constantly denied by practice' (Latour, 2010, p. 483). In support of Latour's analysis, giving a plethora of examples, Brown goes back to the old Greek *Iliad* records, which provide a historical resource for re-animating objects. Brown states that 'narrative might well be understood as the fundamental medium of design' (Brown, 2017, p. 208).

Brown's synthesis of Heidegger's strategy of thought leads us 'beyond both subject and object relations', allowing us to poetically bring together Earth and sky, deities and mortals – as such, 'thinging the world' (Brown, 2017, pp. 205–207). Brown's critique of Heidegger's maker allegory is that considering 'thinging' excludes the process of over-production. In the maker vs designer narrative, Brown incorporates the complexity of contemporary design practice. Brown and Heidegger's thinking extends upon the theoretical notions inherited from the Old Greek philosophical school of thought – where and when issues relating to the over-production of things and the over-population of people or plastics did not exist, and when the ocean was not perceived as blue by *Iliad* records, or over-polluted by the demigod life span of microscopic plastic matter.

The ontological and material turn is of great importance because it plays a pivotal role in this design research and the start of my praxis KraalD (2011–2013) through an MRes in Design at Goldsmiths, University of London. Advocating this kind of 'material turn' enables me to represent a plastic thing, contesting the present marginal engagement of design professions with the theoretical relations of critical encounters with designed things (Section 3.2). For example, my *Thirst* installation (Fig. 4-25) represented the wave of oceanic and plastic discard and allowed the pairing of disposal rituals, encountering single-use plastic things, and interacting with people on the topic of plastic pollution.

In Sections 4.3–4.4, I explore eco-feminist embodied 'new materiality' notions in depth.

4.3 Transposing Nature

> ‘Bio-centred egalitarianism is, for me, such a materialist, secular, precise and unsentimental response to a transversal, trans-species structural connection of those whose bodies are ‘disposable’ in the logic of advanced capitalism.’
>
> — Rosie Braidotti, 2006, p. 99.

Fig. 4-26. Designtransposal, **2015.** *Plastiglomarate* (left); *Sea PET Anemone* (right). Location: Adriatic Sea, Croatia.

This section introduces the reader to Braidotti’s feminist new materiality and theoretical concepts of ‘transpositions’ closely aligned with the ‘notion of the material embodiment’ (Braidotti, 2006, p. 5). In *Transpositions: On Nomadic Ethics* (2006), Braidotti surveys the different ethical approaches taken by

observing difference and diversity as the starting points of reference to the theoretically identifying concepts of transpositions. The term ‘transposition’ has multiple sources because it can be associated with more than one discipline or singular topic. The multi-disciplinary term applies to philosophy, music, photography, mathematics, logic, biology and genetics. Braidotti outlines that ‘transpositions indicate an intertextual, cross-boundary or transversal transfer, in a sense a leap from one code, field or axis into another… in the qualitative sense of complex multiplicities’ (Braidotti, 2006, p. 5).

Braidotti’s non-linear and eco-feminist ‘material embodiment’ enacts the ‘transpositions’ notion ‘by proposing creative links and zigzagging interconnections between discursive communities’ that are usually segregated (Braidotti, 2006, p. 7). A central concept to the ‘nomadic ethics’ of exploring ‘transpositions’ is the material embodiment, especially in bio-genetics, because it emphasises the flexibility of the genome itself (Ibid.). For a genetic example, transposition is the key in the process of mutually interdependent but mutable elements. Haraway best summarises this: ‘the term *“gene”* signifies a mode of durable action where many actors, human and non-human, meet’ (Haraway, 1997, p. 142).

In this section, I explore the leap of an axis of Braidotti’s theory in ‘transposing nature’ and, as she puts it, in ‘becoming other’ concerns. Braidotti affirms that the expression of ‘vitalistic materialism’ is through the body, which is perceived as a living recording device – an actualised and enfleshed memory system that is multi-functional and multi-expressive. Braidotti passionately states that not even Constructivist culture can ‘deny the vitalistic materialism of the kind of bodies our

culture has constructed with and for us' (2006, pp. 96–97). Braidotti asserts that not all bodies are human, which 'brings the practical complications linked to the critique of anthropocentrism' (Ibid.). Braidotti affirms that this is because of the pragmatic facts of embodied and embedded parts of nature that 'vitalistic materialism' of the 'nomadic ethics' contests the arrogance of the anthropocentrism and well-defended fortress of the human consciousness (Ibid.).

Following Haraway's (1997) 'oncomouse' techno-body – a transgenic organism created for the purpose of genetic research – Braidotti strikes a welcoming alliance with the 'productive force of zoe – or life in its inhuman aspects', firmly stating that nomadic philosophies challenge the 'new perverse dualism' in embracing the return of the animal and the Earth's life potency (Braidotti, 2006, pp. 96–106). The newly proposed becoming-animal axis of transformation and the trans-species solidarity become the organic brand of 'new materiality', which respects the primary force of 'life' and the generative process that is open-ended, interconnecting across previously segregated domains.

One can argue that Braidotti's and Haraway's multi-species views are not new, as they build on the 'deep ecology' movement: for example, Naess's (1973), 'biospherical egalitarianism' among all species. What is new is the connectivity of the interdisciplinarity field of 'new materialism' and feminist responses to the post-human predicament, in part inspired by Deleuze's Spinozism (Deleuze, 1968; Spinoza, 2001). New materialism extends agential capabilities to the more-than-human-world and flattens ontology so that humans hold no privileged place in the cosmos (Le Grange, 2018, p. 89).

Braidotti argues that deep ecology (see Section 3.4.2) is spiritually charged in essentialist ways and fails to account for re-readings of Spinoza (2001) by thinkers such as Deleuze and Guattari (1987) and Foucault (1988) (Le Grange, 2018, p. 82). Braidotti takes issue with deep ecology's humanisation of nature, arguing that 'deep ecology anthropomorphises the earth environment' (Braidotti, 2006, p. 116 cited in Le Grange, 2018, p. 82). Merçon (2011, p. 167) put it cogently as follows: 'the objective to which Spinozism aspires… is to naturalise ethics and not to moralise nature' (Le Grange, 2018, p. 85).

Braidotti's bio-centred egalitarianism challenges the prevailing standard of the post-anthropocentric agenda and the assertion of advanced technologies that mean 'man is the measure of all things' (Braidotti, 2006, pp. 96–106): 'bio-centred egalitarianism is a philosophy of affirmative becoming, which activates a nomadic subject into sustainable processes of transformation' (Ibid., p. 110). For clarity, I interpret Braidotti's bio-centred egalitarianism as a way to define eco-feminist environmental justice: a she-fox wake-up call for planetary and equality rights for all life. I relate well to the profound acknowledgement that 'life' is a slippery concept, especially animal life. Multi-species relations and interactions are central and placed along the 'materialist lines of becoming as deep transformations of self and society' (Braidotti, 2006, p. 109).

Therefore, what is the relevance of eco-feminist theoretical thought on 'transpositions' for my research? The idea proposes searching for new modes of plastic-material representation, adequate for disposed things lost in the systemic complexities of global waste management (Chapter Seven) or entangled plastic discard in the oceanic space (Chapter Eight).

Following the 'material turn', influenced by Braidotti's embodiment, a new theoretical influence arises in my research: a liberating feminist notion of changing order with the agency of plastic things and inviting 'non-human others' as actors (Chapter Nine). This re-arrangement of the elements, which is an act of transposition, implies that, to understand complexity, one needs to leap in multiple directions – from the human-centric design view, a leap of intent towards a non-human-centric design perspective (see *Designtransposal: Plastiglomarate* and *Sea PET Anemone* in Fig. 4-26). This is unpacked in more detail in Chapters Eight and Nine.

Peredruk (2020, online) delineates the emerging 'non-human centered design method' as an empathetic process of design that moves past the hierarchy of the human. Concepts of 'transposition' are therefore central in creating my 'Designtransposal' visual strategy and forming the blue design series (Fig. 4-26, right). Through the material representation and visualisation of oceanic change, 'Designtransposal' allows me to record an act of becoming: in this case, the birth of the 'plastisphere' (Zettler et al., 2013). As an Anthropocene marker, I visually present the 'plastiglomarate' phenomenon (Corcoran et al., 2009): see Fig. 4-26, left. 'Plastiglomarate' indicates multi-composite materiality, where rock and plastic merge, affirming planetary changes in tonality – a transposed order of two previously separated things clamped together. This example is the unity and agglutination of solid Adriatic beach rock and a single-use plastic object – in this case, a blue bottle top. For clarity, 'plastiglomarate' – named by geologists (Corcoran et al., 2009, pp. 80–84) – announces a long-term planetary gene

permutation and a ‘plastic matrix’, serving scientifically as a global marker of the Anthropocene epoch. (See Section 3.4.2 and Section 3.5.2.)

My design research offers to look at this ‘super-wicked problem’ (Section 3.3) and complex living matter entanglement from a novel angle. Metaphorically, this enables me to examine the ‘plastic matrix’ as the blue ‘Sea PET Anemone’ (see Chapter Nine). I visually narrate the prelude to ‘Scenario 2150’, forming the ‘aesthetic response’ (Hillman, 1996), shifting the ‘aesthetic vision’ away from the variety of human-made problems towards multi-species experiential and oceanic space wonder (Fig. 4-26, right). The new ‘Designtransposal’ strategy creates tools and experiential practices for my explorations with plastic things (see Chapters Five and Six).

Section 4.4 expands on the eco-feminist materiality and material embodiment that initiated the change in my theoretical horizon and stimulated my creative desire to engage with plastics materiality and disposable bodies on many different levels and from a variety of worldviews with human and non-human actants.

4.4 Material Actants

> ‘My encounters with the microbial strongly suggest that bacteria are the biosphere’s most prevalent and prolific actants, and that, through colonies, they assemble an almost countless array of allies. Most of these assemblages have nothing to do with humans; humans are not even aware of the vast array of microbial assemblages on Earth.’
>
> Myra Hird, 2009, p. 18.

Fig. 4-27. *Theoretical Micro-ontology,* 2019. Mapping board, UK.

This section closes the *Theoretical Review* (Chapter Four) and ends Part One. I briefly introduce Barad's (2007) scientific 'entangled material agencies' and then raise Hird's (2009) considerations of Latour's influence as a critical metaphysical figure. Hird places Latour's analysis as essential in formulating her 'micro-ontologies' between self and non-self bacterial encounters. I have taken additional theoretical refuge in Hird's (2009) book, *The Origins of Sociable Life: Evolution After Science Studies*, because it unearths this brave new world of bacterial life. Hird embraces and harnesses the philosophy of science and thinks through theories familiar to social sciences, applying, for example, paradigms and epistemic cultures, individuality, subjectivity, and the study and appreciation of non-human matter. Hird examines Latour's (1991) 'actor-network theory' and connects the feminist thought of Haraway and the clear scientific path forged by Barad (2007) and the Margulis Laboratory where 'natureculture intra act' (Hird, 2009, pp. X–XI, Preface).

To clarify, I first unpack Barad's new scientific terminology. Hird does her best to flatten Barad's scientific term 'intra-action,' which refers to ontological inseparability: '"Words" (culture) and all "things" (nature), contrasted against the term "interaction" predicated upon (ontologically) individuated entities that subsequently interact' (Hird, 2009, p. 12). Barad problem-solved representational issues of the analogies and homologies of the separate entities by coupling 'words and things' together and treating them ontologically instead of only epistemologically – as she puts it, 'intra-acting within and as the parts of our world' (Barad, 2007, p. 37). Also noteworthy is that the liveness of the matter and all conversational cultural interactions are perceived, observed and experienced by

Barad as ‘entangled’, although she concludes that ‘entangled material agencies’ are ultimately not determined by scientific measurements: ‘In other worlds, reality is defined as things-in-phenomena rather than things-in-themselves’ (Barad, 2007, p. 205; cited in Hird, 2009, p. 11).

I move here towards quantum physics and, putting it as plainly as possible, Barad’s (2007) notion of the volition of physical systems and entanglement challenges the concept of individualism and mental perceptions of the self. Hird agrees with Barad’s ‘agential realism’, which strongly supports the space between matter and culture. Latour’s (1993) ‘parliament of things’ affirms Hird’s ‘micro-ontologies’ conception, coupled with Haraway’s ‘nature cultures’ (Hird, 2009, pp. 12–13) and Braidotti’s ‘neo-materialism’ in conceptualising ‘transpositions’. Hird dissects Latour’s (1991) ‘action-network theory’ critique of ‘actants’ which seeks to place ‘things in themselves’ at the analytic centre. This therefore connects networked ‘actants’ to Latour’s question in *The Pasteurization of France* (1993) – where the reading audience is asked, ‘do you feel that those things are lacking the illumination of your consciousness?’ (p. 193).

In positing the metaphysical question, Latour (1993) extends critical thought to Latour’s own *We Have Never Been Modern* (1991), a critique of Western artificial bifurcation of nature and culture. Latour refines the argument that things in themselves lack nothing, affirming that inert knowledge is in the order of things because the matter is ‘*sui generis’*, meaning self-referential, unique, or in a class by itself (Latour,1993, pp. 205–206; cited in Hird, 2009, pp. 15–17). Hird affirms her material affinity with Latour’s metaphysics, arguing that natural forces cannot

be divided into the ‘human’ and ‘non-human’ because ‘“natures” mingle with one another and with “us” so thoroughly’ and cannot be separated (Ibid.).

Post-humanist sensibilities best support this ‘new materialism’, which focuses on the actants and its vibrant entangled relations that serve ‘itself*’.* Assemblages of objects and things therefore do not require human mediation to act. Latour’s ‘parliament of things’ goes a long way to support the independence of objects and things as material actants. My observation is that Latour’s descriptions of the relations of ‘actants’ are drawn from the human realm, and when the parliament of plastic things is placed within the oceanic gyre, it is difficult to associate with the ‘plastisphere’ from a human perspective (see Chapters Eight and Nine).

New materialism questions the privileging of the human subject in the human/non-human binary and holds that all matter, including inorganic matter, has agential capacities (Le Grange, 2018, p. 82). Thus, new materiality and eco-feminism prompt my praxical making and thinking with plastics (see ‘Designedisposal’) to examine ‘non-human others’ (see ‘Designtransposal’). I am influenced by Hird’s ‘micro-ontology’, which examines the individuality of prokaryotic bacteria, nicknamed ‘social amoeba’ (Hird, 2009, pp. 65–77). My *Theoretical Micro-ontology* (Fig. 4-27) mapping board visually maps theoretical influences and turns to materiality encounters and non-human entanglements (Chapter Four). I created amoeba mapping in mimicry of Hird’s (2009) reflections on bacterial self-hood, symbiotic environment and consciousness from human, thing and non-human perspectives. Hand mapping drawing also relates to understanding that we do not inhabit the Earth but that the Earth inhabits us (Le Grange, 2018, p. 87).

Visually, Fig. 4-27 records a paradigmatic shift in my research, merging my thinking symbiotically with plastic things (see ‘Designedisposal’, Chapter Seven) and moving towards embracing the plastisphere’s bacteria as a material actant and stakeholder in ‘Designtransposal’ workshops (Chapter Eight).

I encounter the plastic-things-nature ethics of ‘Designtransposal’ entangled with human things and non-human relations (Fig. 4-27). I allow post-humanist sensibility to shift and expand the focus of the scientific field (Section 3.5.2) towards forging new ties between the ‘plastisphere’ – the bacterial organism network – and the marine environment through speculative design research and a post-humanist perspective.

Here, I grasp that the birth of the biolayer in the ‘plastisphere’ does not belong to the human reign but to vast oceanic microbial agency. The paradox is that plastics have become ‘live’, creating a biolayer in the vertical spatial context of the marine ecosystem (Section 3.5.2). This research acknowledges that there are no quick, technological fixes to extract plastics from the oceans (Section 3.5), and neither can ‘I’ as an individual or ‘We’ as a multi-species planetary collective (see ‘I/We’, Section 2.1), escape the long-term pollution effects that are in progress. Thus, I address this ‘super-wicked problem’ through aesthetic design activism – visualising plastic pollution, initiating HE symposiums, undertaking participatory design workshops, making gyra installations, visual mapping (Fig. 4-27), having conversations and deriving two cli-fi scenarios: see Part Three.

4.5 Research Questions

This section unpacks my investigative main research question responding to gaps informed by Chapters Three and Four, followed by two sub-research questions supporting my practice experiences explored in Chapters Seven and Eight.

> **MAIN RESEARCH QUESTION** – How can design research in dialogue with marine social science and eco-feminist thinking prompt new ways to re-imagine waste and conceptualise, visualise and re-vocalise plastic oceanic pollution?

I interpret the main research question with plastic materiality through design research, discard study, interdisciplinary scientific influences (Chapter Three) and new materiality thinking (Chapter Four) – visualising plastic pollution. The main research question branches into two action-based sub-questions. The main question is informed by the literature and field review (Chapter Three) and conceptually underpinned in more depth in the 'Theoretical Review' (Chapter Four). I postulate thing theory and post-humanist theory (Chapter Four) to support more than the human view through participatory action with plastics (Chapters Seven, Eight and Nine), creating a new 'Vocabulary and Compendium' (Chapter Two).

My design research is theoretically and scientifically informed, and the main research question posits new ways to re-imagine waste and visualise plastic ocean pollution. My praxis' action research paradigm (Chapter Five, Sections

5.1–5.3) expands the relational aspects of design thinking through HE-based participatory plastic pollution visualisations (Chapter Eight, Sections 8.1–8.2.3). I carve out an investigatory query exploring the relationship between design research, waste culture studies and marine science interpretations of feminist new materiality (Chapters Three and Four).

The two sub-questions directed my two practice-based project streams in this thesis: ‘Green design engagements’ placed in the green timeline from 2014 to 2016 (Chapter Seven) and the ‘blue design series’, placed in the blue timeline from 2014 to 2015 (Chapter Eight): see (Fig. 1-5, Section 1.2). The first sub-research question focuses on the exploration of ‘Designedisposal’ tactics (Chapter Seven) through HE ‘green design engagements’: Sub-research Question 1 – How can a small design practice’s engagement with disposed plastics temporarily reconnect the presently fragmented waste management services with the UK’s local communities and HE stakeholders?

The second sub-research question interprets through action new ‘Designtransposal’ visual strategies (Chapter Eight, Sections 8.2–8.3), which engaged with various HE-based design stakeholders across the UK (Fig. 1-5, right): see Section 9.0, Fig. 9-74 on visually unpacking Sub-research Question 2 – What are the latent emotional aspects of stakeholders’ relations and values towards consumption, plastic waste and marine pollution? It is therefore important to look at multi-disciplinary asterism (Chapter Three) and expanded theoretical multiplicities (Chapter Four in Part One) because these lay the new foundations for my main research question explorations (Chapter Nine).

PART TWO

‘For all of us who attempt to grasp the scale, complexity and seriousness of the problems the human race currently faces, it can seem that overcoming them is actually impossible. Yet we need to ask if we actually can, in fact, distinguish between what, at any given moment, is empirically impossible from what our limited perceptual reach tells us is impossible…

‘Notwithstanding a bleak analysis and the total inadequacy of current action against the forces of defuturing unleashed by human action… it has to be affirmed that the history of humanity is a history of the realization of the impossible.’

— Fry et al., 2009, p. 248.

CHAPTER FIVE: RESEARCH METHODOLOGY

5.0 Visual Overview of Research Methodology and Research Methods

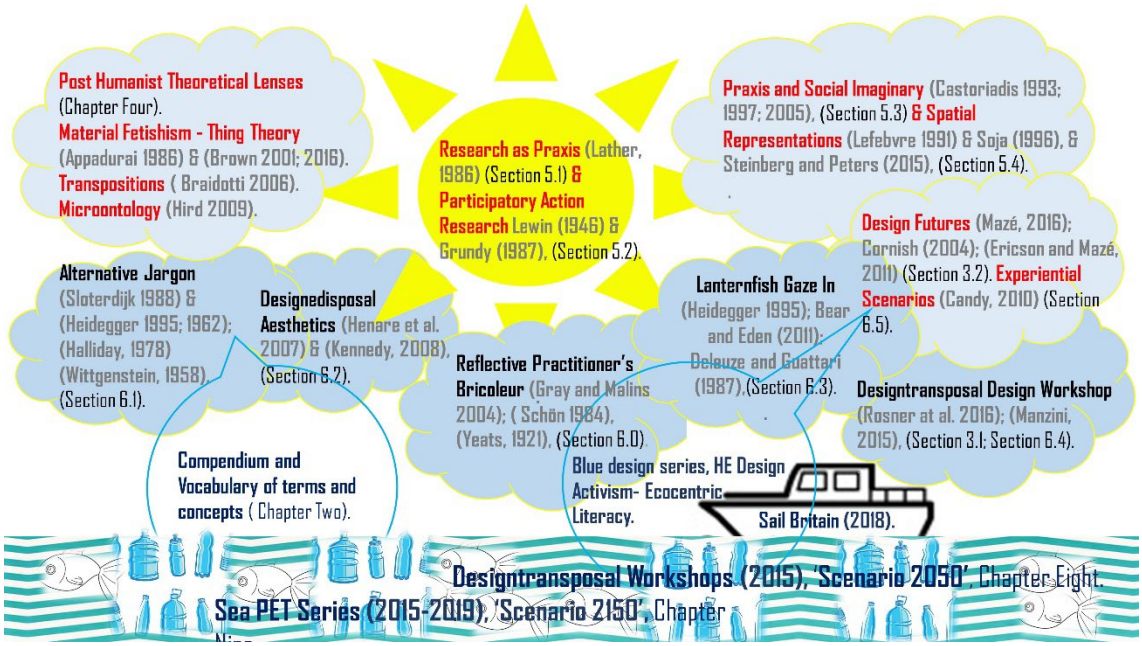


Fig. 5-28. Praxical Landscape: Methodology, methods clouds and blue design series outcomes.

Welcome to Part Two – the middle of the PhD thesis – which consists of Chapter Five on 'Research Methodology' and Chapter Six on 'Research Methods'. The theoretical and feminist 'new materiality' notions described in Chapter Four expanded my conceptual framework, re-situating my praxis paradigm in a post-humanist worldview. This visual overview, 'Praxical Landscape: Methodology, Methods Clouds and Blue Design Series Outcomes' (Fig. 5-28 above), depicts new feminist materiality concepts and philosophical theories (see 'from the left the top clouds in red and grey text'). Chapter Four has influenced my creative methodical approach to innovative methods (Sections 6.1–6.2) and expanded my

'Vocabulary and Compendium' of terms and concepts (see Part One, Chapter Two).

The 'Research Methodology' described in Chapter Five affirms that 'research as praxis' (Lather, 1986) offers sufficient ontological and epistemological structures under which to place this multi-faceted participatory research (Fig. 5-28 – see 'the sun and the top clouds on the right in red text'). The landscape is where the sun radiates upon the paradigm of my praxis (Section 5.1).

My research is powered by the participatory critical action engagements of Lewin (1946) and Grundy (1987) – see Section 5.2. The ideational of the sea landscape is not without clouds. On the contrary, it is over-populated by low-level cumulus formations. The top left- and right-side clouds in red text (Fig. 5-28) incorporate Chapter Four's 'Theoretical Review' (Part One), and its influences, entangled with Chapter Five's methodological structures.

Section 5.3 expands on Castoriadis' 'social imaginary' through 'praxis' (1993; 1997; 2005), and the epistemological scope of Section 5.4 conceptually cultivated with Lefebvre's productive 'spatial representations' (1991), Soja's 'spatial knowledge' (1996) and Steinberg and Peters (2015) 'wet ontology'.

Chapter Six, which looks at research methods, theoretically influences and processes formations hanging heavily under the cloud formations in the black and grey text (Fig. 5-28). The 'clouds in black text' on the left represent Section 6.2's 'Designedisposal Aesthetic' bespoke visualising method, initially influenced by *Thinking Through Things* (Henare et al., 2007) and Kennedy's (2008) 'positive waste'. The adjoining cloud represents everyday political naïveté, as set out in

Section 6.1's 'alternative jargon' tactics through the sharp 'theoretical neokynicism' of Sloterdijk's (1988) critique of Heidegger's (1955; 1996) language and Wittgenstein's (1958) 'language game'. On the right (Fig. 5-28, middle and right clouds in black text), Section 6.0's 'Reflective Practitioners Bricoleur' unpacks multi-method approach representations, which Gray and Malins (2004) validated through Schön's (1984) reflective practitioners' processes.

Below (cloud in black text), my bespoke visualising method in Section 6.3, 'A Lanternfish Gaze In', creatively explores wet oceanic worldhood by following the afterlife of plastics entangled in the gyre patch. The imaginary 'gaze in' perceives and carries Heidegger's 'transposedness' worldview (1995), following the daily migration of the lanternfish. Section 6.4's 'Designtransposal Design Workshop' method, supported by Rosner et al.'s (2016) participatory engagement and Manzini's (2015) 'social innovation', explores visualisation of plastic pollution with plastic materiality and conversational provocations as a strategy (see Fig. 5-28's 'clouds in black text'). Section 6.5, 'Experiential Scenarios', explores Candy's (2010) method for 'plausible and possible' futures and creates a timeline for cli-fi scenarios (Section 8.4 and Section 9.4).

In Chapters Five and Six, I close this Anthropocene plastic pollution enquiry with 'Designing the Case Study' – Section 6.5 – and the two selected case studies addressed in Sections 6.5.1 and 6.5.2. In Part Three, practice-based projects branch off into two areas: the green 'Designedisposal' branch of Chapter Seven and the blue 'Designtransposal' branch of Chapters Eight and Nine.

My research shifted its focus from plastics waste management forged under the *Designedisposal: Green Design Engagements* (Chapter Seven), re-imagining plastic waste disposal towards HE participatory workshops research in the *Designtransposal: Blue Design Series* DIWO 'Scenario 2050' cli-fi narrative (Chapter Eight). followed by the *Designtransposal: Sea PET* aesthetic visionary response to climate change in the DIY 'Scenario 2150' cli-fi narrative (Chapter Nine), Fig. 5-28 – see the 'blue text bubbles, the boat and under the sea text'.

Section 5.1 visually maps my praxis paradigm.

5.1 Praxis Paradigm

> 'The paradigm of Praxis is a sufficient epistemological structure under which to place action research.'
>
> — Patti Lather, 1986, p. 257.

Fig. 5-29. My Praxis Paradigm: Mapping the holon notion of parthood vs whole.

This section first introduces the key qualities and theoretical principles of the praxis paradigm. In Fig. 5-29, the 'social amoeba' hand illustration, I visually unpack my praxis' holistic paradigm before closing with a commentary exploring the modes of epistemological being through a post-humanist lens.

The praxis model shares several perspectives with the interpretive paradigm, using its related qualitative methodologies. In a social science context, Lather's (1986) emancipatory research defined and examined the concept of 'research as praxis' (Lather, 1986, pp. 257–277). The 'research as praxis' process is closely allied with action and participatory research. O'Brien's (2001) methodological overview suggests 'that knowledge is derived from practice, and practice informed by knowledge, in an ongoing process', forming the cornerstone of action research (p. 11). Both authors – Lather and O'Brien – confirmed that neither the interpretative nor the positivist paradigm offers sufficient epistemological structures within which to place action research, strongly suggesting a praxis model instead (Ibid.).

A term first used by Aristotle (384–322 BC), 'praxis', represents the art of acting upon the conditions one faces to change them. Aristotle categorised disciplines into theoretical '*theoria*', practical and technical '*praxis*' and the poetic '*poesis*'. Aristotle allocated 'praxis' as a vehicle for speculative knowledge investigation (Oxford Reference, 2020, online).

'For Aristotle, *praxis* is the highest and most distinctive possibility of human existence' (McNeill, 2019, p. 39). Aristotle's account of the praxis of human life emphasises human involvement and exposes the unpredictability of everyday reality. Such an existence is in no sense transcendent finitude of its situation but offers attainment of an outside perspective on itself. Aristotle conceived that the praxical view is possible if combined with the human and divine condition offering a '"theoretical" vision belonging to the *sophia* of the philosopher' (McNeill, 2019, pp. 39–41). The term *'sophia'* translates as the 'love of wisdom'.

Praxis deals with the disciplines and activities predominating in people's ethical and political lives. Aristotle informs us that logical reasoning combined with experience results in *'eupraxia*', marking an excellent result for a successful praxis. The term *'eupraxia*' contains personal qualities of the social dimensions of 'I' and 'We', drawing a holistic personification of the 'I/We' term I apply to represent individual, society and planetary wellbeing. In this design research, the Aristotelian notion of 'praxis' is closely related to planning and co-creating participatory engagements and instituting praxical knowledge of '*phronesis*', which 'refers to knowledge belonging to human praxis' (McNeill, 2019, p. 40): 'For *phronesis* is a seeing ("knowing") of oneself *as an acting self*' (McNeill, 2019, p. 41).

My methodological research approach is grounded in my praxis paradigm, which has shifted from an interpretative to a constructivist model over the past decade and presently sits in the post-humanist feminist materiality worldview. My ontological and epistemological enactment is visually mapped, forming a holon. This mutational development has changed *My Praxis Paradigm: Mapping Holon Notion of Parthood Vs Whole* (Fig. 5-29 – see legend: X1 to X5).

For clarity, the Greek origin word 'holos' is in neutral gear and represents a form that is simultaneously the part and the whole. Holism is the 'tendency in nature to form wholes that are greater than the sum of the parts through creative evolution' (Smuts, 2013, p. 105). (See Section 3.4.2.)

My praxis 'creative evolution' holon synergises five intertwined elements (Fig. 5-29), as can be seen in the legends (X1 to X5) where:

- X1 represents design research in the sociality of waste.
- X2 represents marine environmental conservation and creative learning in HE under blue design activism.
- X3 represents the planet as the mother to all species, nature others, as seen through a feminist materiality and thing theory lens.
- X4=Y represents my post-anthropocentric aesthetic stance in perceiving the ocean as a (mis)managed and living landfill.
- Y represents the birth of the plastisphere and the creation of the new Anthropocene.
- X5 represents my praxical socio-material narrative, designing waste ontology and exploring novel modes of being with plastic things.

Following the language game, through the 'I/We' term, I explore intrinsic relations to modes of being and becoming with plastic waste. My research follows mismanaged plastic migration in nature and connects humans, things and multi-species. My participatory explorations with plastic things aid in deriving hypothetical future scenarios as part of the research whole – representing ubuntu.

Thus, my praxical knowledge of '*phronesis*' is partly enlightened by Heidegger's '*dasein*' characterisations of existence (1995) and in exploring my human relations of 'ones*elf*' (my emphasis). Nevertheless, in the magical being of my imaginary 'ones*elf*', the singular 'I' existence – following Heidegger's stance – lacks aspects corresponding to the socio-historical 'We' narrative. The '*dasein'*

imagery has no relationship to the historical timeline of plastic production and even fewer ties to the ‘natural and cultural bacterial social intelligence’ (Hird, 2009, pp. 52–54).

My praxis’ post-humanist paradigm illustration (Fig. 5-29) is best described by borrowing from Hird (2009, pp. 65–67) as my research’s ‘social amoeba’. The outcome is vocalised through ‘alternative jargon’ (Section 6.1) and the visualising strategy of ‘Designtransposal’ through praxis (Section 6.4). This seesaw mode of thinking and doing with designed and disposed-of things allows new relations with discarded plastics in nature. The quest leads me towards the participatory and action research that I explore in staggered historical detail in Section 5.2.

5.2 Participatory and Action Research

> 'Promotes emancipatory praxis in the participating practitioners; that is, it promotes a critical consciousness which exhibits itself in political as well as practical action to promote change.'
>
> — Grundy, 1987, p. 154, quoted in Berg, 1989, p. 187.

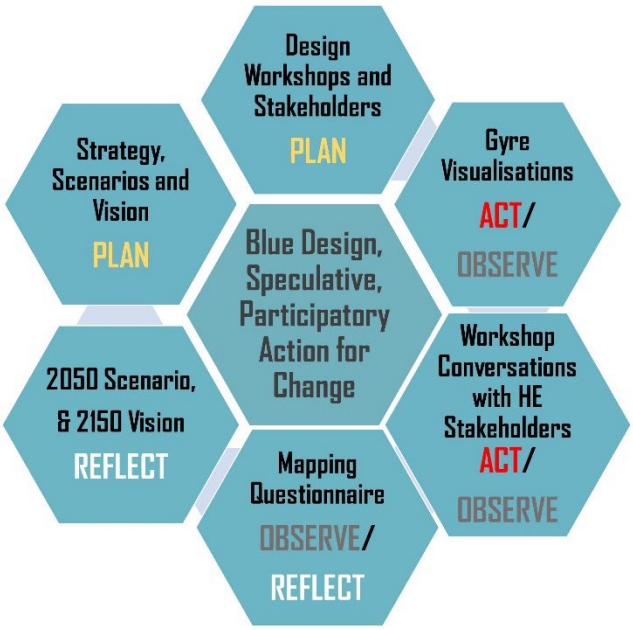


Fig. 5-30. Blue Design Emancipatory Action Diagram: Plan, Act, Observe and Reflect.

The social psychologist Lewin (1946) is often referred to as the originator of the action research field. In particular, his use of the 'if so' questions, which Lewin included in action research, were fundamental to all social science research (Lewin,1946). Action research gives credence to the development of powers of

reflective thought, discussion, decision and action on the part of ordinary people (Wright Mills, 1959, quoted in Adelman, 1993, p. 8). Thereby, Lewin (1946) established two fundamental elements of action research: first, generating knowledge and, second, supporting social systems change.

In addition, Kemmis and McTaggart (2007) developed a simple model of the cyclical nature of the typical action research process. Kemmis and McTaggart proposed that a cycle loop has four steps: 'plan, act, observe and reflect' (Fig. 5-30). The cyclical process is repetitive and provides opportunities for experiential learning through participation, which allows change from within (Kemmis and McTaggart, 2007, quoted by Barth et al., 2016, pp. 166–167).

Winter (1989) further developed a set of six fundamental principles to guide the action research process: 'reflexive critique; dialectical critique; collaborative resource; risk; plural structure; theory, practice and transformation' (1989). Following Lewin's initiation for action researchers (1946), there is no theory without practice because the practice approach applies theory and vice versa, creating a continuous transformation cycle loop (Fig. 5-30).

Several sources outline three distinct types of action research. For example, Grundy (1987, p. 353) discusses three modes of action research: 'technical, practical and emancipating'. Instead, Holter and Schwartz-Barcott (1993, pp. 298–304) communicated two distinct goals of action research: first, to increase the proximity between the day-to-day problems encountered by practitioners in specific settings with the theories used to explain and address the issue. The second goal aimed to assist practitioners in lifting their clouded understandings,

helping them to ‘better understand fundamental problems by raising their collective consciousness’ (Holter and Schwartz-Barcott, 1993, p. 301, quoted in Berg, 1989, p. 187).

Following Grundy (1987), by developing a ‘social critique’, consideration of theory and practice comes together. The development of this sort of social criticism testing ground has a three-part notion embedded in ‘theory, enlightenment, and action’. The social critique approach and understanding together provide emancipation and empowerment to participants, leading to action and change (Grundy, 1987, quoted in Berg, 1989, pp. 187–189).

Berg (1989) summarises critical action research, participatory research, collaborative inquiry, emancipatory research and action learning as variations of a singular theme. In any setting, people’s actions are based on implicitly held assumptions, beliefs, theories and hypotheses, and theoretical knowledge is enhanced with every observed result (Ibid.).

My emancipatory research loop, *Blue Design Emancipatory Action Diagram: Plan, Act, Observe and Reflect* (Fig. 5-30), therefore engages in action research and is an appreciative enquiry platform that encourages hands-on participation, design workshop conversations and visual aesthetic. As a researcher, I make explicit theoretical and practical justifications for planning strategy, the future ‘Scenario 2050’ and visualising plastic pollution through engagements with stakeholders (Chapter Eight).

In Chapter Eight, informal workshop conversations around consumption and disposal beliefs and a five-level questionnaire with workshop stakeholders were

recorded, providing the basis of my research findings. I mapped and transcribed the participants' data, forming the first '2050 Scenario' narrative. The '2050 Scenario' background is visually *Unpacked* (located in Section 8.4., Fig. 8-72), synergising Part Three, Chapter Seven's 'Designedisposal: Green Design Engagements' and Chapter Eight, Section 8.3's 'Designtransposal Workshops Mapping Dialogue', summarising DIWO stakeholders' questionnaire responses and mapping conversational insights.

Chapter Nine focuses on 'non-human others' and plastic waste aesthetics visualising my 'Sea PET' DIY 'Designtransposal: Blue Design Series'. The second '2150 Scenario' is my DIY aesthetic vision of plastic pollution and response to the rise of the Anthropocene, combining '*Hothouse Earth'* scientific future predictions discussed in Section 3.4. (See '2150 Scenario' in Section 9.4., Fig. 9-83, concluding Chapter Nine.)

As reflective action research findings, both scenarios serve as outcomes and visual vignettes for DIWO engagements and the DIY blue project series. The ensuing practical waste management and marine science data – presented in Part One, Chapter Three's 'Literature and Field Review' – are extrapolated to speculative analysis in a transformative participatory action cycle continuously alternating the research emphasis between research theory and re-use practices united under emancipatory action (Fig. 5-30). Section 5.3 explores the contemporary autonomy of 'praxis' and the 'social imaginary' act as critical and political vehicles that promote change.

5.3 Praxis and Social Imaginary

‘One could say that for praxis the autonomy of the other or of others is at once the end and the means; praxis is what intends the development of autonomy as its end and, for this end, uses autonomy as its means.’

— Cornelius Castoriadis, 1997, p. 75.

‘It means that the functionality of what was the animal psyche has been shattered by the emergence of something that is constitutive of the human psyche, that is to say, the radical imagination as perpetual flux of representations, affects, and desires.’

— Cornelius Castoriadis,1993, p. 390.

Fig. 5-31. Social Imaginary: *Death to Fascism – Liberation to the People, translation from Serbian***.**

As an independent neo-Aristotelian thinker, Castoriadis' political understanding and criticism (1993) were influenced by traditional philosophical figures such as the post-Socratics – Plato and Aristotle – as well as Fichte, Hegel, Marx and Heidegger (Adams, 2011, Intro.). In *The Political and Social Writings*, Castoriadis presented a historical overview suggesting that 'imagination' was first questioned by Aristotle (384–322 BC), who recognised and described essential features such as: 'that the soul never thinks without phantasm' (Castoriadis, 1993, p. 226). Guided by the ghostly attributes of imagination, Castoriadis (1997) evaluated relational dynamics in *Praxis and Project*, stating that 'praxis cannot be circumscribed in a model of ends and means' (Castoriadis, 1997, p. 75). Allocating the power of autonomy and blurring the outcomes, praxis cannot be defined by particular technological characteristics. Still, it is governed by its 'internal relation between what is intended (the development of autonomy) and that through which it is intended' (Castoriadis, 1997, p. 76).

For Castoriadis, praxis is based on prior fragmentary knowledge, although praxis derives itself and continually gives rise to new experiences: 'This is why the relations of praxis to theory, true theory correctly conceived, are infinitely tighter and more profound than any "strictly rational" technique or practice' (Castoriadis, 1997, p. 76). The very object of praxis is creating the new, which cannot be quantified or ordered: 'In other words, its object is the real as such and not a stable, limited, dead artefact' (Castoriadis, 1997, p. 77).

The 'relative lucidity' of state of mind, combined with 'autonomy', allows praxis to continuously transform its subject based on the 'experience in which it is engaged, which the subject does or makes, but which also makes the subject'

(Ibid.). The apparent modification, both in form and context, and the relationship between a subject and an object, exalts praxis to revolutionary and autonomous action projects. Castoriadis defines the praxical project as the part and whole of all activity – a non-end of what should be: 'It is the intention of transforming the real, guided by a representation of the meaning of this transformation, taking into consideration the actual conditions and inspiring an activity' (Castoriadis, 1997, p. 77).

In *The Imaginary Institution of Society* (1997), Castoriadis openly seeks to awaken the creative potential in human collectives – a *vis formandi* characterised as the formative force that underlays our experiences and activities. He uses the term 'creative imagination' to encompass the meaning of the specific radical imagination of the individual psyche with radical calls for the 'instituting social imaginary' and for recognising the collective imaginary force of the singular human being as a potential for creation (Castoriadis, 1997, pp. 127–131).

In *Figures of the Thinkable* (2005), Castoriadis prophetically opens his discussion by differentiating the 'imaginary' from the imagination: 'There is no way within the logic-ontology of the same, of repetition, of the forever intemporal (aei) to think a creation' (Castoriadis, 2005, li). He views the 'social imaginary' of the contemporary age as the rising central capitalist imaginary (2005).

Castoriadis critiques unlimited economic expansion and a perpetual production–consumption–disposal cycle, concluding that Western society is, today, at the point of undergoing a capitalistic crisis. Characterisation of the creative imaginary is best cited as:

> I think that we are at a crossing in the roads of history, history in the grand sense… The other road should be opened: it is not at all laid out. It can be opened only through a social and political awakening, a resurgence of the project of individual and collective autonomy, that is to say, of the will to freedom. This would require an awakening of the imagination and of the creative imaginary (Castoriadis, 1997, p. 146).

Castoriadis' (1997) critique of the socio-historical capitalistic imaginary creates an allegory of two crossroads – allocating the first road to society as it is at present (see Chapter Eight 'Scenario 2050') and leading to the second road of culture as yet unexplored (see Chapter Nine 'Scenario 2150') but wide open with all the potential for praxical autonomy and creativity. Castoriadis' critical social stance identifies the need to abandon our present cultural image of representation as 'a projection screen which, unfortunately, separates the subject and the thing'. Castoriadis argues that representation does not provide 'impoverished images of things' but instead allows 'certain segments of representation' (Castoriadis, 1997, p. 331).

Figure 5-31, *Social Imaginary: Death to Fascism – Liberation to the People*, is a visual expression of my psyche – a commentary on the family nucleus and society's relationship with nature. Even from a non-capitalistic stance, I cannot claim that my socialistic urban upbringing left only a shadow of a footprint. The shadows of the three figures cast upon the partisan memorial thumb stone are therefore part of my psyche awakening, raised from the post-consumer ashes. I reflect here and connect upon Part One, Section 3.4, and the future effects of

rapid human population expansion (DESA, 2015), which ‘exacerbates all environmental problems’ (Population Matters, 2020).

Do the imaginary forms of freedom, liberation and death belong to the privileged human community? Or is the ‘other road’ open for taking post-humanist ‘creative imaginary’ initiatives? The post-humanist methodological stance of this research therefore follows the idea that design research and climate change visualisation can significantly contribute towards forming new radical imagination thresholds and aid in re-shaping the present socio-material representations and affects through the participatory emancipatory praxis. (See Chapters Eight and Nine.)

Section 5.4 explores ‘Others, Space, Place’ – best formulated by borrowing Barad’s ‘agential language of relationships’ (2007). To understand the ethico-onto-epistemology context, I visually applied the meta-mapping *Tool 52 Collective Story Telling* (Tham et al., 2008). I situate my agency (production), place (with and where) within the research process space (when with others). I examine my PhD contextual entanglement through Leferbian and Soja’s triadic spatial lens.

5.4 Others, Space, Place

‘Authentic knowledge of space must address the question of its production.’

— Henri Lefebvre, 1991, p. 388.

‘Thirdspace, as I have been defining it, retains the multiple meanings Lefebvre persistently ascribed to social space.’

— Edward William Soja, 1996, p. 62.

Fig. 5-32. My PhD Production Space Place. *Tool 52 Mapping.*

Lefebvre (1991 (1974)) posits that ‘dialectics of triplicity’ theoretically explain how to attempt to define the production of space. Lefebvre distinguishes three spatial types within the trialectics of spatiality:

1. Neutral nearness as ‘spatial practice’.

2. The mental domain as ‘representations of space’.

3. The lived and interactive ‘space of representations’.

The first ‘spatial practice’ is the immediate physical space in which the two-dimensional and three-dimensional plans are designed. The second, ‘representations of space’, represent mental activities: e.g., thinking utopias and ideologies. The ‘representations of space’ in this PhD research are informed by the findings in Part One, Chapter Three: the ‘Literature and Field Review’. The third and last ‘space of representations’ is a social, lived space or place that holds the action and all of the spaces combined. Soya’s trialectics are interpreted as the ‘thirdspace’ or ‘space which is open to othering’ (Soya, 1996, pp. 31–54). This is perceived through images, myths and symbols, or, in this case, a word cloud image map (Fig. 5-32).

This section investigates Lefebvre’s (1930s and 1940s) conceptual explorations and formulation of ‘trialectics of spatiality’. Lefebvre’s dialectics of triplicity defines the mundane life as the entanglement of ‘illusion and truth, power and helplessness; the intersection of the sector man controls and the sector he does not control’ (Lefebvre, 1991, p. 40). Space cannot be defined only by empirical means, nor is our knowledge of area *a priori* to the creation of space itself.

Our personal inner space is not limited by its exterior and interior mathematical measurements. Instead, ‘spatial practice’ is our permanent habitual place and space that ‘I/We’ occupy. By scientifically placing our focus on empirical properties and geometric measurements, we deprive ourselves of the ability to perceive and experience the vastness of ‘representations of space’ for what they can indeed be. In *Being and Time* (1962, Ch. 3, Sec. 14), Heidegger inspired Lefebvre’s conceptual ‘knowledge of space’, which argued for a ‘true space’ rather than accepting a constructed ‘truth of space’ (1991).

Heidegger’s term ‘worldhood’ stands between the Leferbian second ‘representations of space’ and the ‘thirdspace’ or ‘space of representations’ (1995), giving a preliminary encounter meaning to the world of others. My research expands into the spatial quest, initially influenced by Lefebvre’s ontological and ‘three epistemological modes of space’ (Lefebvre, (1991, p. 65). In establishing my ‘true space’, the research interrogates – through physical engagement with plastic waste and informed by marine pollution data – the latent social, cultural and emotional relations between plastic waste and everyday disposal and the vision of oceanic worldhood. (See Chapters Eight and Nine.)

My PhD Production Space Place (Fig. 5-32) illustrates the applied meta-design tool that captured entangled topological intersections within PhD research topics, places and themes. Together with Mathilda Tham, in 2016, I approached my PhD’s complex narrative by word mapping my research space and places of action using meta-design *Tool 52 Collective Story Telling* (Tham et al., 2008). Five colour-coded levels facilitate the telling of the story – sensual (fuchsia), factual (blue), relational (green), futures (red) and synthesis (black) – relating to

the words in the cloud image (Fig. 5-32). (See Table 3, the colour-coded five-column table below to aid with the mapping analysis.)

Sensual	Factual	Relational	Futures	Synthesis
Experiential; Haptic; Hand; Wet; Smooth; Emotions; Anger; Sorrow; Sadness; Fear; Tears; Sensual; Materiality; Beauty; Colourful; Body; Big; Water; Washing; Smell; Stinky; Food; Milk; No Gender; Feminine; Meditation;	UK; London; Rochester; Cornwell; Hvar; Croatia; Japan; HE; Goldsmiths UaL; UCA; Design Star CDT; Disposal; Discard; Waste; Systems; Plastic; Landfill; Land; Ocean; Municipality; Designedisposal; Designtransposal; Activism; Science; Depressing Statistics; Resistance to Change; Bad Recycling Data; Global; Local; Gaia Planetary Mother;	Connectivity; Systemic; Everyday; Entanglement; Global vs Planetary; Planetary Chemistry; Culture, Educational; Technology; Economy; Emotions; Feelings; Desires; Values; Reuse; Refuse; Strategies; Rituals; Littering; Policy; Norms; Metadesign; Nature; Fish; Waste;	Plastisphere; New Weather; 2050 No More Fish; Future Scenarios; Education; Public; Policy; Sci-Fi; Awareness; Embodied; Feelings to Waste; 0% Waste; Past Integration; No Petrol; Mythology; Alchemy; Connection; Solar System; Time; Space; Transposal; Resilience;	Everyday **Conciseness**; **Design Philosophy;** Waste Rituals; Rebellion; **Not So Quiet Revolution**; **I/We**; **Co-Design**; **Vision**;

Table 3. My PhD Production Space Place Table.

Table 3's first three columns transcribe sensual (fuchsia), factual (blue) and relational (green) words extracted from the cloud image (Fig. 5-32). I translate three columns as the 'unsustainable' acts of plastic transgression in nature – the 'ecocide' (Hossay, 2006; Prokeinova and Blazek, 2020): see Section 3.4. The sensual (fuchsia) column maps HE stakeholders (Chapters Seven and Eight) and stakeholders' emotional reactions to plastic pollution: 'anger, sadness, fear, and tears'.

The second column unpacks factual (blue) places and spaces in 'UK, disposal, discard, landfill, land and ocean', to list a few: see Table 3. The relational (green) column presents ('systemic, entanglement, planetary chemistry, nature, fish and waste') creation of destruction on land, air, marine spaces and places. It is not emotionally easy to allow 'experiential', conflicting emotions to rise and face environmental facts and 'depressing statistics': see Norgaard (2011) and Cohen (2001) on environmental denial and Sections 3.4–3.4.2. For this reason, I apply 'designedisposal' tactics with 'positive waste' (Kennedy, 2008) and the 'designtransposal' visual strategy to explore the tension in socio-cultural material such as 'landfill, discard, waste' by visualising plastic pollution in the oceans (Sections 3.5–3.5.2).

My interdisciplinary design approach practically demonstrates marine others' 'representations of space' and seeks explorative ways to allocate topological points of 'spaces of representations' (Lefebvre, 1991). Returning to unpacking Table 3, my futures (red) words in the fourth column help me explore the oceanic world 'thirdspace' (Lefebvre, 1991) 'open to othering' (Soya, 1996) following

lanternfish daily migration and jellyfish bloom ‘wet ontologies’ (Steinberg and Peters, 2015).

I promote design and blue oceanic awareness (Bear, 2014, Section 3.3), applying my existing ‘Designedisposal aesthetics’ tactics with plastic things (Section 6.2) through new participatory ‘Designtransposal design workshops’ (Section 6.4). (See Chapter Eight for three participatory HE design workshop engagements, outcomes and conversational interpretations.)

Under the futures (red) words in the cloud image (Fig. 5-31; Table 3), the ‘Designtransposal’ visual strategies explore, for example, ‘plastisphere, new weather, 2050 no more fish, futures, scenarios, education, planetary chemistry, entanglement’. Through the ‘Designtransposal’ workshops and five-level questionnaire mapping by stakeholders, I was able to unpack and synthesise the black column, forming a participatory narrative for mismanaged landfill, the ‘2050 Scenario’ (Chapter Eight) and single-use packaging: ‘thinking beyond possible’ (Wood, 2007, p. 129) (see Section 3.2).

My storytelling ‘2150 Scenario’ (Chapter Nine) is a planetary ‘vision’ forming a ‘micro-utopia’ (Wood, 2007) that extends non-human ‘futures’ awareness, exploring the novel living landfill concept and alchemical speculations of what space could be in seven human generations from this present moment with regard to oceanic ‘worldhood’ (Heidegger, 1962) and plastics ‘intra-actions’ (Barad, 2007, Chapter Four).

The last layer under synthesis (black) words in the fifth column (Fig. 5-32, Table 3) represents the ‘everyday designing philosophy’, ‘meta and co-design action

research and number ‘4’ – which stands for the feminist fourth wave strike and not so ‘quiet revolution’. This is expressed through the waste aesthetics, vocabulary and eco-centric compendium (see Chapters Two and Six).

The participatory meta-design tool produced the visual word cloud (Fig. 5-32; Table 3), mapping my praxical three spaces of representations and diagnosing that ‘this story focuses on “I” and the core story centres on “We”’ (Tham et al., 2008). The story states that ‘I’ trash, therefore ‘We’ are – where ‘I’ is represented from the standpoint of a humankind individual, global citizen, mother, plastic prosumer, design researcher and DIY maker and ‘We,’ represents the collective human stance, with DIWO plastic thing agency and planetary collective ‘non-human others’.

This conceptual and methodological mapping allows me to create bricoleur experiences formed of things, images, words, vocabulary compendium and scenarios creating ‘generative tools for co-designing’ (Sanders, 2000, p. 4, Section 3.1)

Chapter Six expands on the research methods applied in this PhD research. I develop a ‘reflective bricoleur’ (Gray and Malins, 2004) through my jargon and waste aesthetics, visualising plastic ocean pollution through participatory design workshops, experiential scenarios and two case study methods.

CHAPTER SIX: RESEARCH METHODS

6.0 Reflective Bricoleur

> ‘The product of the bricoleur’s labour is a bricolage, a complex, dense, reflexive, collage-like creation that represents the researcher’s images, understandings, and interpretations of the world.’
>
> — Denzin and Lincoln, 1994, pp. 2–3, cited in Gray and Malins, 2004, p. 74.

Fig. 6-33. Visualising the North Atlantic Gyre Patch. Photo triptych.

Section 6.0 explores the qualitative research methods used as part of the reflective practitioner bricoleur approach applied in this PhD research. Brewer and Hunter (1989) noted that valid qualitative research primarily employs multi-method strategies. By adopting multiplicity, 'the qualitative researcher uses the set of interpretative practices and has been described as the "bricoleur"' (Gray and Malins, 2004, p. 74). The 'bricoleur approach' (Denzin and Lincoln, 1994; Crouch and Pearce, 2012; de Certeau, 1984) forms a multi-disciplinary set of interpretative practices, and the outcomes of the research create a 'bricolage' – an emergent construction' (Gray and Malins, 2004, p. 74).

The concept of the 'reflective practitioner' was initially derived by Schön (1984). Schön proposed that much activity relies on personal and intuitive knowledge, favouring knowing 'how' over knowing 'what' is formulated as reflection in action. Further, and equally important to this research, he stated that designing is a 'reflective conversation with the materials of a situation' (Schön, 1984, p. 78). To support the notion of 'reflective practice' (Schön, 1984, cited in Crouch and Pearce, 2012), one must first embrace the idea that practice is more than an exercise of a technically co-ordinated set of skills. Second, it is necessary to address the consequences of practice beyond just making or producing artefacts. In *Doing Research in Design* (2012), Crouch and Pearce characterise the subjective process and development of reflection as occurring in the following order: 'Identifying; Describing; Analysing; Interpreting and Synthesizing; Revising; Acting' (Crouch and Pearce, 2012, p. 44).

Reflective practitioners' bricoleur is delivered and designed not just in mixed visual media, such as digital platform blogs and visual journals, but as speculative

prototypes, exhibitions and prosumer installations. Still, it serves as a socio-material narrative for shifting paradigms, creating future perspectives and visual insight. *Visualising the North Atlantic Gyre Patch* (Fig. 6-33) represents the entangled outcomes of this design research, forming 'bricolage; the poetic making do' (de Certeau, 1984, p. XV). (See Chapter Eight, Section 8.2.3; Fig. 8-67, *Plastic Soup*).

I reflect here through my DIY works (on the left, Fig. 6-36) and participatory workshop engagement in DIWO *Visualising the North Atlantic Gyre Patch* (on the right, Fig. 6-36). The photo triptych (Fig. 6-33, on the left top and bottom) sketch of the three-dimensional gyre patch depicted as side-sectional views represents my 'poetic making' and lifeworlds 'social imaginary' across the oceanic space depths and materiality – in terms of plastic entanglement. Figure 6-36's middle (top and bottom) shows concept sketches of double, interlinked gyres inspired by the gyre-cone diagram drawings in Yeats' *A Vision* (1921, Fig. 8-54, Section 8.0). The final image (Fig. 6-33, on the right) captures the third 'Designtransposal' workshop – Section 8.2.3, nicknamed 'Plastic Soup', part of the PhD By Design 2015 graduate design conference held at Goldsmiths, University of London.

Figure 6-33 shows a progression from left to right of the gyra patch visualisation by DIY practice example. Oceanic space is mediated through two-dimensional hand drawings combined with mixed media. I applied image-artefact visualisation of the oceanic plastic pollution phenomenon through DIWO participatory 'Designtransposal' design workshops (see Fig. 8-55, Section 8.1 and Fig. 8-56, Section 8.2 – 'Three DIWO Designtransposal Workshops').

The North Atlantic gyre and gyre patch visualisations started as a solitary affair. The DIY method became a research tool that strategically allowed me to reflect upon fast-paced and continuous planetary changes. It is a visual strategy to assess present and future ways for plastic things entangled with non-human others in oceans. Through ‘Designtransposal’ workshops, I suggest approaching the twenty-first-century chronic environmental disaster through individual and group processes of making and visualising with plastic things.

Promoting re-use, I made three-dimensional concept sketches representing the North Atlantic garbage patch (Fig. 6-33) from disposed-of plastic and metal materials leftovers from the ‘Designedisposal’ ‘HE creative residency’ (see Part Three, Section 7.1). The materiality presented and engaged with is the most commonly found debris under the oceanic surface.

The following sections in Chapter Six narrate selected methods – for example, Section 6.2 explores ‘Designedisposal’ waste aesthetics. Here, my three-dimensional visualising method serves as a representational tool for the presentation opening of the ‘Designtransposal’ workshops (see Part Three, Chapter Eight). I unpack the DIWO design workshop method in more detail in Section 6.4.

In Section 6.6, I have selected two case studies – extracted from the plethora of artistic and design references with waste and pollution – because they are both the work of female interdisciplinary practitioners, and I relate well with their artworks and research journeys. The case studies are listed and discussed

individually in Section 6.6.1's 'Discard Study and Pollution Activism' and Section 6.6.2's 'Maintenance Art and Public Repair'.

Section 6.1 borrows Sloterdijk's 'alternative jargon' critique of Heidegger's subject–object terminology in support of vocalising my 'purely ontological intention' with waste-centric terms and through eco-centric concepts (see Chapter Two).

6.1 Alternative Jargon

‘It is precisely by doing away with the myth of objectivity that Heidegger’s existential hermeneutical… philosophy demonstrates in its form of thinking the adventure of banality… By contrast, in the “purely ontological intention”, the burning coolness of real modernity is at work, which no longer needs any mere enlightenment… Laying bare the structure of existence by thinking ontologically, by speaking positively: To this end, Heidegger, in order to avoid the subject–object terminology, throws himself… into an alternative jargon that, viewed from the distance, is certainly no more felicitous then what he wanted to avoid… however, something of the adventure of modern primitiveness shines through: a linking of the archaic with modern time, a reflection of earliest in the latest.’

— Sloterdijk, 1988, pp. 196–197.

Fig. 6-34. Terms and Concepts Word Cloud.

The term ‘alternative jargon’ is borrowed from Sloterdijk’s critique of Heidegger’s language (1988, p. 233). I relate well to Sloterdijk’s original self-developed theory called ‘neokynicism’ and specifically look into his critical reflections in his ‘existential hermeneutical analysis’ (1962). Sloterdijk examines Heidegger’s ‘ambitious plainness’ and literary mischievousness in saying simple and ‘primitive’ things yet being simultaneously sophisticated (Ibid).

Sloterdijk discusses the typical Heidegger’s ‘modern primitiveness’ through his terminology in the following two examples: first, the term ‘*dasein’* and, second, the term ‘*thrownness*’. Conceptually, ‘*dasein’* ontically acknowledges practical, theoretical and aesthetical existence in the everyday through anyone and anything. Second, in facing the ambiguity that ontologically lies in ‘*thrownness*’, Heidegger describes humans’ individual lives as ‘being thrown’ (German – geworfenheit) into the world (Sloterdijk, 1988, pp. 196–215).

Heidegger’s ‘being thrown’ projection helps us to understand the impossible nature of ‘*dasein’s*’ everyday existence through the past and present ‘thrownness’ timeline. Both terms conceptually connect to the ‘*worldhood*’ spatiality notion of being in the world – put simply, they are ontologically grounded (Ibid).

Conceptually interpreting and vocalising the complexity the *Terms and Concepts Word Cloud* (Fig. 6-34) allows me to vocally express and symbolise the void in the design and disposal of plastics’ materiality and discard in relation to plastic things in nature. In tracking plastic materially, my self-seeded jargon reveals the multi-plane voices that ‘follow the things themselves, for their meanings are inscribed in their forms, their uses, their trajectories’ (Appadurai, 1986, p. 9).

In *Language as Social Semiotic* (1978), Halliday conceptually conceived entanglement that explains 'means of reflecting on things, and language as means on acting on things' (Intro). In voicing the material turn, I acknowledge 'this dual aspect in its semantic system, organised around the … reflection and action' (Halliday, 1978, Intro). Here, reflecting on things is expressed as the 'ideational component of meaning' (Ibid). For Halliday, acting on things is 'interpersonal', related to relationships or communication between people.

The vocabulary (Fig. 6-33) terms and word cloud concept carries a 'positive waste' message – that, although rejected by humans as dirty and toxic, the existential primitiveness of waste still reveals signs of life (see Chapter Two). For example, in Chapter Nine, I follow the 'plastisphere' evolution through the 'Designtransposal' strategy. I argue that one can symbolically transform design with plastic things by visually representing, narrating and communicating the possible future (see 'Scenario 2150').

To summarise, 'alternative jargon*'* stands for expressing new meanings to the social and material plastics construct – i.e., using the 'Designedisposal' aesthetical tool to explore material context and space, and the 'Designtransposal' strategy, enabling visual evaluation of plastic ocean pollution. Part One, Chapter Two sets out a full glossary of with vocabulary and any associated terms brought together in this PhD thesis. Section 6.2 addresses the hands-on tactics of 'Designedisposal aesthetics'.

6.2 Designedisposal Aesthetics

> ‘As socially and morally involved designers, we must address ourselves to the needs of a world with its back to the wall, while the hands on the clock point perpetually to one minute before twelve.’
>
> — Victor Papanek, 1985, p. 13.

> ‘I don’t want to say how things lie. / I want to show you how the matter stands.’
>
> — Erich Kästner, 1933, cited in Sloterdijk, 1988, p. 192.

Fig. 6-35. Designedisposal: CitySe*lf* Anima.

In *Thinking Through Things* (2007), Henare et al. addressed the notion that the ‘thinking with things’ approach is not new. This has been drowned out under the action research umbrella in the social and ethnographic fields. What differs is the acknowledgement of plastics’ materiality, using the heuristic stance vs the analytical approach (Fig. 6-35). To borrow Henare’s voice, ‘it is a quiet revolution: from epistemological angst to the ontological turn’ (Henare et al., 2007, p. 7).

The heuristic with and for stance supports the possibilities of things, supported by Latour's advocacy of multi-naturalism, claiming that 'we have never been modern' (Latour, 1993, p. 57) (see Chapter Four).

Following Papanek's 'socially and morally involved design' direction (1985, pp. XIV–XV) (see Section 3.1), I 'stopped working entirely' in architectural and furniture design and re-directed myself into working positively with plastic waste (see Kennedy, 2008, Section 3.6). My research praxis heuristically embraces 'Designedisposal' and explores the consequences of 'positive waste' aesthetics, and the possibility that disposed-of plastic things can be treated '*sui generis*': i.e., forming a class by itself. They are therefore given unique positive qualities.

The initial material departure was to provide meaning and create a positive character for the disposed-of plastics. The birth of a positive identity for plastic things relies on the Aristotelian 'notion of essence'. Over time, through the process of hands-on making, disposed-of plastic became a category of its kind, which methodically 'meant to allow things to carry their definitive properties on their sleeve' (Henare et al., 2007, p. 3).

The nature of disposed-of objects was not altered in form or colour or recycled but considered using re-make and reuse processes. The manual for handcraft and reuse – for product design – is a challenging process because it is limited in a technological way, particularly in the aesthetical outcome manner. This waste-centric focus became the ethical, aesthetical and haptic 'Designedisposal' method's signature for my praxis (Fig. 6-35).

While this seemingly simple ‘Designedisposal’ approach is a tactical learning tool for my design research, ‘designing for re-use’ (Fisher and Shipton, 2010) positions me as a plastic pollution design activist agency – hands on, attending to and standing with plastic things (see Sections 3.1 and 5.3).

In Figure 6-35’s *Designedisposal: CitySelf Anima* photo bricolage, the disposal encountered in my daily consumption and use routine are transformed into speculative objects. The theoretically inspired notions (Chapter Four, Sections 4.1–4.2) of ‘Designedisposal’ tactics are present through practice in works such as the wall light series I developed in *KraaID: Transformation by Designedisposal* (2013) as part of my MRes.

Atelier lights became conversational artefacts that proposed a design-led critical response to the challenges of planetary plastic pollution. Plastic material mediation takes place via the animal personas of the wild springbok antelope (Boki) and domesticated cow heads (Mumu): ‘Nicknamed Boki and Mumu […] re-made with post-consumer high-density polyethylene (HDPE), HDPE bottles and polyethylene terephthalate (PET), PET bottle tops. The “CitySelf Anima” series emphasises a long-lasting toxic element in plastic objects and single-use things’ (Dimitrijevic, 2019b, p. 57).

Both Boki and Mumu revoke the urban jungle ‘thrownness’ totem, positing plastics material ‘Designedisposal’ waste aesthetics and theoretical ‘methodological fetishism’ (Section 4.1). They are ethnobiographically embedded in my everyday post-modernist consumption ritual, cleaning and specifically washing plastics inspired by (Laderman Ukeles, 1971) maintenance art (Section

6.6.2) and forfeiting disposal for recycling. The lights of the *Designedisposal: City*Self *Anima* (Fig. 6-35) were curated in 2016 for a permanent collection in the ETSY headquarters in New York.

Using the 'thinking with things' approach, both hands on and as a visual response, I comment on current socio-cultural post-modernist purity and mass segregation of humans from nature (see Section 3.8). For example, the public landfill depository is an invisible, missing mass, and, through 'Designedisposal Aesthetics' tactics, I can rehabilitate and retrieve this missing x-mass, articulating a nature-plastic hybrid (see Chapter Seven, Section 7.3). Latour's multi-naturalism critiques these missing components 'of quasi-objects, quasi subjects' (Latour, 1991, p. 89) and asks not to separate the trajectory of these 'quasi-objects' analytically (see Chapter Four, Section 4.4).

I do not perceive the plastics displaced in nature only as a 'super-wicked' and problematic issue harming humans alone, and I acknowledge my daily contribution to that growth in plastic consumption (Section 3.3). Returning to Kastner's statement, 'I don't want to say how things lie. / I want to show you how the matters stands' (1933). Thus, standing with 'positive waste' (Kennedy, 2008), which I call my 'joyful plastic things', I re-animate the aural properties of plastics.

Section 6.3 explains the 'gaze in' method that I have developed and applied in HE design workshops, set out in Chapter Eight, and my DIY practice, set out in Chapter Nine for visualising 'non-human others' re-imagining the daily migration of lanternfish and jellyfish bloom in their aquatic environment.

6.3 A Lanternfish Gaze-in

> ‘However, if an original transposedness on man’s part in relation to the animal is possible, this surely implies that the animal also has its world. Or is this going too far? Is it precisely this “going too far” that we constantly misunderstand?… Transposedness into the animal can belong to the essence of man without this necessarily meaning that we transpose ourselves into an animal’s world or that the animal in general has a world. And now our question becomes more incisive: In this transposedness into the animal, where is it that we are transposed to?’
>
> — Martin Heidegger, 1995, pp. 209–210.

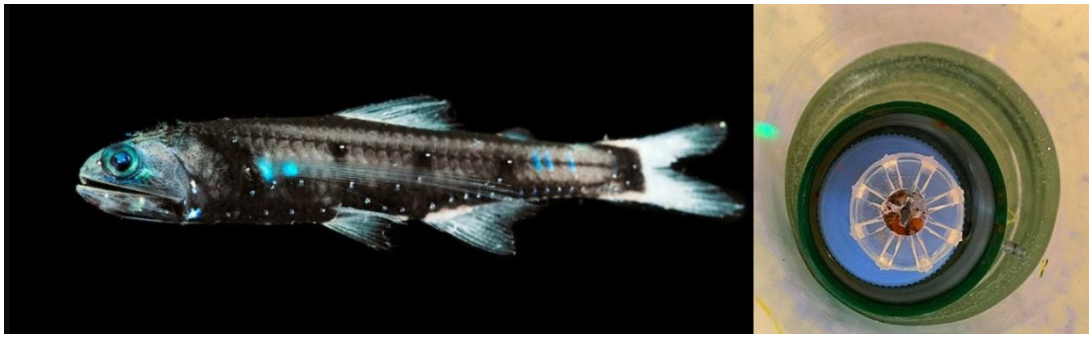


Fig. 6-36. Lanternfish: Gaze-in, reused mixed media: metal, glass and plastic**.**

Bear and Eden’s *Thinking Like a Fish? Engaging with Non-human Difference Through Recreational Angling* (2011) identified and demonstrated that post-humanist literature and animal geographies have focused upon warm-blooded and individual animals only. Across the interdisciplinary board, little attention has been granted to fish and their complex groupings, or aquatic environments: what they call ‘non-airy spaces’ (2011, pp. 336–352). Bear and Eden draw on the

notion of becoming animal from Deleuze and Guattari's (1987) rhizomatic ontology of 'molecular collectiveness' (1987, p. 272) and encounters that are not between 'individuated animals' (1987, p. 240). In contrast, they focus on being and places of water (Deleuze and Guattari, 1987, cited in Bear and Eden, 2011, pp. 338–341).

In order to make sense of, and engage with, the lanternfish shoal, a 'gaze in' view symbolises wet waste alchemy through the blue 'Designtransposal' visual strategy, aiding in perceiving the behaviour patterns of the fish over the oceanic space, from a 'wet ontological' (Steinberg and Pieters, 2015) stance. The 'gaze in' method integrates conceptually, in a hands-on fashion, a visual exploration of the metaphysical essence of Heidegger's subjective '*dasein*', meaning exploring lanternfish daily being entangled with mismanaged plastic things (presence or existence) in the ocean.

For example, Zankl's *Lanternfish* photograph (2014; see Fig. 6-36 on the left) captures the omnipresent multiplicity of existence of 'non-human other' species. Following Heidegger's incisive thought, I posit the possibility of human 'transposedness into animal' and question the spatial meaning of 'where is it that we are transposed to?' (Heidegger, 1995, pp. 209–210). I re-imagine lanternfish 'transposedness', or daily vertical migration, in Chapter Eight, 'Designtransposal Workshops', asking participants to adopt a bottom-up view of the gyre patch from the fish perspective (see Sections 8.2–8.2.3).

Before 'I/We' take the imaginary act of gazing in through the lanternfish eye and diving into the intermediate depth of the oceanic twilight zone, I must state that

Lanternfish: Gaze in – the visualising method – is entangled with plastic thing making (Section 6.2), tacitly mimicking how the micro-plastic habitat is related to plankton in the 'plastisphere' (Section 3.5.2), the food of lanternfish.

In the 'blue design series', DIWO participants (Fig. 6-36, *Gaze in* fish-eye on the right) experience and visualise plastic things pollution from the perspective of a lanternfish (Chapter Eight). In exploring this oceanic 'worldhood', a thread of Heidegger's conceptual worldly notions and 'transposedness' argument continues, and so does the aesthetic visualising 'gaze in' into aquatic being (Fig. 6-36). In Chapter Nine, in the DIY 'Sea Pet Series', I re-imagine the future of oceanic pollution through a metaphorical 'gaze in' as an imaginary blue plastic anemone, a sea urchin and a jellyfish bloom 'Scenario 2150'. In doing so, one temporarily accepts that the animal has a habitat through a design workshop course of action.

In becoming empathetically entangled with marine life, 'I/We' visualise the gyre patch by following the daily mass vertical migration of the lanternfish and its ingestion of large quantities of micro-plastics. The 'gaze in' act can enable us to access aspects of oceanic life multiplicity through the eye of the individual lanternfish (Fig. 6-36, Chapter Eight).

My 'gaze in' is a 'non-human-centered design method' (Peredruk, 2020, Section 4.4), opening up the view to an 'empathetic design' process and 'emotionally durable design' (Overbeeke and Hekkert, 1999, Demir, 2008, Schalk et al. 2017, Sections 3.1–3.2), allowing us to understand a worldview our post-modernist society does not normally see or emotionally relate to.

Thus, I state that ‘socio-materially marginalised nature is politically misrepresented. Victimised, with no direct rights or voices to be recognised, it falls within the same unprioritised, unseen, unheard and hidden category as plastic waste’ (Dimitrijevic, 2019a, p. 121).

Section 6.4 expands on the participatory design workshop platform.

6.4 Designtransposal Design Workshop

‘Workshops shift actors’ relationships to the materials, tools and processes at play to reveal taken-for-granted expectations, priorities, and ideals.’

— Rosner et al., 2016, p. 1.

‘The workshop itself begins with the critique phase, during which all the grievances and negative experiences related to the chosen topic are brought into the open.’

— Jungk, 1962, cited in Cornish, 2004, p. 73.

Fig. 6-37. ***Designtransposal Workshops Diagram*****,** 2015**.**

The participatory design workshop sits between the social and design action approaches, drawing on action research and participatory design tradition (Section 5.2). The term ‘approach’ here ‘denote[s] a combination of elements of an underlying design philosophy, processes, methodologies and tools’ (Fuad-Luke, 2009, p. 147, see Section 3.2). From a sociology stance, the workshop approach draws from the ethnomethodology work associated with Garfinkel’s ‘breaching experiments demonstrations’ (1974, p. 16). Ethnomethodology studies how people use social interaction to maintain an ongoing sense of reality in a situation. The critical idea informing Garfinkel’s appropriated demonstrations is in the disruptive yet straightforward social-psychology technique, which explores stakeholders’ ‘disorganised interaction to highlight how the structures of everyday activities are ordinarily created and maintained’ (Garfinkel, 1991, p. 36).

Corcoran, Marshall and Walsh (2017, pp. 1–15) analysed the psychological benefits of co-design workshops, concluding that ‘these typically intensive, short sessions provide a setting that imparts involvement for the stakeholders and feedback… in the context of longer term engagement on projects or developments that are relevant or important to the researcher or community.’ Design workshops are a popular way of co-designing with stakeholders and tackling complex socio-material rituals and difficult environmental problems through craft and design. The design workshops combine principles of ‘design research through practice’ (Koskinen et al., 2011), ‘practice-based design research’ (Vaughan, 2017) and ‘practice-led design research’ (Mäkelä and Nimkulrat, 2011, cited in Kuure, 2017, p. 2) (see Section 3.2).

In *Out of Time, Out of Place: Reflections on Design Workshops as a Social Research Method* (2016), Rosner et al. examine design workshops in three ways (Fig. 6-37). First, they consider social studies that apply workshops as the 'field site' for DIY projects and community collaboration. Second, they view design workshops as 'research instruments' able to shift the form and character of collaborative work. Third, the design workshop's 'research accounts' are examined and segmented further in a twofold approach: as a metaphor, inviting researchers to practise examination through the lens of the design workshop, or as a 'research account' that involves close scrutiny in the context of the study and analysis (Rosner et al., 2016, pp. 2–3; Dimitrijevic, 2020, p. 141).

Applied method design workshops contribute towards framing a larger construct while creating new 'communities of practice' that develop around things that matter to people (Wenger, 2005, p. 2). Practices are embedded in everyday life, and, in this changing world, everyone designs and participates in 'social innovation' (Manzini, 2015, p. 26). As Jungk and Müllert (1987) have described, their 'future workshops' process opens with the 'critique phase' and is followed by 'the fantasy phase, in which the participants come up with ideas in response to the problems and with their desires, fantasies and alternative views' (Jungk and Müllert, 1987, cited in Cornish, 2004, p. 73). Their workshop concludes with the 'implementation phase', in which participants critically assess power structures and constraints (Ibid.).

The 'Designtransposal' workshop is a primary method for my DIWO projects and the three design workshops I led in a High Educational Design environment. Chapter Eight unpacks the design workshop as my field site for participative re-

imagination, emphasising jargon, collaborative making, trash aesthetics and lanternfish ‘gaze in’ methods (Sections 6.1–6.3). Second, ‘Designtransposal’ workshops are applied as the ‘research instrument’ for DIWO, hands-on material engagements, and as the ‘reflective conversation with the materials of a situation’ (Schön 1984, p. 78) (see Sections 8.2.1–8.2.3). Third, the three workshops’ research accounts (see Section 8. 3) mapped stakeholders’ five-level questionnaire answers and one recorded dialogue. The synergised research accounts form a speculative socio-material narrative for the ‘2050 Scenario’ construct (Dimitrijevic, 2020, pp. 141–142) (see Section 8.4).

The ‘Designtransposal’ workshop opens with a visual presentation (located in Appendices, Fig. 11-88), which became the ‘critique phase’ (Jungk and Müllert, 1987) of the field site (Rosner et al., 2016, pp. 2–3), allowing any negative emotions regarding plastic pollution to surface. Second, a ‘fantasy phase’ (Jungk and Müllert, 1987) experience is made with post-consumer plastics and serves as the visualising ‘research instrument’ (Rosner et al., 2016, pp. 2–3).

The ‘Designtransposal’ workshop event closes with the open-ended ‘research account’ (Rosner et al., 2016, pp. 2–3) that I explore through the ‘implementation phase’ (Jungk and Müllert, 1987) by means of metaphorical mappings, visualisation and a group review regarding futures (located in Chapter Eight, Section 8.2.2, Fig. 8-64 and Fig. 8-65) (see Table 6, Chapter Eight and Table 8, Section 11.4).

The ‘Designtransposal’ workshop process and outcomes are detailed further in Part Three, Chapter Eight, Sections 8.2 to 8.4. Section 6.5 unpacks the ‘experiential scenarios’ (Candy, 2010) method.

6. 5 Experiential Scenarios

‘Futures and design are complementary enterprises, doing similar things on different scales. Futures has historically tended to err on the side of ideation and exploration, and to fall short of effective implementation (often even of effective communication), whereas design’s shortcomings have tended to result from a practice in materiality that has often paid insufficient attention to its long-term, cumulative implications.’

— Stuart Candy, 2010, p. 207.

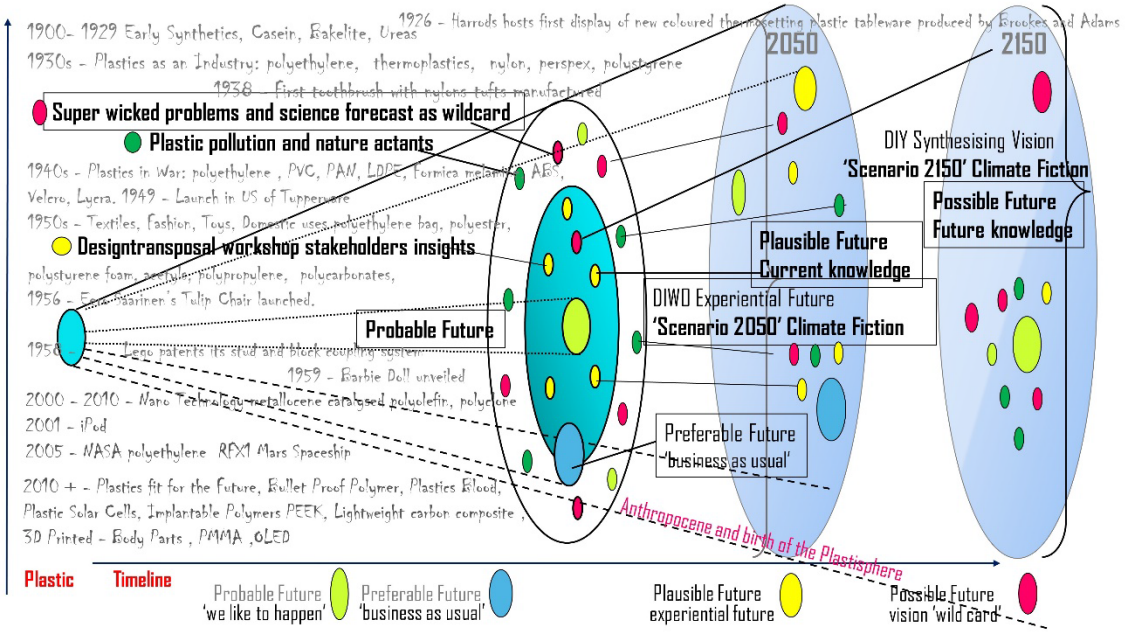


Fig. 6-38. Futures Cone. Plastic timeline and 2050 Scenario and 2150 Scenario projections.

Critical futures scholarship argues that ‘the future’ does not exist as such, but is inherently a domain of ideation and imagination. It ‘cannot be experienced

directly, but only through images, thoughts, feelings and the multiple ways these are subsequently expressed in the outer world' (Slaughter, 2018, p. 444, cited in Candy and Kornet, 2019, p. 5).

Cornish (2004, p. 49) foretold that, in what he calls the 'age of hypercharge', the 'systems approach' helps us understand super-complex relationships and multi-dimensional events. A system may be defined as an assemblage or combination of connected things, forming a complex active whole. WMSs and marine environmental systems are complex wholes (Chapter Three). For example, oceanic environment 'parthood' (Sider, 2007, p. 51) is partite of the planetary system, composed of an infinitude of entangled sub-systems within the whole and forming an oceanic 'holon' (Smuts, 2013). The 'systems approach' is useful as it focuses on relationships rather than things: 'It is the relationships among things, more than the things themselves, that shape events' (Cornish, 2004, p. 49).

In *Design Anthropological Futures* (2016), Mazé points out that 'the future is difficult to predict because it is occupied by the built environments, infrastructures, and things we have designed' (Mazé, 2016, p. 37). Mazé (2019, p. 23) predicts that 'design visioning and prototyping of futures has been crucial for rendering previously textual analyses (such as policy scenarios) and abstract concepts (such as "sustainability") in forms available for empirical (i.e. bodily) experience and public deliberation' (cf. Candy, 2014; Mazé and Önal, 2010, cited in Mazé, 2019, pp. 23–24) (see Section 3.2).

Candy and Potter (2019, p. 1), in the introduction to *Design and Futures*, identify that the 'design community recognise a need to interrogate higher-level consequences – the futures, the worlds – that their products, systems and other outputs help produce'. Candy and Potter (2019) propose a designerly approach to 'working more materially, visually and performatively to instantiate and illuminate possibilities' (pp. 1–2).

Candy (2010, p. 189), in the PhD dissertation, *The Futures of Everyday Life: Politics and the Design of Experiential Scenarios*, discusses the experimental, experiential efforts undertaken in the 'Hawaii 2050', participatory 'experiential scenarios' project and how an *ad hoc* lexicon evolved, distilling certain hard-won insights, and enabling more efficient ideation and iteration. Candy (2010, p. 199) reflects and distils three principles for designing 'experiential scenarios', highlighting that principles do not provide rigid boundaries but serve as 'heuristic levers'. Experiential scenario encounters may occur in any medium or setting, from immersive, 'theatrical intervention' such as the four rooms staged for the 'Hawaii 2050' project, to 'images of the future' or stand-alone 'artifacts from the future' (Ibid.).

The first heuristic lever states 'don't break the universe', which means that a 'scenario or image or artifact' should ideally be presented on its terms as if transplanted from a fully realised, coherent, concretely existing alternate (or rather, future) universe. Candy (2010) advises keeping up a degree of 'strategic ambiguity' because of the sort of questions it raises (p. 193). The second principle, 'the tip of the iceberg', asserts that it is physically and metaphysically impossible to render a complete experience to scale a whole future. Candy (2010)

suggests handling the situation by applying the ‘metaphor’ of the ‘tip of the iceberg’, where the visible part is only a fraction indicating the whole. The ‘iceberg principle’ urges us to select whatever ‘tip(s)’ of the scenario iceberg evoked by triggering the imagination (pp. 195–196).

The third principle for designing and staging ‘experiential scenarios’ is what Candy (2010, p. 202) calls ‘the art of the double take’. The basic idea springs from a playful, exploratory, ‘decolonising’ ethos best captured by Dator’s (2005) ‘second law of the future’, which holds that ‘any useful statement about the future should at first appear to be ridiculous’ (Dator, 2005, cited in Candy, 2010, pp. 202–203).

Candy (2010) concludes that what seemed ridiculous is later revealed, or rather re-perceived, as genuinely viable. Some realisation, some form of learning, has taken place. The ‘double take’ mobilises this notion, embedding it in ‘experiential scenario’ form by aiming for an encounter that unfolds in two parts. For example, Candy’s ‘Hawaii 2050’ experiences were designed to walk a fine line at the edge of plausibility, apparently ridiculous at first, and yet eerily possible on reflection (Candy, 2010, p. 203). The ‘double take’ principle is that one comes to the ‘experiential scenario’ twice: the first time fast, following a snap judgement, and the second time slowly, re-thinking initial impressions. What is important is the journey from one to the other – from acceptance at first towards questioning or from questioning to acceptance (p. 205).

I visually unpack the multi-layered and composite image of Figure 6-38’s mappings from the left to right view. First, grey text in the background identifies

and lists the historical linear plastic timeline records beginning in the nineteenth century: i.e., the inception of Bakelite and plastic synthetics. The timeline follows twentieth-century global production and the development of a variety of polymers such as polyvinyl chloride (PVC), nylon, polystyrene and PET. The historical plastic timeline continues to lead to the present, the twenty-first century. The current plastic time acknowledges human transgression in nature, marked by a new geological epoch, the Anthropocene and the birth of the 'plastisphere' (Sections 3.4–3.5.2). It should be noted that the grey plastic timeline text is blurred and hard to differentiate on the graph and represents the encompassing presence of mismanaged plastics in all planetary systems, which are not easy to see with the naked eye.

Returning to the plastic timeline Figure 6-38 in the background, I list the development of new plastics that are fit for the future, such as space exploration – i.e., plastic blood experimentations and industrial three-dimensional printing polymers such as polyether ether ketone (PEEK). The plastic timeline extends into the future and the twenty-second century, speculating on ontologically different climate and fiction (cli-fi) futures.

My PhD research visualises plastic pollution in various forms. I derived two cli-fi narratives as 'experiential scenarios', starting from DIWO 'Designtransposal' workshops and hands-on participatory installations with plastics (Chapter Eight), moving towards DIY solitary land art metaphorical explorations (Chapter Nine). First, 'Scenario 2050' forms a cli-fi narrative, including participatory conversational feedback and five-level questionnaire responses (see Table 6, Section 8.3, Chapter Eight).

Figure 6-38 represents the future cone and maps a ‘plausible future’ set in the near-future 2050 timeline, re-imagining environmental changes and ‘unsustainable’ Hossay (2006, Section 3.4) single-use packaging regulations and future legislation (see Fig. 6-38, experiential future, yellow elliptical dot). The second ‘experiential scenario’ is set in 2150, seven generations ahead of the present time, taking on solitary DIY visual and conceptual plastic pollution systems ‘possible futures’ visionary tales (Fig. 6-38, possible futures, fuchsia elliptical dot). The ‘2150 Scenario’ process is informed by scientific futures, notably the ‘Hothouse Earth’ (Steffen et al., 2018, Section 3.4), and led by ‘the circularity of images of the future and metanarratives’ (Tham, 2008, p. 179).

The appendices show the initial conceptual mapping board, the Gyre 2050 Scenario and the 2150 vision timeline. Fig. 11-90 sets out the gyre timeline, summarising the past accumulative twentieth-century ‘physical’ actions: e.g. a plastic timeline, informing the backdrop for the cli-fi ‘2050 Scenario’ re-imagining the plastic ‘etheric’ quality of being (see Section 8.4). The cli-fi ‘2150 Vision’ then focuses on the ‘non-human others’ future, which visualises ‘astral’ aquatic planetary living (see Section 9.4).

Section 6.6 details the research selection criteria for the two case studies.

6.6 Designing Case Study

> ‘The development of this research design is a difficult part of doing case studies. Unlike other research methods, a comprehensive “catalog” of research designs for case studies has yet to be developed. There are no textbooks, like those in the biological and psychological sciences.’
>
> — Robert K. Yin, 2003, p. 25.

Yin (2003) proposes that qualitative research case studies can be exploratory, descriptive or explanatory: ‘Even if you can study only a “two-case” case study, your chances of doing a good case design will be better than doing a single-case study’ (p. 53). ‘Certainly, the case study as normally practised should not be demeaned by identification with the one-group post-test-only design’ (Cook and Campbell, 1979, p. 96, cited in Yin, 2003, p. 25). For clarity, the ‘one-group pre-test-post-test design’ is the weakest type of ‘quasi-experimental design’ because the lack of a control or comparison group is a significant limitation. Despite this limitation, results from this design are frequent reports in the media.

Although the scientific norms still consider that the one-shot, post-test-only case study design is categorised under the ‘quasi-experimental design’ and may be regarded as flawed, the case study has now been recognised as ‘a separate research method that has its own research designs’ (Yin, 2003, p. 26). A ‘research design’ follows a logical plan from ‘here to there, where here may be

defined as the initial set of questions to be answered, and there is some set of conclusions' regarding the posited questions (Ibid.).

I follow Yin's 'no-textbook' guidance in applying 'multiple case studies' and 'designing research'-type exploratory investigation (2003, pp. 25–26). The initial research plan started with selecting the 'research group', with waste as the theme in their practice. Second, the waste practice group funnels practitioners using re-use tactics and interdisciplinary waste materiality research and activism. The practitioners' data collected shows that most research group representatives hailed from the fine arts and multi-media discourses from the selection criteria.

A lack of comparison manifested because practitioners only did singular installation works or, at best, the waste artwork series. The final case study's 'research design' process outcomes were therefore important in the ultimate selection of the two interdisciplinary case studies. The process was challenging because the scope was somewhat limited in seeking solely dedicated waste-centric practitioners. My justified reason for such a specific funnel in the 'research designs' range lay in my re-use tactics and sole dedication to plastic waste material sociality.

From the group on waste practice and plastic re-use, I therefore considered two case reviews that are memorable, inspirational, female-led relational narratives, allowing for a more profound understanding of the research field. The visual tracking record of the research design cases is in the *KraalD Pinterest* (2020) digital platform, in the two pinboards.

The ‘Plastic Reuse Muse’ board holds over 500 pins, and the ‘Design & Art & Science & Waste Activism’ board holds over 900 pins (see Appendices, Fig.11-89). The final two filtered case studies are discussed in Section 6.6.1 on design and marine environmental pollution and Section 6.6.2 on landfill art engagement through everyday maintenance and care.

6.6.1 Discard Study and Plastic Pollution Activism

> ‘Plastic pollution exceeds technocratic logics of allowable limits, thresholds, assimilative capacity and industrial ecosystems and so defies usual practices of pollution control.’
>
> — Max Liboiron, 2012, pp. 65–66.

Fig. 6-39. Max Liboiron, 2005. ‘Eco-System’ (on the left) and ‘Sea Globes’ 2014 (on the right).

The first case study relates to the *Discard Studies* blogger and environmental scientist researcher Max Liboiron (Fig. 6-39) – a feminist activist focused on plastic pollution and toxicity in the oceans. Currently, Liboiron is an assistant professor in geography at Memorial University of Newfoundland, Canada, where she directs the Civic Laboratory for Environmental Action Research (CLEAR). CLEAR is 'a feminist, anti-colonial, marine science laboratory' specialising in citizen science and grassroots environmental monitoring of plastic pollution (CLEAR, 2020).

Liboiron's current research in science and activism focuses on the invisible yet harmful nature of an emerging phenomenon, such as toxicants from marine plastics. Liboiron leads a seminal Discard Studies blog, an interdisciplinary hub for research on waste and wasting that acts as an essential link in connecting international scholars interested in waste across disciplinary fields (Discard Studies, 2019). For clarity, as a verb, 'discard' means to reject or throw away something as useless, while 'disposing of' is to eliminate, give a tendency or place to, distribute or arrange in an orderly way.

Liboiron's PhD thesis, entitled *Redefining Pollution: Plastics in the Wild* (2012), from the Department of Media, Culture and Communication, New York University, plays an outstanding motivational and influential role in this research. In parallel with Liboiron's scientific works, the inspirational focus is on Liboiron's ongoing visual and art installation projects. This case study focuses on her early explorative 'dark ecology' projects (Section 3.3), such as those shown in Figure 6-39 on the left. *Eco-systems* (2005) represents a collection of 525 plastic cubes

nicknamed ‘miniature dioramas’ exploring hybridity stories and concepts of nature.

The mixed media installation *Eco-systems* was followed with an exploration of ‘NY City Kitsch’ in *Sea Globes* (2014; Fig. 5-39, on the right), created specifically for Gyre: The Plastic Ocean Exhibition at the Anchorage Museum in Alaska in 2014. The plastics came from the Hudson River, NY, and the rocks, made of bituminous coal, were from local landfill. *Sea Globes* captures accurate material micro-representations of the environment on the New York City waterfront (Liboiron, 2014, p. 207).

Liboiron’s academic research and activist approach combine scientific data and visual representation methods to re-define plastic ocean pollution. For example, her PhD thesis follows the route of plastics to the north and the effects of ‘bio-magnification’. For clarity, ‘bio-magnification’ is the increasing concentration of a substance, such as a toxic chemical, in tissues of organisms at successively higher levels in a food chain: ‘Over the next few thousand years, persistent organic pollutants will concentrate in the North, just as plastics will accumulate in oceans’ (Liboiron, 2012, p. 80). The research interests set out here explore and explain material longevity, toxicity, and propensity to travel and accumulate plastics. Liboiron concluded her PhD thesis with the argument that ‘pollution is colonialism’ and highlights the need to change our ‘relationships to Land’ (Liboiron, 2012).

The first case study relates to the art–science action HE research in Part Three, Chapters Eight and Nine as part of the ‘Sailing on the Plastic Sea 2018’

expedition project. I reference Liboiron's discard and waste system critiques throughout the thesis. We share interests in exploring plastic ocean pollution, employing various visual strategies, integrating representations as knowledge and contributing to the sociality of waste. Liboiron's relationships with nature, her research hybridity from design to marine science, and her influential research into waste are inspiring and resonate well with my PhD design research: see Part Three, Chapters Seven, Eight and Nine.

6.6.2 Maintenance Art and Public Repair

> ‘The sourball of every revolution: after the revolution, who’s going to pick up the garbage on Monday morning?’
>
> — Laderman Ukeles, 1969, Manifesto, p. 2.

Fig. 6-40. Robin Holland, 2016. *Mierle Laderman Ukeles, 1979–1980,* *Touch Sanitation Performance.*

The second case study overviews the lifelong work of a pioneer in landfill activism and maintenance art, Mierle Laderman Ukeles, and her actions within the Department of Sanitation in NYC. In 1977, Laderman Ukeles became the artist in residence at NYC’s Department of Sanitation, a position she has held since. In

the 1979–1980 period, she engaged in the citywide 'Touch Sanitation Performance' (Fig. 6-40), shaking hands with 8,500 sanitation workers across all fifty-nine NYC sanitation districts. Engaged with ecology and city landfill since the 1960s, Laderman Ukeles' performances, sculptural installations and writings have explored neglected issues essential for society (see Section 3.4.2). In addition, the artist extensively explores the role of women in society, work and labour cultures, maintenance and care, and notions of urban and community resilience.

In Laderman Ukeles' *Maintenance Art 1969!*, the manifesto calls to 'sustain the change; protect progress' (Laderman Ukeles, 1971). The personal declaration calls for a full-scale re-organisation of society towards revaluating maintenance work of all kinds and the radical implications of actively valuing rather than dismissing or hiding the process (Laderman Ukeles, 2017).

As a first-time mother, Laderman Ukeles voiced the schism between her domestic life and her identity as a conceptual artist in New York. To borrow the artist's voice, 'In a quiet rage, in one sitting, I wrote the Manifesto for Maintenance Art, 1969! From the beginning, I name three levels of Maintenance as Art: Personal; Society/the City; the Planet… I learned that Jackson [Pollock], Marcel [Duchamp] and Mark [Rothko] didn't change diapers' (Ibid.).

Her latest retrospective exhibition and dialogue – 'Mierle Laderman Ukeles: Maintenance Art' at Queens Museum, USA – presents a unique convening that explores NYC's Department of Sanitation's ambitious initiative to re-work the city's garbage and recycling infrastructure. In what Laderman Ukeles has named

the ‘Repair Room’, the works span three decades and suggest the possibility of repair and transformation of a radically torn social fabric. The exhibition accommodates public debates on ‘Garbage: The Future: What does zero waste to landfills by 2030 look like? A Maintenance Perspective’. This features the perspective and voices of sanitation workers who are rarely heard from, but are critical to the success of waste management (Laderman Ukeles, 2017).

I stand with the singular female voice represented in her manifesto, which shares mutual motherhood experiences that the professional world and society are not seen or talked about. The interests we creatively share in landfill, waste management services and everyday maintenance have influenced the works in Part Three, Chapter Seven, as part of the ‘Designedisposal: Green Design Engagements’ projects.

Laderman Ukeles’ case study presents invisible disposal processes, building human perspectives of individual and community services and care. Her trust and belief in the landfill community’s resilience validates the presence of hope. It is noteworthy that hope stands up as a verb in this research for plastic things. The second case study relates to the art–craft and re-use-plastic waste action HE research in Part Three, Chapter Seven.

The conclusion of Part Two sets out the critical idea informing the research methodology and methods to experience and visualise current plastics entanglement in nature, creating relationships and vocalising new terms and concepts. Reflecting on what I have acted upon is a self-learning transformation into ‘tacit knowing’ (Polanyi, 2010, p. 3). This is an essential part of my interpretive

practice-led and practice-based enquiry because it creates interpretative approaches for this participatory action and design research.

Part Three comprises five chapters and follows a relational way of thinking with plastic things, branching into the green ‘Designedisposal’ engagement in Chapter Seven and the blue ‘Designtransposal’ practice-based projects in Chapters Eight and Nine. Chapter Ten concludes the PhD thesis. Section 7.0 opens Part Three.

PART THREE

‘Conventional discipline based design education cannot contribute to substantial change unless students are inducted into understanding theories of power, social structure and social change, and the like. If one were to design a postgraduate (or even undergraduate) degree course in, say Meta-Design or Transition Design, it might, on the surface, look more like Humanities than design.’

— Anne- Marie Willis, 2015, p. 73.

CHAPTER SEVEN: DESIGNEDISPOSAL: GREEN DESIGN ENGAGEMENTS

7.0 Visual Overview of Green Design Engagements

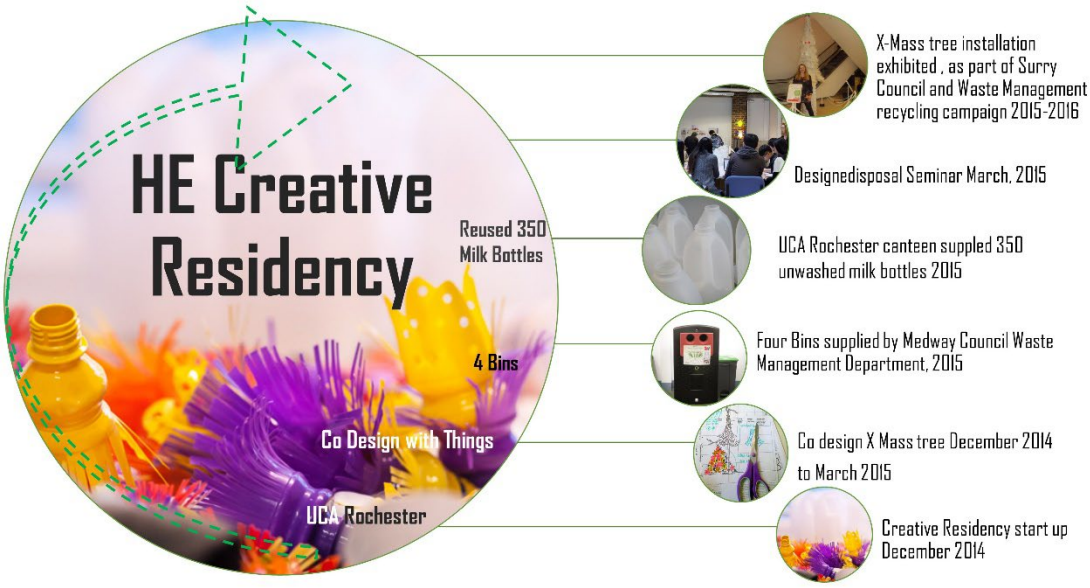


Fig. 7-41. Green Design Projects Diagram 2014–2016.

This section presents an overview of Chapter Seven. Figure 7-41, *Green Design Projects Diagram* 2014–2016 follows my green design engagements (from bottom to top bubbles on the right) with my plastic waste and 'Designedisposal' stance (see Sections 1.0–1.1 and Section 2.1).

Section 7.1 opens with an HE-based 'creative residency', examining common habitual and automated methods of disposal at the UCA Rochester campus. The 'Designedisposal Seminar' event in Section 7.2 explores how particular HE institutional waste disposal habits are situated as part of 'green design engagements'. The 'Designedisposal Seminar' inspired by Laderman Ukeles' *Maintenance Art 1969!* (Section 6.6.2), where plastic waste recycling flow is

temporarily disrupted (Section 7.3), displayed, re-used and re-made to cultivate the ‘XMass Tree’ in Section 7.5.

Chapter Seven’s discussion (Section 7.4) and the closing section (Section 7.5) conclude that the primary obstacles to changing habitual disposal and ethical mindsets have arisen from the anthropocentric way of life. Through practice-based exploratory findings (workshops, HE seminars, post-conversations and exhibitions) and advocating how ‘I/We’ can re-learn to relate to waste positively, I affirm that waste politics systematically centred on EfW and recycling values drum-rolling modernistic purity, emphasising the negative aspects of waste and representing the most significant systemic obstacle to change.

Section 7.1, through the ‘HE creative residency’, unpacks the building of HE tools for sustainable development, advocating plastic re-use with ‘Designedisposal’ (DIWO) tactics. I was excited to put Sub-Research Question One (Section 4.5) in action and test and trial how ‘Designedisposal’ social advocacy can inspire participants to ‘sustain the change’ (Laderman Ukeles, 1971). I connect HE stakeholders with plastic waste, local governmental and waste management services. For a brief background on ‘Plastic Packaging Growth’, see Section 3.4.1, and for a description of the second ‘case study’ by art practice see Section 5.6.2 – ‘Maintenance Art and Public Repair’.

Chapter Seven borrows from Hawkins (2006) socio-material disposable ethics to support re-thinking organisational and systemic plastic waste management habits (Sections 3.6–3.8 and Section 6.2). I approached the HE creative residency from the bottom-up ‘mindset and posture’ (Willis, 2015, p. 73) of the individual single-

use plastics consumer and prosumer (to consume and produce) and advocated how we can re-learn to relate to waste positively. The ‘Designedisposal Seminar’ engaged UCA postgraduate design and contemporary jewellery departments to help organise the event and facilitate workshop sessions. The nine MA workshop project co-ordinators mainly comprised international design students, which I do not discuss in this thesis because of ethics restrictions as I was their MA Subject Leader (see Section 1.7).

The following section briefly describes the scope of my HE creative residency.

7.1 HE Creative Residency

‘Designedisposal is designing from and with discarded plastic things.’

— Katarina Dimitrijevic, 2011–2013, MRes in Design, Goldsmiths UoL.

Fig. 7-42. Photo, Karl Groupe, 2015. *HE Creative Residency at UCA.*

In early 2014, I applied for ‘creative residency’ project funding under the original working title ‘Christmas Tree Made From UCA’s Plastic Bottles’. The MA Contemporary Jewellery and MA Design students were the project co-ordinators, with me as their PG subject leader for the planned series of ‘Bin It!’ DIWO making and conversational workshops, open to all undergraduate UG and PG students

and staff at the Rochester UCA campus (Fig. 7-42). The 'creative residency' project was allocated a dedicated workshop space and established four plastic material collection points across the campus for post-consumer deposits, from December 2014 to March 2015. At my request, Medway Council's Waste and Recycling Department supplied four waste containers to collect the project's single-use plastic bottles (Fig. 7-43).

Fig. 7-43. ***Bin It!*** Left, *Bin It!* poster (Left, right, photo, Karl Groupe, 2015). Right, *Bin Level 4,* creative residency at UCA Rochester campus.

The first part of the proposed project was to allocate plastic collection, and co-design, re-make and visually interpret UCA's Rochester campus' plastic bottles stream. Second, the scope of the 'creative residency' was to provide a free seminar at the UCA Rochester campus during the intermediate phase of the project and promote plastic waste re-use and urban landfill conversations under

UCA's social and environmental sustainability theme. The last aspect of the project was to exhibit the 'XMass Tree' at a public shopping centre during the 2015/16 festive season.

Section 7.1 describes and briefly discusses the timeline of the 'Designedisposal Seminar' event.

7.2 Designedisposal Seminar

‘Recycling is like a band-aid on gangrene.’

— Civic Laboratory for Environmental Action Research, CLEAR, 2019.

Fig. 7-44. Designedisposal Seminar Poster, UCA Rochester campus, UK (Dimitrijevic, 2015). Background photo, Karl Grupe, 2015.

I planned the ‘Designedisposal Seminar’, which was held at the PG Design Department, Rochester campus, on 24th March 2015. The seminar was a one-day, open-to-all event, consisting of three guest speakers and closing with a presentation of the ‘HE creative residency’ (Fig. 7-44). The event brought about HE collaboration and exchange with internal and external members, temporarily

connecting diverse communities of practices, such as the CfSD, KCC, my research praxis KraalD, and Medway Municipality Waste authorities.

Five video segments of the event were recorded and are available to watch on Vimeo under 'Designedisposal Seminar' (Dimitrijevic, 2015). The event opened with presentations from Professor Martin Charter and Scott Keller from UCA's CfSD, Epson, Surrey. Professor Charter's lecture – 'Sustainable Innovation: Trends and Issues' – addressed global green economy development and the green cities that are tackling climate change, water resources, material efficiency and waste production. Professor Charter predicted the re-emergence of the 'circular economy' and 'open source' designs, closing with the global emergence of repair cafes and the hacking of existing products as the co-repairing sustainable trend that supports the change.

The UK's grassroots repair movement is presented in Scott Keller's talk – 'Fixers and Hackers: Community Workshops and the Circular Economy'. Keller's discussion of public motivation for repair and the trend for hacking for social purposes promotes material re-use and citizen collaboration. Keller closed his talk with specific results and outcomes from the repair café in Farnham, Kent, which engages with the local community and promotes re-use (see Fig.7-45).

The third guest speaker was Noel Hatch from KCC, presenting 'Transformed by You: Hacking the Invisible Borders in Our Public Spaces'. Hatch opened his talk by informing the audience of the large-scale delivery of 800 public services under the KCC umbrella, affirming the increasing number of new services that connect social interventions with the local community and stakeholders. KCC's focus is

explicitly on developing solutions for open public spaces using digital technologies interactively designed, tailored and vocalised to help and motivate the local community on a spectrum of issues, including mental wellbeing, self-help, health and fitness. KCC is interested in re-connecting with local universities and marketing agencies to test and develop 'open-source, public space devices' and re-build their tools and devices (see Fig.7-45).

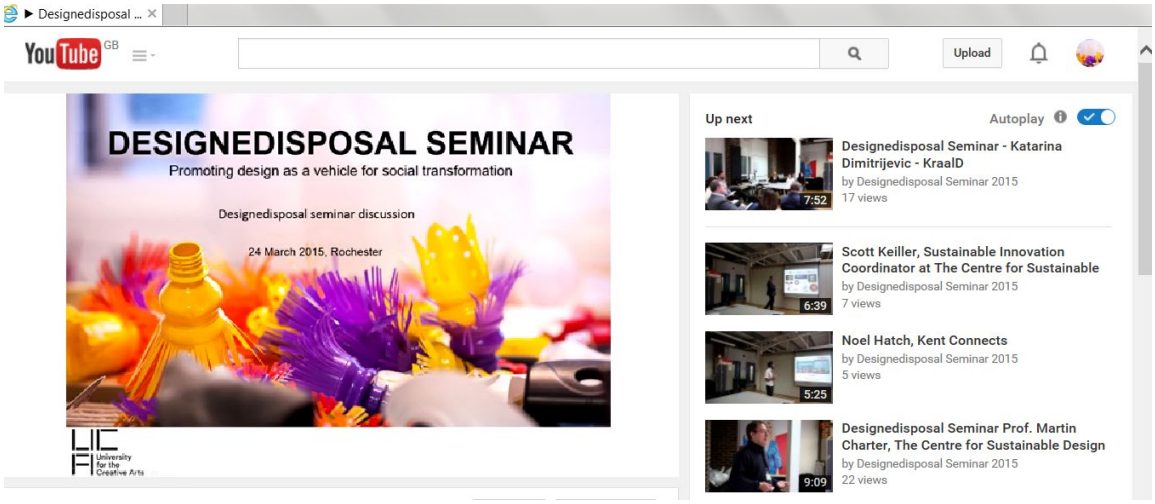


Fig. 7-45. *Screenshot*, Designedisposal Seminar (Dimitrijevic, 2015). UCA Rochester campus, UK.

My research talks – 'Transgressing Plastic Waste: Designedisposal Creative Residency' – introduced the small seminar audience of twenty people to my praxis ethos of 'positive waste' (Kennedy, 2008) and PhD design research with goals relating to waste and 'design for re-use' (Fisher, 2008; 2010): see Sections 3.1 to 3.2 in the 'Literature and Field Review'.

I opened the presentation (see Fig. 7-45) by saying that we live in an age of waste, and consumption statistics for plastic packaging are rising (Sections 3.4 to 3.4.1). As a strategic global node for production organisation, London's waste disposal, involving managing 20 million tonnes per year, poses challenges. Although top-down municipal waste management strategies (MWMS) are gathering momentum, only 48.5% of London's plastic bottle trash is recycled (MWMS, 2011), and this proudly delivered statistic is a devastating reflection of UK and Western society's present and future landfill contribution. Notably, all of Kent's municipal waste falls under London. Over 1 million tonnes of mixed household plastic packaging are disposed of in the UK per annum, so the drive to develop socially, culturally and environmentally sustainable scenarios for London's mature waste management service is gaining momentum (Dimitrijevic, 2014, pp. 60–66). I propose the exhibition as the outcome of the 'creative residency' engagement through my 'design research through practice' (Koskinen et al., 2011): see Sections 3.4–3.4.1 and 3.6–3.8 – 'Literature and Field Review'.

In the background, in the clear municipality recycling bags, the 'joyful plastic things' washed milk bottles were on display, equating and representing plastic things as equal participants in the project (Fig. 7-45 and Fig. 7-46). For more details, see Section 4.1 'Material Fetishism and Thing Theory', which expands on the 'Theory of Things and Design Research' in Section 4.2 and the hands-on methods employed in Section 6.2, 'Designedisposal Aesthetics'.

Fig. 7-46. Creative Residency. UCA Rochester campus, UK. Photo: Karl Grupe, 2015.

The post-conversational debate revolved around disposal and discard habits, landfill, recycling and plastic bottle depository schemes (Table 4). The post-discussion began as an informal closing statement from me, building reflective conversational rapport with guest speakers and seminar attendees. The recording is transcribed below (see Table 4), and the full conversation that followed the seminar is available on the Vimeo platform under the 'Designedisposal Seminar' post-discussion video (Dimitrijevic, 2015).

Participants	Transcript and a brief description of the conversations
KD	I close on how to create joyful activism by asking questions on how to motivate people who are slagging to recycle and promote reuse awareness in the UK. In my closing, I open up informal post-conversation around disposability in the UK.
MC	It is important to change the mentality and integration of behaviour like in China. The UK is lagging 10-20 years behind Germany, Sweden and Northern Europe, where it is normal to separate waste for recycling. MC brings even cynicism regarding creative residency project four 'bins' coming from the non-agreeable people saying: why put it up for recycling as it will end up in the landfill anyway. So, the public relations job is not being done well, and the transparency issues are a challenge.
JD	At this time, it is up to local authorities to reach out a message and intervene nationally. Through the national press, neighbour's and local authorities to reach out.
JH	Personally, every time I see trash, something recyclable, I think this can be recycled. I am trying to save the world here!
SK	You see crisp packets, rubbish all over the floor and a general lack of responsibility that is almost unbelievable and still exists now. I remember seeing people dropping things from the car and that you don't see so much nowadays.
JD	Oh yes, we spend a lot, a lot of money picking this up!
MC	In the UK, we still got 18 to 25 years old dumping staff on the floor without feeling any issues. I think that is to do with education, systems, with the family group. It is interesting to look at Germany, Sweden, Northern Europe and see their transition points; maybe 20 to 25 years ago, that was an issue. And how they dealt with it through the education system and information.
JD	The legislation is coming in specific, bringing regulations specifically with plastics. I want to highlight that we align with European and Industrial regulations. We are becoming conscious of the values of food wasting, plastic and utilities. People need to understand and resonance that we are all here and understand services.
KD	It isn't easy to shop in the supermarket and pick up a product not wrapped in plastic, with a plastic tray and plastic backing. Before, everything was not in plastic. Now everything is wrapped in triple plastic. A little packet is in the plastic box wrapped in the plastic container (transport).
JMV	It can be really simple. When I lived in the Netherlands, I recycled bottles, took them to the supermarket, and got my money back.
MC	Does this mean we need new incentives like, in Germany, you have reverse vending machines? The same principle brings bottles back, and you get Euro back. But, it is also about education and the public as a whole sweet of things to change behaviour.
SK	It is also that people consumed differently 10 to 15 years ago. Take an example of the lunchtime served on the move using disposables and disposable cups nowadays. There is more staff to get rid of conveniently.
KD	If we are to re visualise and change things on a small scale, making the waste policy more than just a suggestion is imperative.

Table 4. Designedisposal Seminar, 2015. *Post-discussion transcript*.

I am unpacking Table 4 participants' legend. Six participants engaged in the subsequent discussion: Katarina Dimitrijevic (KD), Subject Leader PG Craft &

Design; Prof. Martin Charter (MC), CfSD; Johanna Dickson (JD), Waste Development Manager at Medway Council; Jenine Hillarie (JH), MA Fashion Student, Rochester campus; Scott Keiller (SK), CfSD; and Juan Montero Valdes (JMV), MA Design tutor.

Table 4 transcribes the potent conversation on the UK's low recycling rates and careless discard mentality practices in public spaces. This yields three core themes. First, the importance of waste education and cynicism encountered around 'creative residency bins' came to the fore. Second, it was clear that students had different notions of how change could be achieved and recycling would 'save the world'. Third, a lack of UK waste management performance and a lag in catching up with recycling policies and deposit return schemes compared to China and Northern Europe were apparent. The local waste management representative highlighted UK alignment with EU policies. It is important to note that, shortly after the 'Designedisposal Seminar', the Medway Council Waste Management department abruptly pulled back their support for the HE 'creative residency' without explanation.

Zhang (2021), in *Sorting It Out: Sustainability in Higher Education,* writes about 'acts of illusion' and her difficulties in introducing sustainable waste management at Carnegie Mellon University. At that time, I stood alone in raising the issues of waste awareness and reuse to address recycling practices in UK HE. I close Section 7.2 with Max Liboiron's inspiring statement that best summarises the limitations of recycling services, particularly for remedying waste production – it is as efficient as placing a 'band-aid on gangrene' (CLEAR, 2019): see Section 5.6.1.

7.3 Material Depository for XMass Tree

> ‘Recycling tends to be labour-intensive and dirty work, and is often associated with people who have been rejected by society or who have no other way to survive.’
>
> — Landsberger, 2019, p. 12; cited by Drackner (2005) and Yates (2011).

Fig. 7-47. Three Hundred Milk Bottles. UCA Rochester campus, UK. Photo, Karl Grupe, 2015.

Section 7.3 unpacks behind-the-scenes (DIWO) plastic collection and my (DIY) washing for making phase, which operated against the established norms for systemic recycling (Fig. 7.47). The ‘XMass Tree’ was named to highlight the mass of waste created by society during the festive season of consumption. The full body of the plastic tree was made up of hand-cut leaves from over 300 milk bottles, supported by the tree-trunk base made from yoghurt pots. Over four months, the milk bottles were reclaimed from the canteen at UCA’s Rochester

campus in Kent (Fig.7-47). I supplied the single-use yoghurt pots for the tree-trunk base from my prosumer collection.

The most common milk and yoghurt single-use packaging material is HDPE, classed as ‘Recycling Code 2’ (the recycling triangle on the bottom of the packet). HDPE plastic is durable but lightweight, reducing the overall weight-to-volume of the liquid it carries. Interestingly, although most globally disposed plastics are not recycled, ‘Recycling Code 2’ indicates that a product is for ‘closed loop recycling’ – a process best described when ‘waste is collected, recycled and produced to make something new’ (BIFFA, 2018).

Unpacking my ‘Designedisposal’ tactics hacking Rochester campus recycling closed loop, I briefly describe here the ‘creative residency’s’ initial collection process, which started with the four bins (Fig. 7-43). The four bins supplied by Medway Waste Council (MWC), which I strategically placed at the main traffic points at the Rochester campus to investigate types of disposal and gain a sense of the students’ relations to waste regimes. I approached MWC for the bins and gained UCA Rochester campus internal approval for temporarily placing four bins at four levels throughout the campus building.

Alas, my tested South African engagement waste methods (Section 1.0) did not work in the UK. In addition to the issue of non-recyclable crisp packets by the library entrance, the bin depository outcome was low despite bins being placed over four floors. By mid-2015, I returned three bins to Medway Council’s waste management department. I kept one bin at level 4 by the MA studios and workshop. However, the canteen’s kitchen staff were, to my surprise, particularly

responsive. Already re-using rigid plastic food containers to store craft materials for undergraduate students, the kitchen staff offered and supplied a weekly collection stream of unwashed milk bottles for the project. XMass victory!

The second phase in the hacking recycling closed loop for the 'creative residency' involved cleaning the waste plastic for re-use. The inspiration for my washing phase came from Laderman Ukeles' (1971) maintenance art: 'Cleaning out milk bottles is an important element of recycling, not only will it reduce odours in your bin (sour milk doesn't smell sweet!), but it will remove potential contamination of dry materials in your recycling' (BIFFA, 2019).

The four months of solitary DIY for the tree-making started with my weekly collection of material from the canteen. I transported the plastic waste (unwashed milk bottles) in black refuse bags to my residence and began the cleaning process of stripping off the labels and rinsing the bottles and the bottle tops by hand in a cold water bucket before washing the milk bottles in the dishwasher. Needless to say, storing bulky refuse required additional space, and, because of the 'sweet smell' (BIFFA, 2019), my garden became a temporary landfill space (Fig. 7-48, *Milk bottle storage*).

Motivated by Laderman Ukeles' 'maintenance art', landfill activism and public care works (1971; see Section 6.6.2), I returned a few heaps of washed milk bottles – which I re-packed in clear see-through Medway municipality recycling bags – to serve as the 'plastic things' co-participant and 'positive waste' background to the 'Designedisposal Seminar'. After the 'Designedisposal Seminar' event and workshops, my 'creative residency' DIWO phase ended. The

supporting metal wire structure frame and all co-acting plastics were transported back by UCA van to my residence, where my solitary DIY reuse production phase commenced (Fig. 7-49, *Tree and milk bottles transport*).

Fig. 7-48. XMass Tree Hacking Recycling Closed Loop. Left, *Tree and milk bottle transport.* Right, *Milk bottle storage*.

Recycling and upcycling are time-consuming, labour-intensive and repetitive back and forward processes. What I have described is standard practice for the complex and frustrating (to me) operations of the waste management industry's 'closed loop recycling' (BIFFA, 2019): see Section 3.6. Section 7.4 serves as a discussion space that maps out behind-the-scenes encounters during the HE 'creative residency'.

7.4 Mapping Conversations

'We addressed symptoms, rather than the whole cycle of consumption and waste, and despite our energy and commitment, it was impossible to make more systemic change.'

— Kathy Zhang, 2021, p. 2; *Discard Studies* blog.

Fig. 7-49. My Walk of Shame. Tool 52 – Mapping for Creative Residency.

This section discusses my 'action research' (Grundy,1987; Berg, 1989) for 'Designedisposal: Green Design Engagements' and gathers observations for my reflective 'social critique' to borrow the term from Grundy (1987): see Section 5.2 and Figure 7-49, My Walk of Shame. I applied Tool 52, Collective Story Telling

(Tham et al., 2008): see Section 5.4 on Digital Mapping (Fig. 7-49), placing together observations and informal conversations mixed with post-conversations from the 'Designedisposal Seminar' (Table 4) and my experiential commentaries and research findings entangled together (Table 5).

I nicknamed my weekly plastic milk bottle collection 'my walk of shame' because nobody wanted to greet me while I was carrying the refuse bags from the canteen down the three levels of stairs. In my second week of doing the collection, the warden politely asked me not to use the elevator from the canteen towards the staff parking because of the 'sweet smell' (BIFFA, 2019), which students and staff did not like (Fig. 7-49). Symbolically, though, this tedious tale of my back-and-forth transportation from the UCA campus to my residence for further cleaning and purifying compares well with the first-world export of recycling goods to China. Sadly, because of the green economy's good practice for reducing the footprint of Western landfill, 'the Chinese environment is seen as one of the most polluted in the world' (Landsberger, 2019, p. 178).

The 2015 'creative residence' international student group researched the UK's export of plastic waste as part of its 'business-as-usual' recycling and landfill reduction strategies (see Sections 1.4 and 3.4.1). Contextually, the 'creative residency' research taken by MA students detoured from the UK and started following the recycling export's transportation route, stumbling upon China's toxic legacies, particularly the city of Beijing, surrounded by numerous landfill sites. Beijing's dire situation and the consequences of serving as the global recycling unit is well described and summarised in Beijing Garbage: A City Besieged by Waste (Landsberger, 2019). China's decision to enact the existing 'National

Sword' policy in January 2018 – banning the import of recycling from first-world countries as a result of the environmental collapse – does not come as a surprise in my research.

In this chapter, through the 'creative residency', I tested and trialled my first sub-question (Section 4.5), designed to support my participatory action research. However, the difficulties I experienced on many levels when working with plastic waste in the UK HE environment and the resistance I encountered when promoting reuse and not recycling from both waste management councils were initially unaccounted for (Fig. 7-49 and Table 5).

The *HE Creative Residency Mapping Table* (Table 5) presents a breakdown of mapping (Fig. 7-49, *My Walk of Shame*). The five columns of Table 5 capture my sensual (red), factual (black), relational (green), futures (blue) and summary (fuchsia) statements, observations and experiences from the 'creative residency'. The first sensual (red) column is 'experiential', demonstrating the 'emotions, anger, sadness' (see Table 3, Section 5.4) I experienced leading and participating in the 'creative residency'. I found myself experiencing an unexpected set of events. For example, my funded action research and the four bins were enthusiastically approved by UCA, a workshop space allocated and approved by health and safety, and four bins allocated space at the Rochester campus by the warden.

Sensual	Factual	Relational	Futures	Summary
Residency approved, but practice is not accepted; Collection 'walk of shame'; Bins all thrown out; Played out by Medway WM municipality; I am alone; Angry; Restrictions; Exalted; Rejection; Solitary making with the cat; Body pain.	UCA Rochester Campus; KraalD creative residency; UCA canteen staff support; Medway Council; Every day a bit of waste accumulates to a large heap; WM disposal; Double standards; Beijing land and water is toxic; Recycling talks are not popular; Reuse is not practised; Bins are ugly; Bins are rejected; Surrey council needs a tree; XMass tree; Be sustainable but don't walk your talk.	I/We disposal; HE activism; Designedisposal Seminar; Rubbish conversations; Bins are ugly; Collection; 350 milk bottles; Reuse; Washing milk bottles; Complexity; 'Super-wicked'; Politics of waste; Discard: ocean is the oldest landfill; Heap of plastic voices.	Environmental disaster; Reuse as 'business as usual'; WM Council 'walks re-use talks'; Stop plastics; Stop single-use plastics; No lip service policy; Stop exporting waste to China; Refuse production growth; We are all wasting; Art & Waste; Ocean is toxic.	I/We; Standing alone; Plastic waste is beautiful; Is 'green design' and recycling sustainable? Recycling is not a solution.

Table 5. HE Creative Residency Mapping Table.

However, in the third week of 'creative residency,' I observed that the ground-level bin was not in its place. When I approached the warden, I was informed not to worry as bins were moved away and emptied. When I asked why this happened, I was told that the campus was planning an Open Day event and that the management had requested that two bins be hidden to avoid deterring prospective students. I termed this conflict (residency approved, but the practice is not accepted): see the sensual column in red.

Over time, I found that what I thought to be a posh-looking bin with a cover supplied by Medway Council bins (Fig. 7-43) was perceived to be unattractive ('bins are ugly'): see the relational column in green (Table 5). In the next following of months, I received emails from the campus warden requesting removal of the bins. One by one, three bins were expelled. I suggest reading Table 5 for a behind-the-scenes story. See (Table 5) relational green column: ('bins all thrown out'). See (Table 5) summary fuchsia column from 'UCA Rochester campus'. See (Table 5) factual black column ('bins are ugly').

MA student co-ordinators encountered the same resistance to waste ('I/We') (see summary fuchsia column) when promoting reuse workshops. Nobody else enrolled except one MA fashion student and one sessional tutor. The allocated workshop (Fig. 7-46) was placed next to the UG product design studio space, from which we received a rebuff. I note again here that I relate to Zhang's (2021) institutional 'acts of illusion' experience, six years previously. I, too, understood that my HE waste and sustainability 'efforts were superficial' (Ibid. p. 2). The summary column in fuchsia resonates well with questioning ('is green design and recycling sustainable: see Section 3.2) affirming that 'recycling is not a solution'.

The futures column (blue) and summary column (fuchsia) emerged from the ‘creative residency’ green engagement. As in the first mapping, shown in Table 3, the futures and synthesis statements were vague and lacked specificity. Returning, finally, to the sensual column in red, I further depict my ‘solitary making with the cat’ (Fig. 50).

Fig. 7-50. XMass Tree DIY. Solitary making with non-human others. Rochester, UK.

The ‘creative residency’ continued with two months of behind-the-scenes DIY ‘Designedisposal’ production consisting of cutting small frills into the leaves using hand scissors and making larger leaf batches with a manual pasta machine (Fig. 7-50). During this ‘Designedisposal’ making at the home refuge, I surrounded myself with heaps of white plastic single-use packaging, which was slowly transformed into the angel wings that would form the branches of the ever-plastic treetop, accompanied by a feline, Cica. I use the term ‘refuge’ here to define my DIY making phase – in the home garage – as the ‘third space’ (Soja, 1996) and

as a social space for ‘upcycling as fun’ (Sung, 2017, p. 148) for my joyful production with ‘plastic things’ and companionship with ‘non-human others’.

For more details on the combined approaches applied in Chapter Seven, see Chapters Four to Six, notably Section 4.1 on ‘Material Fetishism and Thing Theory’, Section 4.2 on ‘Theory of Things and Design Research’, Section 5.4 on ‘Others Space Place’, Section 6.1 on ‘Alternative Jargon’ and Section 6.2 on ‘Designedisposal Aesthetics’.

The last phase of the ‘creative residency’ was the public exposition of ‘XMass Tree’, the event and findings unpacked in Section 7.5.

7.5 XMass Tree

> ‘The X-Mass tree is an example of how we’re looking at using creativity and new design ideas to reduce the amount of plastic ending up in landfills. I hope the X-Mass tree display will show people that plastic items like milk bottles and yoghurt pots are reusable and easy to recycle.’
>
> — University for the Creative Arts, 2015a.

Fig. 7-51. Happy XMass & New Year, 2016. UCA creative residency and Surrey Council recycling campaign.

The first public exhibit for the ‘XMass Tree’ prosumer installation happened during the Christmas holidays from 8th December 2015 to 6th January 2016 at the Friary Shopping Centre in Guildford. The tree exhibition constitutes part of Surrey Council’s waste management department’s recycling campaign, marking a successful HE ‘creative residency’ outcome for UCA (Fig. 7-51).

In the initial phase, the plan for the festive tree was for it to be displayed in the Medway local shopping centre area. To my surprise, the local authority backed out from the recycling campaign without explanation shortly after the ‘Designedisposal Seminar’ event (Table 4). I continued making and finalising the tree installation (Fig. 7.50). Fortunately, Surrey County Council had a ‘need of the tree’ for their recycling campaign (Fig. 7-51).

Unexpectedly, the ‘XMass Tree’ exhibit took place at the Friary Shopping Centre to mark the end of the ‘creative residency and multi-stakeholders’ engagement under UCA’s HE environment and sustainability directive. The nature of collaboration connected HE PG design department stakeholders with the waste management council, culminating in a public exposition promoting a recycling campaign set by Surrey Environment Partnership (SEP). From the point of impact, the UCA HE ‘creative residency’ affirmed above-average sustainability goals and student engagement set by the institutional directive (UCA, 2015a) and implemented ‘Sustainable Policy’ concerning environmental stewardship in the curriculum (HEFCE, 2005): see Section 3.3 on ‘Role of Design and Humanities in the Changing Climate’ for more detail.

My praxis 'creative residency' was completed under SEP's campaign, entitled 'We Recycle at Christmas' (Fig. 7-52). I could not help but question whether 'MA Design Students Encourage Surrey Shoppers to have A Sustainable Christmas' (UCA, 2015a) with a beauty pageant Christmas tree adjoining the campaign poster would prompt a change in habitual and systemic ways of living: 'However, practice has shown that this educational effect does not take place as automatically and directly as the authorities have assumed over time' (Landsberger, 2019, p. 182). Further, my communication with the waste authorities was like the 'XMass Tree' installation – superficially taped in (Fig. 7-51 and Table 5).

Fig. 7-52. We Recycle at Christmas, 2016. UCA/KraalD/Surrey County Council. Left: *Xmass Tree*. The Friary Shopping Centre. Right: *We Recycle at Christmas,* UCA and Surrey Environment Partnership campaign poster.

Many findings and reflections resulted from the ‘creative residency’ (Tables 4–5). In both municipality encounters (Medway and Surrey), the WM councils’ hierarchy was so tight that nothing could be communicated to higher management. With Medway authority, I could only speak with the appointed marketing officer (see JD participant conversation in Table 4), who later informed me – out of the blue – that the council has cut their recycling campaign funds and, therefore, the ‘Xmass Tree’ exhibition had been cancelled. The higher management and marketing officer allowed no further communications regarding this decision.

Similarly, when I suggested to Surrey authority’s representative – who supervised my installation on behalf of the recycling campaign – that I would like to come in and talk to the shoppers about reuse vs recycling habits, my request was met with astonishment and I was swiftly dismissed with the curious question – what is that for? Naturally, I replied that it was for research purposes. The boundary rope was tightly taped in the same way as the tree’s health and safety decorative rope (Fig. 7-52).

Reflectively (see Tables 4–5), I believe that my reuse and waste advocacy, combined with the HE ‘Designedisposal Seminar’ in a critique of UK recycling (see Table 4), making the representatives of both waste management authorities uneasy and igniting a red alert for the politics of higher management levels. SEP promotes their aim to ‘reduce, re-use and recycle your way through the festive season’ (SEP, 2020, online). It appeared as though their recycling campaign did not welcome my reuse approach (see Table 5).

Recycling management enquiries to the waste authorities continue to be raised, with the latest example coming from the Green Party and *The Guildford Dragon* paper, which questions, 'Where does our recycling go?'. The article, by Curley (2020), states that:

> Surrey's eleven boroughs and districts all have different ways of collecting and handling recycling. Plastic, paper and card put in recycling bins outside houses are sent over 5,000 miles away to a number of countries for sorting and re-processing, including China, the Netherlands, Turkey, Vietnam, Taiwan, Indonesia and other unspecified locations outside of Europe.

Fig. 7-53. XMass and Reuse. Left and centre: *XMass Tree*. Right: Reuse garland.

Retrospectively, five years after the 'Designedisposal: Green Design Engagements' projects, the one-way monologue campaign poster asking shoppers 'do you do it at Christmas?' (Fig. 7-53) on behalf of the waste management authorities, still survives. As for the reducing waste and re-use approach, the everlasting 'Xmass Tree' also remains, trimmed down from its recycling single-use pedestal. This large-scale installation shows 'how matters stands' (Kästner, 1933: see 'Designedisposal Aesthetics' in Section 6.2).

Happily, the fluffy tree installation shines in my back garden every festive season, accompanied by a growing, hand-made tree garland collection (Fig. 7-53). I conclude Chapter Seven, placed under the 'discordia gyre' (Fig. 1-5) green engagements, with my tacit observation that 'We' are motivated to recycle by the authorities, but 'I' chose to act upon this through re-use. As well as emphasising the properties of aural plastic things, I am ready to respond with my festive epiphany to the recycling campaign – that 'I' do indeed reuse at Christmas!

The 'Designedisposal Seminar' and HE 'creative residency' shifted my 'socio-material practices' (Orlowski, 2007) away from landfill disposal and failing recycling UK statistics (see Section 3.4.1). Plastic growth has transgressed all the planetary boundaries (see Sections 3.5–3.5.2).

My perspective shifted because of the 'creative residency' experience. I found my research transposed from managed landfill on land, which I contextually introduced in Section 1.4, towards designing waste ontologies and visualising '(mis)management of plastic packages' (Johansson, 2021) or what the World Economic Forum (2016) calls 'lost to the environment'. Specifically, in my

research, I turned to my ‘aesthetic responses’ (Hillman, 1996; Section 3.8) and the ‘lanternfish gaze in’ (see Section 6.3) towards plastic discard living in the largest mismanaged landfill – the ocean.

The Laderman Ukeles (1969) feminist motto – ‘personal is political’ – practice-based mode continues into Chapter Eight, opening the ‘concordia gyre’ (Fig. 1-5, *Blue Design Series*). The ‘Designtransposal: Blue Design Series’ chapter is initially a visually represented (DIY) ideational exploration of marine plastic pollution, which I visually shared in participatory (DIWO) HE design workshops. The politicised socio-material plastics context shifted from land-based ‘Designedisposal’ tactics, and the ‘Designtransposal’ visualising strategy began to track the single-use trajectory of plastic discard, transposed by the wind into planetary waterways (see Sections 3.5–3.5.2).

Chapter Eight, Section 8.0, poetically introduces Yeats’ (1921) subjective visionary gyres, opening the reader’s inner senses towards oceanic spaces. Nonetheless, my praxis research stays within the HE design environment, floating just below the surface, unseen, marginalised and waiting to happen.

CHAPTER EIGHT: DESIGNTRANSPOSAL: BLUE DESIGN SERIES

8.0 Blue Vignette, A Poetic Gyre Vision

‘Turning and turning in the widening gyre

The falcon cannot hear the falconer;

Things fall apart; the centre cannot hold;

Mere anarchy is loosed upon the world,

The blood-dimmed tide is loosed, and everywhere

The ceremony of innocence is drowned.

The best lack all conviction, while the worst

Are full of passionate intensity.’

— William Butler Yeats, 1921, ‘The Second Coming’, Stanza I.

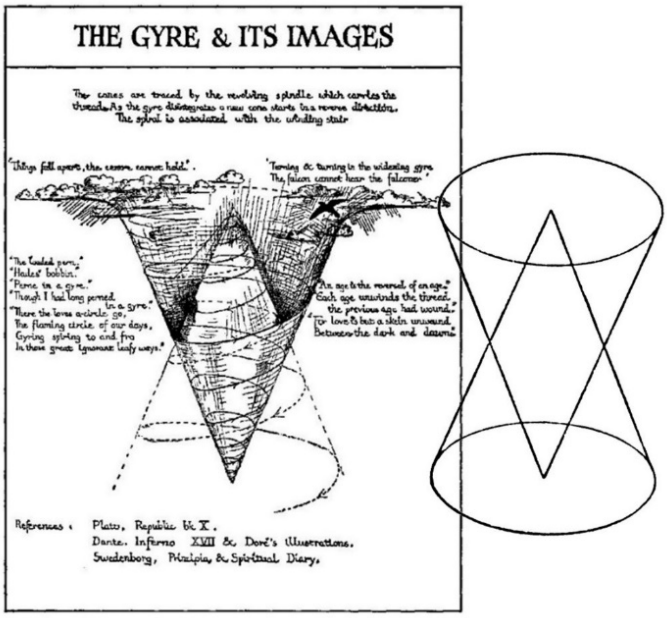


Fig. 8-54. W. B. Yeats, 1921. ‘A Vision’, concordia and discordia gyres diagram.

Prior to unpacking the project overview of the 'Designtransposal: Blue Design Series', it would be useful to pause and take a deep breath together, taking a nano-break from these findings on plastic debris and marine science (Part One, Chapter Three). While slowly exhaling, we see our breath 'turning and turning in the widening gyre' of Yeats' (1921) modernist poetry and vision.

In the poem, 'The Second Coming', the first stanza metaphorically describes the political post-First World War conditions of the early twentieth century in Europe. The poem anxiously captures the social woefulness of modernity (see Section 3.7), following the falcon that has lost its way by flying out of sight, spiralling in a widening gyre. The allegory can be understood as a reference to the collapse of traditional social structures (see Section 5.3) and the rise of modernistic values exploding 'waste things, waste lands' (Lynch, 1990; see Section 1.5).

In the following two chapters, I visualise the growth of MPW (Lebreton and Andrady, 2019, Section 1.4) and its impact on 'non-human others' in aquatic spaces. This was a point in my research timeline when I shifted towards 'ontological designing' (Willis, 2007) and 'wet ontologies' Steinberg and Peters (2015). To summarise, in Chapters Eight and Nine, 'I/We' re-imagine 'more than human entanglements in the Blue Economy' (Bear, 2017, p. 27: see Section 3.3). For this reason, I use the term blue design for my project series in 'engaging practically with aquatic liveliness' (Ibid., p. 30).

The 'A Vision' gyre image (Fig. 8-54), represented in the poem shows a world spiralling outwardly at high speed because it cannot recall its point of origin. Yeats' vision of the gyre incorporates a subjective theory of the history timeline,

articulated and visually represented as the double helix cone. The diagram consists of two conical spirals nested inside one another. The widest spiral rings of one conical spin round the narrowest spiral rings of the other, and vice versa.

Yeats' wife received this vision of turning gyres and cyclical birth and re-birth in a dream-like state (Yeats, 1921). The interlinked gyres captured the contrary motions inherent in human and historical processes, underlining the intrinsic dualism. The bottom cone of the 'concordia gyre' is the primary tincture, representing unity. The second, top cone – the 'discordia gyre' – is the antithetical tincture, expressing human desire. As Yeats points out, the antithetical tincture 'is emotional and aesthetic, while the primary tincture is reasonable and moral' (Yeats, 1921, pp. 9–12).

Yeats' dystopian poem and vision share a belief in the rapidly changing twentieth-century world on the threshold of an apocalyptic revelation. Yeats' family team prophesied that current history had reached the end of the outer top 'discordia gyre' and had begun moving along the inner bottom 'concordia gyre' of unity. The gyres are divided into long historical periods, following lunar phases, and characterising the psychological stages of individuals and society.

Visualising my action research, I borrow the visual, diagrammatic gyra representation for unpacking the two project streams into the green 'discordia gyre' and the blue 'concordia gyre' (see Part One (Fig. 1-5), *Practice-based Projects Overview Diagram 2014–2019* in Section 1.2). Initially, inspired by Yeats' gyre visionary tale, I conceptually mapped the two scenario timelines (see Appendices (Fig. 11-90), *Mapping Gyra: 2050 Scenario and 2150 Vision Timeline*

in Section 11.3 – ‘Mapping Board’). I place my praxical ‘social imaginary’ (Castoriadis’ (1997); Section 5.3) in ‘Scenario 2050’ in the twenty-first century timeline and ‘Scenario 2150’ in the twenty-second-century timeline. Finally, see Fig. 6-38, *Future Cone*, in Section 6.5, for the ‘Experiential Scenarios’ research method that I apply for cli-fi scenarios and for visualising the (DIY) gyra patch ‘metaphor’ (Candy, 2010), which opens the (DIWO) ‘Designtransposal Workshop Presentation’ (Appendices, Section 11.1).

Inhaling, I return to the secondary scientific data referred to in the ‘Literature and Field Review’ in Chapter Three: see ‘We Made the Anthropocene’ in Section 3.4.2, which affirms the poetic discussion in Section 8.0’s blue vignette that the planet has shifted a gear. My research’s evolutionary gyres timeline therefore follows the new Earth biolayer – ‘The Birth of the Plastisphere’ in Section 3.5.2 – set in a ‘plausible future’ thirty years ahead and in a ‘possible future’ 150 years ahead (Fig. 6.38, *Future Cone*, in Section 6.5). I also contend that the past does not equate to the future.

Section 8.1 visually unpacks the diagrammed project structures, giving an overview of the ‘blue design series’ explorations.

8.1 Visual Overview of Blue Design Series Projects

‘I am committed to art science activism as sympoietic practices for living on a damaged planet.’

— Donna Haraway, 2017, p. 31.

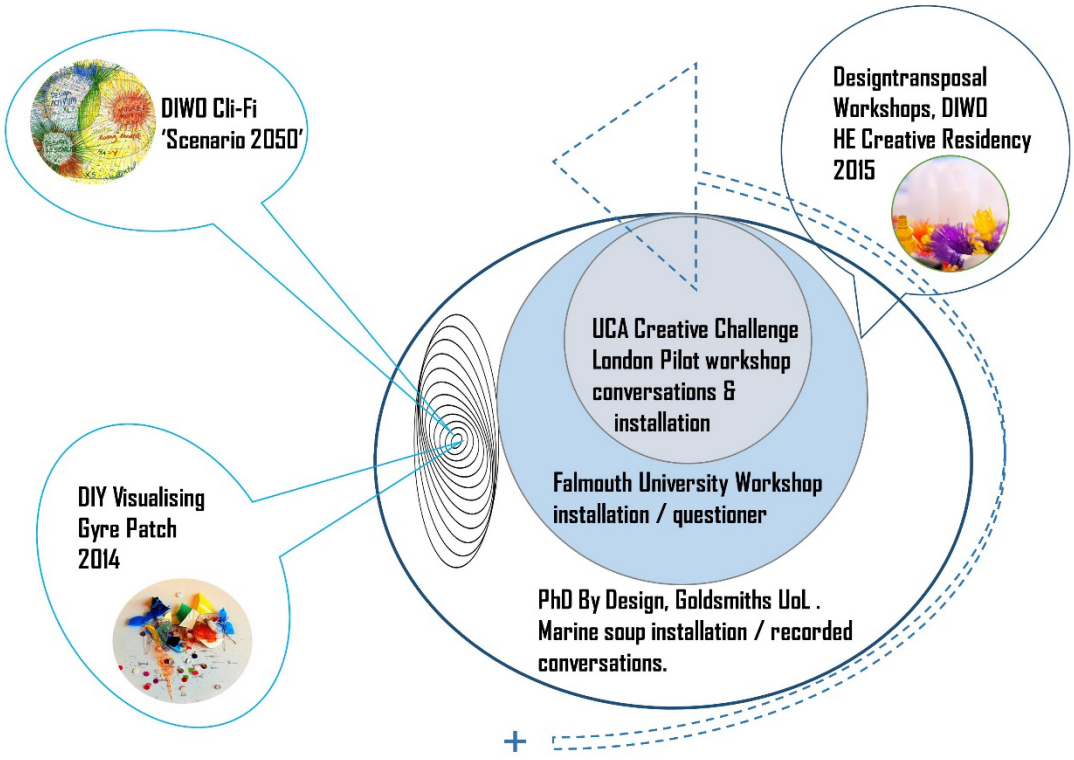


Fig. 8-55. 2014–2015 Projects Diagram DIY and DIWO Projects and 2050 Scenario Overview. Designtransposal: *Blue Design Series,* concordia gyre.

My research 'praxis' extends here into practice-based experiential modes in co-creating DIY – DIWO – DIY participatory projects (see the counter-current concordia gyre arrow in Fig. 8-55). My 'blue design series' is entangled with the everyday wellbeing '*eupraxia*' (McNeill, 2019; Section 5.1), forming experiences as the marker of successful praxical outcomes. In Fig. 8-55, I set out the project outcomes, starting from the left with the (DIY) visualising gyre patch 2014 to (DIWO) 'Designtransposal workshops' 2015 and the (DIWO) cli-fi 'Scenario 2050' summary. Chapter Eight illustrates my blue design projects series (see Sections 8.2–8.2.3), unpacking evidence in Section 8.3 'Designtransposal Workshop Mapping Dialogue', and closing with Section 8.4 and the 'Scenario 2050' narrative.

My research moved from a focus on land landfill to concerns about the increasing amount of MPW (Lebreton and Andrady, 2019) and its impact on aquatic ecosystems (wet landfill). Through 'Praxis and Social Imaginary' (Section 5.3; Castoriadis 1997; 1993) in my hands-on praxis explorations – action research – I first took the design research story through the 'Designedisposal' landfill encounters and re-use of 'plastic things' (Chapter Seven).

Here 'I/We' are (standing), in Part Three, at the top of the thesis structure, where this story takes a spatial vector turn. This counter-current PhD 'u'-turn led me to conceptualise 'Designtransposal's visual strategy inspired by 'new materiality' (Braidotti, 1994; 2002; 2006; Le Grange, 2018; in Section 4.0), creating non-human-centric design lenses. I am visually 'Transposing Nature' in Section 4.3 through eco-feminist 'material entanglements' (Hird, 2009; Barad, 2007; in Section 4.4) with 'plastic things' (Sections 4.1–4.2).

The ‘Designtransposal workshop’ incorporates the views of aquatic ‘non-human others’. In Section 6.3, ‘A Lanternfish Gaze In’, I conceptualise a bespoke ‘non-human centered design method’ (Peredruk, 2020 in Section 4.3), informing visual imaginary and extending my praxical vocabulary (Sections 2.1 and 6.1). The new method supports re-imagining the largest mismanaged landfill – the ocean (Chapter Eight). For more details on my ‘praxis’ research methodology, re-visit Fig. 5-29, ‘My Praxis Paradigm’ in Section 5.1 and Chapter Four, ‘Theoretical Review.’

The oceanic practice-based series (Fig. 8-55) ‘made the unthinkable possible’. I paraphrased Wood’s (2007) ‘metadesign’ synergy notions that ‘combined the art and logic of design’ (Wood, 2007, p. 167). My ‘blue design series’ waste activism is nested in design research (Section 3.2) and influenced by Braidotti’s (2006) transpositions and bio-centred egalitarian multiplicities (see Fig. 4-26, ‘Designtransposal’, in Section 4.3). I explore anthropogenic material entanglement (Fig. 4-26 *Plastiglomarate*, left) in the oceans (Fig. 4-26 *Sea PET Anemone*, right) through ‘art science activism as sympoietic practices’ (Haraway, 2017, p. 31).

Section 8.2 opens with three (DIWO) HE design-based action workshops. These are hands-on workshops relating to the posited main research question, supported by sub-research question two (see Section 4.5, ‘Research Questions’).

8.2 Three DIWO Designtransposal Workshops

> ‘Design appears uniquely capable of practically and materially responding to concerns that critique is not affirmative enough, and art is not real or social enough. Design is more affirmative and positive than critique because design proposes, plans, and produces real, social, and material everyday things. At the same time, the traditions of art and critique offer techniques and perspectives to help the traditions of Design address concerns that it is too affirmative and at times unwittingly harmful.’
>
> — James Pierce, 2015, p. 19.

—

Fig. 8-56. Three DIWO Designtransposal Workshop Installations. Photo triptych: from left to right – *London pilot workshop*, *Falmouth University* and *PhD by Design,* Goldsmiths University of London.

The purpose of the ‘Designtransposal’ workshop platform is to visualise plastic pollution, promote waste-centric advocacy and aesthetics, and educate in a critical and eco-centric way. The three workshops closely follow my new ‘Designtransposal’ strategy, which incorporates eco-centric activism and waste aesthetics through DIWO hands-on re-use tactics while nurturing conversations.

The main aims and objectives of the ‘Designtransposal’ workshop (see Section 1.3, Table 2) is to visualise ‘The Plastic Ocean Pollution’ (Section 3.5) and, in particular, ‘The North Atlantic Gyra and Sargasso Sea Garbage Patch’ (Section 3.5.1), engaging in conversations while undertaking making with ‘plastic things’ (Section 6.2). For more on the ethnographic site and study supporting collective co-designing and discussions on ‘social things’ (Brown, 2001), see Section 4.1, ‘Material Fetishism and Thing Theory’, and Section 4.2, ‘Theory of Things and Design Research’.

The ‘design workshop method’ (Rosner et al., 2016 in Section 6.4) is a participatory platform allowing stakeholders to shift their relationships to the materials (Fig. 6-37). The ‘Designtransposal’ workshop’s ‘field site’ platform supports participative re-imagination, emphasising collaborative making and accumulation of tacit knowledge (Fig. 8-56). The workshop conversations and questionnaire responses (Section 8.3) are the ‘research instrument’ (Rosner et al., 2016) for material engagement in ‘reflective practice’ (Schön, 1984): see Section 8.3, ‘Designtransposal Workshops Mapping Dialogue’, evidencing conversational transcripts, and my mapping processes, synergising stakeholders’ perceptions and changing awareness. I re-used the ‘research accounts’ as an experiential metaphor for the ‘2050 Scenario’ construct (Section 8.4).

The workshop's bespoke research method 'alternative jargon', set out in Section 6.1, engenders my eco-feminist notions expanded in 'Vocabulary and Compendium Index' (Section 2.1), representing HE-activist 'blue design series' PhD projects. The workshop stimulated informal discussion on the cultural, social and material qualities of single-use plastic packaging, waste, consumption, re-use and marine plastic pollution (Fig. 8-57).

The 'Designtransposal workshop' supports HE design sustainable learning and co-creating new processes with plastic things and meaningful relations with nature (Sections 3.1–3.3). As a participatory research platform, the three workshops mobilised micro-insights from HE design stakeholders' groups (see Section 8.3, Table 6). To explain further (Fig. 8-57), I gathered and mapped all three workshops stakeholders' dialogues and recorded conversations, questionnaire responses and perceptions (Fig. 8.70–8.71) towards plastic, consumption, disposal and plastic ocean pollution within the locality of London and the south west of England. Finally, I synergised recorded participatory conversations (Table 6) and questionnaire responses (Fig. 8.70), and mapped latent emotions (8.71) for interpreting the cli-fi '2050 Scenario', constructing a 'plausible future' narrative (Fig. 8.72).

I opened all three workshops with a visual presentation of plastic ocean pollution informed by scientific findings and MPW data (see Addendum Fig. 11-88 for a complete set of visual presentation slides). I juxtaposed the 'plastisphere' biolayer scientific introduction with my DIY image-artefact (Fig. 8-58, *Invite: Visualising through the North Atlantic Gyre*).

My first event was a two-hour design workshop as part of UCA's *Creative Challenge* programme, under the banner of the 'Creative Ecology Week' held in London on 25th March 2015. This test pilot event enrolled six stakeholders from UCA, UK, with visiting guest students from the French-based HE institution L'Ecole Supérieure d'Art and Design Le Havre/Rouen (ESADHaR), one UCA MA Design sessional tutor (see Table 5 in Chapter Seven) and one London-based environmental policy official (Fig. 8-56, *London pilot workshop*). The second full-day workshop, 'Designtransposal: Visualising Through the Gyre', took place with thirty-two undergraduate Sustainable Product Design students at Falmouth University, Cornwall. Both workshops' student groups interpreted their household plastic packaging that streams directly into the oceans (Fig. 8-56, *London Pilot Workshop,* and *Falmouth University*).

Compared to the London pilot group's tepid emotions towards recycling and plastic oceanic pollution, the Cornwall-based student group was enthusiastic and engaged with the local SAS group. To my surprise, the workshop questionnaire mapped the groups' hidden anger toward plastic things (Fig. 8-65 – *Designtransposal Workshop 5 Level Dialogue*). In particular, through the questionnaire analysis (Fig. 8.70 – *Stakeholders Responses to Questions 1 and 2*), the plastic shopping bag revealed s*elf* (my emphasis) to be a local villain (see Chapter Nine, Section 9.0).

Fig. 8-57. DIY and DIWO projects overview, 2014–2015. *Designtransposal Workshops.*

The third workshop was part of a peer-to-peer programme for this PhD by Design's *Researching Across the Difference* event: a graduate student-led conference held at Goldsmiths University of London in November 2015. In the third workshop, I engaged with six graduate students from three universities across the UK: Goldsmiths, University of London, Loughborough University and the University of Dundee. I nicknamed the last workshop 'plastic soup', inspired by scientific updates (Eriksen et al., 2016) and nano-plastic field samples (Fig. 8.67, *Max Liboiron, 2015*). The hands-on workshop explored the inherent properties of the Barents Sea gyre patch (Fig. 8-56, *PhD by Design*). The introductory presentation also touched upon the Sargasso Sea fauna and flora entanglement, vertical under-ocean transportation currents, surface flotsam and

the sedimentation time of plastics. After the scientific introduction, I recorded group conversations that organically migrated towards consumption patterns, everyday behaviour and systemically embedded restrictions (Tables 6 and 8). The ‘Designtransposal’ workshop concluded that making oneself break away from a plastic-free lifestyle is particularly tricky, if not impossible, within social norms (Fig. 8-57).

The forthcoming sub-sections (Sections 8.2.1 to 8.2.3) describe the structure of each workshop, which I facilitated in the UK in 2015. The participatory workshops addressed the main research question – and sub-research question two (Section 4.5).

8.2.1 London Pilot: Creative Challenge, UCA

‘Katarina told to the group, “We are basically lethal to nature and therefore lethal to ourselves.”’

Fauxdrapeaux, 2015, cited in Dimitrijevic, 2020, p. 144.

Fig. 8-58. **Invite: Visualising through the North Atlantic Gyre.** *Creative Challenge*, 2015. London pilot Designtransposal workshop.

The initial test workshop was held as part of the *Creative Challenge Week* held at the Ugly Duck, 47–49 Tanner Street, London, SW1, on 25th March 2015, and organised by UCA. The *Creative Challenge Week* was a unique two-institutional social and environmental entrepreneurship programme that empowered humanities students to address the increasing number of global challenges (Fig. 8-58). Only six participants self-enrolled in the workshop.

I structured the fast-paced, two-hour workshop with activities in three phases. The first phase involved an introductory presentation to increase stakeholders' understandings of plastic ocean pollution, visually narrated by the (DIY) North Atlantic Gyre Patch (Fig. 8-58) below-the-sea imaginary. I asked the six workshop participants to visualise a segment of the North Atlantic Gyra, the gyra patch, which is otherwise invisible to humans. In the first phase, I allocated twenty minutes.

The second phase of the workshop supported collaborative making with prosumer plastics and metal, which I brought in a travelling suitcase on the train from Rochester, Kent. The outcome was a three-dimensional temporal installation called *The Gyre Patch* (Fig. 8-59). This exercise lasted sixty minutes. The third and last phase of the workshop supported informal conversations with the participants. This exercise lasted thirty minutes but continued informally throughout the *Creative Challenge Week* events, including a lunch and gathering.

Fig. 8-59. The Gyra Patch. Fauxdrapeaux, 2015. Designtransposal workshop pilot (left) *As Above the Gyre Patch* (right) *So is the Trash Below*, installation.

The pilot started with a visual educational and environmental presentation (Fig. 11-88). The visual presentation introduced the 'plastisphere', an ecological phenomenon of plastic oceanic pollution, as the by-product of global consumption and MPW, including discard and disposal (see Sections 3.4–3.4.1). I asked the group to role-play – to view the phenomena, not from a human perspective, but to transpose themselves and visually imagine the gyra patch from the perspective of the lanternfish (see Fig. 6-33 and Section 6.3 – 'A Lanternfish Gaze In'). I imagined the lanternfish shoal's vertical diel migration approaching the surface and re-imagined the lanternfish shoal's experiences of the gyra patch, seen as a beautifully radiating micro-plastic cloud illuminated by the moon at night (Fig. 8-60).

This small fish performs a mundane vertical migration as, during daylight hours, lanternfish return to depths of 400 metres but, at night, can ascend to forty metres below the oceanic surface. The lanternfish (Myctophidae) habitat is the

mesopelagic or twilight zone, but their night feeding grounds are towards the sea's surface, where they seek out the plastic habitat for their food source.

Fig. 8-60. **The Lanternfish Gyra Patch Gaze In.** Dimitrijevic, 2020.

Lanternfish follow the migration of plankton, which serves as its primary food source. We can shift perspectives from humans to other species. Some oceanic species use plastics as pasturage. Marine science reports many interactions between plastic debris and marine organisms. Davison and Asch (2011, pp. 173–180) inform us that the ingestion rate of plastic debris by mesopelagic fishes in the North Pacific is estimated to be from 12,000 to 24,000 tonnes per year.

Microbial biodegradation and macro-fauna grazing facilitate plastics' fragmentation (Eriksen et al., 2016, Section 3.1.1.). Macro-fauna is any animal visible to the naked eye, such as the lanternfish. In 'Frequency of Micro-plastics in Mesopelagic Fishes from the North West Atlantic', Wieczorek et al. (2018) reported that 73% of all tested fish contained plastics in their guts (pp. 1–9). Overall, they found much higher levels of micro-plastic fragments, mainly

polyethene fibres, in fish guts. I therefore proclaim that 'the lanternfish is my plastic waste ocean management hero and the reuse muse' (Dimitrijevic, 2020, p. 144).

As the presentation came to its end, there was an awkward silence in the room. The workshop floor was strewn with plastic trash. To break away from the emotional heaviness brought about by the devastating marine and MPW data, I said: 'Let's make something'. Fish only ever view their food by looking up. Hanging their creation from the frame of a stripped umbrella, the students adopted a fish-eye perspective (Fauxdrapeaux, 2015).

The second part of the two workshops supported the process of making with disposed-of plastic. The activity we initiated by co-creating, as a group, a three-dimensional suspended gyre patch installation was experienced and visualised not from a human point of view but from the lanternfish's perspective – from below the sea's surface.

The visible outcome of London's pilot workshop was a three-dimensional temporal gyra patch installation that we suspended from the frame of a broken umbrella, which I brought with me (Fig. 8-59, left, *As Above the Gyre Patch*). The ceiling installation mirrored the floor's metal and plastic sediment heap (Fig. 8-59, right, *So is the Trash Below*).

Fig. 8-61. Creative Challenge. Fauxdrapeaux, 2015. Designtransposal workshop.

The third phase consisted of informal conversations during and after the hands-on making phase. This small group discussion is congruent with twenty-first-century pedagogies, 'which is to teach students to think and to engage with their own and others' learning through the articulation of views and understanding' (Bligh, 1986, cited in Fry et al., 2009, p. 91). The workshop processes outlined represented participative experiences, encouraging self-engagement.

Through the fast-paced pilot workshop, I derived insight from informal conversations with stakeholders, affirming the current apathetic attitude toward dirty streets, looting and recycling in the UK and France (Fig. 8-61). For comparison, see Table 5, Chapter Seven. Running the pilot 'Designtransposal' workshop as part of the event limited my research in gaining further participatory feedback.

8.2.2 Falmouth University Workshop

> ‘Participation here refers not just to local events of engagement in certain activities with certain people, but to a more encompassing process of being active participants in the practices of social communities and constructing identities in relation to these communities.’
>
> — Etienne Wenger, 2005, p. 4, cited in Dimitrijevic, 2020, p. 146.

Fig. 8-62. KraalD/UCA 2015 Designtransposal Workshop Invite. Sustainable Product Design, Falmouth University, Penryn campus, UK.

I led the second Designtransposal workshop at Falmouth University, Penryn campus, Cornwall, UK, funded by UCA’s School of Design and Crafts (Fig. 8-62). The event was a full-day participatory engagement with thirty-two first-year

Sustainable Product Design students, using the students' plastic waste stream for interpreting the gyre patch.

I structured the Falmouth workshop with activities in four phases. The first phase involved an introductory presentation to increase the students' understanding of marine pollution. The second phase was held at the workshop facilities and supported collaborative groupwork to make a three-dimensional temporal installation of the North Atlantic Gyre Patch. The third phase engaged the students in reflective five-level questionnaire mapping. Finally, the fourth phase closed the workshop activity with an exhibition of the group's installations (Fig. 8-66).

Before the workshop, I asked students to collect single-use plastic material for the second making phase engagement. However, based on my past experiences (Chapter Seven), I was concerned about whether the students would supply a sufficient volume of plastic. In my London-based pilot workshop (Section 8.2.1), bringing along self-disposed plastic resulted in a marginal response from participants. However, I was surprised and uplifted by the students' enthusiastic response and the vast volume supplied, and simultaneously repelled by the putrid smell of the sour milk streaming from all corners of the workshop. Alas, they did not wash their single-use products depository for the workshop. The making process in the second phase engaged the first-year Sustainable Product Design students in a 'reflective conversation with materials' (Schön, 1984) and created a fertile conversation platform for making and thinking with 'plastic things' (Fig. 8-63).

Fig. 8-63. Designtransposal Workshop, 2015. *Making with Plastics.* Sustainable Product Design students, Falmouth University, Penryn campus, UK.

The large-scale sea-creature-like installation consisted of the students' accumulated waste, including plastic beverage and milk bottles, food packaging, shopping bags, rope, wire and 3D printing offcuts (Fig. 8-63). The conversation flowed hand-in-hand with the process of making, involving discussion of reuse strategies vs recycling waste management and local marine pollution. I discovered that a handful of the participants proactively engaged with a local foundation: SAS. The students were in high spirits, taking a pragmatic, hands-on approach to community beach clean-ups. They were also well informed about changes in the oceanic environment. For example, they were aware of the

difficulties in spotting abandoned shipping containers floating near the water's surface, posing a threat to ocean-going vessels.

For my third workshop phase, I designed five questions for the student group (Fig. 8-64). The first three questions focus on ('items'), specifically 'plastic things' only. Questions one to three were staggered, asking the group to respond ('easy replacement' to 'essential' to 'willing to give up') from a stance of questioning behaviour change towards reducing ('my') individual plastic consumption. The fourth question strategically posited 'lifestyle changes' examination, leaving the domain of personal behaviour and turning attention to systemic, governmental regimes, policy and industrial production as plastic reduction at its production source (see Section 3.4.1). Last, the fifth question raised 'super-wicked problems' (Levin et al., 2007 in Section 3.3), enabling the group and I ('I/We') to draw some conclusions playfully in a co-designerly way (Fig. 8.64).

In designing five cheeky questions, I hoped that this staggered questionnaire would reveal the lack of transparency of '3-97 ratio' waste production (MacBride, 2011 in Section 3.4). Before starting, I confess that I was incredibly annoyed with the emergence of zero-waste warriors, who claimed to fit their yearly plastic waste in a jar to solve the plastic pollution pandemic. As the mother of a small child and a weekly family shopper (Fig. 1–4), I knew that this was a futile example of what Liboiron (2012) calls 'major scalar fallacies in environmentalism', which can be combated, 'through individual consumer choice' with full respect to individual good-will actions (see Section 3.4.1). For example, I wanted to point out the good properties of plastic and the material revolution (Fig.6.38, *Plastic Timeline*), changing medical, transport and space exploration, through the second question

(see Section 6.5). Borrowing from Candy (2010), the five-level questionnaire does not provide rigid boundaries but serves as 'heuristic levers' keeping up a degree of the workshops' 'strategic ambiguity' (Ibid.).

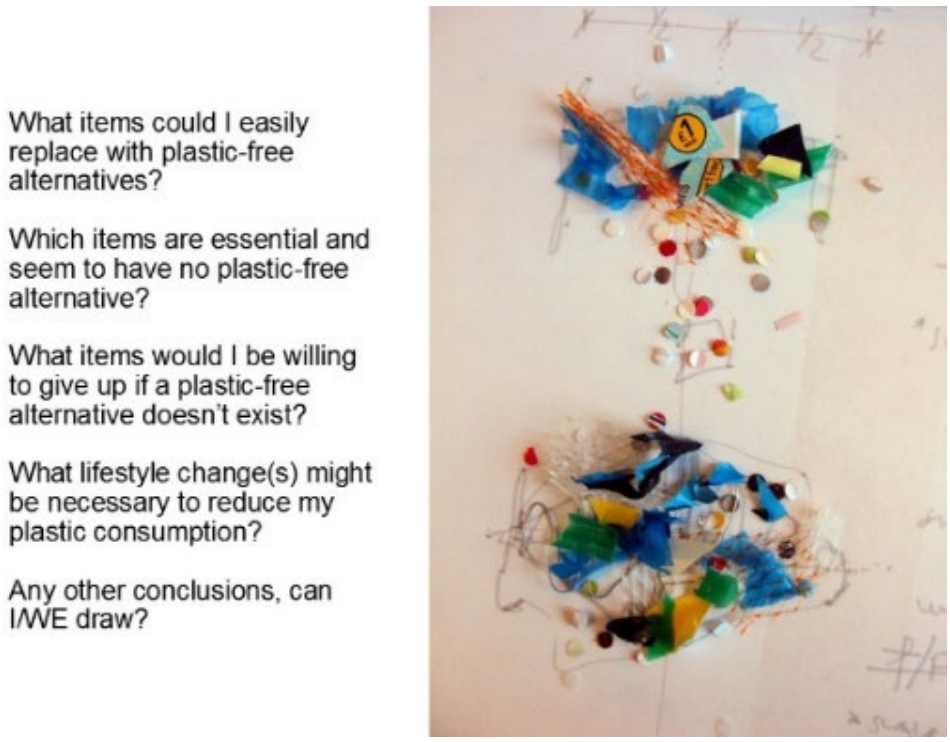


Fig. 8-64. Designtransposal Workshop, 2015. *Five Level Questionnaire***.** Sustainable Product Design students, Falmouth University, Penryn campus, UK.

After the lunch break, the group gathered for the third phase of the workshop. The reflective engagement consisted of five questions posed to the participant student group. I asked the first question: *What items could I easily replace with plastic-free alternatives*? I followed this with question two: *Which items are essential and seem to have no plastic-free alternative*? Next, I steered towards question three, asking: *What items would I be willing to give up if a plastic-free*

alternative doesn't exist? The fourth question posed was as follows: *What lifestyle change/s might be necessary to reduce my plastic consumption*? The final question was: *What other conclusions can I/We draw, if any*? The fifth question offered participants ideational sense-making and drawing as a response (Fig. 8-64).

Fig. 8-65. Designtransposal Workshop, 2015. *5 Level Dialogue*, with Sustainable Product Design students, Falmouth University, Penryn campus, UK.

Once all the post-it note responses were gathered on the wall, the group discussion steered around automated daily habits and the meanings of objects and materials in our everyday lives (Fig. 8-65). The post-dialogue engagement resulted in the group grasping the complexity of plastic waste's social and material dynamics. Despite only being in their first year of specialist design sustainability study, the group had well-established views on the sustainability of the materials. Students engaged in a dialogue, sharing their individual

experiences of sailing troubles and oceanic pollution concerns, particularly as the campus is located on the Cornwall peninsula.

As a result of living in the contextual proximity ‘where the land meets the sea’, the inevitable socio-material and environmental changes in progress were visible, and thus experiential and relevant to the students. I found the Cornwall student group in stark contrast to the apathetic responses I experienced from their counterparts in the pilot event held in London (Section 8.2.1).

Fig. 8-66. Sea Jellyfish, 2015. *Designtransposal Workshop Installation*, Falmouth University, Penryn campus, UK.

The fourth phase of the workshop, the exhibition, displayed the installation in the central space of the open studio (Fig. 8-66). The second workshop installation hung suspended from the ceiling and became a conversational piece like the pilot workshop. The putrid-smelling plastic creature embodied the vision of the gyre patch, entangled with the PET plastic fishes made by the students.

Despite its instant waste aesthetic appeal, the ‘Sea Jellyfish’ had to be quickly disassembled and disposed of because of the persistent scent of rotting milk. What was initially a pile of disposed-of plastic packaging on the floor, the group transformed into the ‘Sea Jellyfish’ of Fig. 8-66, despite its short-lived exposition life span.

A sense of disappointment was apparent in the air because the participatory visualisation installation could not be displayed for a more extended period. The ‘Sea Jellyfish’ was unceremoniously taken down, dragged through the university’s corridors to the service yard, and disposed of straight into the blue recycling bins.

The ‘Sea Jellyfish’ installation (Fig. 8-66) became a visible ocean debris garbage patch and an experiential example of fast-track single-use packaging and the overwhelming presence of discarded plastic things in our environment: ‘Modernity’s structures of knowledge, its dominant relations of power, re/production, and wealth, its patterns of environment-making: these form an organic whole’ (Moore, 2015, p. 3). As much as putting out the rubbish may feel like an ordinary and mundane aspect of life, it is at the core of Modernism’s cultural and material performance.

The automated daily act follows a sequence of complex material practices that deploy a multitude of services, technologies and purifying techniques. For the first time, participating students acknowledged the importance of cleaning plastic litter before reuse processing. As well informed as we may be in sustainable materials, I have realised how little we, as professional designers, are educated in and therefore know about recycling waste management processes and purity waste regimes.

The second ‘Designtransposal’ workshop engagement resonates and aligns well with Section 3.1., Fig. 3-11, *No Waste Challenge*, by WDCD 2020. I received good post-workshop feedback from the student group, stating that they enjoyed making conversations and identifying the informative value of my guest workshop on plastic pollution and the ‘plastisphere’.

8.2.3 PhD By Design, Goldsmiths, University of London

> ‘Entanglement is a condition of being twisted together or entwined, involved with; it speaks of intimacy gained, even if it was resisted, or ignored or uninvited. It is a term that gestures towards a relationship or set of social relationships that is complicated, ensnaring, in a tangle but which also implies a human foldedness.’
>
> — Sarah Nuttall, 2009, p. 13.

Fig. 8-67. Plastic Soup. PhD By Design, 2015. Designtransposal workshop invites visualising through the gyre. Photo Bricolage: (left) *DIY Visualising Gyre Patch*, 2014, DIY (right) Max Liboiron, 2015. Image, Nano-plastic field sample.

The ‘Plastic Soup’ workshop formed part of the PhD By Design conference at Goldsmiths, University of London (PhD By Design, 2015, pp. 48–49). The participants comprised six graduate students from across the UK – five from design research and one from political science. During the workshop, the participants engaged in cooking plastic soup whilst having waste-centric and environmental conversations.

The workshop explored the properties of the North Atlantic Gyre and, in particular, the Barents Sea Patch, the newly identified sixth gyre (Van Sebille and Froyland, 2012, pp. 1–6). While the Barents Sea Patch is accumulating and growing, it is still passive, which means that it has yet to start rotating – forming a gyre (see Section 3.5.1). As a result of its lack of visibility to the human eye (Steinberg and Peters, 2015, Section 3.5), I asked the group to visualise this passive oceanic gyre, which not only floats under the surface of the sea but is found at all depths. Recently, scientists have described and documented phenomena akin to ocean *smog* slowly settling on the sea floor (Eriksen et al., 2016, Section 3.5.1; Section 6.0, Fig. 6-33, *Visualising the North Atlantic Gyre Patch*).

I structured the fast-paced, one-hour workshop with activities in four phases. For the first introduction phase, see Section 8.2. The second phase started with preparing and chopping ingredients for a plastic soup while discussing the presence of micro-plastic particles and their propensity to release waterborne pollutants, thereby leading to the seawater becoming toxic – e.g., releasing Bisphenol A (BPA) and other toxins. Sadly, all the plastic materiality introduced by global production so far will ultimately end up being discarded, carrying the

toxic message of the anthropocentric era. The duration for the second phase of the workshop was thirty minutes (Fig. 8-68).

The second phase of the plastic soup workshop involved a short follow-up on the introduction (see Appendices, Fig. 11-88) to micro-particles, revealing that six major garbage patches have emerged – one in each of the five sub-tropical basins and one patch not previously identified in the Barents Sea. This conversation continued while chopping and cutting single-use plastics I had washed and supplied for the event (Fig. 8-68), mimicking mechanical plastics degradation (Eriksen et al., 2016).

Fig. 8-68. Chopping Ingredients for Plastic Soup. PhD By Design, 2015. Goldsmiths, University of London.

We filled a large plastic tank with lukewarm salted water to simulate the sea environment. I had brought a selection of plastic waste, so we added used food packaging, plastic bags, balloons, net, rope and plastic animals' toys to the water.

We chopped, confetti punched and cut the plastic into small pieces, and all were added to the water to simulate the three processes of degradation at play in the oceans: 1) mechanical, 2) chemical, and 3) biological (Eriksen et al., 2016, Section 1.1; see Section 3.5.1). The chopping and punching sped up the degradation and fragmentation of the plastic, which happens over time in the gyres (Fig. 8-68).

Fig. 8-69. Plastic Soup Making. PhD By Design, 2015. Left: rotation. Right: flotsam and aggregation. Goldsmiths, University of London.

Next, one of the participants stirred the plastic soup mix with her hand to mimic both vertical and horizontal oceanic currents. Almost instantly, the whole lot became entangled. In the salty water, the entanglement of plastic things emphasised the ‘human foldedness’ (Nuttall, 2009), which meant that

it was now difficult to break the individual plastic elements free. It made us think of a sea turtle caught in a fishing net (Fig. 8-69, left).

Mimicking the second chemical phase (Eriksen et al., 2016), we found the colours and the rotational movement of the plastic soup to be beautiful and lethal (Farrelly and Shaw 2017, Section 3.5.1). The hand-induced current stimulated the rapid drop of the plastic to the bottom of the tank. Sedimentation is the ultimate fate for plastic lost at sea (Eriksen et al., 2016, Section 3.2). The rotation also created a cloud of buoyant plastics gathered under the water's surface. The plastic tank 'Designtransposal' workshop improvisation reflected aspects of the dynamics within the gyre and confirmed some scientific facts, such as plastics aggregation, the effect of flotsam and the fast vertical sedimentation and biological entanglement in the oceans (Fig. 8-69, left).

While cutting, chopping and mixing plastics for the marine soup, the plastic pollution and toxic leach from plastic conversation led to a discussion of the difficulty for individuals in the UK in shopping for daily food not wrapped in plastic. From the sea of choices given overall, 'I/We' concluded that 'there is almost no choice for plastic-free products in a UK shopping aisle' (Dimitrijevic, 2019a, pp. 119–120). The transcript segments show selected highlights of the recorded group conversation I captured in Table 6, located in Section 8.3. The complete third workshop conversation transcript is found in the appendices, Section 11.4, Table 8.

The fourth phase engaged in reflective five-level questionnaire mapping, in the same way, described for the third phase of the Falmouth University workshop (see Fig. 8-64, *Designtransposal Workshop: Five-level Questionnaire*): see Section 8.2.2 for more details. The conversation ended with a lacklustre tone, reflecting upon the decline of the marine habitat. To borrow the words of a stakeholder, she likes to follow environmental news that makes her so anxious that 'it feels like the end of the world'.

The 'Plastic Soup' workshop found that small plastic particles aggregated together. These clustered plastics create an instant habitat for microbial colonies, such as phytoplankton, the staple diet for lanternfish. Dominating the biomass in our oceans, the small lanternfish (under 150 millimetres long) provide an essential food source for many large predators, such as dolphins, seals and tuna. For more details, see Part One, Chapter Three, Sections 3.4.2–3.5.2.

Section 8.3 records conversations, and highlights, juxtaposes and maps the 'critical dialogue' (Vygotsky, 1978) findings of all three HE 'Designtransposal' workshops.

8.3 Designtransposal Workshops Mapping Dialogue

> ‘If language is ancient as consciousness itself, if language is consciousness that exists in practice for other people, and therefore for myself, then it is not only the development of thought but the development of consciousness as a whole that is connected with the development of the world.’
>
> — Lev Semenovich Vygotsky, 1978, p. 285.

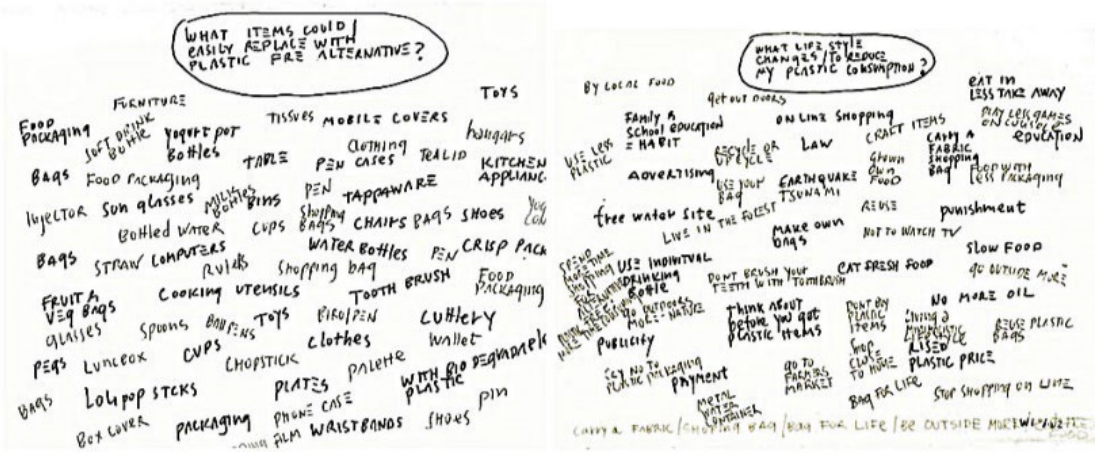


Fig. 8-70. Designtransposal Workshop Mapping Dialogue. Dimitrijevic, 2020. Left: *Stakeholders Responses to Questions One and Two.* Right: *Responses to Questions Three to Five.* Sustainable Product Design department, Falmouth University, Penryn campus, UK.

Section 8.4 serves as the discussion section. Pedagogically, the experiential teaching and thinking in the discussion were designed not to provide a definitive set of answers but instead to present a complex background and facilitate a critical dialogue. Vygotsky (1978) states that the importance of cultural and social context for ‘effective learning is inherently a social activity and that we

learn best from a social and experiential construction of knowledge' (Vygotsky, 1978, cited in Fry et al., 2009, p. 94). Table 6 highlights segments of the conversational transcript, which took place during the third workshop: see Section 8.2.3. The full transcript, Table 8, sits in the Addendum, Section 11.4. (See seven participants' legends**:** Katarina Dimitrijevic (KD), Designtransposal Workshop facilitator and participant; Participant 1 (P1); Participant 2 (P2); Participant 3 (P3); Participant 4 (P4); Participant 5 (P5); and Participant 6 (P6). Note that P5 was second design sessional tutor and a participant in my creative residency workshops at UCA.)

Following Table 6, I make an introductory statement as follows: 'fish like plastic too' (see Fig. 8-71 and Fig. 8-73). The workshop empirically affirmed that plastic sinks fast below the surface and biotic entanglement is inevitable ('look, it's all entangled, like the sea turtle'). I observed that, with the exception of KD and P5, nobody was willing to dip their hands in the water. Introducing discussion about toxicity and endocrine disruption (see Table 8) made participants uneasy.

P2 posits valid questions concerning building my 'vocabulary compendium and visualisations' as applied methods in my PhD. The third workshop empirically affirmed flotsam, sedimentation and entanglement but most notably developed a participatory visual representation of plastic pollution as an outcome (see Fig. 8-69 and Fig. 8-68). P2 nicknamed my 'plastic things' as 'curated trash' and affirmed plastic waste's inherent designed beauty.

Participants	Segment transcript of the recorded workshop three conversations 1-4.
KD	Asking all participants to endorse recording of the part of the workshop session. Conversation covers materials distribution like scissors and chopping boards to cut single-use plastics to make small particles. Followed by the lanternfish bioluminescence properties and their vertical migration towards the surface. I am describing how colourful plastic serves as the habitat for plankton. Lanternfish eat plankton and graze on small plastic particles; thus, I make the statement 'fish likes plastic too'. P1–P4 Chopping and cutting sound in the background. See Table 8. Page 1.
P5	Started mixing the soup with hand, the sound of water swirls in the background. Look, it is all entangled, like the sea turtle in the net! See Table 8. Page 2 Look how all is sunk at the bottom. Only some plastics are floating at the top! see Table 8. Page 4.
KD	And this is all in the box. While in the ocean, it is all horizontally and vertically constantly moving and changes in the organisation of the space. Look how it creates patterns and clusters together. You can see the same on the beaches. See Table 8. Page 1. You can touch the water. It is all super clean. Observation Besides KD and P5, nobody wants to feel the plastics in the water. But what are your thoughts on all of this? I worry about endocrine diseases; it freaks me out completely! See Table 8. Page 2.
P2	Beauty lies in these objects—picking parts from the bag. Do kids make these? This is your previous staff made from yoghurt bottles? Are you going to use some of these words for your PhD – as the method? Also, using visuals and images too. See Table 8. Page 3.
KD	A very interesting PhD question. I started mapping UCA and Falmouth workshops questionnaire responses. I am still trying to digest it all. There is a lot of focus on things like using less bags and less bottles, not on the action and systemic changes. Now I am questioning how do we feel about all these things. But we still need to do the questionnaire, so let's see how emotional we are at the end. Visualisation and images are critical methods in my PhD. P1–P6 Chopping, punching, and cutting sounds in the background. See Table 8. Page 3.
P4	To sort all these will require significant lifestyle changes. See Table 8. Page 4.
KD	Shopping, for example. Even if you shop organic, it is wrapped in a plastic packet. Plus, it is extra expensive. See Table 8. Page 4.
P4	I buy all my fruit and veggies from the Turkish street vendors in London. They don't use so much plastic, and they are cheaper. However, the produce might come in big plastic boxes for transport. You think you know, and you have a choice, but you don't have a choice. See Table 8. Page 4.
KD	Of course, produce comes in large plastic boxes. And we don't have a choice. Having no choice, this is the point when I get angry. You feel powerless that you cannot change staff. However, you can but on a small level. With reuse, it's tricky not to hoard things.
P1	It is good to reuse. Like takeaway, you can wash the boxes and reuse them as Tupperware. See Table 8. Page 4.
KD	It is good, but you might end up having more than you need. See Table 8. Page 4.
P5	Or take old boxes to take away to be refiled—exchange things. See Table 8. Page 4.
P4	Once I went to the supermarket and bought all kinds of things when I got to the till I paid but started taking all the plastic off as I did not want them. Like

	in Germany, when you could get rid of the packaging and throw it on the floor. It was the shops' responsibility. Why do you need an aubergine in plastic? I found since I had children that I consume more and wash much more. See Table 8. Page 4.
KD & P1-P6	Taking photos of the plastic soup installation and closing activity.

Table 6. HE Designtransposal workshop three segment transcript 1–4.

During questionnaire mapping, conversations continued, turning towards shopping, plastic packaging and food transportation and the notion of no choice besides plastic choice (Table 6). Although this event was part of a larger event, I had no opportunity to receive feedback as in the pilot workshop (Section 8.2.1). However, I stayed in touch with two participants (P2 and P5) over subsequent years and received plenty of informal feedback, mostly revolving around design activism with waste and visualisations of pollution.

I now unpack the second workshop questionnaire (Fig. 8-70, Section 8.2.2). To reiterate (see Fig. 8-64, Section 8.2.2), the first question asked was: What items could I easily replace with plastic-free alternatives? This was followed by question two, which asked: Which items are essential and seem to have no plastic-free alternative? After mapping and contrasting the Falmouth students' responses to questions one and two (see Fig. 8-70), it was clear that the group flowed with ease, suggesting replacements and plastic-free alternatives and indicating preference for biodegradable plastic alternatives derived from renewable agricultural sources such as corn and sugar cane. At the university workshops for rapid prototyping, the students favoured using polylactide (PLA), a thermoplastic polymer, which is a renewable thermoplastic and a polymer. PLA

is processed from the starch of plants such as corn, sugar cane and sugar beet, making it an environmentally friendly and sustainable material.

The conversation steered towards question three, which asked: What items would I be willing to give up if a plastic-free alternative doesn't exist? Enthusiasm was rising and a few students were willing to sacrifice their computers and furniture as items with no plastic-free options. The first three levels were, as expected, over-populated with plastic items and things: e.g., single-use food packaging, shopping bags, cups, bottles, straws, chopsticks, pens, bins, cooking utensils, glasses, clothing and shoes (see Fig. 8-70, left).

The fourth question was: What lifestyle change/s might be necessary to reduce my plastic consumption? The responses to the fourth question ignited individual concerns regarding habitual food consumption services and shopping patterns, read in dictum from the individual suggestions text (Fig. 8-70, right). These included buying locally from farmers' markets, eating self-prepared meals, fresh food, less takeaway food, fresh food for cats and reduced levels of online shopping, as well as calls for free public water points, a reduction in plastic food and beverage packaging and more DIY craft items, such as home-made clothing and grocery bags. Conclusively, all diverged towards recycling, upcycling services and reuse strategies. The final question asked was: What other conclusions can I/We draw, if any?

The first three questions, once mapped, revealed the group's tendency to focus on things, although I designed questions four and five to guide the group towards questioning consumption patterns, services and systems. Some participants

suggested radical changes to school education, publicity and advertising, demanding slow food, new laws and attentive environmental punishment.

Global scenarios of dystopian futures also emerged, incorporating, for example, oil shortages, earthquakes and tsunamis. In a nod to unsettled relationships with nature, a minority of the students in the group expressed a need to spend more time outdoors, live in the forest and grow their food (see Fig. 8-70, right).

The PhD By Design 2015 postgraduate conference workshop conversations revolved around shopping patterns and financial, spatial and regulatory restrictions for the individual to 'break free' from plastic packaging consumption (see Tables 6 and 8). 'The 'Plastic Soup' workshop also opened a space to acknowledge the potential of latent emotional sensitivity to non-human species living in the ocean. The group dialogue acknowledged that, paradoxically, 'if the lanternfish is ingesting plastic, so are we' (Dimitrijevic., 2019a). Conclusively, I argue that 'I/We' are all plasticised by food ingestion (aquatic life and humans), water consumption and air inhalation (humans and 'non-human others'). I aesthetically develop more of these concepts in Chapter Nine.

Fig. 8-71. **Visual Transcript Bricolage, 2016**. Mapping process overview for three Designtransposal workshops – Visualising Through the North Atlantic Gyre. Top: Falmouth white pages. Middle: PhD By Design green notes. Bottom: London pilot pink notes. See Fig. 8-70 and 8-73 for more details.

The participatory engagement of ‘Designtransposal’ brought critical dialogue to the table, mapping stakeholders’ disruptive and innovative suggestions that were on a par with slower consumption critiques (Cooper, 2008, pp. 51–76). Figure 8-71 shows the design tool of individual practice (showing the mapping process) with insights into consumer behaviour (Piscicelli et al., 2014, pp. 1–15). The design field has applied these models to propose a range of methods and tools to trigger behavioural change, as an emerging research area known as ‘design for behaviour change’ (Bhamra and Tang., 2011, pp. 427–445), discussed in Section 3.1 – ‘Green Design Evolution’.

The Organisation for Economic Co-operation and Development (OECD, 2008) highlights that consumers are vital in driving sustainable production and playing a central role in sustainable development. The trend towards considering the social dimensions of sustainable consumption has led to greater attention on how products are produced. Taxes and charges, subsidies and incentives, communications campaigns, education, corporate reporting and public procurement are all listed as good practices (OECD, 2008, pp. 1–44).

Design for behaviour change concerns how design can shape or influence human behaviour and prompt sustainable innovation (Niedderer et al., 2016, pp. 91–106). My blue design series calls for consideration of ‘consumer rights’ for all on the planet, including marine species that ingest micro-plastics or are entangled in them: see Chapter Nine for more.

The findings of Part Three’s Chapter Eight ‘Designedisposal’ workshops are supported by the ‘Literature and Field Review’ of Part One. I apply participatory mappings and synergise dystopian elements for the experiential cli-fi narrative ‘2050 Scenario’, visually unpacked in Section 8.4.

8.4 2050 Scenario

‘Designed for disposal

The question to address in the future is whether or not these newly designed, socially sustainable realities are remedying only one aspect, neglecting the overall environmental impact. Within the design process, the opposing issue emerged: Is this just another… trend and are we all about to globally realize its unsustainably disappointing end?’

— Katarina Dimitrijevic, 2010, p. 8.

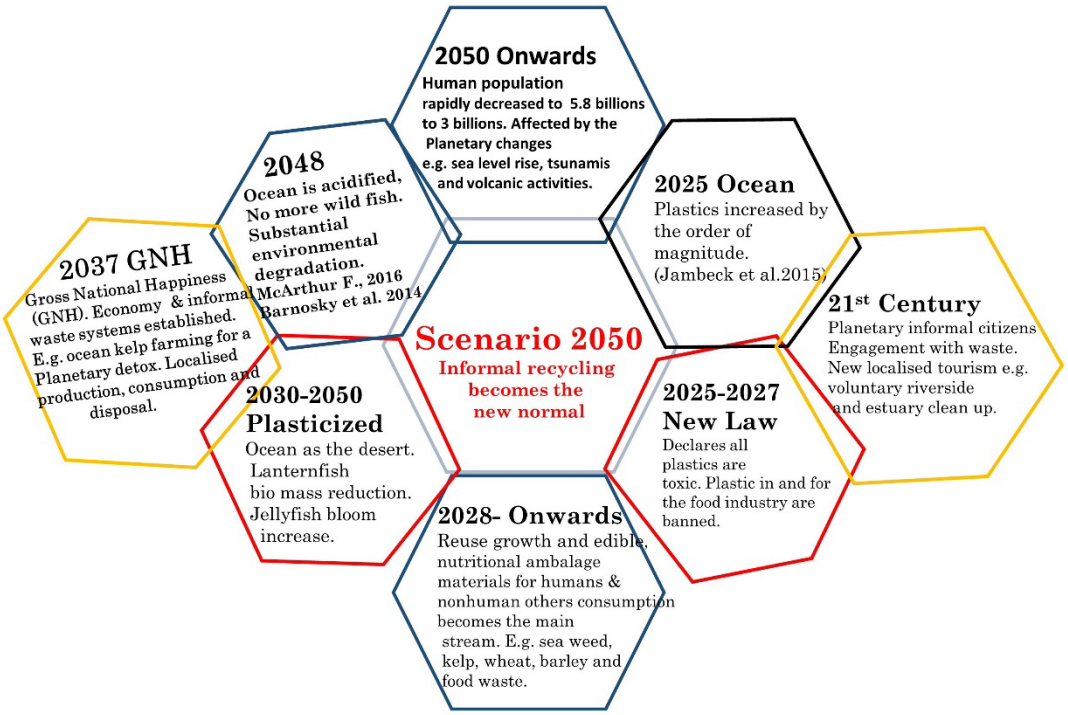


Fig. 8-72. Unpacked ‘2050 Scenario’ Diagram. *Informal becomes the new normal.*

I want to open a debate on systemic change requirements and necessary support from all waste management levels (see Section 3.8). The question must be asked whether 'I/We' can embrace the fact that plastic pollution cannot be resolved from an individual or consumer perspective alone or by recycling or cleaning technology. As a design researcher, I investigate – through the speculative processes of promoting oceanic landfill awareness and design activism and thinking – relating and interacting with plastic materiality (Chapter Four). I posited the '2050 Scenario' at complex environmental, social, cultural and political waste levels. I unpack my own DIY practice-led and DIWO practice-based reflective examinations, synergised with the three 'Designtransposal' workshop participatory dialogues and questionnaire responses that I mapped in Section 8.3.

As an interpretative cli-fi metaphor, I visually postulate the '2050 Scenario' diagram (Fig. 8-72), foretelling what will probably happen by 2050: the near 'possible future'. This is demonstrated in Chapter Three 'Literature and Field Review' and the experiential gatherings set out in Chapter Eight. This is the 'positive waste' (Kennedy, 2008) narrative funnelling design for behaviour change into an 'experiential scenario' (Candy, 2010; Section 6.5). I predict (Mazé, 2016) growth of the informal waste management sector as the new social normality combined with Burns' (2011) Gross National Happiness (GNH) growth as the 'tip of the iceberg' (Candy, 2010) in this story. I announce a growing 'informality [with] non-state regulated forms of social, economic and cultural action' (Jenkins, 2006, p. 86). Jenkins (2006) explains that informality pervades our lives in many ways but is more symbolic in higher-income countries where states are usually strong

and state activity penetrates social and economic life more profoundly (Ibid.): see Sections 3.6–3.8 for the ‘business as usual scenario’.

The *Unpacked Scenario 2050 Diagram* (Fig. 8-72 – Legend: (centre), *Informal recycling becomes the new normal*) identifies the near future using single-use packaging as the leading actor. The story starts with *2025 Ocean*: ‘Plastics increased by order of magnitude’ (Jambeck et al., 2015). (See Section 3.5 – ‘The Plastic Ocean Pollution’, which explains that the ocean is the largest unregulated planetary landfill.)

Continuing clockwise around Fig. 8-72, we see that in the *Twenty-first Century*, planetary kinship and activism are on the rise, as is the scientific engagement of informal citizens with waste and pollution. Reducing transport becomes the primary trend by 2030, and the new standard is to take a ‘staycation’. Local is lekker (good) in Afrikaans. New and localised tourism is growing and is engaged in environmental community initiatives, such as voluntary riverside and estuary clean-ups as part of the near-home holiday package.

The *2025–2027 New Law* declares that all plastics are toxic. Plastics used in food manufacturing and for the food industry packaging are banned. Extended Producer Responsibility (EPR) has become a critical new policy tool, and large manufacturing companies are held accountable for their environmental impact (i.e., ecocide) and solely responsible for their end-of-life plastic and bio-plastic products: see Section 3.4.1, ‘Plastic Packaging Growth’, for the ‘business-as-usual’ scenario and Section 3.2, ‘Design Research, Activism and Futures.’

In *2028–onwards*, re-use growth and edible nutritional packaging materials for humans and 'non-human others' consumption become mainstream. Single-use packaging is locally made from seaweed, kelp, algae, fish waste, wheat, barley and food production wastage.

In *2030–2050 Plasticised*, oceans become deserts. A radical reduction takes place in lanternfish numbers from the current 60% biomass to 30% biomass. As lanternfish is the staple diet for the majority of the fish catch, and the fishery industry is brought to a halt. As a result of acidification, sea anemone and jellyfish blooms increase throughout the year.

In *2037 GNH*, GNH (Burns, 2011, pp. 73–87) economy and informal WMSs are becoming the norm globally. A rise takes place in ocean kelp farming as part of a planetary detox initiative and nutritional single-use packaging materials are commonly used – rapid growth also takes place in localised production, consumption and disposal.

In *2048,* the ocean will be acidified, and there will be no wild fish. As a result, substantial environmental degradation takes place (MacArthur, 2016; Barnosky et al., 2014). The Adriatic Sea is too acidic for humans to swim in for leisure. For more, see Section 3.4.2 – 'We Made the Anthropocene'.

In *2050 Onwards*, the human population has rapidly decreased to 5.8 billion (with a further decline to 3 billion by 2100) because of a series of planetary domino effect changes: e.g., sea-level rises, tsunamis and volcanic activities (Section 8.3). Like the lanternfish species, the human population is becoming sterile because of the effects of plastics on the endocrine, gut and reproductive systems:

see Section 3.4 – 'Urban Expansion and Waste Production' for current human population growth data. Notably, unregulated human population expansion became the 'super-wicked problem,' with incongruous effects on the planet's ecosystems and the decline in diversity (see Section 3.3 – 'Design and the Humanities' Role in the Changing Climate').

I visualise a '2050 Scenario' (Fig. 8-72) not as a dystopian future but as a near future that resiliently bounces off planetary transformations through a radically reduced societal transposition towards planetary sustainment. A vision of community is guided by the positive psychology of GNH (Burns, 2011, pp. 73–87). Wellbeing replaces the current Gross Domestic Product (GDP) 'business-as-usual' normative. I re-imagine re-growth in localised manufacturing, food and informal waste sectors, particularly radical changes compared to recycling waste management services (inspired by my Chapter Seven experiences). I imagine a systematic central authority regulatory transposition that quickly supports and enacts new laws and degrees, implementing re-use strategies such as developing localised plant-based nutritional and edible packaging.

The '2050 Scenario' is jaded by dystopian scientific forecasts and data from Chapter Three's 'Literature and Field Review' and influenced by my mapped dialogues of the 'Designedisposal' workshop's stakeholders' conversations (see Fig. 8-73, *Fish Like Plastic Too*).

Fig. 8-73. **Fish Like Plastic Too.** Designedisposal workshop stakeholders mapped dialogues.

Further, the praxical 'social imaginary' (Castoriadis, 1997; see also Section 5.3) combined with the 'relative lucidity' (Ibid.) state of mind brings my plausible construct to the forefront. After all, we all need to learn how to live with the side effects of macro-, micro- and nano-plastics for the next seven generations, as not even the utopian scenario of a 100% recycling rate can eradicate its embedded footprint in the water, earth and air.

I present here a final scenario note – in case the reader's mind finds this scenario hard to process, so too does your bacterial colony, which at this very time struggles to digest the nano-plastic particles in your gut. The Waste2Worth Team (2020) suggests taking a speculative pink pill called 'plasteeze' to help your gut

digest plastic smoothly (see Section 3.2, Fig. 3-12, *Plasticful Food*). Chapter Nine describes my (DIY) ocean plastic explorations that simulate the entanglement of aquatic ‘non-human others’ with plastic waste.

CHAPTER NINE: DESIGNTRANSPOSAL SEA PET

9.0 Blue Vignette, Climate Change Denial

‘Climate denial leaves us with big questions: How do we break through denial into awareness? How do we re-invigorate political and economic systems? How do we move forward in the face of enormous uncertainty?’

— Kari Marie Norgaard, 2011, p. 227.

Fig. 9-74. Plastic Material Actants. Angry plastic bags – past, present, future/s.

This section briefly introduces Chapter Nine's (DIY) 'Designtransposal: Sea PET' projects and closely looks at climate denial. I return to the 'plastic things' dialogue, visually interpreting ocean pollution through material actants and affirming Barad's (2009) 'intra-action' power relations in nature (see Section 4.4). Figure 9-74 – *Plastic Material Actants* – visualises angry plastic bags posited in the past, present and future/s. I have chosen a plastic bag as the top representative item. I discovered from gathered second workshop stakeholders' responses to questions one and two (Section 8.3; Fig. 8-75, left *Designtransposal Workshop Mapping Dialogue*) that the projected group focused their anger on 'bags and plastic bags' following the UK's plastic bag ban, introduced in October 2015. In Fig. 9-74, three plastic bags represent urban plastic litter, and I visually narrate the past and present and leak the collective denial of toxic future/s (Fig. 9-74). To reiterate, in the main research question (Section 4.5), I invite eco-feminist thinking (Chapter Four) in dialogue with marine science (Chapter Three) and practice-based (Part Three) experiences to metaphorically re-imagine and visualise plastic ocean pollution. I pair 'intra-acting' suppressed human emotions with plastic things (see Fig. 9-74).

The left blue bag in Figure 9-74 describes a part of the implicative denial that led to the hegemony of single-use plastic. The middle green bag describes the present's double life and apathy. For example, the London pilot 'Designtransposal' workshop brought social 'apathy' towards waste recycling to the research table and prompted the praxis to critically and visually engage with the socio-emotional material pathos hidden in plastic things (see Section 8.2.1). The three 'Designtransposal' workshop experiences opened the door for latent

emotional outcomes – making the heap of denial that makes us collectively unresponsive to radical change (see Section 3.3: Levin et al., 2012, 'Hyperbolic Discounting'). Double lives and consumer apathy leave us abandoned and discarded like angry plastic bags, leading to anxious and fearful core reactions and possible toxic future/s (Fig. 8-74, red bag on the right).

Recalling the mapped questionnaire findings (Section 8.3) of the second Falmouth workshop (Section 8.2.2), the stakeholders directed their anger towards the plastic grocery bag instead of the global systems inducing the ongoing planetary 'ecocide' (Section 3.4). It is difficult to stream your emotional dissatisfaction towards a distant organisational paradigm *per se* when plastic things are close by. Governmental or individual denial of environmental atrocities and the suffering of 'non-human others' (such as the sea turtles in Section 8.2.3) can take the form of several logical assertions, including 'literal, interpretative, or implication' acts that justify events (Cohen, 2001, p. 99). Therefore, in Part Three, Chapter Eight, the three participatory workshops allocated a form of practised conscious group denial, which relates not to deception but to 'the deliberate choice not to expose ourselves to certain unpalatable information' (Ibid.). For example, I do this to emotionally survive my weekly shopping routine at the supermarket, where I have no choice but to shop for products wrapped in plastic single-use packaging (see Section 8.2.3). For a 'plausible future' alternative, see Section 8.4 – 'Scenario 2050'.

My note for environmental activists and readers who feel angry or uneasy and feel that they are not in denial regarding long-term climate change is to feel or think twice and re-trace your pollution contributions in everyday consumption,

powering an avalanche of planetary evolution (see Sections 3.3–3.4.2). Cohen's (2001) psychoanalytic theory explains the cognitive state of human denial, vetoed by the unconscious psyche: 'The psyche blocks off information that is literally unthinkable or unbearable. The unconscious sets up a barrier which prevents the thought from reaching conscious knowledge' (Cohen, 2001, p. 5). I call this the survival protection trigger: we are all bound by the 'intra-active' system of the human body and mind.

'Those who believe in their own organic integrity are all too human for the future [to come]' (Plant, 1997, p. 205, cited in Hird, 2009, p. 91). Acknowledging human vulnerability, I recognise the biological power and emotional awareness that steers my mind's decisions (Sections 4.3–4.4). Thus, I fear that my thirteen-year-old son will be part of the last carefree generation to experience swimming in the sea and eating food from the ocean while living and breathing under cumulus clouds and blue skies (see Section 8.4 – 'Scenario 2050').

The blue series in Chapter Nine's Sea PET projects closes with the second 'experiential scenario' (Candy, 2010; Section 6.5), set in the twenty-second century. Section 9.4, on 'Scenario 2150', deals with' wild card' (Fig. 6-38) cli-fi narrative 'Hothouse Earth' (Steffen et al., 2018; Section 3.4). The background to cli-fi takes on a scientific vision of Earth's cyclical process, with potential to take us back to the Permian period's past, described by Ward (2007) as the 'mother of all extinctions'. Thus, in the 'possible future' to come, we live under a murky green sky, and, in a temporary absence of my self-denial, 'I' can say that 'We' are presently greening our future atmosphere. The following sections give a visual overview of Chapter Nine's projects.

9.1 Visual Overview of DIY Sea PET Projects

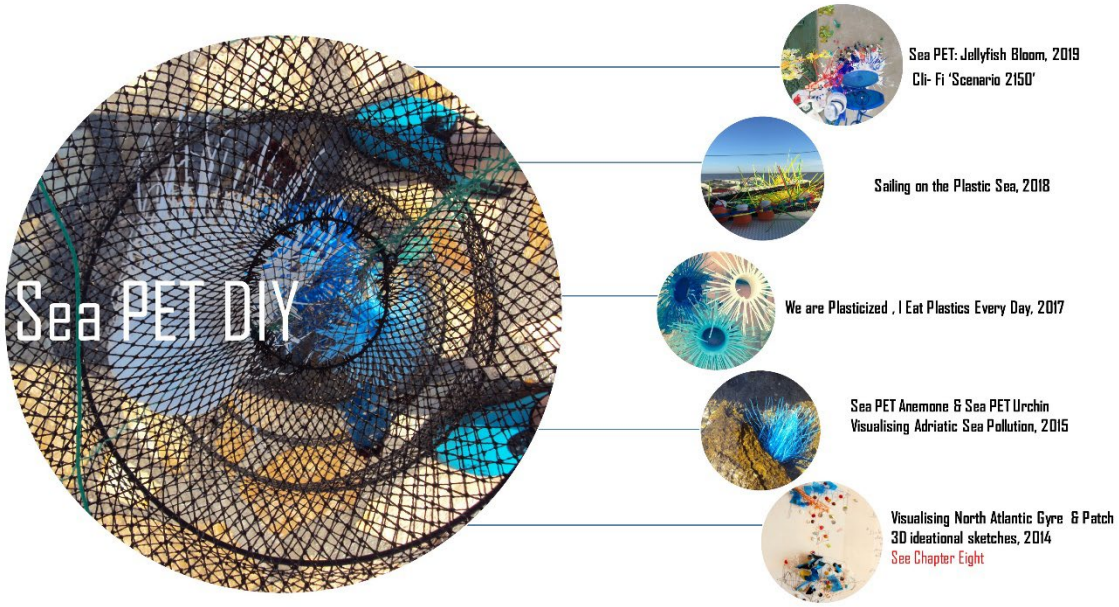


Fig. 9-75. Sea PET DIY Projects 2014–2019. Blue design series diagram.

Figure 9-75, *Sea PET DIY Projects 2014–2019*, visually unpacks my praxical 'blue design series' (left bubble) and *Do-It-Yourself* catch of the day projects (right bubbles, which are chronologically read from bottom to top). The *Visualising North Atlantic Gyre & Patch 2014* bubble was inspired by Yeats' (1921) 'A Vision' (Section 8.0). This is my starting point for conceptualising pollution through the three-dimensional sketches that I used as visual aids to ignite opening conversations for the HE Designedisposal workshops: see Section 8.2, 'Three

DIWO Designtransposal Workshops', and sub-sections 8.2.1 to 8.2.3 to unpack each workshop engagement.

The next bubble represents the *Sea PET Anemone & Sea PET Urchin 2015*, which used a visual 'Designtransposal' strategy to approach and 'gaze in' to the Adriatic Sea. In Section 9.2, 'Adriatic Sea PET', I work with PET plastic yoghurt bottles, animated through an oceanic land art series. During the summer of 2015, I started making the 'Sea PET' project, which represents conceptual eco-feminist 'bio-centred egalitarianism' (Braidotti, 2006). My 'Sea PET 2015' early works helped me to develop dialogue (see the next bubble, which represents Section 9.2.3, 'We are Plasticised – I Eat Plastics Every Day'), supporting my holistic argument that 'I/We' are all plasticised (see Fig. 9-80, *Plasticised 2017*).

The following two ascending bubbles, *Sailing on the Plastic Sea 2018* and *Sea PET Jellyfish Bloom 2019*, are unpacked in Section 9.3 through environmental art and design action research and a sailing expedition connecting me to two participatory exhibitions in London. Chapter Nine's poetic 'gaze in', combined with marine scientific projections, supports Section 9.4's closing 'experiential scenario' and vision, 'Scenario 2150', narrating my plasticised argument and visually equating mismanaged landfill 'plastic things' with living landfill voices (Section 9.4).

The DIY 'Designtransposal' blue design series explores the conceptual aim of this PhD to create multi-disciplinary perspectives (see Table 2) by practice. In the 'Sea PET' series, I use the full spectrum of approaches discussed in Section 6.0,

‘Reflective Bricoleur’, applying ‘positive waste’ aesthetics (Section 6.2) and conceptual vocabulary (Sections 2.1 and 6.1).

Chapter Nine re-represents and re-vocalises the voice of mismanaged plastics in nature and our bodies. I address the main research question (Section 4.5) through a series of DIY hands-on learning methods for spatial representations design and art merged projects (Section 3.3) for visualising plastic ocean pollution. Returning to Section 4.3, ‘Transposing Nature’, and Section 4.4, ‘Material Actants’, I stand and advocate for my third PhD objective (Table 2), creating attuned ‘theoretical micro-ontologies’ (Fig. 4-26; Section 4.4), as well as emphatic being and becoming with ’more than human worlds’ (Puig de la Bellacasa, 2017).

I welcome you to the Sea PET urchin and Sea PET anemone worldhood (see Section 5.1, ‘Paradigm of Praxis’, and Section 6.3, ‘A Lanternfish Gaze In’) in the following section.

9.2 Adriatic Sea PET

> ‘Plastic is wholly swallowed up in the fact of being used: ultimately, objects will be invented for the sole pleasure of using them. The hierarchy of substances is abolished: a single one replaces them all: the whole world can be plasticized, and even life itself…’
>
> — Roland Barthes, 1957, p. 99.

Fig. 9-76. Sea PET 2015. Catch of the day, Adriatic Sea.

I developed the Adriatic Sea PET project through my solitary DIY visualisations, which allowed me to express my political stand through environmental art and craft experimentations (Sections 6.5.1 and 6.5.2). Alongside my HE participatory engagements (Chapters Seven and Eight), I explore oceanic plastic waste alchemy through art and design practice (Fig. 9-76, *Sea PET 2015*).

I reiterate that, in perceiving the ocean as the largest mismanaged landfill, my visual metaphor poetically interprets plastic packaging's raw self-transposition as the 'plastisphere' (see Section 3.5.2). From a perspective of designing wet waste ontologies (see Section 1.5), the act of 'gazing in' integrates the conceptual and metaphysical essence of 'molecular collectiveness' (Deleuze and Guattari, 1987), re-defining my worldview (see Section 6.3).

As a petroleum-based society, we have created a space for a new hybrid environment (Section 3.4.1). The plastic materiality introduced so far by expanding global production will be discarded, carrying a toxic message into future epochs (Section 3.4.2). As I look upon the oceans into the plastisphere, a new paradigm of materiality opens up (Section 3.5.2). Trying to visualise the gyre patch from the perspective of a lanternfish helps me, as a human (designer), to make a leap, emotionally and cognitively, from my usual position on land, into a much more dynamic and unfamiliar blue space (Section 3.3).

As a human being, in visualising plastic pollution from the perspective of a sea anemone and sea urchin sensory, it becomes possible to accept that ocean animals have a right to their planetary habitat – the 71% water world. At the fringe, the 'thirdspace' (Soja, 1996), nature's materiality and aquatic stakeholders are represented on the main stage with plastic yoghurt bottles in the Sea PET project (Fig. 9-77 to Fig. 9-78).

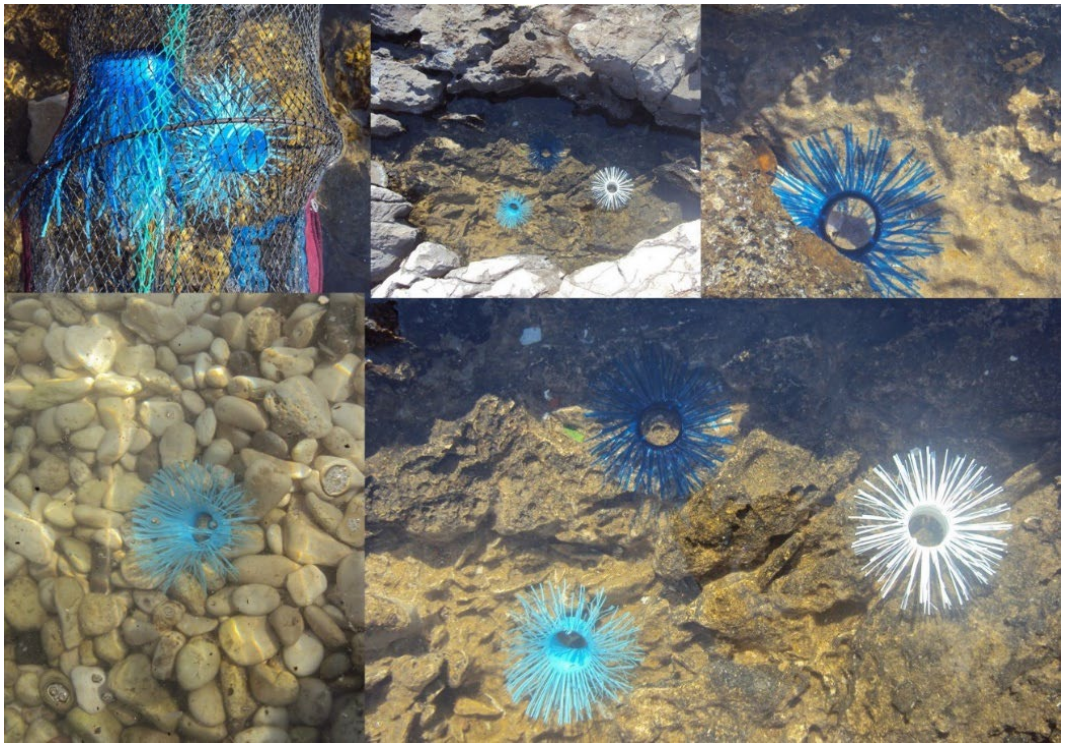


Fig. 9-77. Sea PET Urchin. Adriatic Sea.

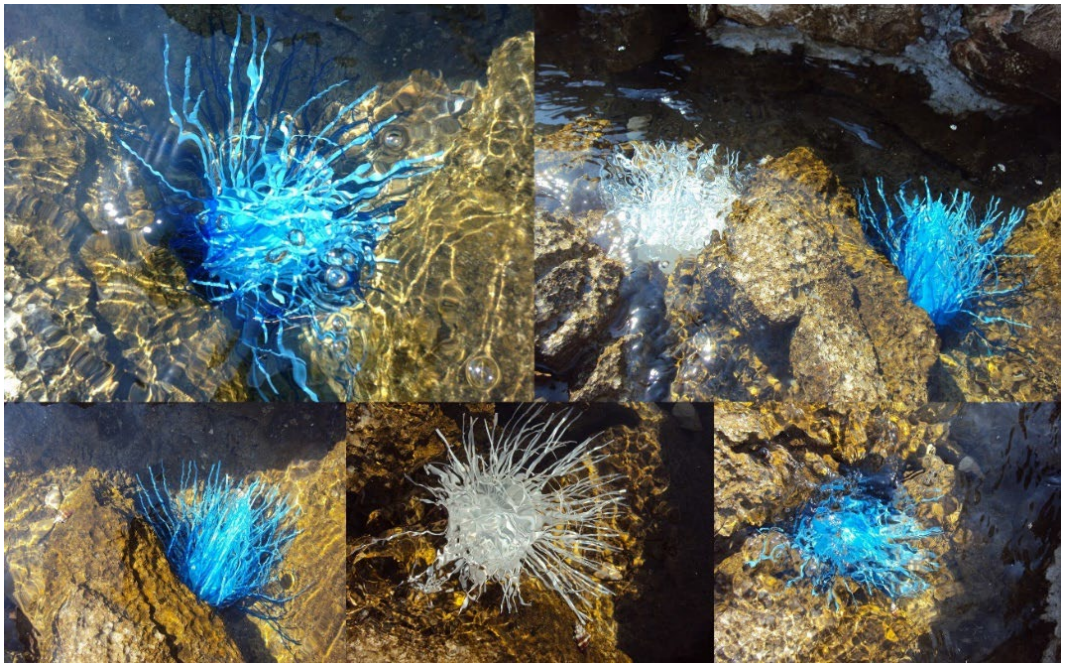


Fig. 9-78. Sea PET Anemone. Adriatic Sea.

I performed the Sea PET land art installation (Fig. 9-79) at the Adriatic Sea. The photographic triptych opens the blue design narrative with agglutinated blue bottle tops onto a rock on a beach on a small island, Jerolim, adjoining the island of Hvar in Dalmatia (see Fig. 9-79, left, *Plastiglomarate*).

Unknown to tourists, the secret clean-up of this pristine-looking beach starts two to three months before the tourist season begins as a result of the winter debris brought by the current, which is exponentially growing in volume every year: 'The Mediterranean Sea, including the Adriatic Sea, has been described as one of the area's most globally affected by marine litter, wherein quantities of marine litter, including micro-litter, are one of the highest in the world' (Palatinus et al., 2018, Introduction).

I represent the experiences of marine 'non-human others' through locally available PET yoghurt bottles (PET is a tough thermoplastic resin used mainly in manufacturing plastic containers). The Sea PET 'new materially' highlights the muted oceanic voices of the Sea PET urchin and Sea PET anemone species (Fig. 9-77 to Fig. 9-78). For example, in examining the vital role of the sea urchin in the aquatic 'blue economy,' I created a hybrid (Fig. 9-79, middle, *If I Am Sea Urchin*) 'advocating the re-assembling of the human and more-than-human in marine space' (Bear, 2017, p. 28). I connect my human relationship with nature, and as I perform on a site-specific basis, I hear the voices of oceanic worldhood through the waves and see the motion mobilising my blue and white plastic yoghurt bottles.

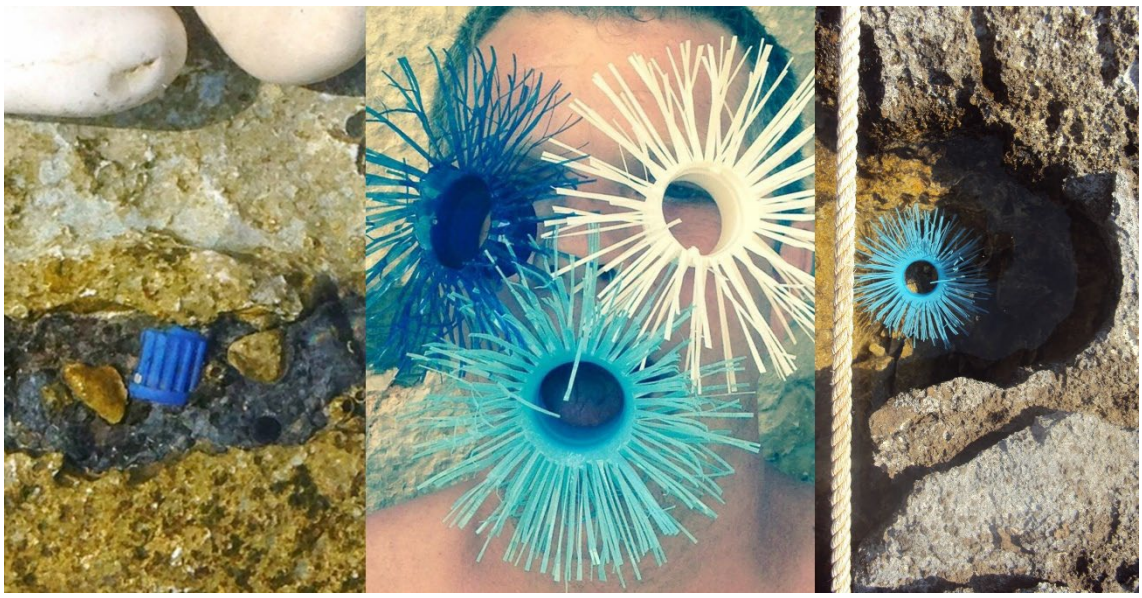


Fig. 9-79. Sea PET, Photo bricolage: (left) *Plastiglomarate*, (middle) *If I Am Sea Urchin* and (right) *Sea PET Urchin*.

The science article ‘Surprise! Your Cousin’s a Sea Urchin’ by Bryner (2006) informs us that human and sea urchin species are genetically related. The Sea Urchin Genome Sequencing Project (SUGSP) Consortium – led by the Human Genome Sequencing Center at Baylor College of Medicine (BCM-HGSC) in Houston – sequenced the genome of a male California purple sea urchin: ‘Unravelling the sea urchin genome has yielded striking similarities and surprising differences between sea urchins and humans’ (Ibid.).

Following the great extinction of animals 250 million years ago, modern sea urchins emerged as the dominant echinoderms (Greek for spiny skin) species – so we both share spines. The sea urchin has genes for sensory proteins that are also involved in vision and hearing in man. Whilst the sea urchin has no eyes or ears, science further informs us that the eyeless urchins ‘see’ in low resolution

with their spines. Additionally, marine scientists have discovered an important and overlooked role that sea urchins play in maintaining the health of the fast-growing kelp forest ecosystem (Tasoff, 2019).

The Sea PET urchin (Fig. 9-77 and Fig. 9-79) reminds me of the holistic unity of all life on Earth (see, in particular, Section 5.1, 'Paradigm of Praxis', and Fig. 5-29, *My Praxis Paradigm:* Mapping Holon Notion of Parthood vs Whole). Metacognitively, the Sea PET project opened up the praxis to acknowledge the potential of latent emotional sensitivity to discarded 'plastic things' and the importance of prioritising the presence of all nature in my designing processes (Section 3.2).

Oceanic plastic pollution is inducing an inevitable decline in biological diversity. Thus, I embrace the transposedness of the 'plastic thing' into the 'non-human other', which is a part of the whole and entangled in the complexity of everyday living and swimming with plastics. I reveal this planetary foldedness with plastics: 'despite having names of Greek Shepherds (…Polyethylene), plastic … is, in essence, the stuff of alchemy' (Barthes, 1957, p. 97).

Thus, if I were a Sea PET anemone (Fig. 9-78), you could not hear me shouting, 'stop destroying my habitat'. If I were a Sea PET urchin (Fig. 9-79), I would not see the difference between what is artificial and what is not, but the Sea PET urchin could sense it (Fig. 4-26) – speculatively experiencing 'vibrant materialism' and the taste of plastic. *If I am, Sea Urchin* whispers that lanternfish love eating plastics too! (see Fig. 8-73, Chapter Eight).

9.2.1 We are Plasticised – I Eat Plastics Every Day

> ‘Denial is understood as an unconscious defense mechanism for coping with guilt, anxiety and other disturbing emotions aroused by reality.’
>
> — Stanley Cohen, 2001, p. 5.

Fig. 9-80. I/We Eat Plastics 2017. Blue design series photo diptych.

This sub-section sets out my Sea PET discussion and reflective findings. The Adriatic Sea PET material speculation supports my observations and later

scientific findings that 'I/We' eat and breathe plastics every day, which is why I state that nature is plasticised (Fig. 9-80). While empathising with other species, I cannot escape shopping for single-use plastic packaging in UK supermarkets (Tables 6 and 8). It also appears that lanternfish cannot avoid grazing upon plastics particles either (Section 8.2.3). Both species are therefore involved with plastics. Human food is wrapped in plastic packages, and microscopic marine colonies live on discarded plastic particles. I ask whether wet living landfill teaches humans a lesson in circularity and reuse, revealing how discarded plastic materiality became a living habitat, offering multi-species engagement.

I summarised and presented my 'dark ecologies' plasticised explorations at the *Lives and Afterlives of Plastic* carbon-free online conference organised by Massey University Political Ecology Research Centre in 2017. The 'Plasticized' (Dimitrijevic, 2017) audio-visual content of the Sea PET project was narrated by my – at the time broken – female voice, mimicking the polluted context of the marine underworld space and the toxicity of displaced plastics, emphasising nature's interconnectedness and the inherent beauty in all plastic things.

My blue design series and activism do not posit slogans for 'saving the earth' or 'saving our oceans' but ask for environmental awareness and reduction (at its production source), reducing the oceanic landfill footprint impact of plastic pollution on Earth's 'homegrown oceans' (Dorminey, 2010), which never have and never will belong to us. As a mother, I would love to see my family's legacy extended to save ourselves. The 'blue design series' alerts us that human perceptions and values regarding planetary stakeholders need to change

radically: politically, ethically and biologically if 'I/We' are to survive as a species that only occupies the surface landmass on this predominantly oceanic planet.

Oceanic plastic pollution represents waste in the wrong place. It is hidden from human eyes and announces an environmental disorder that awakens a horrible feeling. MPW (Lebreton and Andrady, 2019) entering the waterways recalls Douglas' (1966) old definition of plastics in nature as 'a matter out of place' (Sections 3.6–3.8). Marine science urges us to consider the significant environmental impact of these single-use plastics on the marine system, critically bringing to the fore the politically polarised question of whether it is a good idea to use waste that lasts forever, regardless of whether it is adequately recycled. Mature WMSs are modern sectors that have fallen behind with climate change policies. Recycling is an extension of the political tradition of hiding and forgetting about waste – 'out of sight, out of mind' (Mauch, 2016) – to prevent the disadvantages of the current economic model.

Through visualising the North Atlantic Gyre Patch (see Section 8.2 – 'Three DIWO Designtransposal Workshops'), I encountered stakeholders' apathy and denial as latent emotions. Norgaard's 2011 book, *Living in Denial*, identifies that 'social norms exert pressure [and] complying with them serves as a tool or tactic for emotional management' (Ibid., p. 123). In order to engage with collective apathy and break through climate change denial, I devised the 'Designtransposal' strategy. 'Designtransposal' is a visual aid that helps me transpose my environmental fears and release eco-anxiety. 'Designtransposal' is a sustainable learning workshop that brings creative, visual, narrative-based imaginations with 'plastic things' whilst visualising plastic pollution (Fig. 8-80, right).

The solitary ‘Sea PET’ project explored the oceanic waste present and future, imagining future scenarios with aquatic ‘plastic things’. I began the ‘wet ontology’ (Steinberg and Pieters, 2015) story by imagining a gyre patch, following the lanternfish’s vertical migration, encountering the immortal sea urchin and exploring the stationary beauty of the sea-bed-based sea anemone in Part Three. Here, concluding this section and announcing a hybrid narrative with the uncomfortable symbiotic agglutination of the human-plastic-urchin species imaginary. In awe, I acknowledge my daily nano-plastics consumption (see Fig. 9-80, *I/We Eat Plastics*).

This thus feels like a personal and collective wake-up from climate change denial (Section 9.0), a call to raise a new Earth paradigm, as we need to start fundamentally transposing the way we feel, relate and therefore conceptualise, design, manufacture, distribute, consume, dispose of, discard and try to digest plastics (see Section 3.2). After all, ‘I/We’ are similar to a contemporary fairy tale, for the next thousand years plasticised in our toxic future/s. The following section opens new (DIY) Sea PET explorations through participation in the sailing expedition.

9.3 Sailing on the Plastic Sea

> ‘The very nature of materiality is an entanglement. Matter itself is always already open to, or rather entangled with, the “Other”.
>
> ‘Not only subjects but also objects are permeated through and through with their entangled kin.’
>
> — Karen Barad, 2007, pp. 392–393.

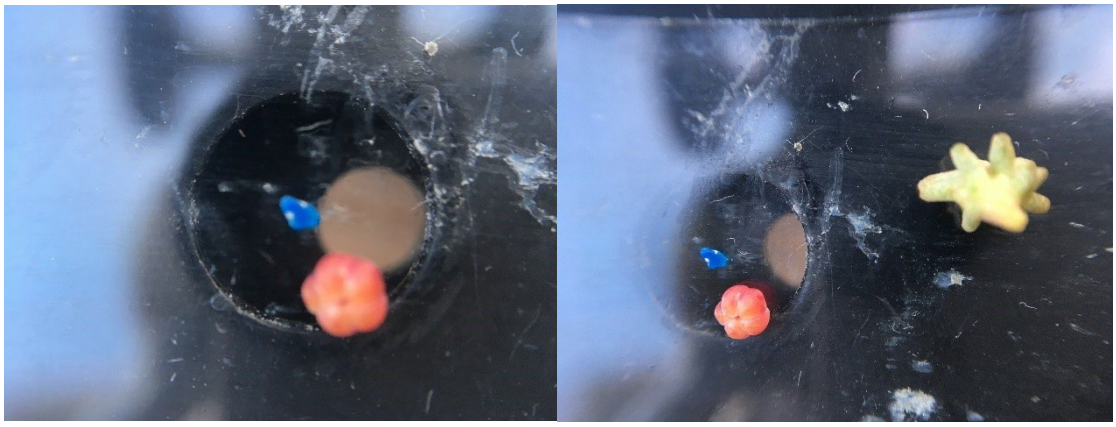


Fig. 9-81. Plastic Geographies, 2018. *Sailing on the Plastic Sea*, Sail Britain, UK.

This section explores further actions emerging from my research. I wanted to continue exploring ‘wet ontologies’ and creating a design and action art research dialogue with the social sciences, providing an interdisciplinary platform for critical feminist materiality and speculative spaces. More than human design, research is open to investigating human and non-human environmental health influenced by ‘organic pollutants’ (Taffel, 2021, Section 3.5) and chemicals within

our bodies. I count my body as an animal representative and wet spaces as the planet's body of emotional knowledge. My work represents the micro-ontology of a complex bacterial, fungal and bio-cell meta-cluster (see Chapter Four).

Reflectively, the first and third participatory (DIWO) workshops were part of HE events (Chapter Eight) and did not allow me to do follow-up interviews. However, I received positive feedback from students from the second guest workshop. I wanted to explore and experience in more depth the impact of my 'Designedisposal' aesthetics alongside examining the learning potential of 'Designtransposal' for understanding ocean and plastics entanglement (see Chapter Six).

One of the interdisciplinary and exploratory methods I have undertaken involved participating as one of the eight crew members on the 'Sail Britain 2018' expedition under the title *Sailing on the Plastic Sea*. 'Sail Britain' aims to inspire positive change for the oceans through sailing and exploring the British coastline, working towards cultural exchange and ocean literacy through exploration, education and learning how to sail. During the sailing leg from Ipswich to St Kathrin's Docks in London, we collected micro-plastic debris samples using surface net trawls, but anthropocentric signposts were all around us (see Fig. 9-81 – Plastic Geographies).

Ocean literacy and science communication was an important element of the sailing experience, and we used on-board equipment such as a moving image microscope, plankton and a micro-plastics net to enable a view into the ocean's life beyond our senses (Sail Britain, 2018).

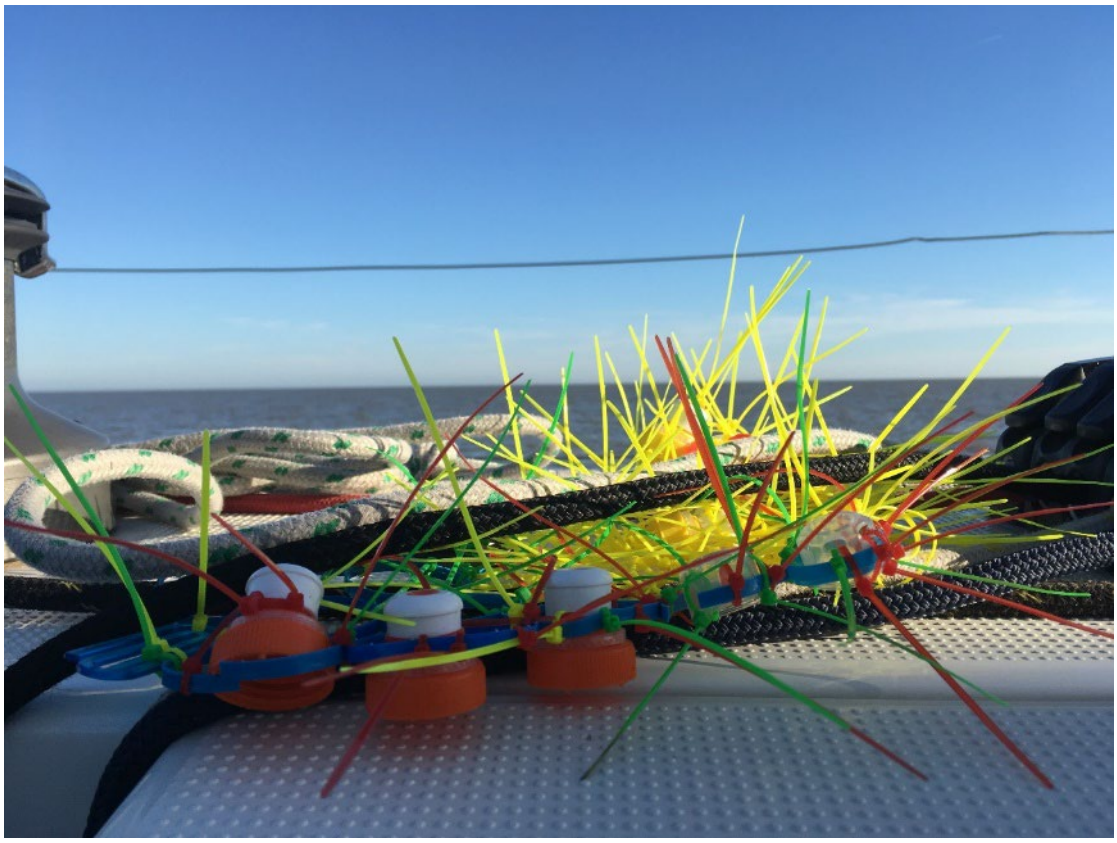


Fig. 9-82. Sailing on the Plastic Sea, 2018. *Sea PET Eddy,* Sail Britain, UK.

The crew was an interdisciplinary humanities mix, with graduates from the RCA. At the end of the sailing experience, to my surprise, I was invited to join in with my works in progress: see Fig. 9-82, *Sea PET Eddy* and the planned RCA group exhibition held at St Kathrin's Dockyard platoon from 12th to 13th October 2018. This participatory experience led to my second invitation and participation with the RCA group. I exhibited part of the 'Tall Tales of the Kitchen Kelpies' Soup' group exhibition at the RAW Labs, Bow Arts, in London from 30th August to 8th September 2019 (Row Arts, 2019).

I displayed exhibition works under the title ‘What is Above so is Below: … Sea PET Jellyfish’ (KraalD, 2019), which I digitally manipulated and used for the ‘Scenario 2150’ visual narrative background (Fig. 9-83).

Section 9.4 closes this chapter through cli-fi visioning with the Sea PET jellyfish bloom, envisioning the far future of the ‘2150 Scenario’ in more than just the human world.

9.4 Vision 2150 Scenario

> ‘No actant is so weak that it cannot enlist another. Then the two join together and become one for a third actant, which they can therefore move more easily. An eddy is formed, and it grows by becoming many others.’
>
> — Bruno Latour, 1993, p. 159, cited in Hird, 2009, p. 17.

Fig. 9-83. Hothouse Earth. *2150 Scenario*, Sea PET Jellyfish re-works.

Scientific evidence shows that humanity's impact on the Earth's atmosphere, oceans and wildlife has pushed the planet into a new geological epoch: the Anthropocene. I derived the background story narrative for the second future scenario constructs from scientific forecasts and present trends (Chapter Three), which I detail further here. Climate change denial, especially when set far away in time, gives us a false sense of safety. The second cli-fi '2150 Scenario', is situated 130 from now – seven generations ahead. The seven generations timeline is an indigenous culture that appropriates a sustainable future.

Figure 8-83's background narrative is that ongoing changes in the chemical composition of the ocean and the air affect the sea's colour polarisation and the sky. Even when the purple-hued ocean is too acidic for fish to live in, favouring the 'plastisphere', the stakeholders of microbial colonies thrive in the lethal algal and jellyfish bloom waters. The ocean's surface is mauve (pale purple), and the sky has changed from blue to a primordial light-green hue.

Coastal urban areas are flooded or abandoned because the air contains much higher rates of hydrogen sulphide, especially in hot zones, so breathing masks are required to be outdoors for a prolonged time. The global human population sits at 900 million, and most have migrated to live in the entirely ice-free Arctic or coastal Antarctica, which is also progressively losing its ice cover. Although a reversal in oceanic oxygenation started to occur in the tropical aquatics, even former continental areas are too hot and saturated with hydrogen sulphide – the air smells like toxic rotten eggs – to be a habitat for large human populations.

I visually unpack the Sea PET *Jellyfish Bloom* (Fig. 9-83), the suspended installation that hangs in the London gallery space as part of the artworks 'What is Above so is Below – Sea PET Jellyfish' (KraalD, 2019). I made the suspended jellyfish mobiles from non-recyclable bottle tops, bottle top rings, plastic net packaging and brand-new cable ties (representing new plastic packaging production).

Figure 9-83's digital re-works shows a three-dimensional digitally manipulated photograph taken from the 'Tall Tales of the Kitchen Kelpies' Soup', an interactive group exhibition held at the Raw Labs, London, in September 2019. The second series of my blue design Sea PET works (see Fig. 8-63) were inspired by the outcomes of the Falmouth 'Designtransposal' second workshop installation (see 'Three DIWO Designtransposal Workshops', Section 8.2, Fig. 8-56 and Section 8.2.2, Fig. 8-66). Chapter Nine and the Sea PET series 'mediated representations' (Farrelly et al.,2021, Section 3.3) link to the main research question (Section 4.5), affirming the role of visual significance in environmental activism for understanding plastic pollution and its impact on behavioural change (Ibid.).

Since the 1960s, the ocean's oxygen content has declined by 2%, while the volume of ocean waters completely depleted of oxygen has quadrupled. Ocean deoxygenation, meaning loss of oxygen in the ocean, has started to alter the balance of marine life, favouring hypoxia-tolerant species (e.g., microbes, jellyfish and some squid) at the expense of hypoxia-sensitive marine species, including most large fish such as tuna, swordfish and sharks (IUCN, 2019).

The loss of oxygen in the ocean has two primary causes. First, ocean warming-driven deoxygenation is when warmer ocean water holds less oxygen and is more buoyant than colder water. Second, excessive growth of algae is caused by fertiliser, sewage, animal waste, aquaculture and nitrogen deposition from fossil fuel burning. This excessive growth of plant life – a process known as eutrophication – mainly affects coastal areas (IUCN, 2019).

Global bio-geochemical cycles (Fu et al., 2018, p. 552) give a novel trend overview of possible increasing oxygen levels from 2100. The term 'bio-geochemical' is a contraction that refers to the biological, geological and chemical aspects of living matter. Gathered from the various scientific resources quoted in the text below and considering current trends in fossil fuel emissions and the slow transition to decarbonisation, Fu et al.'s (2018) *Reversal of Increasing Tropical Ocean Hypoxia Trends with Sustained Climate Warming* affirmed that carbon dioxide levels are likely to continue to increase in the near future (Friedlingstein et al., 2014).

Sadly, even with success in stabilising or reducing emissions, climate carbon feedback and other slowly changing processes can contribute to additional in-the-pipeline warming (Hansen et al., 2005) and increases in ocean heat content that persist for many centuries (England et al., 2015, cited in Fu et al., 2018, pp. 552–557).

Retrospectively, as part of the dystopian 'Hothouse Earth' pathway, even as human emissions reduce (Steffen et al., 2018) 'Scenario 2150', becomes a sustainable planetary narrative that helps understand future reality through a

visual metaphor and scientifically informed future vision. The ‘Scenario 2150’ colour transposition is influenced by Ward’s (2007) book *Under a Green Sky*. This depicted the end of the Permian period when the oceans were purple from a thick layer of bacteria because hydrogen sulphide had changed the atmosphere’s chemistry, and cloud formation had altered drastically.

The Permian period was the last period of the Palaeozoic Era, lasting from 299 million to 251 million years ago. Ward (2007) sets out his palaeontologist study and the work of other scientists, researching microbial bio-markers to determine the chemical composition of the Earth’s oceans and atmosphere during the Permian period. The violet-coloured seas were revealed as toxic and devoid of oxygen, while the sky was soft hazy green with carbon dioxide and methane (Ibid., pp. 61–107).

As a closing thought, by over-producing anthropogenic plastic waste, ‘I/We’ have formed a planetary bio-layer – a twenty-first-century bio-geochemical eddy named the ‘plastisphere’. In ‘Scenario 2150’, the ‘plastisphere’ grew to become a twenty-second-century-situated ecology, which I refer to as a new Earth (Fig. 9-83 – *Hothouse Earth, aka Sea PET Jellyfish Bloom*). This reminds the reader that every second breath is homegrown by the ocean, not by you or I, who inhale aquatic oxygen waste for a living. Long live kelp!

This section has closed Chapter Nine, introducing the final and concluding chapter, Chapter Ten. Note: I use the KraalD, 2019 exhibition works in Chapter Ten in Fig. 10-84; 10-85 and 10-87.

CHAPTER TEN: CONCLUSIONS

10.0 The Literature Field Vignette

‘We decided on the name Eurythenes Plasticus as we wanted to highlight the fact that we need to take immediate action to stop the deluge of plastic waste into our oceans.’

– Alan J. Jemieson, 2020, Newcastle University Press Release.

Fig. 10-84. Photo 2020, *Eurythenes Plasticus*. Found at the Mariana Trench, hadal zone.

In this last chapter, I open with a brief vignette section announcing a new species introduction (see Fig. 10-84). 'The Literature Field Vignette' is resonant with Chapter Three's 'Literature and Field Review' and serves as a scientific update on the 'plastisphere'. My PhD journey began along the same historical timeline of discovery as the new bio-layer, the 'plastisphere' (Zettler et al., 2013; see Chapter Three, Section 3.5.2), and is coming to a close with Weston et al.'s (2020) announcement of the new species of Eurythenes from the depths of the Mariana Trench in the Pacific Ocean (Crustacea Amphipoda).

In a short span of eight years, during my PhD, marine science has now discovered microscopic new colonies living close to the ocean's surface, followed by the discovery of the new Crustacea species found in the hadal zone. Sea depths of greater than 6,000 metres, usually called oceanic trenches, are described as the hadal zone. The new Eurythenes plasticus species found with PET micro-plastics in their hindgut (ascending colon) affirms the body of plastics deposited in all planetary realms and the growing contribution of 'literature on marine organisms ingesting plastic and microfibers' (Weston et al., 2020, p. 177; Fig. 10-84). I conclude my PhD thesis here. However, scientific findings are yet to reveal the full spectrum of the effects of plastic toxicity combined with the Earth's body.

Section 10.1 offers a reflective focus on the contributions of the PhD research.

10.1 Research Contributions

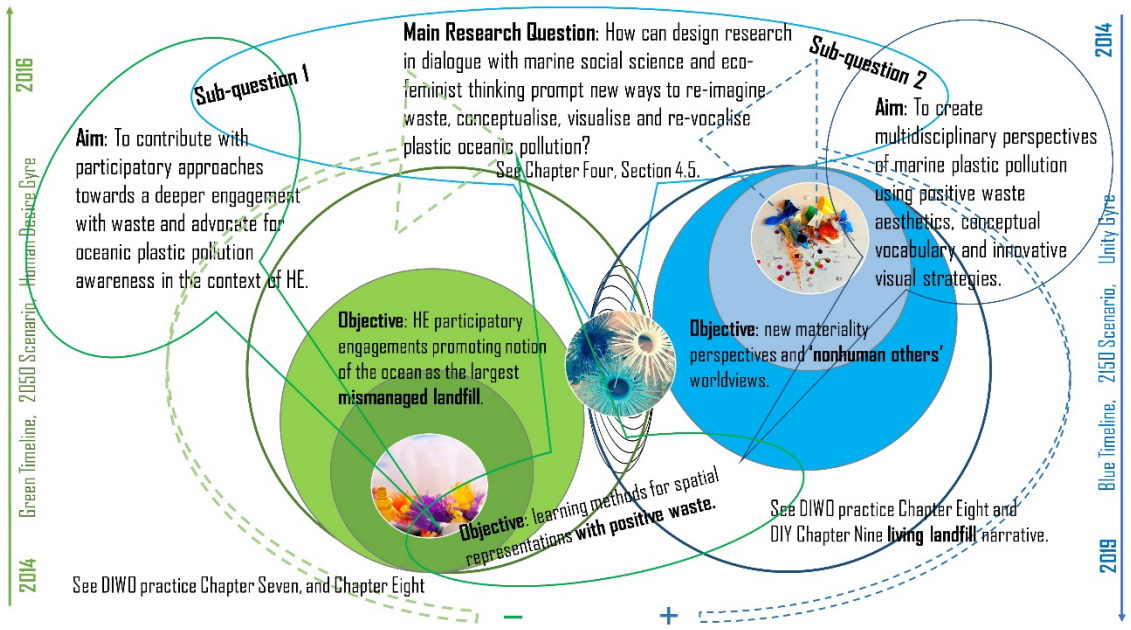


Fig. 10- 85. Aims, Objectives, Research Questions and Practice-based Green Design and Blue Design Series Chart.

This section discusses the significance of my original research contributions in expanding the boundaries of the design research field. My PhD research has developed the three research contribution clusters and clarified the posited questions prompted by the two aims and three subsidiary objectives (Part One, Section 1.3, Table 2 and Section 4.5). This PhD has one main research question and two sub-research questions (Sections 1.3 and 4.5), which guided practice-based research approaches and processes. The practice-based research study proposed two sub-research questions with three objectives for the participatory acts (Part Three): see Fig. 10-85, which visually maps the entangled relationships

between the research questions, aims and objectives and the two practice-based outcomes series.

Two aims (Fig. 10-85; Table 2) connected to the main research question and were supported by two sub-questions in the following ways. The research first adopted participatory approaches towards a deeper engagement with waste and advocated awareness of oceanic plastic pollution in the HE design context. The second research aim created multi-disciplinary perspectives on marine plastic pollution using positive waste aesthetics, new conceptual vocabulary and innovative visual and learning strategies (Fig. 10-85, *Aims, Objectives, Research Questions and Practice-based Green Design and Blue Design Series Chart*). Using the two aims and three objectives, the research compiled a socio-material narrative of Chapter Three's 'Literature and Field Review', specifically linking design Sections 3.1–3.3 with marine science and plastic ocean pollution Sections 3.5–3.5.2 and waste management Sections 3.6–3.8, which informed the main research question and two sub-research questions (Section 4.5). The net value of the PhD research stands in connecting interdisciplinary topics in a new and novel way through practice-based design research: see Part Three.

The main research question and two PhD aims (see Table 2, Section 1.3) addressed two interdisciplinary 'plastisphere' marine scientific bodies of knowledge and discard study. The main research question, on 'super-wicked' design dialogue, was funnelled through the two sub-research questions. First, praxis advocacy research has raised awareness of oceanic plastic pollution over the last decade, particularly in the HE UK design context.

Second, practice-based research co-created multi-disciplinary perspectives representing plastic waste and marine plastic pollution with HE design stakeholders. For example, Fig. 10-85 connects the first sub-research question and aims with the first two objectives. The green design practice temporarily reconnected waste management services with the HE design community, integrating alternative jargon and applied ‘positive waste’ aesthetics (see Chapters Two and Six). The waste-centric practice-based outcomes resulted in new learning research methods in the HE design context (see Part Three, Section Seven).

Through the first aim, the praxis agency advocated transformative awareness of plastic ocean pollution within the HE design environment, and later more comprehensive public content (exposition and sailing expedition). The design research explored the topics of waste and plastic pollution, generated HE seminar and participatory workshop engagements promoted novel aesthetics, design and waste language, and argued that the ocean is the largest mismanaged landfill: see Parts Two and Three, Chapters Seven, Eight and Nine.

This participatory action-based PhD engaged student stakeholders with ‘plastic things’ and co-designed and co-created new experiential relationships with ‘positive waste’ through the second sub-research question and aims (Fig. 10-85). At the same time, the blue design series gave a voice to inanimate objects influenced by critical and feminist theory (Chapter Four). This design research importance contribution is demonstrated in Chapter Two’s outcome, vocalised through ‘Alternative Jargon’ (Section 6.1) and visualising the ‘Designtransposal’ strategy through praxis agency (Section 6.4).

As part of second aim and third objective of the main question, the research generated new concepts and terms that expanded the existing 'Designedisposal' vocabulary (Chapter Two). 'Chapter Two: Vocabulary and Compendium' follows 'Chapter One: Introduction' at the opening of Part One and is not attached to the bibliography at the end of the PhD thesis: 'In standing, humans rise up from earth to achieve an uplifted, reflective view of it. When we are standing, we are not protected' (Tham, 2019, p. 109). In a sense, this is the PhD thesis' structural standing resistance and significant praxis research contribution.

The PhD research scope developed sustainable learning methods for spatial representations through DIY and DIWO craft techniques (Part Two, Chapter Six). The three objectives were explored in a hands-on way through DIY and DIWO participatory acts and HE design engagements (see Part Three). The research through praxis agency contextually re-framed plastic pollution and developed alternative (transformative environmental awareness) methodological approaches in HE design (Fig. 10-85).

The action research vocalised all-new 'Designtransposal' insights, exploring 'wet ontology' spaces (Section 5.4) and re-imagining aquatic 'non-human others'' entanglements with plastics. The third objective explored non-human-centred design approaches, thinking with plastic things and interpreting relations to nature (plastic pollution) through design research processes (Section 1.3).

The research promoted waste and transformative environmental awareness in HE design, building on 'new materiality' perspectives and worldviews of non-human others (Part One, Chapter Four and Part Two, Chapter Five). The third

objective's 'gaze in' (Section 6.3) visualised oceanic plastic pollution invisible to the human eye. This research developed a set of bespoke visualising approaches and tactical methods (Chapter Six). The practice-based work in this PhD captured the relationships between plastic things (of all scales), and human and nature/culture ecologies, emphasising marine ecosystems under threat. The research has generated three clusters of contributions corresponding to the aims, objectives, and research questions in the following ways.

This design research's first knowledge contribution has developed new innovative processes by praxis: see 'Chapter Six: Research Methods'. The participatory research engaged with 'plastic things', forged new relations with plastics, and visually re-imagined agential 'vibrant materiality' (Section 4.4) of MPW (Part Three). The research created an aesthetic response to waste and oceanic plastic pollution as a critical sustainable learning tool for understanding radical climate change in HE design (Sections 3.1 to 3.3): see Chapter Seven, 'Designedisposal: Green Design Engagement', and the experiential findings expanded upon in Chapter Eight, 'Designtransposal: Blue Design Series', which conceptualised new 'wet ontologies' spaces and re-vocalised plastic oceanic pollution. Chapter Nine, the 'Designtransposal: Sea PET' series, visualised the marine ecosystem through praxis.

The second knowledge contribution of the PhD developed new terms and concepts, extending existing 'alternative jargon' equating to plastic things (Part One, Chapter Two). The praxis agency encountered and engaged with 'plastic things', emphasising natural relations (Fig. 10-85). The research processes re-vocalised new terms and participated in the 'language game' (Wittgenstein, 1958;

Section 2.0) that transposed praxis agency worldview notions (Chapter Four). The purpose of ‘alternative jargon’ (Section 6.2) was essential because it empowered ‘Designedisposal’ waste aesthetics with a political voice. The ‘Designtransposal’ ‘language game’ became ‘thoughtfully compassionate’ jargon entangled with ‘positive waste’ (Kennedy, 2008; in Section 3.7), ‘nomadic ethics’ and ‘material actants’ (Braidotti, 2006; Hird, 2009 in Sections 4.3–4.4). The research created a valuable design counter-narrative supporting growing voices in the transitions of social and design education professions (Sections 3.1–3.3) and extended environmental and pedagogical design activism.

The third knowledge contribution relates to connecting interdisciplinary topics through innovative practice-based design approaches as part of praxis agency. This builds on eco-feminist dialogues and theory, which were tested hands on in Chapter Eight through a DIWO approach, visualising plastic ocean pollution and supported by the largest mismanaged landfill argument. The DIY approach in Chapter Nine re-imagined a co-creative biological leap (transposition), producing a future space for the planetary vision (see ‘Vision 2150 Scenario’, Section 9.4). From an eco-feminist egalitarian perspective, praxis agency ethical aesthetics argued that ‘I/We’ eat plastics daily, concluding that all nature is plasticised.

Brown (2017) rightfully points out that design ‘should be at the centre’ and that the profession is ‘particularly consequential’ to conversations about the theories of things. An inner sense of frustration arises (in my gut) because design is typically allocated with an adjective. Describing is a vital result of creating things – for example, specifying dimensions, shape, and colour – substantially affecting ideas and making. I find the ‘super-wicked’ conversation noteworthy because

design professions are not in the centre and because 'I/We' are not verb adjoined: we professionally lack political power (Section 3.3). However politically small, I hope that my eco-feminist and 'new materiality' plasticised dialogues contribute to a global change in the 'blue economy' and its environmental protection and new policies. I hope that new policies are implemented into health and safety regulatory systems for change in the toxicity of plastic packaging standards (see 'Scenario 2050', Section 8.4).

The process of undertaking this PhD research has changed my praxis agency stance (see Section 5.3 – 'Praxis and Social Imaginary'), which generated new waste imaginaries through action research and praxis agency (Fig. 10-85). This has come about through developing a 'Designedisposal' recycling critique (Chapter Seven) and discovering with stakeholders the depth of oceanic plastic pollution through 'Designtransposal' workshops (Chapter Eight). This PhD research formed a design agency (Section 5.1), new vocabulary and a compendium of terms and innovative approaches as its main contribution (Section 2.1).

With and through this multiplicity of research questions, aims and objectives posited (see Section 1.3), I conclude my PhD journey, which has opened a speculative wet space and created new responsible relationships with plastic materiality in HE design.

Section 10.2 summarises the research approaches and processes that supported the research outcomes.

10.2 Scope of Research Outcomes

'This is not the end of the story, but an ongoing process of re-evaluating spaces in an innovative and creative manner.'

– Katarina Dimitrijevic and Jennifer Kopping, 2008, p. 143.

Fig. 10- 86. Plastic Thing–Plastic Object. Theoretical ingredients mapping board. Background *Sea PET: Jellyfish*, 2019. Mixed plastics suspended installation, Raw Labs, London.

The research strategically designed the experiential findings from all three contributions clusters to be open ended. The research processes explored speculative methods of spatial representations through aesthetic tactics and visual strategy. The learning design tactics and visual strategy can be applied in different contexts and situations. For example, in the HE 'Designedisposal: Green Design Engagements', I learned how stakeholders relate to recycling and plastic waste (see Chapter Seven, Section 7.4 – 'Mapping Conversations'). Spatial waste aesthetics emerged by promoting re-use and making with 'plastic things' as an engagement design and craft tactic (Section 7.5 – 'XMass Tree'). The aesthetic outcome re-vocalised the 'Designedisposal' green recycling systems critique and expanded research towards mismanaged waste and wet landfill spaces (Chapter Eight).

The new 'Designtransposal' visual strategy and HE design workshop findings (see Chapter Eight) merged 'methodological and pedagogical approach[es] towards how waste and waste management can be imagined and deconstructed' (Ek and Johansson, 2020). It is worth reiterating (see Chapter Four, Section 4.3 – 'Transposing Nature') the philosophical notion of Braidotti's eco-feminist material embodiment and the concept of 'transpositions', which play a critical theoretical role in forming the 'Designtransposal' visual strategy. In the prologue to nomadic subjectivity, Braidotti expands on this as follows:

> Resting on the assumption of a fundamental and necessary unity between the subject and object, the theory of transpositions offers a contemplative and creative stance that respects the visible and hidden complexities of the very phenomena it attempts to study (2006, p. 6).

Notably, the ‘unity between the subject and the object’ offered allowed a speculative design approach (see Candy, 2010; in Section 6.5 – ‘Experiential Scenarios’) to creatively perceive multi-directional experiences with plastic things (see Chapters Eight and Nine). In empowering the consequential action of agency (Section 5.3) and the ability to act upon ideas, praxis agency imagined that design can change its professional relationships with materiality and things (‘Scenario 2050’, Section 8.4). *Plastic Thing–Plastic Object* (Fig. 10-86) critically probes the designed life span of single-use plastic objects, bringing ‘the intrinsic qualities of the designer-thing-user-environment complex’ to the surface (Atzmon and Boradkar, 2017, p. 2; Section 4.2). The seemingly simple waste aesthetics (Hillman, 1996; Section 3.8) and the response and style of ‘Designedisposal’ with plastic things support social, cultural, and political material narratives (Part Six).

’Plastic things’ are, through Part Three, at the epicentre of the visual socio-material narrative. The practice-based research extended the thought pathway of what Brown calls ‘thingly character’ thinking. Brown (2017) concludes that ‘the chair chairs’ in his designerly chair allegorise thinking, building on Heidegger’s (1950) ‘the thing things’ symbolic representations lectures (Chapter Four). For example, ‘Participatory and Action Research’, the research methodology set out in Section 5.2, promoted plastic pollution awareness through HE-funded events and engagements (Chapters Seven and Eight).

The practice-based design research introduced ‘plastic things’ and designed ‘a learning workshop methodology to bring out creative visual and narrative-based imaginations of waste’ (Ek and Johansson, 2020, p. 5). Combining interdisciplinary approaches in Chapter Five, ‘Research Methodology’ (Sections

5.1–5.4), were important for forming ‘Reflective Bricoleur’ (Section 6.0) asterism and developed an innovative ‘Designtransposal Design Workshop’ research method (Section 6.4). For research methods, see my first knowledge contribution discussion in Section 10.1.

According to Braidotti, complex multi-species interconnection signifies transposition. In the case of ‘Designtransposal’, the praxis agency interpreted the ‘plastisphere’ (Section 3.5.2) and ‘plastiglomarate’ (Sections 4.3 and 9.2) through landfill narrative. Thus, this research embraced Braidotti’s concept and the ‘state of being transposed’ by plastic materiality ‘not merely in the quantitative mode of plural multiplications, but rather in the qualitative sense of complex multiplicities’ (Braidotti, 2006, p. 5; Section 4.3).

The praxical processes were led by designed waste ontologies, HE action platforms, aesthetical outcomes, stakeholders’ plastics relations and latent emotional insights. For details of the findings and analysis, see Part Three, Chapters Seven to Nine and the Appendices, which unpack expositions, mapping dialogues, stakeholders’ reflective questionnaires, mapping responses and recorded conversations.

The following three sub-sections reiterate the significant three knowledge contribution cluster (Section 10.1) entangled with three research outcomes clusters in this PhD thesis. This is unpacked following the chronological Part Three, with the chapters in narrative order.

10.2.1 Designing Waste Ontologies

Designing waste ontologies is set in plastic pollution's 'super-wicked' and problematic context (Section 3.3). The first sub-section summarises praxical design-based encounters (Section 3.1-3.2), interpreting the critical and cultural meaning of 'positive waste' (Kennedy, 2008, in Section 3.6). Chapter Three, 'Literature and Field Review', defines the interdisciplinary body of green design evolution and research with scientific, geographical, geological, marine science, waste theory and data evidence for the largest mismanaged landfill reasoning.

Chapter Four, 'Theoretical Review', introduces the influence of the theory of things (Appadurai, 1986; Brown, 2001; Brown, 2003), woven into 'Designedisposal' research methods (Chapter Five). The 'new materialism' (Braidotti, 2000; Braidotti, 2006; Joselit et al., 2016; Le Grange, 2018) in Chapter Four shifted the research processes towards 'the post-human predicament', enabling encounters with 'plastic things' and design research (Atzmon and Boradkar, 2017; Brown, 2016; Brown, 2017; Heidegger, 1950). Chapter Four merged the interdisciplinary Chapter Three with action design research (Chapter Five), supporting the mismanaged landfill premise (see Section 10.1, third knowledge contribution).

The findings set out in Chapters Three to Five allow this research to explore 'green design engagements' (Chapter Seven) and test design praxis agency through action (Grundy, 1987; in Section 5.2) with HE design stakeholders and Kent and Surrey's waste management municipalities. Chapter Seven is supported by the introductory Section 1.5, 'Designing Waste Ontologies (Chapter

One), and Section 3.2, ‘Design Research, Activism and Futures’, which concluded in designing waste ontologies (Wills, 2007, 2015; Escobar, 2018; Mazé, 2016, Schalk et al., 2017, Candy and Kornet, 2019).

The research visually emphasised ‘Designedisposal’ tactics related to ‘positive waste’ (Kennedy, 2008). Chapter Four affirmed encounters with the theory of things and the shift in design practice towards the ‘*immaterial turn*’ (Hall, 2017; Dubberly, 2017; Atzmon and Boradkar, 2017; Section 4.2). ‘Green design engagement’ outcomes, findings and experiences (Chapter Seven, Section 7.2; Table 4, Designedisposal Seminar, 2015. *Post-discussion transcript*) changed views of recycling ideologies and waste management political hierarchies (Lynch, 1990; Bulkeley and Gregson, 2009; Hawkins, 2006; in Sections 3.6–3.8). Thus, design research nomadically (ethically and geographically) moved away from not-so-green landfill positions towards designing blue waste ontologies (Chapter Eight).

10.2.2 Visualising Plastic Ocean Pollution

The innovative design methods and interpretative methodology tools produced an important contribution to visualising plastic ocean pollution (Chapter Six; Section 10.1, knowledge contribution one). The 'Designtransposal' strategic initiative incorporated thinking with plastic things (Chapter Four), which influenced 'Designedisposal' tactics of engagements, enabling me to visually address 'super-wicked problems' (Levin et al., 2012; Chapter Three): for example, new learning tools for visualising plastic oceanic pollution and environmental changes through DIWO participatory HE-based action platforms, connecting Chapters Three, Five, Six and Eight).

From a historical perspective, oceans have long been prominent spaces regarding the entangled relationship between humans and nature. In Chapter Eight, 'I/We' experientially 'gaze in' (Section 6.3) to oceanic spaces and depths (Section 5.4). I do this with others (DIWO), and, following the lanternfish migration, we visualise plastic pollution set in dynamic wet spaces, concealing mismanaged human discard and becoming the largest landfill. For example, see Chapter Five's digital landscape diagram of key projects, terms and ideas. Figure 5-28, *Praxical Landscape,* informed and influenced the blue design series in Chapters Eight and Nine.

Chapter Eight opens the 'Designtransposal' workshops carrying eco-feminist and marine science dialogue to a 'wet ontological' (Steinberg and Peters, 2015; Chapter Five) vertical volume of sea. Expanding the spatial trialectics critique (Lefebvre, 1991; Soya, 1996; Section 5.4) created participatory haptic and visual

experiences and represented plastic oceanic pollution, heightening transformative awareness of oceanic 'worldhood' (Heidegger, 1996; see Chapter Five, Section 5.4, and Chapter Six, Section 6.4 – 'Designtransposal Design Workshop').

Chapter Six, 'Reflective Bricoleur', synergises the umbrella of approaches. I merged geographical gyre patch visualisation (Section 3.5.1) and conceptual gyra ideations (Section 8.0, Fig. 11-90, *Mapping Gyra: 2050 Scenario and 2150 Vision Timeline,* in Section 11.3 'Mapping Board') to support participatory 'conversations with materials' (Schön, 1984) in Sections 8.2–8.2.3.

Chapter Five, Section 5.4, depicted five-level dialogues (Fig. 5-32 – *My PhD Production Space Place*) and created a visual depository PhD map using the meta-design 'Tool 52' (Tham et al., 2008): see transcribed Fig. 5-32, Table 3, *My PhD Production Space Place Table*. The first mapping process helped design Chapter Seven's events, and the second process aided in developing the Chapter Eight workshop questionnaire. In Part Three, Chapter Seven, Section 7.4, I re-applied the meta-design 'Tool 52' (Tham et al., 2008) for mapping my difficult personal experiences and encounters for my 'green design engagements' (Fig. 7.49 – *My Walk of Shame*): see transcribed Fig. 7-49, Table 5, *HE Creative Residency Mapping Table.* It is therefore essential to acknowledge all my diagrams, word clouds and hand and digital mappings as part of my visualising processes, which emerged as unexpected contributions in this PhD research in parallel with visualising plastic ocean pollution.

For example, stakeholders' responses were derived through the five-level questionnaire (Fig. 8-64, Section 8.2.2) in the second and third 'Designtransposal' workshops. By analysing and mapping workshop findings (Fig. 8-70 – *Designtransposal Workshop Mapping Dialogue*), I found that shareholders could acknowledge the power and agency of discarded things. In the second workshop, stakeholders focused their anger on plastic things. Participants reflected upon new oceanic changes and the effects of plastic toxicity systemically inducing decline in biological diversity (Fig. 8-71 – *Visual Transcript Bricolage* in Chapter Eight, Section 8.3). These personal engagements and recorded stakeholders' conversations (Chapter Seven, Tables 4 and 5 and Chapter Eight, Tables 6 and 8) located in Appendices) aid in revealing how plastic materiality contains future spaces of possibility: see 'Scenario 2050', Section 8.4, and 'Scenario 2150', Section 9.4.

The findings from Chapters Seven and Eight are visually set out in Figure 8-72 – *Unpacked 2050 Scenario Diagram* – in Section 8.4, telling a near-future tale of informal waste management and the design for behaviour change influenced by changing single-use packaging legislation and materiality. 'Scenario 2050' (Fig. 6-38 – *Futures Cone;* Section 6.5) combined with the relevant findings helped foresee planetary kingship when waste management is localised and informal, and production is based on GNH (see Jenkins, 2006; Burns, 2005).

10.2.3 I/We Language Games

Chapter Nine visualises plastic pollution, creating aquatic 'non-human other' personas made from single-use packaging. This chapter re-imagines agential plastic voices (Chapter Two and Section 10.1, second knowledge contribution). This chapter served as the art, design and science bridge and expressed blue design notions (Section 3.3). In this humanistic way, the research addressed the concerns of multi-disciplinary asterism (Chapter Six) and transpositions.

The Sea PET projects are theoretically agglutinated by the plastisphere's (Chapter Three) biological and chemical 'intra-actions' of 'vibrant materiality' while encountering plastic things (Chapter Four). I synergised environmental art, political craft and design research with 'new materialism' and eco-feminist theory (Braidotti, 2006; Haraway, 1997; Hird, 2009; Barad, 2007; Latour, 1991; Latour, 1993): see Fig. 9-75 – *Sea PET DIY Projects 2014–2019*, blue design series diagram).

'Chapter Two: Vocabulary and Compendium' comes into full force here, promoting oceanic pollution awareness and DIY single-use plastic re-use, forging new terms and concepts (Fig. 9-79 – *Sea PET*, *If I Am Sea Urchin,* Section 9.2) combined with marine science (Bryner, 2006; Tasoff, 2019). 'Alternative jargon' (Sloterdijk, 1988) is supported by land art (Fig. 9-77 and Fig. 9-79) and future visualisations (Fig. 9-83, Hothouse Earth, *2150 Scenario*, Sea PET Jellyfish re-works). The I/We 'language game' combined Heidegger's (1966) 'ambitious plainness' in simple wording agglutinations and promoted DIY making with

reused plastics – i.e., 'Designedisposal'; 'I/We'; 'Designtransposal' and 'Sea PET' as design activism through language contributions (Chapter Two).

Armed with the new 'Designtransposal' visual strategy, this research symbolically transformed design with 'plastic things', representing or communicating 'super-wicked' environmental concerns through art (Fig. 9-80 – *I/We Eat Plastics*). The vocabulary (Chapter Two) stands for expressing new social and material meanings and post-humanist paradigm (i.e., 'Designtransposal'), enabling us to represent plastics within the oceanic space ('Plasticized', Dimitrijevic, 2017).

Chapter Nine's 'Sea PET' plastic series, 'gazes in' beyond technocratic and technological solutions and addresses the polarities of the politics of plastics production coupled with the failing recycling campaigns of WMSs (Sections 3.4–3.4.2). The DIY blue design series is made up of 'dark ecologies' (Morton, 2007), encouraging visualisation of the entanglement of planetary plastics on the land and in the oceans (Section 3.3). The Sea PET series prompted me to research biologically superior and even a few immortal species (sea urchin and jellyfish species): see Fig. 9-79.

The 'Sea PET' project (Fig. 9-82, *Sea PET Eddy*, Section 9.3 – 'Sailing on the Plastic Sea') visually re-imagined and experienced micro-plastic pollution on the UK sailing leg (Sail Britain, 2018). I recorded plastic and biotic entanglement samples photographically using a macro-lens (Fig. 9-81, *Plastic Geographies*). Chapter Nine concludes that 'no actant is so weak that it cannot enlist another' (Latour, 1993, cited in Herd, 2009; Section 4.4). Section 9.4, '2150 Scenario', visually narrates the twenty-first-century 'plastisphere', which grew into the

twenty-second century's situated ecology, referred to as 'Hothouse Earth' (Steffen et al., 2018).

Thus, I conclude my axis research and eight-year revolution, and the story returns to the micro-ontologies of s*elf*. Section 4.4, 'Material Actants', through 'Sea PET' and sea urchin/human hybrid visual works, argue that 'I/We' eat plastics, meaning that nature is plasticised. Stepping out of plastic toxicity and climate change denial (Cohen, 2001; Norgaard, 2011), in awe, I acknowledged that I eat plastics every day.

In this research, plasticised nature became an unmediated space resting below the surface of the swirling accounts of the human realm. The dire nature of the situation primordially calls humans to re-calibrate socio-cultural production, consumption and sensitivity values of things – objectively, stepping out of their mind-constructed, self-imposed and habitual denial.

Section 10.3 summarises the outputs and conclusions of this research and finally brings this story to its end.

10.3 Summary of Outputs and Conclusions

‘Nothing Special Happened.’

— Katrina Palmer, 2018.

Fig. 10- 87. Nothing Special Happened, 2019. Yorkshire Sculpture Park, where I hacked Katrina Palmer installation. Photo: Rui Leitão, 2019.

This last section briefly summarises the published outputs of this PhD thesis and visually closes with Figure 10-87, *Nothing Special Happened*.

Broad public exposure was demonstrated through three academic publications. First, 'CitySelf Anima', has a section contributing to *Design Research for Change 2019* (Dimitrijevic, 2019b, pp. 56–57). The second chapter, 'Living Landfill' (in 'Section III: Standing'), sits in the book, *Design and Nature: A Partnership* (Dimitrijevic, 2019a, pp. 118–123). The third chapter, 'Chapter Eight – Visualising the North Atlantic Gyre Patch', was published in *Perspectives on Waste from the Social Sciences and Humanities: Opening the Bin* (Dimitrijevic, 2020, pp. 136–157). In the first two publications, I answered open calls for contributions. I was selected for the anthology for the third publication as a participant in the seminal 'Opening the Bin' academic workshop held at Lund University in Helsingborg, Sweden, on 26th to 30th April 2017.

To summarise, highlighting the 'Introduction', 'Literature and Field Review' and 'Theoretical Review' in Part One, supported by the combination of Part Two's 'Research Methodology' and 'Research Methods' chapters, the research has opened a plastic socio-material narrative reasoning that the ocean is the largest mismanaged landfill. Based on this premise, the following argument is backed up by Chapter Three's scientific findings and influenced by Chapter Four's eco-feminist theory. Following eco-feminist notions, the research argued that we are plasticised and I concluded that I eat plastics daily (Chapter Nine).

The mismanaged landfill to living landfill plasticised nature claims are funnelled into two cli-fi scenarios. The first scenario depicts an imagined near dystopian

human future (Section 8.4). The second scenario was set far ahead in time and re-imagined through ‘non-human others’ planetary development (Section 9.4). The three thesis parts are linked with re-used plastic things. The knowledge set out in the interdisciplinary chapters influenced this research to narrate, visualise and synergise representations of plastic pollution as an overall knowledge contribution.

Visually closing, I temporarily occupied Katrina Palmer’s 2018 installation at the Yorkshire Sculpture Park, highlighting women’s heroism in battle during the First World War. After a decade of standing with plastics, I temporarily lay down in the grass, facing the earth beneath, imagining the ocean plastic snow sediment falling and thinking that, after almost eight years of design research and activism, *Nothing Special Happened* (Fig. 10-87).

This open-ended speculation represents the apparent incompleteness and the limitations of my PhD thesis research agenda, which addressed ‘super-wicked problems’ (Levin et al., 2012). The plastics political lobby’s ‘super-wicked’ global expansion is no-*thing* (Sections 3.4–3.4.1). Scientific warnings, toxicity alerts and environmental policy do not matter as they are no-*thing* (Sections 3.4.2–3.5). Ongoing ecological ecocide sits in the imaginary land of cli-fi denial (Sections 8.4 and 9.4). However, I visualised the novel PhD contributions as the tiny bit of mortar connecting previously disconnected disciplinary bricks of design humanities to discard study and social science research with feminist ‘new materiality’.

BIBLIOGRAPHY

Adams, S., 2011. *Castoriadis's Ontology: Being and Creation.*
Available at http://www.jstor.org/stable/j.ctt13x0d8h (Accessed: 17 March 2015).

Adelman, C., 1993. *Kurt Lewin and the Origins of Action Research*, in Educational Action Research, Volume 1, No. 1. University of Reading, United Kingdom. https://www.tandfonline.com/doi/pdf/10.1080/0965079930010102

Anthropocene Working Group, 2017. *The Anthropocene: Scientists Respond to Criticisms of a New Geological Epoch*. Available at https://theanthropocene.org/topics/anthropocene-working-group/ (Accessed: 02 May 2018).

Alexander, C. & Reno, J., 2012. *Economies of Recycling: Global Transformations of Materials, Values and Social Relations,* London: Pluto.

Alexander, C. & Reno, J., 2014. *From Biopower to Energopolitics in England's Modern Waste Technology,* Anthropological Quarterly 87(2): 335-58.

Allison, E.H. & Bassett, H.R., 2015. *Climate Change in the Oceans: Human Impacts and Responses,* Science 13 November 2015: 778-78.
Available at http://www.sciencemag.org/content/350/6262/778.full (Accessed: 19 January 2017).

Appadurai, A., 1986. *Commodities and the Politics of Value, The Social Life of Things: Commodities in Cultural Perspective*, Ed. Appadurai, Cambridge University Press.

Aristotle, BC. *Nicomachean Ethics*, the 2nd ed., translated by Terence Irwin, Indianapolis: Hackett Publishing Co.

Arvatov, B., 1925. *Everyday Life and the Culture of the Thing: Towards the Formulation of the Question,* trans. Kiaer, C., October, (Summer 1997) 81:119-28.

Atzmon, L., and Boradkar, P., Ed., 2017. *Encountering Things: Design and Theories of Things,* Bloomsbury Academic Publishing.

Barad, K., 2007. *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning,* Durham, North Carolina: Duke University Press.

Barbero, S., and Fassio, F., 2011. *Energy and Food Production with a Systemic Approach*. Environmental Quality Management, 21(2), pp. 57-74.

Barnosky, D. A., Brown, J. H., Daily, G. C., Dirzo., Ehrlich, A. H., Enronen, J. T., Fortelius, M., Hardy, E. A., Leopold, E. B., Mooney, H.A., Peterson Myers, J., Naylor, R. L., Palumbi, S., Stenseth, N. C., and Wake, M. H., 2014. *Introducing the scientific consensus on maintaining humanity's life support systems in the 21 st century: information for policy makers*, The Anthropocene Review 1, Issue:1 (2014): 78-109. Available at doi: https://doi.org/10.1177/2053019613516290. (Accessed: 08 February 2017).

Barth, M., Michelsen, G., Rieckmann, M., and Thomas, I., Ed. 2016. *Routledge Handbook of Higher Education for Sustainable Development*, Earthscan from Routledge.

Barthes, R., 1957. *Mythologies*, transl. Lavers. A., The Noonday Press-New York Farrar, Straus & Giroux.

Basurama, 2014. *Inhabiting Plastic Oceans*, Available at https://basurama.org/en/projects/inhabit-plastic-oceans-in-lo3-we-trash-cape-town/#:~:text=Inhabiting%20Plastic%20Oceans%20is%20an,fans%20to%20blow%20it%20up. (Accessed: 01 March 2017).

Bataille, G., 1991. Transl. Hurley. R., *The Accursed Shared,* Volume I, Zone Books.

Bawden. T., 2019. *The UK Will Burn More Than Half Its Rubbish As It Doubles the Number of Incinerators Over Next 10 Years,* INews. Available at

https://inews.co.uk/news/environment/waste-incinerators-double-burning-rubbish-air-pollution-uk-159516 (Accessed: 26 October 2019).

Bear, C., 2017. *Assembling Ocean Life: More-Then-Human Entanglements in the Blue Economy*, Dialogues in the Human Geography 2017, Vol. 7(I) 21-31, Sage.

Bear, C., and Eden, S., 2011. *Thinking Like a Fish? Engaging with Nonhuman Difference Through Recreational Angling,* Environment and Planning D: Society and Space, 2011, volume 29, pages 336-352. Available at https://www.academia.edu/284426/Thinking_like_a_fish_Engaging_with_non-human_difference_through_recreational_angling?email_work_card=view-paper

Berg, B. L., 1989. *Qualitative Research Methods for the Social Science,* 4th edition, Allyn & Bacon.

Bhamra T, Lilley, D., and Tang, T. 2011. *Design for Sustainable Behaviour: Using Products to Change Consumer Behaviour,* The Design Journal 14 (4): 427-445.

BIFFA, British International Freight Association, 2018. *What Is Closed Loop Recycling?* Available at https://www.biffa.co.uk/biffablog/2018/june/your-guide-to-closed-loop-recycling (Accessed: 26 August 2019).

BIFFA, British International Freight Association, 2019. *The Life Of A Plastic Milk Bottle*. Available at https://www.biffa.co.uk/biffablog/2019/june/the-life-of-a-plastic-milk-bottle (Accessed: 26 August 2019).

Bligh, D. A., 1986. *Teach Thinking by Discussion,* Society for Research into Higher Education & NFER-Nelson.

Boehner, J., 2014. *Design vs. the Design Industry,* Design Philosophy Papers.Boehner, J., 2016. In *Mapping Controversy in an Environmental Communication, Design for Sustainability & Flourishing*, RSDS symposium, Canada. Available at http://systemic-design.net/rsd-symposia/rsd5-2016/rsd5-flourishing/

Boehner, J., 2018. *Design, Ecology, Politics: Towards the Ecocine*, Bloomsbury Publishing.

Boetzkes, A.,and Pendakis, A., 2013. *Visions of Eternity: Plastics and the Ontology of Oil*, E-flux Journal #47 - September 2013. Available at https://www.e-flux.com/journal/47/60052/visions-of-eternity-plastic-and-the-ontology-of-oil/ (Accessed: 23 August 2021).

Bradshaw, A., 2014. *Rubbish and other Crap, Debris, Detritus, Dirt, Discards, Garbage, Junk, Le! overs, Litter, Refuse, Rejects, Remains, Ruins, Scrap, Shit, Shreds, Trash and Waste Newspaper.* Available at http://alicebradshaw.co.uk/stuff/rubbishnewspaper.pdf (Accessed: 16 October 2015).

Braidotti, R., 1994. *Nomadic Subjects: Embodiment and Sexual Difference in Contemporary Feminist Theory*. New York: Columbia University Press.

Braidotti, R., 2000. *Teratologies, in Deleuze and Feminist Theory,* edited by Buchanan, I., and Colebrook, C., 156–72. Edinburgh: Edinburgh University Press.

Braidotti, R., 2002. *Metamorphoses: Towards a Materialist Theory of Becoming*, Cambridge: Polity Press.

Braidotti, R., 2006. *Transpositions: On Nomadic Ethics,* Cambridge: Polity Press.

Brewer, J., and Hunter, A., 1989. *Multimethod Research: A Synthesis of Styles*, Newbury Park, CA: Sage.

Breeze, P., 2014. *Power from Waste*, in Power Generation Technologies, P. Breeze (ed.), pp. 335–52. Boston, MA: Newnes.

Brown, B., 2001. *Critical Inquiry,* Vol. 28, No. 1. pp. 1-22.

Brown, B., 2003. *A Sense of Things: The Object Matter of American Literature,*1st ed. The University of Chicago Press: Chicago and London.

Brown, B., 2016. *Other Things*, Chicago: University of Chicago Press.

Brown, B., 2017. *Encountering Design, Encountering Things,* Atzmon, L., and Boradkar, P., Ed., Bloomsbury Academic Publishing.

Bryner, J., 2006. *Surprise! Your Cousin's a Sea Urchin,* Live Science, November 09, 2006. Available at https://www.livescience.com/1103-surprise-cousin-sea-urchin.html (Accessed: 19 September 2018).

Buchanan, R., 1992. *Wicked Problems in Design Thinking,* Design Issues Vol. 8, No. 2 Spring, 1992, pp. 5-21, The MIT Press, DOI: 10.2307/1511637. Available at http://www.jstor.org/stable/1511637 (Accessed: 29 March 2015).

Buckminster Fuller, R., 1963. *Operating Manual for Spaceship Earth*, New York: E.P. Dutton & Co.

Bulkeley, H. & Gregson, N., 2009. *Crossing the Threshold: Municipal Waste Policy and Household Waste Generation*, Environment and Planning A 41: 929-945.

Burns, G. W., 2005. *Naturally Happy, Naturally Healthy: The Role of the Natural Environment in Well-Being*, Huppert, F.A., Baylis, N., & Keverne B., Eds. In *The Science of Well-Being,* pp. 405–431. Oxford: Oxford University Press.

Burns, G. W., 2010. *Gross National Happiness: A Gift from Buthan to the World*. Positive Psychology as Social Change (pp 73-87), Springer. Available at http://www.grossnationalhappiness.com/articles/ (Accessed: 11 February 2015).

Cambridge Dictionary, 2017. *Waste*. (Accessed: 21 March 2017). https://dictionary.cambridge.org/dictionary/english/waste

Candy, S., 2010. *The Futures of Everyday Life: Politics And The Design Of Experiential Scenarios.* PhD Thesis in Political Science, University of Hawaii. Available at https://www.researchgate.net/publication/305280378_The_Futures_of_Everyday_Life_Politics_and_the_Design_of_Experiential_Scenarios (Accessed: 06 February 2019).

Candy, S., 2014. *The Age of Imagination: A history of experiential futures 2006-2031*, In Proceedings of the conference on Human Factors in Computing Systems CHI, Toronto, Canada.

Candy, S., and Kornet, K., 2019. *Turning Foresight Inside Out: An Introduction to Ethnographic Experiential Futures,* Ed. Candy, S., and Potter, C., *Design and Futures*, Journal of Futures Studies, 23(3), March 2019, Tamkang University Press Taipei.

Candy, S., and Potter, C., 2019. *Introduction to the Special Issue: Design and Futures* (Vol. I), Ed. Candy, S., and Potter, C., *Design and Futures*, Journal of Futures Studies, 23(3), March 2019, Tamkang University Press Taipei. DOI:10.6531/JFS.201903_23(3).0001

Candy, S., and Dunagan, J., 2017. *Designing an Experiential Scenario: The People Who Vanished*, Futures, 86, 136–153.

Candy, S., and Dunagan, J., 2016. *The Experiential Turn. Human Futures*, 1, 26–29. Available at https://www.researchgate.net/publication/311910011_The_Experiential_Turn

Canevacci, M., 2013. *Methodological Fetishism has the Power to Mix Two Classic Elements of Western Philosophy: Subject and Object.* Ano 7 Nº 1 January/June 2013 – São Paulo – Brasil – Massimo Canevacci – p.169 -178. Matrizes. Available at

file:///C:/Users/kdani/Downloads/56651-Article%20Text-71531-1-10-20130613.pdf (Accessed: 19 January 2019).

Carson, R., 1962. *Silent Spring*, Houghton Mifflin, Mariner Books.

Casella, E., and Croucher, K., 2011. *Beyond Human: The Materiality of Personhood.* In *Interchanges*, Feminist Theory 12(2) 209–217, SAGE. Available at https://journals.sagepub.com/doi/abs/10.1177/1464700111404264 (Accessed: 07 December 2018).

Cassouto, B., 2015. *Tackling the Plastic Trash in Our Oceans.* Available at http://www.bluecommunity.info/view/blog/54e4c4050cf24e13a842468d (Accessed: 08 April 2016).

Castoriadis, C., 2005. *Figures Of The Thinkable,* Ed. anonymously. Paris: Editions du Seuil.

Castoriadis, C., 1993. *Political and Social Writings*, Ed. D. A. Curtis, Vol 3, Minneapolis: University of Minnesota Press.

Castoriadis, C., 1997. *The Imaginary Institution of Society,* Trans.Blarney, K., Cambridge: Polity Press.

Ceschin, F., and Gaziulusoy, I., 2016. *Evolution of Design for Sustainability: From Product Design to Design for System Innovations and Transitions,* Design Studies 47 (2016) pp. 118-163, Elsevier Ltd.

Cetin, O. D., 2016. *Design Activism from the Past to Present: A Critical Analysis of the Discourse*, pp. 388-393, In Wong, W. S., Kikuchi, Y. and Lin, T., (Eds.). *Making Trans/National Contemporary Design History*, ICDHS 2016 – 10th Conference of the International Committee for Design History & Design Studies. São Paulo: Blucher Design Proceedings, November 2016, No 1, Vol 1.

Chapman, J.A., 2005. *Emotionally Durable Design: Objects, Experiences and Empathy*, Earthscan from Routledge London, UK.

Chow, C. F., Mui So, W. W, Cheung, Y. T. Y, Yeung, S. K., 2017. *Plastic Waste Problem and Education for Plastic Waste Management*, Editors Kong, S.E., Wong, T. L., Yang, M., Chow, C. F., Tse, K. H., *Emerging Practices in Scholarship of Learning and Teaching in a Digital Era,* pp.125-140.Springer. DOI: 10.1007/978-981-10-3344-5_8.

CLEAR, Civic Laboratory for Environmental Action Research, 2020. *About*, Available at https://civiclaboratory.nl/ (Accessed: 19 January 2020).

CLEAR, Civic Laboratory for Environmental Action Research, 2019. *Recycling Is Like a Band-Aid On Gangrene*. Available at https://civiclaboratory.nl/media/ (Accessed 06 September 2019).

Cohen, S., 2001. *States of Denial: Knowing about Atrocities and Suffering*, Polity Press.

COMET® Programme, 2011. *Global Upper Ocean Circulations and Subtropical Gyres*. Available at https://www.nationalgeographic.org/encyclopedia/ocean-gyre/ (Accessed: 07 November 2014).

Conklin, J., 2005. *Wicked Problems and Social Complexity,* PhD. 1st ed. Cog Nexus Institute. Available at http://cognexus.org/wpf/wickedproblems.pdf (Accessed: 15 November 2016).

Corcoran, P.L., Biesinger, M.C., and Grifi, M., 2009, *Plastics and Beaches: A Degrading Relationship*. Marine Pollution Bulletin, v. 58, p. 80–84, DOI: 10.1016/j.marpolbul.2008.08.022

Corcoran, P.L., Moore, C, J., and Jazvac, K., 2014. *An Anthropogenic Marker Horizon in the Future Rock Record*, GSA Today, vol. 24, no. 6. Available at:

http://www.geosociety.org/gsatoday/archive/24/6/article/ i1052-5173-24-6-4.htm. (Accessed: 22 March 2019).

Corcoran, R., Marshall, G., and Walsh, E., 2017. *The Psychological Benefits of Cooperative Place-Making: A Mixed Methods Analyses of Co-Design Workshops*, CoDesign, DOI: 10.1080/15710882.2017.1340484.

Cook, T. D, and Campbell, D.T., 1979. *Quasi-Experimentation: Design and Analysis Issues for Field Settings*, Houghton Mifflin.

Cooper, T., 2008. *Slower Consumption: Reflections on Product Life Spans and the "Throwaway Society". Journal of Industrial Ecology*, 9(12), 51–67. doi: https://doi.org/10.1162/1088198054084671.

Cooper, T., 2009. *War on Waste? The Politics of Waste and Recycling in Post-War Britain*, 1950–1975, Capitalism Nature Socialism 20(4): 53-72.

Cornish, E., 2004. *Futuring: The Exploration of the Future*, World Future Society Bethesda, Maryland, USA.

Corvellec H., Ek. R., Johansson, N., Svingstedt, A., Zapata, P., Zapata Campos, M. J., 2018. *Waste Prevention is About Effective Production and Thoughtful Consumption – Not About Waste, Seven Lessons from The Research Project,* From Waste Management to Waste prevention, Helsingborg, Department of Service Management and Service Studies, Lund University.

Creative Challenge, 2015. *Creative Ecology,* Creative Challenge Student Exhibition Week. Available at: http://www.creativeecology.eu/creative-challenge-exhibition-week (Accessed: 19 June 2015).

Cross, N., Hiller, B., Musgrove, J., and O'Sullivan, P., 1984. *Developments in Design Methodology,* 1st ed. Chichester, New York, Brisbane, Toronto, Singapore: John Wiley& Sons Ltd.

Crouch, C., and Pearce, J., 2012. *Doing Research in Design,* 1st ed. London - New York: Berg Publishers.

Crutzen, P. J., and Schwägerl, C., 2011. *Living in the Anthropocene,* Available at: http://e360.yale.edu/feature/living_in_the_anthropocene_toward_a_new_global_ethos/2363/ (Accessed: 11 March 2016).

Curley, R., *2020*. Where Does Our Recycling Go? The Guildford Dragon News. Available at https://www.guildford-dragon.com/2020/03/20/where-does-our-recycling-go/ (Accessed 31 August 2020).

Daily Mail, 2018. *The Burning Truth: Official Figures Show That 40% of Waste is Incinerated Instead of Being Recycled or Sent to Landfill,* 14 February 2018. Available at https://www.dailymail.co.uk/news/article-5393197/Figures-40-waste-incinerated.html (Accessed: 07 December 2019).

Damon, A., 2019. *Microplastics in the Sargasso Sea*, The Ecologist Journal for the Post Industrial Age, 29 August 2019. Available at https://theecologist.org/2019/aug/29/microplastics-sargasso-sea (Accessed: 18 November 2019).

Dator, J., 2005. *De-Colonizing the Future*, Journal of Futures Studies, 9(3): 93-104.

Davison, P., and Asch, R. G., 2011. *Plastic Ingestion by Mesopelagic Fishes in the North Pacific Subtropical Gyre,* Mar Ecol. Available at http://www.int-res.com/abstracts/meps/v432/p173-180/ (Accessed: 25 January 2015).

De Certeau, M., 1984. *The Practice of everyday life,* Berkeley: University of California Press.

Deleuze, G., 1968. *Différence Et Répétition,* Paris:Presses Universitaires de France. English translation: *Difference and Repetition*, trans.Patton, P., London: Athlone.

Deleuze, G., and Guattari, F., 1987. *A Thousand Plateaus*, trans. Massumi, B., Minneapolis: University of Minnesota Press.

Demaria, F. and Schindler, S., 2015. *Contesting Urban Metabolism: Struggles Over Waste-to-Energy in Delhi, India*, Antipode 48 (2): 293–313.

Demir, E., 2008. *The Field of Design and Emotion: Concepts, Arguments, Tools, and Current Issues*, in METU JFA 2008/1, (25:1), 135-152.

Denzin, N., and Lincoln, Y., 1994. *The Landscape of Qualitative Research: Theories and Issues*. Thousand Oaks, CA: Sage.

DEFRA, Department for the Environment Food and Rural Affairs, 2018. *Generating Energy from Waste*. Available at https://deframedia.blog.gov.uk/2018/02/15/thursday-15-february-canada-visit-waste-incineration-air-quality-and-supreme-court-ruling/ (Accessed: 09 September 2019).

DESA, Department of Economic and Social Affairs, 2015. *World Population Prospects The 2015 Revision.* Available at https://population.un.org/wpp/Publications/Files/Key_Findings_WPP_2015.pdf (Accessed: 29 June 2020).

Dewberry, E., and Fletcher, K., 2001. *Demi: Linking Design with Sustainability*, In: The 7th European Roundtable on Cleaner Production, IIIEE, 2-4 May 2001, Lund, Sweden. Available at https://core.ac.uk/reader/82049 (Accessed: 07 May 2021).

Diamanti-Kandarakis, E., Bourguignon, J-P., Giudice, L. C., Hauser, R., Prins, G.S., Soto, A.M., Zoeller, R.T., and Gore, A.C., 2009. *Endocrine-Disrupting Chemicals: An Endocrine Society Scientific Statement*, Endocrine Reviews 30, no. 4: 293–342.

Diffen, A., 2019. *Autotroph vs. Heterotroph*. Available at https://www.diffen.com/difference/Autotroph_vs_Heterotroph (Accessed: 18 January 2020).

Dimitrijevic, K., and Kopping, J., 2008. *Street synergy: African Re-Tale in Global Narrative*, Ed. Peressut, L., B., Forino, I., Postiglione, G., Scullica, F., *Places & Themes of Interiors: Contemporary Research Worldwide,* Interiors Studies Franco Angeli, Milano, Italy.

Dimitrijevic, K., 2010. *Township Metropolis-Design for Disposal,* Ed. Taylor, M., Lee, G., and Lindquist, M., *Interior Spaces in Other Places*: IDEA (Interior Design/Interior Architecture Educators Association) Symposium Brisbane. Available at https://idea-edu.com/symposiums/2010-interior-space-in-other-places/ (Accessed: 24 June 2015).

Dimitrijevic, K., 2013. *KraalD: Transformation by Designedisposal*. MRes in Design Thesis, Goldsmiths University of London. Available at https://www.academia.edu/43206426/Katarina_Dimitrijevic_KraalD_MRes_in_Design_Thesis_Goldsmiths_UoL_2013 (Accessed: 22 June 2020).

Dimitrijevic, K., 2014. *Transgressing Plastic Waste: Designedisposal Strategic Scenarios*, pp. 60–66, Sustainable Innovation 2014, in *Cities & Regions as Catalyst for Smart & Sustainable Innovation,* 19th International Conference November 2014, KADK, Copenhagen, Denmark. Available at https://www.academia.edu/37924470/Sustainable_Innovation_2014 (Accessed 29 November 2021).

Dimitrijevic, K., 2015. *Designedisposal Seminar.* Available at: https://vimeo.com/user42226423 (Accessed 29 March 2019).

Dimitrijevic, K., 2017. *Plasticized*, Carbon Free Conference, *Life and the Afterlife of Plastics*, Political Ecology Research Centre, Massey University. Available at http://perc.ac.nz/wordpress/panel-4-packaging-lcas-and-design/ (Accessed: 27 August 2017).

Dimitrijevic, K., 2019a. *Living Landfill,* Ed. Fletcher, K., St. Pierre, L., Tham, M., *Design and Nature: A Partnership*, Earthscan from Routledge, UK.

Dimitrijevic, K., 2019b. *CitySelf Anima*, Ed. Rodgers, P. A., Design Research for Change 2019, Lancaster University.

Dimitrijevic, K., 2020. *Visualizing The North Atlantic Gyre Patch*, Perspectives on Waste from the Social Sciences and Humanities Opening The Bin: *Opening the Bin*, Ed. Ek, R., and Johansson, N., Cambridge Scholars Publishing.

Diprose, R.,1994. *The Bodies of Women: Ethics, Embodiment and Sexual Difference*, London: Routledge.

Discard Studies, 2019, *Home*, Available at https://discardstudies.com/ (Accessed: 16 October 2019).

Discard Studies, 2016, *Municipal Versus Industrial Waste: Questioning the 3-97 Ratio*
Available at https://discardstudies.com/2016/03/02/municipal-versus-industrial-waste-a-3-97-ratio-or-something-else-entirely/ (Accessed: 03 December 2017).

Dolphijn, R., and Van der Tuin, I., 2012. *New Materialism: Interviews & Cartographies.* Open Humanities Press, An imprint of MPublishing – University of Michigan Library, Ann Arbor.

Dorminey, B., 2010. *Earth Oceans Were Homegrown*, American Association for the Advancement of Science, ScienceMag, Nov. 29, 2010. Available at https://www.sciencemag.org/news/2010/11/earth-oceans-were-homegrown#:~:text=But%20a%20new%20study%20suggests,planet%20has%20always%20harbored%20water.(Accessed: 16 May 2019).

Douglas, M., 1966. *Purity and Danger: An Analysis of Concept of Pollution and Taboo,* London: Routledge.

Drackner, M., 2005. *What is waste? To whom? – An anthropological perspective on garbage*. Waste Management & Research, 23, pp. 175-181.

Dubberly, H., 2017. *Connecting Things: Broadening Design to Include Systems, Platforms and Product Service Ecologies*, Ed. Atzmon, L., and Boradkar, P., in *Encountering Things: Design and Theories of Things*, Bloomsbury Academic Publishing.

Dunne, A., and Raby, F., 2013. *Speculative Everything: Design, Fiction, and Social Dreaming*, Cambridge, MA: MIT Press.

Easy Biology Class, 2019. *Bacterial Cell Surface Structures and Appendages*, Available at https://www.easybiologyclass.com/bacterial-cell-surface-structures-and-appendages-flagella-fimbriae-and-pili/ (Accessed: 25 January 2019).

Ek, R., and Johansson, N., 2020. *Introduction: Let us Open the Bin.* Perspectives on Waste from the Social Sciences and Humanities: Opening the Bin, Cambridge Scholars Publishing.

Ellen MacArthur 2020. *Plasticful Foods Project*. Available at https://ellenmcc.com/plasticful-foods (Accessed: 19 October 2021).

Ellen MacArthur Foundation, 2017. *The New Plastics Economy: Rethinking the Future of Plastics & Catalysing Action.* Available at

https://www.ellenmacarthurfoundation.org/publications/the-new-plastics-economy-rethinking-the-future-of-plastics-catalysing-action (Accessed: 19 March 2018).

Ellen MacArthur Foundation, 2016. *New Plastics Economy Report.* Available at https://www.ellenmacarthurfoundation.org/ (Accessed: 27 June 2017).

Ellis, E.C., and Ramankutty, N., 2008. *Putting People in the Map: Anthropogenic Biomes of the World*, pp.435-439. Available at http://ecotope.org/people/ellis/papers/ellis_2008.pdf (Accessed: 16 January 2019).

Ellis, E. C., Goldewijk, K.K., Siebert, S., Lightman, D., Ramankutty, N., 2010. *Anthropogenic Transformation of the Biomes* 1700 to 2000, Global Ecology and Biogeography, 19(5).

England, M. H., Kajtar, J. B., & Maher, N., 2015. *Robust warming projections despite the recent hiatus*, Nature Climate Change, 5(5), 394–396. Available at https://doi.org/10.1038/nclimate2575 (Accessed: 27 February 2019).

Eriksen, M. Laurent, C., Lebreton, M., Carson, H.S., Thiel, M., Moore, C.J., Borrero, J.C., Galgani, F., Ryan, P.G., Reisser, J., 2014. *Plastic Pollution in the World's Oceans: More than 5 Trillion Plastic Pieces Weighing over 250,000 Tons Afloat at Sea,* Available at http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0111913 (Accessed: 09 September 2016).

Eriksen, M., Thiel, M., Lebreton, L.C.M., Takada, H.K., 2016. *Nature of Plastic Marine Pollution in the Subtropical Gyres,* DOI:10.1007/698_2016_123. Available at https://www.researchgate.net/publication/313594097_Nature_of_Plastic_Marine_Pollution_in_the_Subtropical_Gyres (Accessed: 16 July 2017).

Ericson, M. and Maze, R., Editors. 2011. *DESIGN ACT: Socially and politically engaged design today*, Berlin: Sternberg/Iaspis.

Escobar, A. 2018. *Designs for the Pluriverse: Radical Interdependence, Autonomy, and the Making of Worlds*, Durham, NC: Duke University Press.

ESA, European Space Agency, 2017. *Space Debris,* Available at http://www.esa.int/Our_Activities/Operations/Space_Debris/About_space_debris (Accessed: 03 February 2018).

ECR, Ethical Corporation Report, 2017. *Plastics Briefing*, Available on request http://www.ethicalcorp.com/whitepapers/responsible-business-trends-report-2017 (Accessed: 15 February 2018).

Fargnoli, M., Sakao, T., and Notarnicola, S., 2005. *A Procedure to Identify Effective Redesign Options in Ecodesign*, International Conference on Engineering Design (ICED 05), Melbourne, August 15-18, 2005.

Farrelly, T. A., Taffel, S., and Shaw, I.C., 2021. *Our Plastic Inheritance*, Plastic Legacies: Pollution, Persistence, and Politics, AU Press.

Farrelly, T. A., and. Shaw. I.C., 2017. *Polystyrene as Hazardous Household Waste*, In Household Hazardous Waste Management, edited by Daniel Mmereki, 45–60. IntechOpen. DOI: 10.5772/65865.

Fauxdrapeaux. 2015. *Designtransposal workshop,* UCA Creative Challenge Blog. Available at https://fauxdrapeaux.wordpress.com/2015/03/25/workshop-with-the-sea-and-pollution-design-transposal-visualising-through-the-gyre/. (Accessed: 25 April 2015).

Fisher, T., 2008. *Objects for Peaceful Disordering: Indigenous Design and Practices of Protest*, The Design Journal, vol. 11, no 3, pp. 221-238.

Fisher, T., and Shipton, J., 2010. *Designing for Re-use: the life of consumer packaging*, Earthscan UK and USA.

Fleetwood, S., 2005. *Ontology in Organization and Management Studies: A Critical Realist Perspective*, Organization 12, 197e222.

Fletcher, K., St. Pierre, L., and Tham, M., Editors. 2019. *Design and Nature: A Partnership,* Earthscan from Routledge.

Fletcher, K., and Tham, M., 2019. *Earth Logic: Fashion Action Research Plan*, The JJ Charitable Trust, London. Available at https://earthlogic.info/wp-content/uploads/2021/03/Earth-Logic-E-version.pdf (Accessed: 17 January 2020).

Foucault, M., 1988. *The Ethics of Care for the Self as Practice of Freedom*, In: *The Final Foucault*, Eds.Bernauer, J., Rasmussen, D. Cambridge: MIT Press.

Folke, C., Carpenter, S., Walker, B., Scheffer, M., Elmqvist, T., Gunderson, L., and Holling, C.S., 1996, *Regime Shifts, Resilience, and Biodiversity in Ecosystem Management*, Annual Reviews, p. 557-575. Available at https://www.ethz.ch/content/dam/ethz/special-interest/usys/ites/ecosystem-management-dam/documents/EducationDOC/EM_DOC/Recommended%20readingDOC/Folke_etal_2004.pdf (Accessed: 27 November 2019).

Foucault, M., 1980. *Power/Knowledge*, New York: Pantheon.

Foucault, M., 1988. *Technologies of the Self: A Seminar with Michael Foucault*, Ed. Martin et al., Amherst: University of Massachusetts Press.

Friedlingstein, P., Meinshausen, M., Arora, V. K., Jones, C. D., Anav, A., Liddicoat, S. K., & Knutti, R., 2014. *Uncertainties in CMIP5 climate projections due to carbon cycle feedbacks*, Journal of Climate, 27(2), 511–526. Available at https://doi.org/10.1175/Jcli-D-12-00579.1(Accessed: 05 November 2018).

Fry, H., Ketteridge, S. and Marshall, S., Ed. 2009. *A Handbook for Teaching and Learning in Higher Education,* 3rd ed. London: Routledge.

Fry, T., 2019., *Introducing 'The Sustainment'*, Ed. Willis A.M., *The Design Philosophy Reader.* Bloomsbury.

Fry, T., 2010. *Design as Politics,* New York: Bloomsbury.

Fu, W. W., Primeau F., Moore, J.L., Lindsay, K., Randerson, T., 2018. *Reversal of Increasing Tropical Ocean Hypoxia Trends with Sustained Climate Warming*. Department of Earth System Science, University of California, Irvine, CA, USA, 2 Climate and Global Dynamics Division, National Center for Atmosphere Research, Boulder, CO, USA. Global Biogeochemical Cycles, AGU 100 Advancing Earth and Space Science. Volume32, Issue4, April 2018, pp.551-564. Available at https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1002/2017GB005788 (Accessed: 03 October 2019).

Fuad-Luke, A., 2009. *Design Activism: Beautiful Strangeness for a Sustainable World,* London; Sterling, VA: Earthscan.

Furniss, L., 2015. *Beyond Discipline Design Practice and Design Education in the 21st Century Report,* Strategic Creativity Research Lab, UK. Available at http://chead.ac.uk/wp-content/uploads/2015/11/BeyondDiscipline_web1.pdf (Accessed: 11 February 2016).

Gaffney, O., and Steffen, W., 2017. *Future Earth. The Antroposcene Equation,* The Anthropocene Review, Sage Journals. Available at https://doi.org/10.1177/2053019616688022 (Accessed: 14 July 2018).

Galgani, F., Zampoukas, N., Fleet, D., Franeker, J. v., Katsanevakis, S., Maes, T., Mouat, J., Oosterbaan, L., Poitou, I. & Hanke, G. 2010. *Marine Strategy Framework Directive: Task Group 10 Report Marine Litter*, Office for Official Publications of the European Communities.

Garfinkel, H., 1974, *On the Origins of the Term "Ethnomethodology,"* In Turner, R. (Ed.), Ethnomethodology. Penguin, Harmondsworth.

Garfinkel, H.,1991. *Studies in Ethnomethodology*, Polity Press.

GAIA, Global Alliance for Incinerator Alternatives, 2013. *The Global Alliance of Waste Pickers.* Available at http://globalrec.org/tag/global-alliance-for-incinerator-alternatives/ (Accessed:16 October 2015).

Gbowee, L. R., 2011. *Ubuntu Definition.* Available at: https://psychology.wikia.org/wiki/Ubuntu (Accessed 29 July 2020).

GDC, Greenside Design Centre, 2005. *10% Projects,* Available at http://designcenter.co.za/facilities-student-life/10-percent/ (Accessed: 12 March 2015).

GESAMP, Group of Experts on the Scientific Aspects of Marine Environmental Protection, 2015. *Sources, Fate and Effects of Microplastics in the Marine Environment: A Global Assessment*, Kershaw, P. J., Ed. GESAMP Reports and Studies No. 90, 96 Available at http://ec.europa.eu/environment/marine/good-environmental-status/descriptor-10/pdf/GESAMP_microplastics%20full%20study.pdf (Accessed: 25 July 2017).

GESAMP, Group of Experts on the Scientific Aspects of Marine Environmental Protection 2018. *The Magnitude and Impacts of Anthropogenic Atmospheric Nitrogen Inputs to the Ocean,* GESAMP Reports and Studies No. 97 GAW REPORT No. 238.

Gibson, C., Waitt, G., R., Head, L., M., and Gill, N., 2011. *Is it Easy Being Green? On the Dilemmas of Material Cultures of Household Sustainability.* Eds. Lane, R., and Gorman-Murray, A. W., Material Geographies of Household Sustainability, pp. 19-33. Surrey, England: Ashgate Publishing Limited. Available at https://ro.uow.edu.au/scipapers/817

Giddens, A., 1984. *The Constitution of Society: Outline of the Theory of Structuration*, University of California Press.

Gille, Z., 2010. *Actor networks, modes of production, and waste regimes: reassembling the macro-social,* Environment and Planning A42(5): 1049-1064.

Gourmelon, G., 2015, *Global Plastics Production Rises, Recycling Lags*, Worldwatch Institute, Available at http://www.worldwatch.org/global-plastic-production-rises-recycling-lags-0 (Accessed: 05 February 2016).

Gray, C. and Malins, J., 2004. *Visualizing Research.* Ashgate Publishing, Ltd.

Grundy, S., 1987. *Curriculum: Product or Praxis*? Falmer Press.

Groupe, K., 2015. *Photo credits.* The Mango Lab, Available at https://themangolab.co.uk/ (Accessed 29 October 2019).

Grusin, R., 2015. *The Nonhuman Turn: 21st Century Studies,* Minneapolis: University of Minnesota Press.

Gyre, 2014. National Geographic Encyclopaedia. Available at https://www.nationalgeographic.org/encyclopedia/great-pacific-garbage-patc (Accessed: 02 May 2015).

Hall, P., 2017. *When Objects Fail: Unconcealing Things in Design Writing and Criticism*, Ed. Atzmon, L., and Boradkar, P., *Encountering Things: Design and Theories of Things*, Bloomsbury Academic Publishing.

Halliday, M. A. K., 1978. *Language as Social Semiotic*, Edward Arnold Publishing.

Hansen, J., Nazarenko, L., Ruedy, R., Sato, M., Willis, J., del Genio, A., 2005. *Earth's energy imbalance: Confirmation and implications*, Science, 308(5727), 1431–1435. Available at https://doi.org/10.1126/science.1110252 (Accessed: 01 October 2019).

Haraway, D., 1997. *Modest_Witness@Second_Millennium.FemaleMan_Meets_OncoMouse,* London and New York Routledge.

Haraway, D., 2003. *The Companion Species Manifesto: Dogs, People, and Significant Otherness*, Chicago: Prickly Paradigm Press.

Haraway, D., 2017. *Arts of Living On A Damaged Planet,* Ed. Tsing, A., Swanson, H., Gan, E., Bubandt, N. University of Minnesota Press.

Hase, S. & Kenyon, C., 2000. *From Andragogy to Heutagogy,* Ulti BASE. Faculty of Education Language and Community Services, RMIT University. Available at http://pandora.nla.gov.au/nphwb/20010220130000/http://ultibase.rmit.edu.au/New/newdec00.html (Accessed: 29 August 2019).

Hawkins, G., 2006. *The Ethics of Waste – How We Relate to Waste,* 1st ed. United States of America: Rowman & Littlefield Publishers, INC: UNSW Press.

Hawkins, G. & Muecke, S., 2003. *Culture and Waste: The Creation and Destruction of Value,* 1st ed. United States of America: Rowman & Littlefield Publishers, Inc.

HEFCE, Higher Education Funding Council for England, 2005. *Sustainable Development in Higher Education,* [Online] Available at http://webarchive.nationalarchives.gov.uk/20100303151747/http://www.hefce.ac.uk/pubs/hefce/2005/05_28/ (Accessed: 21 December 2016).

Heidegger, M., 2001. *The Thing,* in *Poetry Language Thought*, trans. Hofstadter, A., New York: Perennial Classics.

Heidegger, M., 1995. *The Fundamental Concepts of Metaphysics: World, Finitude, Solitude*, trans. McNeill, W., and Walker, N., Indiana University Press: Bloomington and Indianapolis.

Heidegger, M., 1962. *Being and Time,* trans. Macquarrie, J., and Robinson, E., Blackwell Publishers Ltd.

Hekman, S., 2010.*The Material of Knowledge Feminist Disclosures*, Indiana University Press.

Henare, A., Holbraad, M., and Wastell, S., 2007. *Thinking Through Things,* 1st ed. London and New York: Routledge.

Hicks, D., and Beaudry M. C., Ed. 2010. *The Oxford Handbook of Material Culture Studies*. Oxford University Press.

Hillgren, P. A., Seravalli, A., and Emilson, A., 2011. *Prototyping and Infrastructuring in Design for Social Innovation*, CoDesign, 7(3–4), pp. 169-183. Available at http://dx.doi.org/10.1080/15710882.2011.630474. (Accessed: 07 August 2021).

Hillman, J., 1996. *Aesthetics and Politics*, Institute of Labor and Mental Health, Tikkun, San Francisco Vol. 11, Iss. 6, Nov/Dec 1996: 38-44.

Hird, M. J., 2009. *The Origins of Sociable Life: Evolution After Science Studies,* Queens's University, Canada, Palgrave Macmillan Publishers Ltd.

Holland, R., 2016. Photo. *Mierle Laderman Ukeles,1979-1980, Touch Sanitation Performance,* Queens Museum, USA. Available at

https://queensmuseum.org/wp-content/uploads/2016/12/Mierle%20Laderman%20Ukeles_Maintenance%20Art_Brochure.pdf (Accessed: 27 February 2017).

Holter, I. M., and Schwartz-Barcott, D., 1993. *Action Research: What is it? How has it been used and how can it be used in nursing?* Journal of Advanced Nursing, 128, pp. 298-304.

Hossay, P., 2006*. Unsustainable: A Primer for Global Environmental and Social Justice*, United Kingdom: ZED Books.

Hultman, J. & Corvellec, H., 2012. *The European Waste Hierarchy: From the Socio-Materiality of Waste to a Politics of Consumption,* Environment and Planning A44(10): 2413-2427.

IDEO, 2003. *Method Cards,* Available at https://www.ideo.com/us/post/method-cards (Accessed: 07 November 2015).

IEP, Internet Encyclopedia of Philosophy, 2017. *Martin Heidegger (1889-1976).* Available at https://www.iep.utm.edu/heidegge/ (Accessed: 03 February 2020).

INDEX, 2005. *Design to Improve Life: Future Scenarios,* Available at https://designtoimprovelife.dk/ https://issuu.com/index/docs/future_scenarios (Accessed: 26 May 2016).

IPCC, Intergovernmental Panel on Climate Change, 2019. *Climate Change and Land and The Ocean and Cryosphere in a Changing Climate* Reports, Available at https://www.ipcc.ch/2019/ (Accessed: 11 March 2020).

IUCN, International Union for Conservation of Nature, 2018. *Marine Plastics,* May 2018 Issues Brief. Available at https://www.iucn.org/resources/issues-briefs/marine-plastics (Accessed: 04 March 2019).

IUCN, International Union for Conservation of Nature, 2019. *Issues Brief Ocean Deoxygenation,* December 2019. Available at https://www.iucn.org/sites/dev/files/ocean_deoxygenation_issues_brief_-_final.pdf (Accessed: 17 February 2020).

Jambeck, J. R., Geyer, R., Wilcox, C., Siegler, T.R., Perryman, M., Andrady, A., Narayan, R., Law, K.L., 2015. *Plastic Waste Inputs From Land into the Ocean,* Science Vol. 347, Issue 6223, pp. 768-771, DOI: 10.1126/science.1260352. Available at http://science.sciencemag.org/content/347/6223/768 (Accessed: 27 May 2016).

Jemieson, A. J., 2020. *The New Face of the Plastics Crisis*, Newcastle University Press Office. Available at: https://www.ncl.ac.uk/press/articles/latest/2020/03/eurythenesplasticus/ (Accessed: 19 October 2020).

Jenkins, P., 2006. *Informal Settlements: Infernal or eternal? The role of research in policy advocacy and urban informal settlements in Angola*, in Eds., Huchzermeyer, M. and Karam, A. *Informal Settlements a Perpetual Challenge.* Cape Town: UCT Press.

Johansson, N., 2021. *Intervention – Disaster capitalism, COVID-19, and Single-Use Plastic.* Antipode Online, 26 January 2021. Available at https://antipodeonline.org/2021/01/26/covid-19-and-single-use-plastic/ (Accessed: 16 April 2021).

Joselit, D., Lambert-Beatty, C., and Foster, H., 2016. *A Questionnaire on Materialisms,* October 155, Winter 2016, pp. 3–110, October Magazine, Ltd. and Massachusetts

Institute of Technology. Available at https://dspace.mit.edu/handle/1721.1/113914 (Accessed: 16 January 2019).

Jungk, R., & Müllert, N., 1987. *Future Workshops: How to Create Desirable Futures*, London, England: Institute for Social Inventions.

Kästner, E. E., 1933. *The Flying Classroom (Das Fliegende Klassenzimmer)*, Germany.

Kay, T., 1994. *Upcycling*, Reiner Pilz. Salvo, Germany. October (23), 11-14.

Kemmis, S. and McTaggart, R., 2007. *Participatory Action Research: Communicative Action and the Public Sphere*. In: Denzin, N. and Lincoln, Y., Eds., *Strategies of Qualitative Inquiry*, Sage, Thousand Oaks, 271-330.

Kennedy, G., 2008. *An Ontology of Trash, The Disposable and Its Problematic Nature*, Suny Series in Environmental Philosophy and Ethics.

Knapp, R., 2008. *Wholesome Design for Wicked Problems.*Public Sphere Project. Available at http://www.publicsphereproject.org/patterns/lv?page=4 (Accessed: 24 November 2016).

Knoetze, F., 2013. *Cape Mongo – VHS,* featuring Kaelo Molefe. Available at https://francoisknoetze.carbonmade.com/projects/4395983 (Accessed: 30 June 2015).

Koskinen, I., Zimmerman, J., Binder, T., Redström, J., & Wensveen, S., 2011. *Design Research Through Practice: From the Lab, Field, and Showroom*, Waltham, MA: Morgan Kaufmann / Elsevier.

KraalD., 2015. *Designtransposal Workshop*. PhD By Design, Goldsmiths University of London. Available at https://issuu.com/phdbydesign/docs/pbd_conference_documentation_2015/49 (Accessed: 11 April 2016).

KraalD., 2019. *What is Above so its Below: Land CitySelf Flock, Sea PET Eddy, Sea Urchin & Jellyfish.* Group exhibition *Tall Tales of the Kitchen Kelpies' Soup*, Raw Lab, London. Available at https://kraald.org/work-page/ (Accessed: 14 July 2020).

KraalD., 2020. *Plastic Re Use Muse* and *Design & Art & Science & Waste Activism,* Pinterest Boards. Available at https://www.pinterest.co.uk/kraald/plastic-re-use-muse/ and https://www.pinterest.co.uk/kraald/design-art-science-waste-activism/ Accessed: 28 May 2020).

Kramvig, B., and Pettersen, M., 2016. *Living Land-Below as Above,* Editor Belina, M., *Living Earth Field Notes from the Dark Ecology Project 2014-2016 Norway and Russia*, Sonic Act Press & the Authors.

Kristeva, J., 1991. *Strangers to Ourselves,* New York: University Press.

Kuure, E., 2017. *Workshops as a Catalyst for Common Good,* University of Lapland, Rovaniemi, Finland. Available at http://artofresearch2017.aalto.fi/papers/6_Essi_Kuure.pdf (Accessed: 10 July 2018).

Laderman Ukeles, M., 1971. *Manifesto For Maintenance Art 1969! Proposal for an Exhibition 'Care',* Originally published in Jack Burnham, *Problems of Criticism*, Artforum (January 1971) 41; reprinted in Lucy Lippard, *Six Years: The Dematerialization of the Art Object.* New York: New York University Press, 1979: 220-221.

Laderman Ukeles, M., 2017. *Maintenance Art Works,* Ed. Phillips, P.C., and Finkelpearl, T., Lippard, L.R., Published by Queens Museum DelMonico Books: Prestel Munich London New York.

Landsberger, S., 2019. *Beijing Garbage: A City Besieged by Waste*. Amsterdam University Press.

Lather, P., 1986. *Research as Praxis,* Harvard Educational Review, 56.3. In: 1986: 257-277.
Latour, B., 1991. *We Have Never Been Modern*. Translated by Porter, C. Cambridge, Massachusetts: Harvard University Press.
Latour, B., 1993. *The Pasteurization of France,* trans Sheridan A., and Law J., Harvard University Press Cambridge, Massachusetts and London, England.
Latour, B., 2010. *An Attempt at a "Compositionist Manifesto," New Literary History,* Vol. 41, No. 3 (Summer 2010), pp. 471-490. The Johns Hopkins University Press.
Le Grange, L., 2018. *Spinoza, Deep Ecology and Education Informed by a (Post)human Sensibility*, Acess: Contemporary Issues in Education 2018, Vol. 39, No. 1, 81–90.
Lebreton, L., and Andrady, A., 2019. *Future Scenarios of Global Plastic Waste Generation and Disposal*, Palgrave Communications (2019) 5:6. Available at: https://www.nature.com/articles/s41599-018-0212-7 (Accessed: 07 September 2020).
Lefebvre, H., 1991. *The Production of Space.* Translated by Nicholson-Smith, D., Oxford: Wiley-Blackwell.
Leopold, A., 1949. *A Sand County Almanac: And Sketches Here and There*, Oxford University Press.
Levidow, L. & Upham, P., 2016. *Socio-Technical Change Linking Expectations and Representations: Innovating Thermal Treatment of Municipal Solid Waste (MSW),* Science and Public Policy.Doi: 10.1093/scipol/scw054.
Levidow, L., 2017. *Treating Waste as a Resource,* RGS-IBG Annual International Conference 2017. Available at: http://conference.rgs.org/AC2017/39 accessed 26 July 2017 (Accessed: 12 June 2018).
Levin, K., Cashore, B., Bernstein, S., & Auld, G., 2007. *Playing it Forward: Path Dependency, Progressive Incrementalism, and the ''Super Wicked'' Problem of Global Climate Change*, Paper presented at International studies association convention, Chicago, Il, February 28th–March 3. Lindblom, C. E., 1959. The Science of Muddling Through. Public Administration Review, 19(2), 79–88.
Levin, K., Cashore, B., Bernstein, S. and Auld, G., 2012. *Overcoming the Tragedy of Super Wicked Problems: Constraining our Future Selves to Ameliorate Global Climate Change,* Policy Sciences. 45 (2): 123–152.
Lewin, K.,1946. *Action Research and Minority Problems*, in Ed. Lewin, G.W., 1948. In *Resolving Social Conflicts*, New York: Harper & Row.
Liboiron, M., 2005*. Eco-System,* Available at https://maxliboiron.com/2013/08/05/eco-system/ (Accessed: 24 June 2016).
Liboiron, M., 2012. *Redefining Pollution Plastics in the Wild*, PhD Theses in the Steinhardt School of Culture, Education and Human Development, New York University.
Liboiron, M., 2014*. Sea Globes,* Available at https://maxliboiron.com/2014/03/23/sea-globes/ (Accessed: 27 June 2016).
Liboiron, M., 2014. *SEAGLOBE 2012,* In *Gyre: The Plastic Ocean,* Booth-Clibborn Editions.
Liboiron, M., 2015. *Visually Representing Slow Disasters,* Discard Studies. Available at http://discardstudies.com/2015/03/27/visually-representing-slow-disasters/ (Accessed: 04 July 2018).
Liboiron, M., 2016. *Redefining Pollution and Action: The Matter of Plastics*, Journal of Material Culture 21, no. 1: 87–110.
Liboiron, M., 2020. *Dr. Max Liboiron on Reorienting Within a World of Plastic /156.* January For The Wild, Episode 156 podcast on 29 January 2020.

Available at https://forthewild.world/listen/max-liboiron-on-reorienting-within-a-world-of-plastic-156 (Accessed: 29 February 2020).

Longobardi, P., 2014. *Wilderness and Invasion: Plastic Place-Markers of the Anthropocene*, In *Gyre: The Plastic Ocean,* Booth-Clibborn Editions.

Lovelock, J., 2001. *Gaia: The Practical Science of Planetary Medicine*, Oxford University Press.

Lury, C., and Wakeford, N., Eds. 2012. *Inventive Methods: The Happening of the Social,* Routledge.

Lynch, K., 1990. *Wasting Away*, Edited, with contributions by Southworth, M., San Francisco: Sierra Club Books.

Lippitt, L., 1998. *Preferred Futuring,* Beret Koehler Publishers, Inc.

Lippsett, L., 2013. *Behold the 'Plastisphere,' Colonies of microbes flourish on tiny bits in the ocean.* Oceanus magazine, December 17, 2013. Woods Hole Oceanographic Institution. Available at https://www.whoi.edu/oceanus/feature/behold-the-plastisphere/ (Accessed: 04 November 2014).

MacBride, S., 2011. *Recycling Reconsidered: The Present Failure and Future Promise of Environmental Action in the United States*. Boston: MIT Press.

McNeill, W., 2019. *The Complication of Praxis*, Ed. Willis A.M., *The Design Philosophy Reader.* Bloomsbury.

Mäkelä, M., & Nimkulrat, N., 2011. *Reflection and Documentation in Practice-led Design Research*, Proceedings of 4th Nordic Design Research Conference. Helsinki, Finland.

Manser, M. H., 2007. *The Facts on File Dictionary of Proverbs*. Infobase Publishing.

Manzini, E. 2014. *Making Things Happen: Social Innovation and Design*, Design Issues, 30(1), pp. 57-66. Available at http://dx.doi.org/10.1162/DESI_a_00248.

Manzini, E., 2015. *Design, When Everybody Designs. An Introduction to Design for Social Innovation*, Cambridge: MIT Press.

Mato, Y., Isobe, T., Takada, H., Kanehiro, H., Ohtake, C., and Kaminuma, T., 2001. *Plastic Resin Pellets as a Transport Medium for Toxic Chemicals in the Marine Environment,* Environ. Sci. Technol. 35, 318–324.

Maturana, H. R. & Varela, F. J., 1992. *The Tree of Knowledg*e, Boston: Shambala.

Mauch, C., Ed. 2016. *Out of Sight, Out of Mind: The Politics and Culture of Waste,* RCC Perspectives: Transformations in Environment and Society 2016/1., Rachel Carson Center.

Maximenko, N., Hafner, J. & Niiler, P., 2012. *Pathways of Marine Debris from Trajectories of Lagrangian Drifters*, Marine Pollution Bulletin 65, 51-62.

Mazé, R., & Önal, B., 2010. *Hands on the Future*, In Proceedings of the Stockholm Futures Conference, KTH Royal Institute of Technology, Stockholm.

Mazé, R., 2016. *Design and the Future: Temporal Politics of 'Making a Difference*.' in *Design Anthropological Futures.* Edited by Smith, R. C., Vangkilde, K. T., Kjaersgaard, M. G., Otto, T., Halse, J., Binder, T., Bloomsbury Academic.

Mazé, R., 2019. *Politics of Designing Visions of the Future*, Ed. Candy, S., and Potter, C., *Design and Futures*, Journal of Futures Studies, 23(3), March 2019, Tamkang University Press Taipei.

McDonough, W., and Braungart, M., 2002. *Cradle to Cradle: Remaking the Way We Make Things*, North Point Press, New York.

McDonough, W., and Braungart, M. 2013. *The Upcycle: Beyond Sustainability–Designing for Abundance*, North Point Press, New York.

Merçon, J., 2011. *Environmental Ethics and Spinoza's Critique of Anthropocentrism*, Ethica, 18, 161–173.

Micklethwaite, P., 2019. *Reviewed by (2019) Design Ecology Politics: Towards the Ecocene, by Joanna Boehnert*, The Design Journal, 22:6, 905-909, DOI: 10.1080/14606925.2019.1649955

Morton, T., 2007. *Ecology Without Nature: Rethinking Environmental Aesthetics,* Harvard University Press.

Moore, J. W., 2000. *Environmental Crises and the Metabolic Rift in World-Historical Perspective,* Organization & Environment, 13 (2): 123-157.

Moore, J. W., 2015. *Capitalism in the Web of Life: Ecology and the Accumulation of Capital,* New York: Verso.

Moore, S. A., 2012. *Garbage Matters: Concepts in New Geographies of Waste*. Progress in Human Geography, DOI:10.1177/0309132512437077.

Morley, D., 1991. *Resource Analysis as Action Research: Resource Analysis Research in Developing Countries.* Toronto: York University.

Museum für Gestaltung Zürich, Plastic Garbage Project, 2009- 2017. *Out to Sea?* Plastic Garbage Project, International touring exhibition. Available at www.plasticgarbageproject.org (Accessed: 06 August 2018).

MWMS, The Mayor's Waste Management Strategies. 2011. *London's Wasted Resource the Mayor's Municipal Waste Management Strategy,* November 2011. Available at: http://www.london.gov.uk/publication/londons-wasted-resource-mayors-municipal-waste-management-strategy (Accessed 09 January 13).

Naess, A., 1973.*The Shallow and the Deep Ecology Movements*, Inquiry Vol 16, pp. 95-100, Oslo, Norway.

Napper, I. E., Pahl, S., and Thompson, R.C., 2021. *Marine Litter: Are There Solutions to This Global Environmental Problem?* Plastic Legacies: Pollution, Persistence, and Politics, AU Press.

Niedderer, K., Mackrill, J., Clune, S., Lockton, D., Ludden, G., Morris, A., and Hekkert, P. 2016. *Creating Sustainable Innovation Through Design for Behaviour Change: Full project report*, International Journal of Design, Vol. 10 No. 2 (2016): 67-85.

Norgaard, K. M., 2011. *Living in Denial: Climate Change, Emotions, and Everyday Life.* Michigan: The MIT Press.

NOAA, National Ocean and Atmospheric Administration, 2020. *Garbage Patches.* Available at https://marinedebris.noaa.gov/info/patch.html (Accessed: 09 May 2020).

NOAA, National Ocean and Atmospheric Administration, 2015. *National Centres for Environmental Information*. Available at http://research.noaa.gov/News/NewsArchive/LatestNews/TabId/684/ArtMID/1768/ArticleID/11153/Greenhouse-gas-benchmark-reached-.aspx (Accessed: 11 June 2018).

Norgaard, K. M., 2011. *Living in Denial: Climate change, emotions and everyday life*, Massachusetts Institute of Technology.

Nuttall, S., 2009. *Entanglement: Literary and Cultural Reflections on Post-apartheid,* University of the Witwatersrand Press, RSA.

O'Brien, R., 2001. *An Overview of the Methodological Approach of Action Research,* M.Sc. University of Toronto: Faculty of Information Studies.

Available at http://www.web.ca/robrien/papers/arfinal.html#_Toc26184659 (Accessed: 07 October 2015).

OECD, Organisation for Economic Co-Operation and Development. 2008. *Promoting Sustainable Consumption Good Practices in OECD Countries*. Available at https://www.oecd.org/greengrowth/40317373.pdf. (Accessed: 29 January 2018).

Orb Media, 2017. Tyree, C., and Morrison, D., *Invisible Plastics Report.* Available at: https://orbmedia.org/stories/Invisibles_plastics (Accessed: 27 November 2018).

Orlikowski, W. J., 2007. *Sociomaterial Practices: Exploring Technology at Work,* Organization Studies (28)9, pp. 1435-1448.

Overbeeke, C. and Hekkert, P.P.M., 1999. *Proceedings of the First International Conference on Design & Emotion*, 3-5 November 1999, in Overbeeke, C.J. and Hekkert, P., Eds, Department of Industrial Design, Faculty of Industrial Design Engineering, Delft University of Technology, Delft, the Netherlands.

Oxford Dictionary, 2016. *Glocal*, Available at https://en.oxforddictionaries.com/definition/glocal (Accessed: 10 October 2016).

Oxford Reference, 2020. *Praxis*, Available at https://www.oxfordreference.com/view/10.1093/oi/authority.20110803100342205 (Accessed: 27 May 2020).

Packard, V., 1960. *The Waste Makers*, David McKay, United States.

Palatinus, A., Kovač Viršeka, M., Robiča, U., Gregob, M., Bajtb, O., Šiljićc, J., Suariad, G., Liubartsevae, S., Coppinie, G., Peterlina, M. 2018. *Marine Litter in the Croatian Part of the Middle Adriatic Sea: Simultaneous assessment of floating and seabed macro and micro litter abundance and composition*, a) Institute for Water of the Republic of Slovenia, b) National Institute of Biology, Marine Biology Station Piran, Slovenia, c) Institute for Oceanography and Fisheries, Croatia, d) CNR-ISMAR, Institute of Marine Sciences, National Research Council, Italy, e) Centro Euro-Mediterraneo Sui Cambiamenti Climatici, Italy. Available at https://doi.org/10.1016/j.marpolbul.2018.12.038 (Accessed: 09 September 2020).

Palmer, K., 2018. *The Coffin Jump*, Yorkshire Sculpture Park, WF4 4JX, UK. Available at https://ysp.org.uk/media/press-releases/new-co-commission-by-katrina-palmer-to-be-unveiled-at-yorkshire-sculpture-park (Accessed: 08 October 2019).

Palumbi, S. R. & Palumbi, R. A., 2014. *The Extreme Life of the Sea.* Available at http://press.princeton.edu/titles/10178.html (Accessed: 27 April 2017).

Papanek, V., 1985. *Design for the Real World: Human Ecology and Social Change,* 2nd ed. London: Thames & Hudson.

Peredruk, E., 2020. *Discussing Non-human Centered Design with Kelvin Godee and Simon Wijrdeman*, NextNatureNet Magazine, December 7th 2020. Available at https://nextnature.net/magazine/story/2020/non-human-centred-design (Accessed: 13 September 2021).

Pierce, J., 2015. *Working by Not Quite Working: Designing Resistant, Interactive Proposals, Prototypes and Products,* PhD thesis, Carnegie Mellon University.

Piscicelli, L., Moreno, M., Cooper, T., and Fisher, T. 2014. *The Individual-Practice Framework as a Design Tool to Understand Consumer Behaviour,* The Anthropocene: Politik Economics Society Science, Editor: Audley Genus. Springer.

PhDByDesign, 2015. *Workshops: Visualising through the gyre,* Available at https://issuu.com/phdbydesign/docs/pbd_conference_documentation_2015 (Accessed: 20 September 2016).

Plant, S., 1997. *Zeros + Ones*: *Digital Women + The New Technoculture*, New York: Doubleday, p. 205.

Plastics Europe, 2013. *Plastics – The Facts 2013: An Analysis of European Plastics* Production, Demand and Waste Data, PlasticsEurope, Available at https://www.plasticseurope.org/application/files/7815/1689/9295/2013plastics_the_facts_PubOct2013.pdf (Accessed 10 August 2016).

Plastics Europe, 2015. *Plastics – The Facts 2015: An Analysis of European Plastics* Production, Demand and Waste Data, PlasticsEurope, Available at https://www.plasticseurope.org/application/files/3715/1689/8308/2015plastics_the_facts_14122015.pdf (Accessed 10 August 2016).

Plastics Europe, 2016. *Plastics –The Facts 2016: An Analysis of European Plastics* Production, Demand and Waste Data, PlasticsEurope. Available at https://www.plasticseurope.org/application/files/4315/1310/4805/plastic-the-fact-2016.pdf (Accessed 21 February 2021).

Plastic Reef, 2010. *The Sargasso Sea*. Available at http://www.plasticreef.com/?p=271 (Accessed: 19 October 2015).

Polanyi, M., 2010. *Knowing and Being: Perspectives on the Philosophy of Michael Polanyi,* Edited by Margitay, T., Cambridge Scholar Publishing.

Policy-UK, 2015. Available at http://www.policy-uk.com/event/1766/The_Future_of_Art__Craft_and_Design_in_Schools__Next_steps_for_cultural_education (Accessed: 21 January 2017).

Population Matters Org, 2020. *Why Population Matters*, Available at https://populationmatters.org/the-issue (Accessed: 06 December 2020).

Prokeinova, M., and Blazek, R., 2020. *Will Ecoside Become an International Crime*? Archivio Penale, 2020, no.1. Available at https://archiviopenale.it/File/DownloadArticolo?codice=66a0a83e-5317-4f88-b261-cb3d0ea8dc57&idarticolo=25913 (Accessed: 29 September 2021).

Puig de la Bellacasa, M., 2017. *Maters of Care: Speculative Ethics in More Than Human Worlds*, Minneapolis, Minnesota Press.

Racha, C., 2017. *Difference Between Phytoplankton and Zooplankton*, BIO Differences June 21, 2017. Available at https://biodifferences.com/difference-between-phytoplankton-and-zooplankton.html (Accessed: 11 October 2019).

Ramos, J., 2006. *Consciousness, Culture and the Communication of Foresight*, Futures, 38, pp. 1119–1124.

RAW Labs, 2019. *Kitchen Kelpies Soup,* Bow Arts, London, E16 2QP. Available at https://bowarts.org/whats-on/exhibitions-and-events/tall-tales-kitchen-kelpies-soup-sep19 (Accessed: 12 November 2019).

RECOUP, Recycling of Used Plastics Limited, 2012. *UK Household Plastics Packaging Survey 2011.* Available at http://www.recoup.org/business/default.asp (Accessed: 28 February 2015).

RECOUP, Recycling of Used Plastics Limited, 2017. *UK Household Plastics Collection Survey 2017*. Available at http://www.recoup.org/download/479/2017-recoup-household-plastics-collection-survey. (Accessed: 04 December 2017).

RECOUP, Recycling of Used Plastics Limited, 2018. *UK Household Plastics Collection Survey 2018*. Available at file:///C:/Users/kdani/Downloads/recoup-2018-uk-household-plastics-collection-survey-1547214745.pdf (Accessed: 19 January 2019).

Reim, W., Parida, V., and Örtqvist, D., 2015. *Product – Services Systems (PSS) Business Model and Tactics- A Systematic Literature review*, Journal of Cleaner Production, Volume 97, pages 61-75. Available at https://www.sciencedirect.com/science/article/pii/S0959652614006830#! (Accessed: 16 September 2018).

REISC, Research Ethics and Integrity Sub-Committee, 2020. *Goldsmiths University of London*. Available at https://www.gold.ac.uk/governance/committees/researchethicsandintegritysub-committee/ (Accessed: 21 February 2020).

Repessé, A., 2016. *#360 Unpacked*, France. Available at https://www.worldphoto.org/sony-world-photography-awards/winners-galleries/2016/professional/shortlisted/campaign/antoine#&gid=1&pid=7 (Accessed: 23 May 2017).

Rittel, H. W. J. and Webber, M. M., 1973. *Dilemmas in a General Theory of Planning,* Policy Sciences. 4: 155–169.doi:10.1007/bf01405730.

Rockström, J., W. Steffen, K. Noone, Å. Persson, F.S. Chapin, III, E.F. Lambin, T.M. Lenton, M. Scheffer, C. Folke, H.J. Schellnhuber, B. Nykvist, C.A. de Wit, T. Hughes, S. van der Leeuw, H. Rodhe, S. Sörlin, P.K. Snyder, R. Costanza, U. Svedin, M. Falkenmark, L. Karlberg, R.W. Corell, V.J. Fabry, J. Hansen, B. Walker, D. Liverman, K. Richardson, P. Crutzen, and J.A. Foley, 2009. *A safe operating space for humanity,* Nature, 461(7263), 472–475, doi:10.1038/461472a.

Rockström, J., Schellnhuber, J.H., Hoskins, B., Ramanathan, V., Schlosser, P., Gaffney, O., Brasseur, G.P., Nobre, C., Meinshausen, M., Rogelj, J., Lucht, W., 2015. *Earth Statement, Earth League,* Available at http://www.EarthStatement.org (Acessed: 01 July 2017).

Rosner, D. K., Kawas, S., Li, W., Tilly, N., Sunget, Y.C., 2016. *Out of Time, Out of Place: Reflections on Design Workshops as Social Research Method*, Proceedings of the 19th ACM Conference on Computer-Supported Cooperative Work & Social Computing, pp. 1131-1141. San Francisco, California, USA.

Roszak, T., 1992. *The Voice of the Earth: An Exploration of Ecopsychology*, Phanes Press An Alexandria Book.

Royal Boskalis Westminster, 2017. *Combating Plastic Pollution,* Available at https://magazine.boskalis.com/issue04/combating-plastic-pollution (Accessed: 29 September 2018).

Sail Britain 2018. *Sailing on the Plastic Sea,* St Katharine Docks, E1W 1BP, London. Available at http://www.sailbritain.org/exhibitions/ (Accessed: 02 December 2019).

Sanders, E.B.N., 2000. *Generative Tools for Codesigning*, in Scrivener, S.A.R., Ball, L.J. and Woodcock, A., Eds., *Collaborative Design*, Springer-Verlag, London; 3-12.

Sassen, S., 2001. *The Global City: New York, London, Tokyo.* Princeton: Princeton University Press, 1st ed. ISBN 0-691-07063-6.

Schalk, M., Mazé, R., Kristiansson, T., Fanni, M., 2017. *Introduction: Anticipating Feminist Futures of Spatial Practice,* Ed. Schalk, M., Kristiansson, T., Mazé, R., in *Feminist*

Futures of Spatial Practice: Materialisms, Activisms, Dialogues, Pedagogies, Projections, AADR – Art Architecture Design Research, an imprint of Spurbuchverlag.

Scanlan, J., 2005. *On Garbage*, Reaktion Books.

Schön, D. A., 1984. *The Reflective Practitioner: How Professionals Think in Action,* New York: Basic Books. New York: Basic Books.

Shaw, I. C. 2014. *Chemical Residues, Food Additives and Natural Toxicants in Food: The Cocktail Effect*, International Journal of Food Science and Technology 49, no. 10, pp. 2149–57.

Sider, T., 2007. *Parthood*, The Philosophical Review 116 (1), 51–91, 2007.

Simmel, G., 2005. *The Philosophy of Money,* 2nd ed. London: Routledge.

Slat, B., 2016. *The Ocean Cleanup,* Available at http://www.theoceancleanup.com/the-problem.html (Accessed: 18 March 2017).

Slaughter, R. A., 2018. *Two Fine Additions to the Futures Literature. Foresight*, 20(4), 443–446. doi:10.1108/FS-08-2018-098

Slaughter, R. A., 1996. *How to Develop a Social Foresight Capacity*, In: H.F. Didsbury Jr. *Future Vision: Ideas, Insights, and Strategies*, Bethesda, MD: World Future Society, pp. 88–100.

Sloterdijk, P., 1988. *Critique of the Cynical Reason,* translation by Michael Eldred; foreword Andreas Huyssen, Minneapolis, University of Minnesota Press, ISBN 0-8166-1586-1.

Smuts, J. C., 2013. *Holism and Evolution*, Gestalt Journal Press.

Söderbäck, F., 2012. *Revolutionary Time: Revolt as Temporal Return,* Signs, Vol. 37, No. 2, *Unfinished Revolutions*, A Special Issue, Ed. Rothwell, P., (January 2012), pp. 301-324, The University of Chicago Press. Available at https://doi.org/10.1086/661710

Soja, E.W., 1996. *Thirdspace: Journeys to Los Angeles and Other Real-and-Imagined Places*. Blackwell Publishing: Oxford.

Spinoza, B., 2001. *Ethics*, (W. H. White, Trans.), Wordsworth: Hertfordshire.

Srinivas, H., 2017. *The Inverted Pyramid for Solid Waste Management*, Urban Waste Blog. Available at https://www.gdrc.org/uem/waste/inverted-pyramid.html (Accessed: 16 February 2018).

St. Pierre, L., 2019. *Design and Nature: A History*, Ed. Fletcher, K., St. Pierre, L., Tham, M., *Design and Nature: A Partnership*, Earthscan from Routledge, London, UK.

Strasser, S., 1999. *Waste and Want: A Social History of Trash.* 2nd ed. Metropolitan Books: Henry Holt and Company.

Steffen, W., Rockström, J., Richardson, K., Lenton, T.M., Folke,C., Liverman, D., Summerhayes, C.P., Barnosky, A.D.,. Cornell, S.E., Crucifix, M., Donges, J.F., Fetzer, I., Lade, S.J., Scheffer, M., Winkelmann, R., and Schellnhuber, H.J., 2018. *Trajectories of the Earth System in the Anthropocene*, PNAS August 14,
2018 115 (33) 8252-8259 Available at https://www.pnas.org/content/115/33/8252 (Accessed: 21 May 2021).

Steffen, W., Persson, A., Deutsch, L., Zalasiewicz, J., Williams, M., Richardson, K., Crumley, C., Crutzen, P., Folke, C., Gordon, L., Molina, M., Ramanathan, V., Rockström, J., Scheffer, M., Schellnhuber, H. J., and Svedin, U., 2011. *The Anthropocene: From Global Change to Planetary Stewardship,* Ambio 40(7):739–761
Available at https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3357752/ (Accessed: 07 November 2015).

Steinberg, P., and Peters, K., 2015. Wet Ontologies, Fluid Spaces: Giving Depth to Volume Through Oceanic Thinking, Environment and Planning D: Society and Space, 33(2), pp. 247-264.

SAS, Surfers Against Sewage, 2016. *18,720 Pink Bottles*, washed on the Cornwall beach, UK. Available at https://www.sas.org.uk/news/beach-cleans/pink-bottles/ (Accessed: 12 January 2016).

SAS, Surfers Against Sewage, 2017. *Climate Change: A Surfers Perspective*. Available at https://www.sas.org.uk/wp-content/uploads/Climate-Change-Report_2007_V1.pdf (Accessed: 28 October 2018).

SEP, Surrey Environment Partnership, 2021. *Reduce, Reuse and Recycle Your Way Through the Festive Season,* Available at https://www.surreyep.org.uk/prefestive-and-festive/ (Accessed: 21 May 2021).

Sung, K., Cooper, T., Kettley, S., 2019. *Developing Interventions for Scaling Up UK Upcycling*. Energies 2019, 12, 2778; doi:10.3390/en12142778. Available at https://www.research.ed.ac.uk/en/publications/developing-interventions-for-scaling-up-uk-upcycling (Accessed: 27 June 2021).

Sung, K., 2017. *Sustainable Production and Consumption by Upcycling: Understanding and Scaling-up Niche Environmentally Significant Behaviour,* Doctoral thesis, May 2017, Nottingham Trent University.

Suzuki, D., McConnell, A., and Mason, A., 2002. *The Sacred Balance: Rediscovering Our Place in Nature*, Greystone Books, Canada.

Taffel, S., 2021. *Communicative Capitalism, Technological Solutionism, and The Ocean Cleanup*, Plastic Legacies: Pollution, Persistence, and Politics, AU Press.

Takada, H., 2013. *Microplastics and the Threat to Our Seafood,* Tokyo University of Agriculture and Technology.
Available at http://www.oceanhealthindex.org/News/Microplastics (Accessed: 13 July 2015).

Tasoff, H., 2019. *Marine Scientists Discover an Important, Overlooked Role Sea Urchins Play in the Kelp Forest Ecosystem.* University of California- Santa Barbara. Available at https://phys.org/news/2019-07-marine-scientists-important-overlooked-role.html (Accessed: 06 August 2019).

Thackara, J.,1988. *Design After Modernism: Beyond the Object,* London: Thames and Hudson.

Tham, M., Lockheart, J., Shah, I., Williams, P., 2008. *Tool 52 Collective StoryTelling*, Metadesigners, Tools. Available at https://metadesigners.org/Tool-52-Collective-StoryTelling (Accessed: 17 September 2016).

Tham. M., 2008*. Lucky People Forecast: A Systemic Futures Perspective On Fashion and Sustainability,* Doctoral thesis, Goldsmiths University of London, London.

Tham, M., 2019.*Section III: Standing,* Ed. Fletcher, K., St. Pierre, L., Tham, M., *Design and Nature: A Partnership*, Earthscan from Routledge.

Tharp, B. M., and Tharp, S. M., 2013. *Discursive Design Basics: Mode and Audience*. Nordes 1, no. 5. Available at http://www.nordes.org/opj/index.php/n13/article/view/326 (Accessed: 09 February 2017).

The Earth Charter, 2000. *What is The Earth Charter?* Available at https://earthcharter.org/read-the-earth-charter/ (Accessed: 11 September 2021).

The Ocean Cleanup, 2018. *The Ocean Clean Up: Home*, The Ocean Cleanup. Available at https://www.theoceancleanup.com/ (Accessed: 09 February 2019).

UCA, University for Creative Arts, 2015a. *MA Design students encourage Surrey shoppers to have a sustainable Christmas*. Available at https://www.uca.ac.uk/news/news-archive/news-archive-2015/x-mass-tree/ (Accessed: 29 August 2020).

UCA, University for Creative Arts, 2015. *UCA Creative Challenge Programme*, *Creative Ecology Week in London: Workshops, Talks, Interventions.* Available at http://www.creativeecology.eu/creative-challenge-exhibition-week/ (Accessed: 06 August 2015).

UKRI, 2017. UK Research and Innovation. *Policy and Guidelines on Governance of Good Research Conduct* Available at https://www.ukri.org/about-us/policies-standards-and-data/good-research-resource-hub/ (Accessed: 28 July 2021).

Universities UK, 2019. *The Concordat to Support Research Integrity.* Available at https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Documents/2019/the-concordat-to-support-research-integrity.pdf (Accessed: 10 February 2020).

UN, United Nations, 2019. *Sustainable Development Goals Report.* Available at https://www.un.org/sustainabledevelopment/progress-report/ (Accessed: 16 March 2020).

Van Sebille, E. and Froyland, G., 2012. *Origin, Dynamics and Evolution of Ocean Garbage Patches from Observed Surface Drifters Environmental Research Letters,* doi: 10.1088/1748-9326/7/4/044040. Available at https://www.researchgate.net/publication/234002610 (Accessed: 22 November 2014).

Vaughan, L., 2017. (Ed.). *Practice-based Design Research*. New York: Bloomsbury Academic.

Verma, R., Vinoda, K.S., Papireddy, M., Gowda, A.N.S., 2015. *Toxic Pollutants from Plastic Waste- A Review College of Sericulture Chintamani, University of Agricultural Sciences, Bangalore, India,* International Conference on Solid Waste Management, ICSWM, Procedia Environmental Sciences 35 (2016) 701 – 708. Available at https://ac.els-cdn.com/S187802961630158X/1-s2.0-S187802961630158X-main.pdf?_tid=2065ae54-ebc5-11e7-aaea-00000aab0f02&acdnat=1514461934_4b3e948c56de813d94398349f7f32bb8 (Accessed: 26 January 2016).

Vickers, P., and Bekhradnia, B., 2007. *International Student Policies in UK Higher Education from Colonialism to the Coalition: Developments and Consequences,* Journal of Studies in International Education September 2014 18: 325-344.

Vygotsky, L. S.,1978. *Mind in Society*: *The Development of the Higher Psychological Processes*, Cambridge, MA: Harvard University Press.

Walker, B. H., Abel, N., Anderies, J. M. & Ryan, P., 2009. *Resilience, Adaptability, and Transformability in the Goulburn-Broken Catchment, Australia*, Ecology and Society 14(1):12. Available at http://www.ecologyandsociety.org/vol14/iss1/art12/ (Accessed: 29 May 2016).

Walker, S., 2012. *The Spirit of Design: Objects, Environment and Meaning*, Routledge.

Walker, S., 2014. *Wasteland: Sustainability and Designing with Dignity* (Terra dos Resíduos: sustentabilidade e design com dignidade), in *Design Waste & Dignity,* coordination by Loschiavo dos Santos, M. C. University of Sao Paulo pp. 17-28.

Waste, 2017. Cambridge dictionary. Available at https://dictionary.cambridge.org/dictionary/english/waste (Accessed: 01 February 2018).

Waste2Worth, 2020. *Plasticful Food*, Available at https://plasticfulfoods.com/theproblem.html (Accessed: 01 May 2021).

Ward, P.D., 2007. *Under a Green Sky: Global Warming, the Mass Extinctions of the Past and What They Can Tell Us about Our Future*, Harper Collins.

Waste Incineration, 2006. BBC News, Q & A Waste Incineration. Available at http://news.bbc.co.uk/1/hi/sci/tech/4622484.stm (Accessed: 06 May 2016).

WDCD, What Design Can Do, 2020. *No Waste Challenge Campaign*. Available at https://nowaste.whatdesigncando.com/about/campaign/ (Accessed: 24 October 2020).

Wenger, E., 2005. *Communities of Practice: Learning, Meaning and Identity*, Cambridge University Press.

Wernick, I. K., Herman, R., Govind, S., and Ausubel, J. H., 1996. *Materialization and Dematerialization: Measures and Trends,* Daedalus, 171-198.

Wesselman, H., 2016. *The Re-enchantment,* Bounder, Colorado, Sounds True.

Weston, J. J., Carrillo-Barragan, P., Linley, T.D., Reid, W.D.K., and Jemieson, A. J. 2020. *New species of Eurythenes from hadal depths of the Mariana Trench, Pacific Ocean (Crustacea: Amphipoda),* ZOOTAXA 4748(1): 163-181, Magnolia Press. Available at: https://www.biotaxa.org/Zootaxa/article/view/zootaxa.4748.1.9 (Accessed: 11 October 2020).

WHCOHH, Woods Hole Center for Oceans and Human Health, 2013. *Behold the 'Plastisphere.'* Available at https://www.whoi.edu/oceanus/feature/behold-the-plastisphere/ (Accessed: 27 March 2015).

Wieczorek, M. Alina, Liam Morrison, Peter L. Croot, Louisse A. Allcock, Eoin MacLoughlin, Olivier Savard, Hannah Brownlow, and Thomas K. Doyle. 2018. *Frequency of Microplastics in Mesopelagic Fishes From The NorthWest Atlantic,* Frontiers in Marine Science. (Accessed: 19 February 2018). doi:https://doi.org/10.3389/fmars.2018.00039

Wikipedia, 2019. *Order of Magnitude.* Available at https://en.wikipedia.org/wiki/Order_of_magnitude (Accessed: 12 August 2019).

Williams, C. C., 2004. *Towards A Commodified World: Re-Reading Economic Development In Western Economies. International Journal of Economic Development.* Available at http://www.spaef.com/file.php?id=946 (Accessed: 14 February 2015).

Williams, W. C., 1992. *Paterson,*1st ed. New Directions Publishing Corporation: New York.

Willis, A. M., 2015. *Transition Design: The Need to Refuse Discipline and Transcend Instrumentalism*, Design Philosophy Papers 13 (1): 69–74.

Willis, A. M., 2019. *Introduction*, Ed. Willis A.M., *The Design Philosophy Reader.* Bloomsbury.

Willis, A. M., 2007. *Ontological Design – laying the ground,* In Willis A-M Ed. Design philosophy papers collection three. Ravensbourne: Team D/E/S Publications.

Winder, G. M., and Le Heron, R., 2016. *Assembling a blue economy moment? Geographic engagement with globalising biological-economic relations in multi-use marine environments,* Dialogues in Human Geography, Sage.

Winter, R., 1989. *New Directions in Action Research*, Ed. Zuber-Skerrit. O., Falmer Press.

Wittgenstein, L.,1958. *Philosophical Investigations*, New York: Macmillan.

Wood, J., 2007. *Design for Micro-Utopias: Making the Unthinkable Possible*, Ed. Copper, R., Gower Publishing Limited.

Wood, P., 2017. *What Happens When a Country Strives for Happiness - at any cost*? ABC News Breakfast. Available at https://www.abc.net.au/news/2017-06-23/bhutan-strives-for-happiness-but-at-what-cost/8633424 (Accessed: 17 April 2019).

Woodring, D., 2016. *Environmental Disaster at Cheung Sha Beach on Lantau Island*, Quartz composite of eight land satellites, Hong Kong. Available at https://coconuts.co/hongkong/news/public-outcry-over-mounds-rubbish-washed-hong-kong-shores-recent-weeks/ (Accessed: 12 July 2016).

World Bank, 2012. Hoornweg, D., and Bhada-Tata, P., *What a Waste A Global Review of Solid Waste Management,* Urban Development Series, no 15. Available at https://siteresources.worldbank.org/INTURBANDEVELOPMENT/Resources/336387-1334852610766/What_a_Waste2012_Final.pdf (Accessed: 11 November 2015).

World Commission on Environment and Development, 1987. *Report of the World Commission on Environment and Development: Our Common Future.*

World Economic Forum, 2016. *The New Plastics Economy: Rethinking the Future of Plastics*. Available at http://www3.weforum.org/docs/WEF_The_New_Plastics_Economy.pdf (Accessed: 16 April 2021).
Available at http://www.un-documents.net/wced-ocf.htm (Accessed: 29 July 2016).

WMO, World Meteorological Organisation, 2020. *Global Cryosphere Watch*, Available at https://globalcryospherewatch.org/about/cryosphere.html (Accessed: 17 May 2020).

Wright Mills, C., 1959. *The Sociological Imagination,* New York: Oxford University Press.

Yates, M., 2011. *The Human-As-Waste, the Labor Theory of Value and Disposability in Contemporary Capitalism*. Antipode 43:5, pp. 1679-1695.

Yeats, W. B., 2015. (1937). *A Vision: The Revised 1937 Edition: The Collected Works of W.B.Yeats*, Scribner.

Yeats, W. B., 1921. *The Collected Poems of W. B. Yeats*. Wordsworth Poetry Library.

Yin, R. K., 2003. *Case Study Research: Design and Methods,* Sage.

Zalasiewicz, J. et al., 2008. *Are We Now Living in the Anthropocene?* The Geological Society of America, GSA.

Zankl, S., 2014. *Lanternfish.* Available http://solvinzankl.photoshelter.com/portfolio accessed 12/03/2014 (Accessed: 09 September 2015).

Zero Waste Europe, 2015. *Air Pollution from Waste Disposal: Not for Public Breath Report*. Available at https://zerowasteeurope.eu/downloads/air-pollution-from-waste-disposal-not-for-public-breath/ (Accessed: 14 January 2016).

Zettler, E., Mincer, T. & Amaral-Zettler, L., 2013. *Life in the Plastisphere: Microbial Communities on Plastic Marine Debris,* Sea Education Association, Woods Hole Oceanographic Institution, United States. Environ. Sci. Technol., 2013, 47 (13), pp 7137–7146. Available at http://pubs.acs.org/doi/abs/10.1021/es401288x (Accessed: 10 March 2014).

Zhang, K., 2021. *Sorting It Out: Sustainability in Higher Education*, Discard Studies, *Guest Author*, 15 November 2021, Available at https://discardstudies.com/2021/11/15/sorting-it-out-sustainability-in-higher-education/ (Accessed: 18 December 2021).

APPENDICES

11.0 Research Ethics Form

DEPARTMENT OF DESIGN

RESEARCH ETHICS APPROVAL FORM (Students)

*(NOTE: **Staff applications** are submitted on a different form to the College Research Ethics and Integrity Sub-Committee. See:* https://goldmine.gold.ac.uk/PoliciesForms/Documents/Advice and information/Academic Resources/Research and enterprise/ethical-approval-form.doc *)*

This form should be completed for any research project that involves human participants or if the research involves animals or if it may involve environmental harm. The student's supervisor is responsible for exercising appropriate professional overview of the research. Both student and supervisor sign this form.

Students should:

1. read and understand the UKRIO Code of Practice for Research: http://ukrio.org/wp-content/uploads/UKRIO-Code-of-Practice-for-Research.pdf
2. complete this form in discussion with your supervisor
3. submit the form with both signatures to the Department Ethics Contact: s.keirl@gold.ac.uk
4. wait for approval before contacting any potential participants in your research.

The application will be considered whenever possible within two weeks of receipt. Care in completing the form accurately as the outset will avoid delays.

Section One Applicant Details

1.1 Name of researcher	Katarina Dimitrijevic
1.2 Status (undergraduate student, postgraduate student)	Postgraduate
1.3 Goldsmiths email address	kdimi013@gold.ac.uk
1.4 Contact address	31 Grasmere Grove Rochester, ME2 4PN, Kent, UK
1.5 Contact phone number	07528338333

Section Two Programme information

2.1 Programme & Programme leader	PhD
2.2 Module & Module leader	Design Department
2.3 Name of the Design Department member of staff supervising your research project	Mathilda Tham

Section Three Project Details

3.1 Project title: Designtransposal Workshops
3.2 Brief outline of the project, including its purpose: Retrospective summary for the three design and craft workshop engagements for the PhD thesis *"Plastics with the Living Voice: Visualising Plastic Ocean Pollution: KraalD Encountering Critical & Cultural Meaning of Things."*
3.3 Brief description of methods of data collection/activity: Photos were taken of temporary installations made during the workshops, anonymous field notes were taken during the workshops, and five step questionnaire, audio recording of one workshop. The aim of the workshops was to generate experience and responses from participants about plastic things and oceanic pollution.
3.4 Where will the data collection be undertaken? The data collection tool place in 2015, in the UK. Workshop 1. UCA, Creative Challenge Event, London. Workshop 2. Falmouth University, Cornwell. Workshop 3. PhD by Design Conference at Goldsmiths University of London, London.

Section Four Human participants

4.1 How many and what type of participants are involved in the research?
The total number of participants was 35. Workshop 1. (6 participants, PG students, lecturing staff, municipality member); Workshop 2. (23 participants, all UG students); Workshop 3. (6 participants, all graduate students and PhD researchers).

If NIL go to Section Seven. Otherwise, complete this Section.

4.2 How will the participant(s) be recruited? *(Attach copies of any recruiting materials if used).*
Workshop 1. By workshop poster for the Creative Challenge Event as part of the event's activities, self-elective enrolment by the event's participants. Workshop 2. By workshop poster advertising the guest lecture and workshop at Falmouth University. Workshop 3. By workshop poster for the PhD by Design conference as part of conference activities, self-elective enrolment to activities that where the part of the conference programme.
See attached JPGs: Workshops 1_2_Poster_UCACreative Challenge and Falm.University_15; Workshop 3_Poster_PhDbyDesign_15;

4.3 How will the participant(s) consent be obtained? *(Include a copy of any proposed consent materials)* The participants were informed of the workshops' purpose through visual recruitment materials and through visual presentation at the beginning of each workshop. At the start of each workshop, participants were verbally informed of the purpose of participation and how data, material, documentation would be used in the PhD research. They were verbally informed of the rights to withdraw participation at any time.

There was no coercion to participate. No students had their academic performance jeopardised in any way as the result of participating/not participating in the workshops. No student participants were associated to my academic position at UCA.

Note: none of the participants' personal identity details were used in the PhD research.
Note: all participants in the PhD by Design workshop approved audio recording of the workshop.

Insert ✓	Y	N
4.4 Will it be necessary for participants to take part in the study without their knowledge and consent at the time? (e.g., covert observation of people in non-public places)		✓

4.5 Is there any deception involved?		✓
4.6 Will the participant(s) be paid or rewarded?		✓
4.7 Will the participant(s) be fully informed about the nature of the project and of what they will be required to do? (*Attach any associated materials.)* Note: not all participants in the PhD by Design workshop partake in the installation making process but all participated in the anonymous five step questionnaires.	✓	
4.8 Will the participant(s) be told they can, if they wish, withdraw from participation at any time and that they do not need to give a reason for doing so? (*Attach any associated materials.)* Participants were verbally informed of the rights to withdraw participation at any time. See recruitment pdf presentation attached for 4.7.	✓	
4.9 If you have ticked a box marked * please give the question number/s and fuller information here:		

Section Five Persons who are young, vulnerable or in legal custody

Insert ✓	Y	N
5.1 Will any persons who are: young (under the age of 18 years); vulnerable (e.g., with learning difficulties or with severe cognitive disability); or, in legal custody be involved in the research? ***If NO, go to Section Six. If YES please complete this section.***		X
5.2 How will consent be given (i.e., from the participant themselves or from a third party such as a parent or guardian) and how will agreement to the research be asked for? (*Attach any associated materials.)*		
Insert ✓	Y	N
5.3 If you are conducting research with young persons under the age of 18 years or 'vulnerable persons' do you have Disclosure and Barring Service (DBS) clearance? (*Please attach evidence of such clearance.)*		
5.4 Will face-to-face interviews or observations or experiments be overseen by a third party (such as a teacher, care worker or prison officer)?		

5.5 Is it possible that the research might disclose information regarding child sexual abuse or neglect? *(If yes, indicate how such information will be passed to the relevant authorities (e.g., social workers, police), but also indicate how participants will be informed about the handling of such information were disclosure of this kind to occur. A warning to this effect must be included in the consent form if such disclosure is likely to occur.)*		
5.6 If you have ticked a box marked * please give the question number/s and fuller information here:		

Section Six Participants' personal data

Insert ✓	Y	N
6.1 Will personal data of any kind (including digital and images) be gathered on participants? Note: you may require a Data Management Plan. As a minimum you should consider the information given in the document: GDPR Goldsmiths Guidance for participants Aug 2018 ***If NO go to Section Seven. If YES, complete this Section***.	✓	
6.2 Will the data be anonymous? All visual and audio data is anonymous. All images were taken by the event organiser for the workshop 1, lecturing staff for the workshop 2 and participants for the workshop 3. Note all workshops were held during the 2015 before the GDPR. There are no confidentiality issues related to these events.	✓ *	*
6.3 Will the data be treated confidentially? All three workshops visual and one workshop audio data is threated confidentially.	✓ *	*
6.4 Will the study involve discussion of topics sensitive to the participants (e.g., religious or culturally sensitive issues, sexual activity, drug use)?	*	✓
6.5 Where will the data be stored and what security be applied to it? All data was safely stored on a password protected laptop.		
6.6 How long will the data be stored and how will it be eventually destroyed? The data will be stored during the duration of my PhD and then destroyed by deleting the files from the computer.		

6.7 If you have ticked a box marked * please give the question number/s and fuller information here: 6.2 The participants' names were not recorded. All workshops participants' visual data is anonymous, no images showing the likeness of any participants were used in the PhD. Clear images of myself were used in PhD thesis. 6.3 The voice recordings have been translated to a visual mapping chart only, which is void of any identifiers. There is no conversation transcript.

Section Seven Risk and Duty of Care issues

Insert ✓	Y	N
7.1 Will the research involve the investigation of illegal conduct?		✓
7.2 Are there any potential adverse consequences to the participant(s), or any other person?		✓
7.3 Are there any procedures which may cause discomfort, distress or harm to the participant(s), or any other person?		✓
7.4 Will the research place you in situations of harm, injury, or criminality?		✓
7.5 Have you any special personal considerations or vulnerabilities that might influence your safety while carrying out fieldwork (injuries, disabilities, allergies, asthma, personal conflicts with informants/community etc.).		✓
7.6 Might the research cause harm to those represented in it?		✓
7.7 Will the research involve any animal subjects?		✓
7.8 Will the research cause any environmental harm?		✓
7.9 Are drugs, placebos or other substances (e.g., food substances, vitamins) to be administered to the study participants or will the study involve invasive, intrusive or potentially harmful procedures of any kind?		✓
7.10 Will blood or tissue samples be obtained from participants?		✓
7.11 Is pain or more than mild discomfort likely to result from the study?		✓

7.12 Could the study induce psychological stress or anxiety or cause harm or negative consequences beyond the risks encountered in normal life?		✓
7.13 Will the study involve prolonged or repetitive testing?		✓
7.14 Do you know of any other potential developments arising from this research that may lead to ethical, health, safety, risk, harm, or duty of care concerns?		✓
7.15 If you have ticked a box marked * please give the question number/s and fuller information here:		

Section Eight Other matters

Insert ✓	Y	N
8.1 Are there any conflicts of interest regarding the investigation and dissemination of the research (e.g., with regard to compromising independence or objectivity due to financial gain)?		✓
8.2 Is the research likely to have any negative impact on the academic status or reputation of the College?		✓
8.3 Is data to be collected from an institutional location (such as a school, prison, hospital)? *If 'yes', attach evidence of agreement obtained from the relevant authority (e.g. Head Teacher, Local Education Authority, Home Office)?*		✓
8.4 If you have ticked a box marked * please give the question number/s and fuller information here:		

Section Nine Attachments, signatures and submission

Wherever possible, applications will be dealt with within two weeks of receipt. Delays will occur if the application has not been carefully completed. The decision regarding your application for ethical approval will be communicated to you and your supervisor (if applicable) directly.

You should now complete the following checklist, supply any necessary signatures and submit the full application/documentation to the Department Ethics Contact (Steve Keirl s.keirl@gold.ac.uk).

9.1 Attachment checklist:
Have you attached copies of all supporting materials? Please indicate which and insert ü in the appropriate column.

Document	Not applicable	Attached
Recruitment document/s		✓
Informed consent materials	x	
Other information for participants	X	
Consent agreements for young, vulnerable or 'in custody' persons	x	
Disclosure and Barring Service (formerly Criminal Records Bureau) Check	x	
Institutional location agreement	x	
Other *(please specify)* ...		✓
- Workshop_UCA_Creative_Challenge_Invite and Designtransposal workshop_Brief_2015		✓
- KD Ethics support statement 22_11_19		✓

9.2 To be completed by the student applicants…
Please note that your Supervisor and the Department Ethics Contact should be notified of any adverse or unforeseen circumstances arising out of this study. They should also be notified of any significant changes to the research design regarding research ethics.

Signature of Applicant Date 21 November 2019

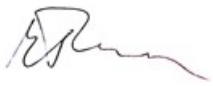
9.3 To be completed by Principal Supervisor

Please note that the Department Ethics Contact should be notified of any adverse or unforeseen circumstances arising out of this study or of any emerging ethical concerns that the Supervisor may have about the research once it has commenced.

Insert ✓	Y	N
Has the student read and understood the UKRIO Code of Practice for Research?	✓	

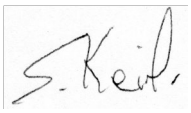
Has there been appropriate discussion of the ethical implications of the research with you as Supervisor?	✓	
Are the ethical implications of the proposed research adequately described in this application?	✓	
Have data management issues been adequately discussed?	✓	
Please add any other comments you wish to make here: I do acknowledge that this is a post-event ethical approval request. I am confident of the ethical robustness of the research and sincerely hope that this will meet your approval.		

Signature of Principal Supervisor Date 12 December 2019



10.0 Ethical Approval

This project has been considered using agreed Departmental procedures and is now approved. This approval is valid for a maximum period of 2 year/s.

Signed  Date. 28th Jan 2020

Print Name. Steve Keirl

Department Ethics Contact

Design: R&E Ethics Students 2019

Table. 7. Research Ethics Form, 2020. The inserted document form, see pp. 402-410.

11.1 Designtransposal Workshop Presentation

Fig. 11-88. Designtransposal Workshop Presentation. Slides 1–24, see below.

Fig. 11-88. Designtransposal Workshop Presentation. Slides 1 and 2 of 24.

Fig. 11-88. Designtransposal Workshop Presentation. Slides 3 and 4 of 24.

Fig. 11-88. Designtransposal Workshop Presentation. Slides 5 and 6 of 24.

Fig. 11-88. Designtransposal Workshop Presentation. Slides 7 and 8 of 24.

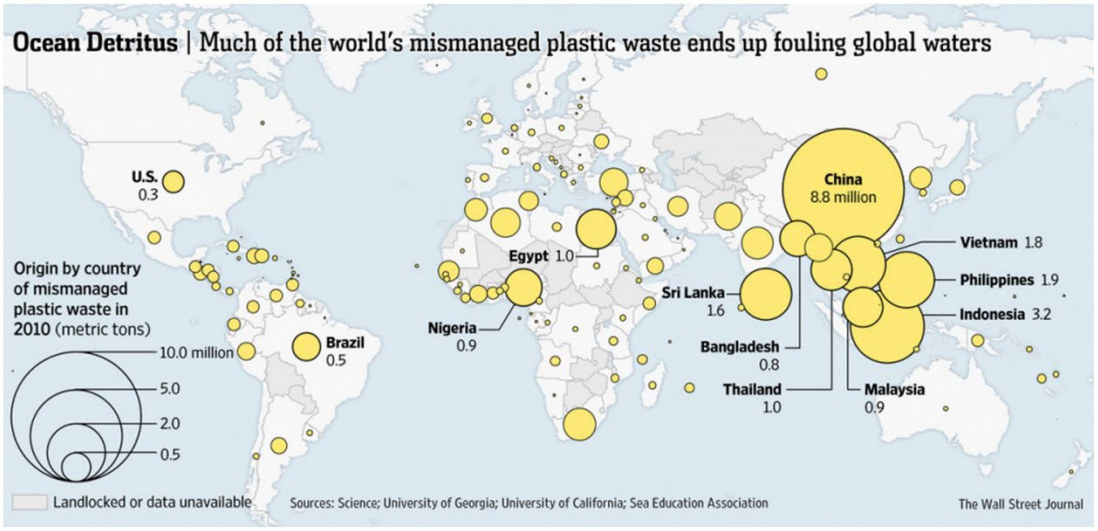


Fig. 11-88. Designtransposal Workshop Presentation. Slides 9 and 10 of 24.

Fig. 11-88. Designtransposal Workshop Presentation. Slides 11 to 14 of 24.

Fig. 11-88. Designtransposal Workshop Presentation. Slides 1 5 to 18 of 24.

Food Chain

In a September press conference, Doug Woodring from Project Kaisei, said that assessments of the impact of plastic debris on phytoplankton, zooplankton, and mesopelagic (midwater) fishes are undergoing. The samples collected from the seawater will be subject to more scientific studies for the toxicity of the plastics and how this is really affecting our food chain (in ways that are only just becoming known… and not good ways).

What items could I easily replace with plastic-free or less plastic alternatives?

What items would I be willing to give up if a plastic-free alternative doesn't exist?

What items are essential and seem to have no plastic-free alternative?

Fig. 11-88. Designtransposal Workshop Presentation. Slides 19 to 22 of 24.

What lifestyle change(s) might be necessary to reduce my plastic consumption?

What other conclusions, if any, can I/WE draw?

Fig. 11-88. Designtransposal Workshop Presentation. Slides 23 and 24 of 24.

11.2 KraalD Pinterest

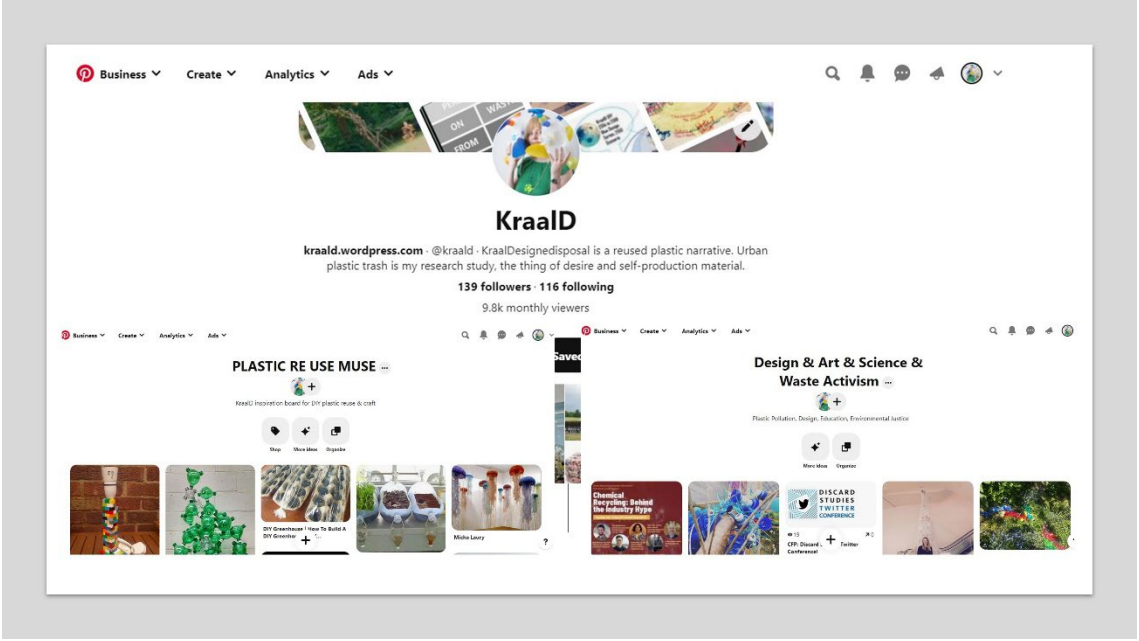


Fig. 11-89. ***KraalD Pinterest.*** Screenshot, Plastic Re-use Muse and Design & Art & Science & Waste Activism' board.

11.3 Mapping Board

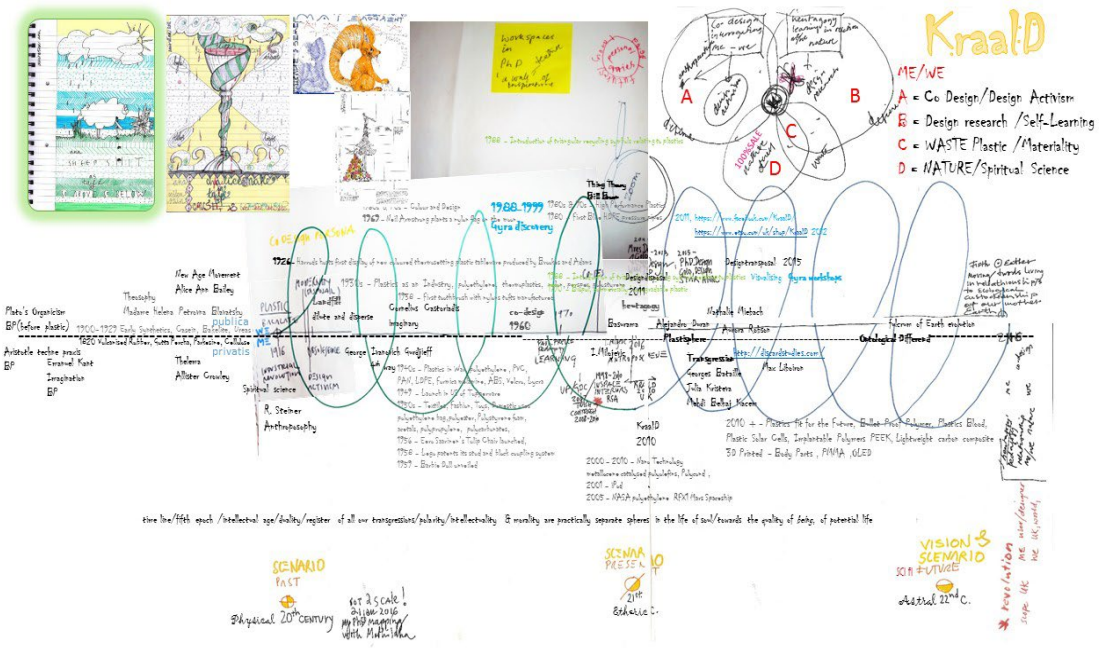


Fig. 11-90. Mapping Gyra: 2050 Scenario and 2150 Vision Timeline, sectional elevation**,** size A0. (See Sections 5.4 and 8.0.)

11.4 Designtransposal Workshop Conversation Transcript

Here is the complete third workshop conversation transcript: see Part Three, Chapter Eight, Sections 8.2.3 to 8.3. Table 7 consists of four sheets. See seven participant legends**:** Katarina Dimitrijevic (KD), Designtransposal workshop facilitator and participant: Participant 1, (P1), Participant 2 (P2), Participant 3 (P3), Participant 4 (P4), Participant 5 (P5) and Participant 6 (P6). P5 is the second design sessional tutor and a participant in my creative residency workshops at UCA.

Participants	Complete transcript of recorded workshop three conversation 1.
KD	Asking all participants to endorse recording of the part of the workshop session. Conversation covers materials distribution like scissors and chopping boards to cut single-use plastics to make small particles. Followed by the lanternfish bioluminescence properties and their vertical migration towards the surface. I am describing how colourful plastic serves as the habitat for plankton. Lanternfish eats plankton and graze on small plastic particles; thus, I make the statement 'fish likes plastic too'. P1–P4 Chopping and cutting sound in the background.
KD	We are cutting small particles and adding them to the 'plastic soup' to observe the physical properties of plastic in the ocean. Add big pieces to see how long they will float. P1–P4 Chopping and cutting sound with dropping items in the water in the background.
P1	What are these sketches -pointing to the visual on the screen?
KD	I am briefly talking about my DYI gyre patch ideational sketches. P1–P4 Chopping, punching, and cutting sound with dropping items in the water in the background.
P5	What are these things here? Pointing at the pile of plastic trash heap on the table. P5 is still reluctant to touch and cut anything.
KD	You can touch them, and they are all washed and cleaned. All these things and staff I brought from my house here. They are things I have consumed. You find things on the streets, and the wind takes them to the ocean. So, you can pop and cut some balloons in the water.
P5	Taken new balloon, asking to cut them? KD Yes. P1–P5, you can hear a balloon popping sound in the background and screams.
P6	What is in these bags? The last participant joins in the making activity.

KD	Let's cut some plastic bags, and they are very popular found in the ocean. Some metal and the rubber. P1–P6 Chopping, punching, and cutting sound with dropping items in the water in the background.
P2	So, we are making the plastic soup?
KD	Yes, let's take some photos of the soup. I am also interested to see how long things will stay on the surface. Most of the staff actually sinks and floats just half a meter below to down. So, when you sail on the boat, you don't really see much. Let's add some wildlife, the spider. P1–P6 Chopping, punching, and cutting sound with dropping items in the water in the background.
P3	Are there any areas of the sea that you can control and protect from plastic?
KD	We are talking while cutting. It is very difficult to control the natural environment. I would advise you to engage your hands while we are talking. It becomes like a crafting experience. We think with our hands too. P1–P6 Chopping, punching, and cutting sound with dropping items in the water in the background.
P1	There is no way you can control it. For example, the fisherman uses fishing nets. They get lost in the sea.
KD	Yes, this is what I am doing now, cutting some fishing net in.
P4	Why are they distributing them?
P1	I don't know, but there are tons and tons of fishing nets everywhere.
P2	What about the coral reefs and staff?
KD	The coral reefs are also dying too. In the 1960s, there were two or three dead areas in the sea due to toxicity and pollution. Now there are over five hundred dead areas.

Participants	**Complete transcript of recorded workshop three conversation 2.**
P3	Hamm, it's quite worrying.
KD	Yes, it is. I am worried about being the mother of a small child, and I would like to have grandchildren. I worry, what does all this toxicity do to us? What does it do to the natural environment? Some biologists say that there will be no life as we know now in the ocean in forty years. We must enjoy our sushi and sashimi while we can. P1–P6 Chopping, punching, and cutting sound with dropping items in the water in the background.
P1-P6	Group laughter.
P1	Well, I must say that's quite a way to respond to the crisis – enjoy while we can.
P2	Business as usual.
KD	Exactly, we are all enjoying ourselves as business as usual until we break our world down. Then, ups we are out of petrol. And this is all made from petrol anyway.
P1	Hamm agrees.
P4	Does your project have a solution to all of this?
KD	Oh, not at all. I cannot be that ignorant to think I have a solution for this.
P1-P6	Group laughter.
KD	But what I have in mind is being engaged and talking to small groups of people like this. And try to bring awareness about what's happening and contribute to the change.
P4	How do you personally contribute? Besides this project, what do you do to change all of this? P1–P6 Chopping, punching, and cutting sound with dropping items in the water in the background.

KD	I am interested in discard study and trying to be an adamant recycler, and I pick up lots of trash by the river and estuary where I live in Kent. The area is catastrophically full of rubbish. I and a few others (senior citizens) we pick up rubbish. I believe in everyday tactics.
P1	Did you start this rubbish pickers club, for example?
KD	I did not. Actually, I saw a poster in a park while picking and walking, so I joined in.
P2	Do you wash all this rubbish at home?
P5	Oh yes, she washes a lot of rubbish. And when I say a lot, you can't imagine. I can tell how a lot it is. Full garage. Note P5 is the second design sessional tutor for my creative residency at UCA.
KD	I do wash a lot of milk bottles for the Surrey council Christmas tree project.
P3	Shocked, so you take rubbish home!
KD	Yes, some I take home, and some I put in allocated bins.
P1	Most of the plastic can be recycled.
KD	Yes, but this is also part of the problem. Some are saying that we are over recycling things.
P1	But, how can this be possible?
KD	Well, it is a complex story. Recycling is expensive and pollutes—it is a big and political problem. Look, everyone staff has started sinking. Let's record it. Observation it took nine minutes for sedimentation to happen. P1–P6 group is observing the plastic soup properties.
P5	Started mixing the soup with hand, the sound of water swirls in the background. Look, it is all entangled, like the sea turtle in the net!
KD	You can touch the water. It is all super clean. Observation Besides KD and P5, nobody wants to feel the plastics in the water. But what are your thoughts on all of this? I worry about endocrine diseases; it freaks me out completely!
P4	What's that staff?

Participants	**Complete transcript of recorded workshop three conversation 3.**
KD & P5	Endocrine deformities and mutations occur in the body.
P1	Why is that?
KD	Basically, we are eating all this plastic. And if it affects fish, then it affects us—the food chain. It changes our hormonal balance and mutates.
P5	The sperm count as well.
P1	What about the chemicals that add to plastic parts? Water bottles are full of these chemicals and create hormonal unbalance in your body. But at the same time, we feed our animals with antibiotics, and the earth is full of pesticides.
P4	The same happens if you don't rinse your dishes. A lot of people don't rinse the soap and let it dry. It also affects your hormones.
KD	There is a lot of toxicity. For example, when the ocean is 25-28 degrees warm, plastic releases toxins and absorbs more. That is a similar temperature and condition in your dishwasher. Some particles are more toxic than others. When fish eat particles, some are more harmful than others. The best is not to eat fish. But I still do. But I think there is some kind of beauty in this plastic soup.
P2	Beauty lies in these objects—picking parts from the bag. Do kids make these? This is your previous staff made from yoghurt bottles?
KD	Oh, that stuff was made by a bunch of five-year-old kids and me.

P2	How did that happen? Did they follow you?
KD	Oh, the kids saw me making, and they followed. Other people were not interested.
P3	What are you going to do with this after the workshop?
KD	Oh, I'll take it back home. I'll just empty the water. For me, this is all precious, like this conversation is precious too.
P2	Are you going to use some of these words for your PhD – as the method? Also, using visuals and images too.
KD	A very interesting PhD question. I started mapping UCA and Falmouth workshops questionnaire responses. I am still trying to digest it all. There is a lot of focus on things like using less bags and less bottles, not on the action and systemic changes. Now I am questioning how do we feel about all these things. But we still need to do the questionnaire, so let's see how emotional we are at the end. Visualisation and images are critical methods in my PhD. P1–P6 Chopping, punching, and cutting sounds in the background.
P1	I think this is worth working on, a very important matter.
P2	I love the marine landfill ways. How did you start all of this? With a focus on the land.
KD	I started on the land, with London landfill, recycling waste, municipalities and researching landfill, I realised that largest landfill is in the ocean. Did you know that only 10% of the sea is protected, from which 1% is controlled protection? I often travel to Hvar, a little island in Croatia where you come to the beach and think it is so clean and pristine. But it has a high level of plastic pollution. The beach is full of plastic waste, local people clean the beach before tourists come, and we constantly pick up trash. So I brought some of the small pieces and particles which they called in the UK 'mermaid tears'. I add beach plastics and glass to the soup.
P6	Looking at the plastic soup. Did you choose the colours for all of this, to look like this?
KD	I did pick and select; I do bite of trash curating.
P1-P6	Group laughter. Saying I am a trash curator.
P6	There is an artist who curates by colours and puts it all together in nature.
KD	Yes, I know of him well. I am referring to Alejandro Duran works.
P2	Is there some kind of mushroom that eats plastics?
KD	They did find an Amazon type of polyp that eats HPDE plastics. Basically, every single plastic we made past hundred years still circulates around. I play my Sea PET video with the sound of the sea.

Participants	**Complete transcript of recorded workshop three conversation 4.**
P1	And yes, some bacteria eat up plastics. By the time we resolve all of that, all other life and marine life will be dead. There is no immediate solution.
P5	Look how all is sunk at the bottom. Only some plastics are floating at the top!
KD	And this is all in the box. While in the ocean, it is all horizontally and vertically constantly moving and changes in the organisation of the space. Look how it creates patterns and clusters together. You can see the same on the beaches.
P4	To sort all these will require significant lifestyle changes.
KD	Shopping, for example. Even if you shop organic, it is wrapped in a plastic packet. Plus, it is extra expensive.
P4	I buy all my fruit and veggies from the Turkish street vendors in London. They don't use so much plastic, and they are cheaper. However, the produce might come in big plastic boxes for transport. You think you know, and you have a choice, but you don't have a choice.

KD	Of course, produce comes in large plastic boxes. And we don't have a choice. Having no choice, this is the point when I get angry. You feel powerless that you cannot change staff. However, you can but on a small level. With reuse, it's tricky not to hoard things.
P1	It is good to reuse. Like takeaway, you can wash the boxes and reuse them as Tupperware.
KD	It is good, but you might end up having more than you need.
P5	Or take old boxes to take away to be refiled—exchange things.
P4	Once I went to the supermarket and bought all kinds of things when I got to the till I paid but started taking all the plastic off as I did not want them. Like in Germany, when you could get rid of the packaging and throw it on the floor. It was the shops' responsibility. Why do you need an aubergine in plastic? I found since I had children that I consume more and wash much more.
KD & P1-P6	Taking photos of the plastic soup installation and closing activity.

Table. 8. Complete transcript of recorded Designtransposal workshop three conversations 1–4. For the inserted document, see pp. 421–425. (See Sections 8.2.3–8.4.)

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