Responsible Design is the Apex Design Mode to create our sustainable future

This process benefits all the Sustainable Development Goals (SDGs)

Greg Campbell[1], Cheryl Campbell[2]

[1]DesignOz Pty Ltd, Sydney, Australia, designoz@iinet.net.au
[2]Society for Responsible Design, Sydney, Australia, srd@srd.org.au

Abstract

Most design modalities strive to embrace sustainability, yet none are broad or agile enough to evolve to new problems that are appearing faster. This led us to intentionally capitalise on the current strengths of leading design modalities and combine them with the best elements of future focused trends into a more cohesive framework. One that develops long-term sustainability as soon as possible. A fusion of Circular Design plus Regenerative Design and Transition Design comes fairly close yet each alone falls short in several critical areas. There is no longer the luxury to 'get things more wrong'. Required is a design modality that fuses together every component that benefits all natural life. We go beyond reviewing major design trends by defining what is lacking and show how best this may be addressed and rebalanced. For decades, practitioners and Society for Responsible Design curators have proposed beneficial new ideas to design thinking practice. Initial research and feedback on design directions has been very positive and we share our findings for wider review and consideration. This includes that evaluation of ideas from multiple perspectives is required and they increase in value when reviewed through a 'Responsible lens'. The continuously developing area of Responsible Design is a methodology that invites everyone to add to these strengths. Integrating all these design components results in an approach that makes it worthy of claiming the newly nominated term 'Apex Design Mode' as appropriate. This forms the collective of processes holding the greatest opportunity to address all the SDGs and more. It is well supported by the capacity to achieve significantly better long-term results in many fields. This complete approach also includes the more robust techniques of collating, assessing, developing and implementing best global greener practice, across all fields. Then we shall achieve much better results in the fastest manner possible. When sustainability is fused with responsibility we can show, 'Responsible Design = Good for everything'.

Keywords: Responsible Design, Apex Design Mode, Ecological Best Practice, Responsible Thinking, Sustainability

Figure 1. *(Oral presentation Slide 1) Responsible Design...*

1. Introduction

The idea of Responsible Design has been around for well over 30 years and referenced in design processes through those years in many ways. In recent times however, this potentially quite significant ingredient of all good design has been sidelined and it is now time to reassess its value. Our need now for a more effective set of design guidelines, to develop real sustainability solutions to the many existing global problems is urgent.

You would think that multiple global crises demand the most expedient responses to them all. The Nobel Prize Summit (2021) relates very well, on just what and where the many issues are that need to be addressed. Just citing Climate Change and Species Extinction while massive, in reality are still only parts of the combined dilemmas that are often referred to as wicked problems (Rittel and Webber 1973; de Almeida Kumlien and Coughlan 2018). The ideas presented while great still left some gaps in their methods of application.

The core concepts of sustainability are well known as are the many related global issues being addressed by the United Nations (UN) Sustainable Development Goals (SDGs) and every form of development. Quite simply, if we all continue to destroy the natural world which supports us at multiple levels, we shall certainly suffer the same fate. Working more closely with nature was confirmed in the globally televised Leaders Climate Summit on Earth Day this year. From the US to China, it was stated in several ways but using a similar message. US President Joe Biden (2021) explaining, “it's also about providing a better future for all of us” and later by China’s President Xi Jinping (2021), “to improve the environment is to boost productivity”. These ideas may be relatively simple statements, yet they need to be well resolved as to HOW globally we may best achieve them in the shortest possible timeframe.

These global issues have definitively not happened just this century, nor has defining responses and appropriate solutions. We have been working within design spheres for several decades and have developed numerous simple processes of adding responsible actions that can easily be combined to suit individual situations to benefit all the SDGs and the related and overarching issues as well.

The amalgamation of lived, observed and working experiences with the realities of sustainability, particularly living eco-systems and wildlife conservation, underpin the thinking and methodology for this paper. Early work with scientific researchers identified massive losses in significant geographical range reductions and related loss of animal numbers that were already occurring. Further indications for many species following these trends were in high likelihood of becoming endangered or facing extinction. Such understandings and later work (Seidensticker 1991; Newton 1990; Brown and Morgan 1989) confirmed the recognition that many changes in systems, processes and behaviour were required to support rather than detract from nature and humanity. This highlighted the need for more rigorous sustainability assessments and that there are many levels of sustainability. Being nearly sustainable is just not enough, whatever is created in large numbers or requiring large quantities of natural resources must be shown to be sustainable in the long term. Anything less is just not responsible. The number of crises today result from not practicing sustainable actions over time.

***Figure 2**. (Oral presentation Slide 2) all SDGs benefit from Responsible Design.*

Many years assessing and curating the Graduate Sustainable Design Exhibitions (20 in all), where exhibitors were chosen as best in discipline for their designs across Australia, confirmed that sustainability needed to be coupled with responsibility. This was the key complement of the equation. When designs were reviewed to meet responsible directions, it reconfirmed the need for a more comprehensive approach to product, process or design assessments, for them to become truly beneficial and ecologically sound on a larger scale. Responsible Design criteria evolved over time, honed and broadened with sustainable briefs, on-going consultation and collaboration with lecturers, designers and design disciplines. The development of Responsible Design was a dynamic thing and continues to remain dynamic.

If we collectively want to solve multiple global crises, perhaps the bar with the SDGs and pandemic is set too low? Will our current trajectory reverse the climate disruptions and biodiversity loss as well, or is this too much to hope for? We can certainly all aim for this with the intent that we will succeed. Problem solving is a capacity that great design uses in abundance. Can reviewing the many design methodologies give insights to get us all in front of the curve? Acknowledging that all ideas and modes should be treated with respect and collaboration is the only answer. Revisiting Papanek's *Design for the Real World* (1972), we also invite the reinstatement of 'responsible' as the key method or factor to get us there. Using Responsible Design allows us to replace unsustainable assets with responsibly designed and co-create 'new business as usual'.

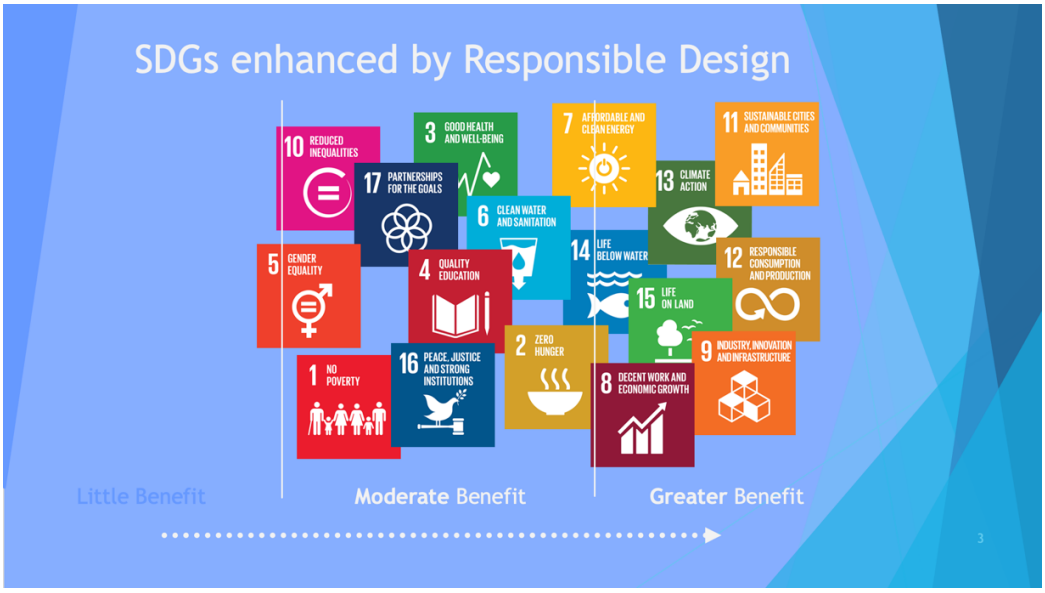


***Figure 3**. (Oral presentation Slide 3) SDGs enhanced by Responsible Design.*

Usage of 'Responsible' to describe new industry sub-sectors markedly increased in recent decades e.g., Responsible Investing, Responsible Travel, Responsible Business. Google searches in May 2021 returned over one billion results on each. One of these, Responsible Industry (2014) confirmed products and services need to measure up to how Environmental, Social and Ethical Responsibility criteria increase value, reputation and avoid risks while improving benefits for all. The related health & ageing category also included privacy, safety, gender equality, ethics, treatment of employees, CO2 footprint and data handling, confirming the breadth of issues to cover. It is interesting to note that 'Responsible Design' was a forerunner in the late 80s with associations forming globally, including the Society for Responsible Design (SRD) in 1989. (SRD weblink 2021).

As an ever-evolving process, Responsible Design acknowledges great successes and failings of human activity, especially those challenges threatening our long-term survival. It thrives on concerted efforts by a range of stakeholders collaborating to solve a problem or devise the design of things from individual items to whole communities. It recognises no one industry or sector has achieved sustainability alone and not moving from 'business as usual' equates to disaster. The global imperative calls for a substantive rethink to better directed management of innovation. Redesigning everything with responsible thinking at its core may be the best way to achieve real progress in sustainability across

all the SDGs. Applying Responsible Design to the SDGs suggests this is achievable after including the top elements of all design modes to strengthen this position.

Responsible Design method is many things but quite simply all about applying the definitions and practice of 'responsible' to all we create. Our experience, studies and research over decades shows this is insufficiently used. These are the terms to employ; stewardship, caring, meeting obligations, being accountable, answerable, trustworthy, rational, setting benchmarks and appropriate standards to create things that are beneficial to the natural world for the longer term.

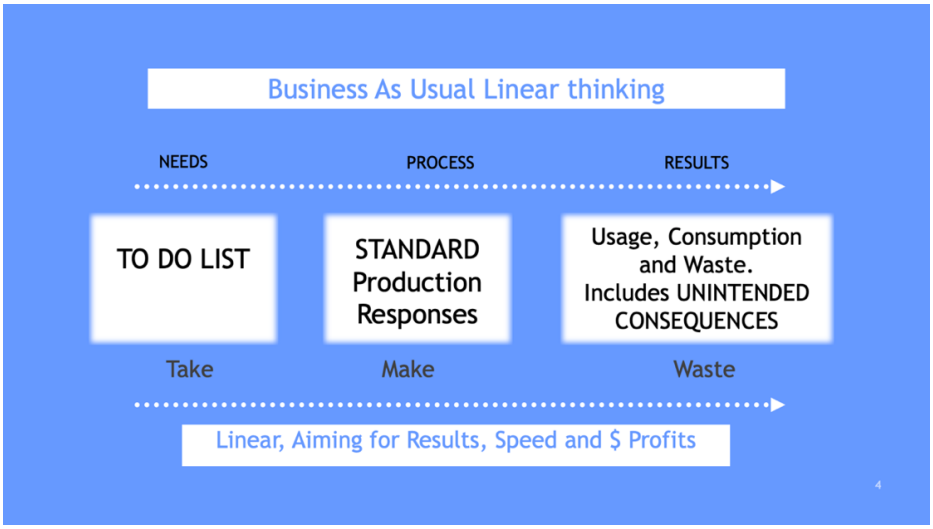


Figure 4. *(Oral presentation Slide 4) Business as usual linear practice.*

It represents a broad set of methods and steps to guide design across all disciplines, industries and production processes to help streamline and follow proven ecologically effective steps to achieve the best results possible. Its other main point of difference is by promoting the use of ethically based solutions at the core of all design processes. In simple theory, to stop plastic pollution, you could just stop making plastics. This may be impossible in the short term so using Responsible Design encourages you to take all steps possible to counter this. There are multiple methods to restrict plastic production to the minimum while looking for alternative or better performing materials and also encouraging higher rates of plastics recovery plus designing more appropriate usage that doesn't get discarded. Essentially using every workaround and new methods possible to reduce the negative plastic impacts, then remove it where and however possible (Ellen MacArthur 2021a; Yes! Magazine 2021).

Linear production models are still widespread, though business and public pressure are starting to encourage moving away from this toxically wasteful practice.

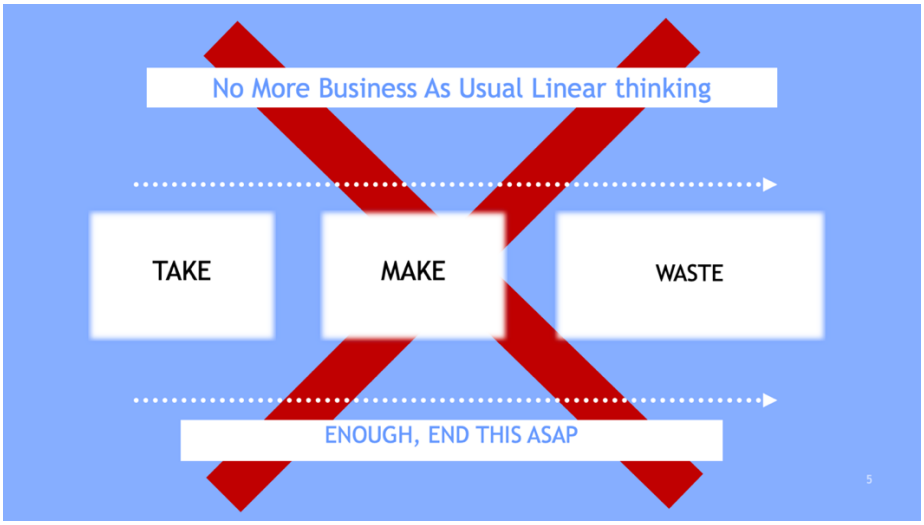


Figure 5. *(Oral presentation Slide 5) No More Business As Usual Linear thinking.*

2. Methods

Using a narrative analysis format with a goal to identify the best framework to address global crises, this paper will review the top design modes, acknowledge their strengths and review their shortcomings. We then show means to use Responsible Design thinking to assist making each of them stronger, more resilient and successful. Additionally, by exploring the many definitions of 'responsible', we confirm it embodies numerous valuable dimensions worthy of greater attention. We describe several examples of products and services that illustrate these ideas to spur further cooperative sharing and development. For background, we relate the processes adopted over 30 years in the Society for Responsible Design that has led to the Responsible Design model and show the results of an ongoing SRD survey with responses from a broad audience to confirm the direction of designing our future. The paper completes with calls for action and collaboration in a variety of ways to ensure growing knowledge and community that we may all enjoy. Recent studies have identified the value and relevance for many of these strategies with the objectives of socially inclusive and environmental sustainability (Monson 2021).

3. Results and Discussion

During the last Century we have seen wicked problems significantly increase. There are even several descriptions of them, due to their fluid and interconnected nature, they inhabit variable dimensions. From scope to scale they are unique, avoid defined boundaries, may appear and disappear and one can be a symptom of another.

To help devise better modes to address these, timeline references and discussion of many methods as design directions are reviewed in (Friant 2021; Friant et al. 2020; Ceschin and Gaziulusoy 2016). They mostly revolve around more widely applicable design approaches such as the Circular Design concept which requires that all possible must be contained within a closed perpetual loop. Nature and Regenerative Design neatly fit into these cycles as well. Our intent is to show how these design modes, explaining methods and procedures, may all be used to their best capacity. By combining their strengths and adding to their evolution, we can arrive at a stronger result that can be more widely used for maximum ecological results. Transition Design is also added to the group of design modalities that show inherent benefits (and some limitations) to deal with our current challenges. The application of a much broader results-oriented design methodology fused with our collective best practice learnings should be able to address current problems within shorter timeframes. Following are the main features of the top design modes.

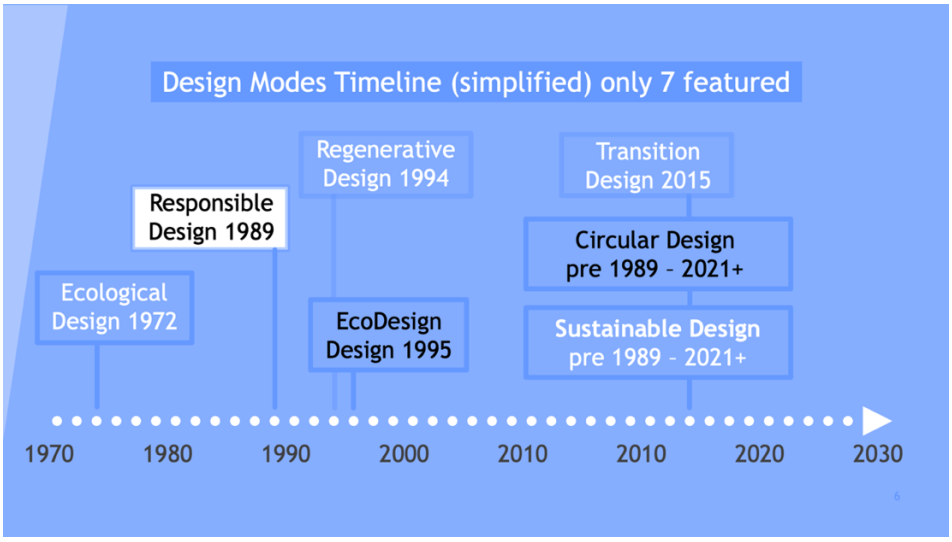
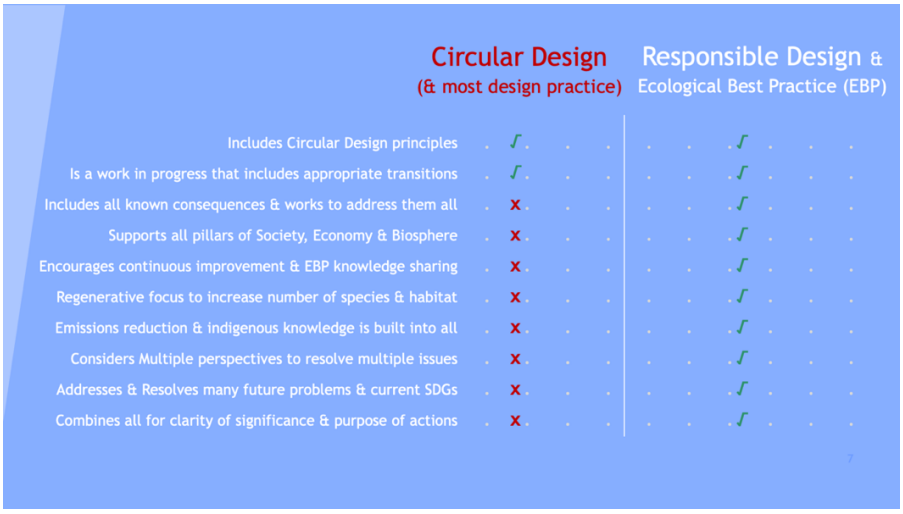


***Figure 6**. (Oral presentation Slide 6) Design Modes Timeline (simplified) only 7 featured.*

Circular Design has many parts, origins and relatives. It seems like even lay people have a basic understanding of it. Possibly the most historically similar applications of it were during the Great Depression. So many were doing all they needed, improvising with whatever they could, to sustain their families. Quite a few parallels to recent years in some respects. Global crises demand appropriate and

varied responses with so many lives profoundly affected. The modern incarnations of Circular Design or Circular Economy or Circular Thinking has many obvious benefits by redesigning systems to keep everything possible in a perpetually productive loop. If we all were practicing it, there would be far less to resolve. The process still has some fairly large flaws that need addressing. Most man-made systems are not readily circular. It is most likely that some may not be possible to be made circular. This would suggest capping or reducing their negative components asap. This is underway in several industries from chemicals to fossil fuels. We can all certainly relate to the medical usage and wastage of single use plastics and related over the current pandemic that are not easily made circular or readily resolved. We are suggesting that adding the 'Responsible' component to all points possible or appropriate may be the best course of improved action. There are still many strengths to the Circular process not least of which is its marketability as it makes for quite recognisable graphics and the uptake by many through the great work of the Ellen MacArthur Foundation (2021b). They have adopted the Circular Economy as one of their major sources of processes and solutions with many businesses and countries participating.

Table 1. *(Oral presentation Slide 7) Responsible Design benefits over Circular Design Table.*



Regenerative Design has its origins in Permaculture featuring self-reliant living, organic gardening within a local agricultural environment theme. Developed further by Professor John T. Lyle to include all systems in consumption and production. This led to the *Cradle to Cradle* book (McDonough and Braungart 2002) and process. Using a whole systems approach, Regenerative design replaces any linear sequences or production systems with those that are completely cyclical, natural and self-renewing in every manner possible. Innovation and thoughtful use of companion partnerships closely match natural systems at every opportunity. In practice, it aims to mirror nature in creating its own cycles of renewal for all the energy and materials it uses, allowing its parts to revitalise through their operation with minimal external maintenance. Solar radiation is the main energy source teamed with other renewables and passive energy conservation techniques. Reusing all components is maximised plus full recycling and composting systems for end wastes focusing on organic and natural substances. All toxic substances are avoided as is the minimal use of fossil fuels and related products.

This mode works to match and assist nature's amazing capacities and the sustainable practices to live well within them. Most sustainable practices seek to maintain systems without degrading them, whereas regenerative practices go beyond by applying management techniques to restore systems and even improve them and their productivity. This mode can have some great results though it can be a bit limited in scaling to industrial proportions. It is more often suited to agricultural and food production as it can be somewhat challenged with more difficult technically based industries, synthetics and complex practices. This mode can still be significantly strengthened by applying a Responsible lens to ensure global responses are adequate for dealing with the severity of issues at hand.

Some processes straddle several modes with relative ease. A dynamic model in responsible design Construction and Architecture is found in the International Living Future Institute (2021) Living Building Challenge (LBC). Advancing a "sea change in building, infrastructure and community

design", LBC is an intended catalyst for our reconnection to the natural world. Doing so collectively, we can all address climate change and more. This holistic approach expects the integration of the natural and built environments, adopting building project guidelines around everything from independent energy generation, water capture and waste process directions. They also go well beyond mere 'box ticking' exercises. Their Red List identifies the "worst in class" materials, chemicals, and elements known to pose serious problems and not for human usage. This is a serious guide to incentivise all governments, professionals, building contractors and humanity at large to re-establish our relationship with the living environment. Two worthy examples of the many Full Living Certified buildings include: the Bullitt Centre, Seattle, Washington with a claim to be the greenest commercial building in the world and the Sustainable Buildings Research Centre University of Wollongong that won a significant capital works construction grant from the Australian Government. While these buildings and principles are breathtaking, they don't address the much greater bulk of existing buildings in the substantive way that is needed. Retrofitting these for lower energy may encourage more responsible progress. Worth noting, in the 90s, NSW Chapter of the Australian Institute of Architects confirmed in effect that "you can't design a sustainable building by itself, you need to develop a sustainable society to inhabit the building to make sustainability truly work".

Transition design (TD) is a practice of designing and planning that looks at the longer term and implements staged strategic linked steps to reach there. Their focus is on sustainability via urban design and advocating design-led societal transition toward more sustainable futures. It works to simplify some scenarios by not trying to perfectly solve an exact local problem but the overall problems of the area so it can avoid getting lost in minute details by giving an overviewed result. It favours prioritising designs, modular construction and using well-educated stages to reach the optimal ecological result with better long term outcomes more effectively and sometimes faster than other means. This design mode has developed fairly recently and enjoys several origins. One of the foundational lecturers and 'voices' for Transition Design was himself also an early SRD/EDF convenor/director. It is good to see the immediate past Convenor of the Society for Responsible Design having such success with another eco design modality that holds truly great promise. We also note the words of TD founder, Terry Irwin (2018, 2012) explaining in a TEDx Talk her epiphany that she became convinced, "…I had to learn to design in a more appropriate or responsible way". We agree that TD has some exceptionally well developed concepts based on earlier foundations that are well worth sharing. We would share in return that 'Responsible actions' may really strengthen this valuable work and gain greater traction and benefits across society.

Apex Design Mode (ADM) is the title we apply to Responsible Design for its capacity to stitch together all the salient design modes into a cohesive form of addressing wicked problems. When Responsible is secured at the Apex of our thinking, the results are far more likely to flow into more plausible longer-term solutions across the board. Our experience suggests that dynamic inclusion of new ideas found to enhance this process is the best way forward and suggest wider adoption and usage of Responsible action and the term Apex Design Mode.

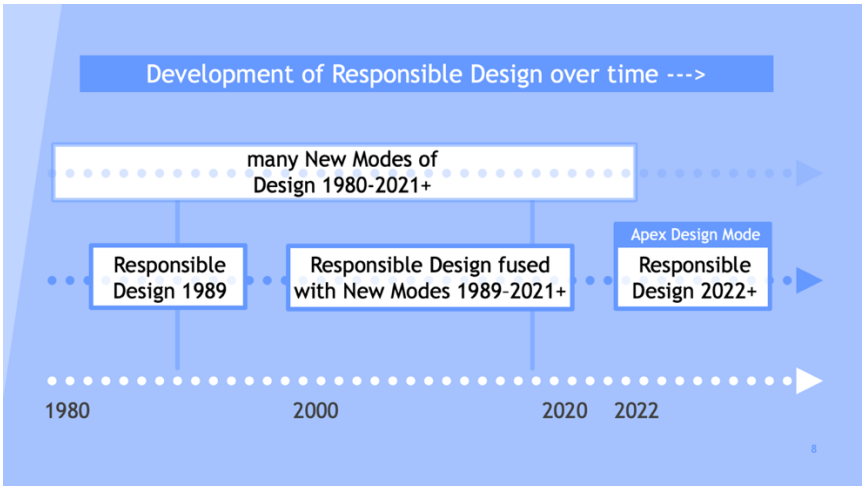


Figure 7. *(Oral presentation Slide 8) Responsible Design evolves into the 'Apex Design Mode'.*

This simple ecological test may be utilised to see when any activity needs adjustment. If the total of any business or activity including emissions, materials, supply chain and by-products or disposal is ultimately assisting in the loss or decline in the number of species, you get a fail. However, if your business or activity is assisting in the increased number of species, you clearly get a win. A midpoint is also a loss as it likely ties in with those who on balance are causing a loss of species, that you are not improving. We have to be singly and collectively creating conditions that encourage multiple species to thrive just as nature has done, largely unaided, for millennia. Additionally, any offsets made should be clearly shown to be advancing the increase of the number of species.

Design Thinking has been deservedly enjoying a significant growth phase in the 21st Century. It consistently creates value in multiple forms and avenues, making significant advances. Most would assume that this can only be a good thing. There is however the negative aspect that design can be used to create things that are the cause of results significantly worse than previously considered, especially when you take into account a range of criteria, unintended consequences for a start. (Shedroff 2019; Papanek 1972).

Ecological Best practice is an all embracive description of how we may collate and follow the most efficient means to achieve global improvement. It is a method of thinking, assessing, developing and then implementing best global greener practices. It involves every sphere of activity by humans and their interaction with nature from economic to social and environmental aspects, ensuring the responsible approach is included with every element. What is best for all species and our planet? A collection of directions and methods to tackle the world's problems aided by collective governance.

Many countries and groups in recent years have declared a Climate Emergency and an Ecological Crisis (Comms Declare 2021; Citizens Declare 2020). These declarations have seen increased interest by scientists, engineers, designers, academics, councils, governments and civil society to devise potential solutions to the many challenges. We suggest utilisation of the Apex Design Mode processes which offer responsible adaptability and flexibility to meet changing factors, conditions and environments would generate the change scenarios required faster. This should assist in achieving Net Zero Emissions by 2050 with 50% CO2 emissions reduction by 2030. All the design modes would be strengthened by requiring higher standards in many key areas. A dynamic fusion of the best design modes is what Responsible Design has strived to achieve since inception. Following is a summary of the salient points of Responsible Design and discussion of how it has and continues to evolve.

Responsible Design method is many things but quite simply all about applying the definitions and practice of 'responsible' to all we create. Our experience, studies and research over decades shows this is insufficiently used. These are the terms to employ, stewardship, caring, meeting obligations, being accountable, answerable, trustworthy, rational, setting benchmarks and appropriate standards to create things that are beneficial to the natural world for the longer term.

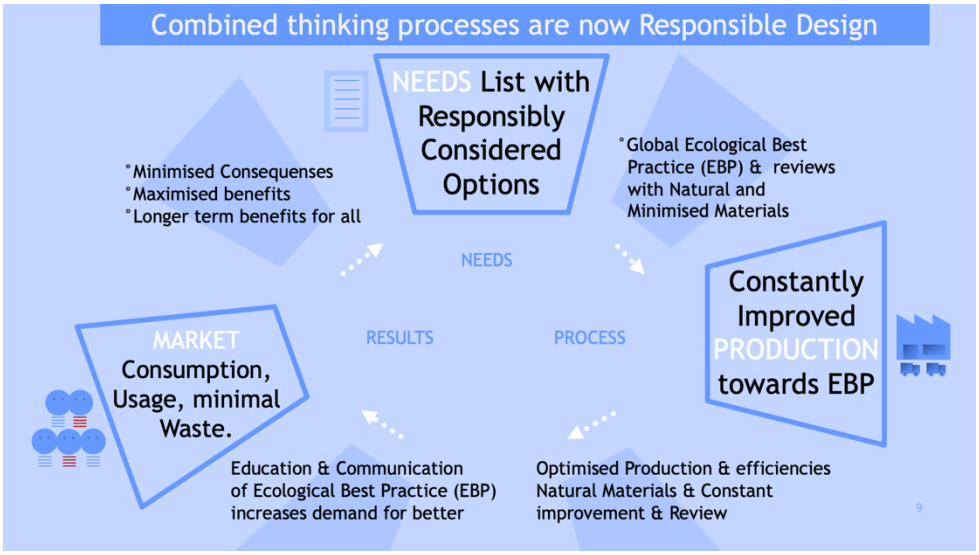


***Figure 8**. (Oral presentation Slide 9) Combined thinking processes are now Responsible Design.*

Just 10 Responsible Design defining components include: *Recognises the world we create has to be designed better *design decisions create the future *this is an ever-evolving process *considers all relevant issues before designing *researches the range of good and bad practices *works to understand the many perspectives of the project *is inclusive in its outlook and process *recognises the responsibility of designing. The larger the project, the greater this is *uses best practice to create then reviews and shares this information *Collaboration increases the benefits all round.

It should be noted, it was never the designers role to fix the world by themselves. If we have deadlines to fix things and scientists say we have only 10 years, we all should be working in the same directions. The whole population needs to be involved in creating solutions that have the best chance of making the difference. All interconnected as they should be. All design modes are good, in fact they are each brilliant in their own ways. What's not being well discussed is how we can make them all work best together. We suggest the added link / lens of Responsible Design. Using this Apex Design Mode has the best chance of resulting in the whole being sustainable. It is incumbent on us that we all work together. Because only through working collaboratively and responsibly with the design methods we currently have can we develop them to create workable solutions urgently.

Top features of Responsible Design: *complements all design modes by making them more ethically based and ecologically balanced *Insists appropriate consideration for positive impacts to benefit all natural life now and well into the future *creating Sustainable Value that considers human and global consequences of actions *encourages understanding the implications of design, in materials, production, consumption, final product or service *encourages a cleaner, healthier, safer and more sustainable world with concepts and directions *reduces global environmental impacts and enhances social benefits through all design disciplines, services, well-being and beyond.

Design may significantly contribute or detract from desirable outcomes unless properly studied and due consideration is applied including the latest in considered design thinking and innovation. Design or innovation devoid of responsible design too easily results in superficial change with limited benefits and potentially catastrophic long term consequences as we are beginning to discover now. Globally these are massive challenges that we all may contribute to in many ways. Responsible Design encourages the positive and discourages the negative, wherever possible rethinking and redesigning all we create.

Table 2. *(Oral presentation Slide 10) Ten more Responsible Design components include:*

To demonstrate these directions, for 8 consecutive years 2004 – 2011, innovative leading edge designs were showcased in the SRD Change Graduate Sustainable Design exhibition series. It grew from a good student initiative to become a fully self-funded National event with significant cash and software prizes. Designs for each exhibition were selected from a wide selection of design

disciplines. Many benefits resulted for exhibitors from their cross-disciplinary consultation and collaboration, as they worked together to design, stage, market, present and promote the concept of sustainable responsible design thinking to peers, lecturers and general public. Participants also found new understandings in sustainable approaches from their experience that dispelled any 'silo thinking'. All of which finally lead to a greater appreciation of design thinking and application from their newly acquired broader responsible lens. Much of their work (SRD Change National 2011) and two papers are still available online (Ramirez et al 2011, 2010). Sponsors included international creative corporation Adobe and Australian sustainability leaders Investa. Promotion included presenting a catalogue of these good ideas to Richard Branson in 2011 at Sydney's 'Carbon War Room' conference.

Two Industrial design projects from the SRD Change National graduates exhibition are also worthy of special mention for their responsible conceptual thinking and development. Balin Lee's project 'Kopper', a palm-sized soap replacement device, offers to provide a superior level of hygiene particularly in the third world. Many preventable diseases can be controlled through basic hand washing practices, unfortunately many don't have access to clean water or soap. 'Kopper' increases hygiene as it uses existing water supplies (regardless of contamination). It's electrolysis and filtration systems eliminate 99.99% of all parasites, viruses and bacteria, whilst producing clean water as it's only by-product of use. 'Kopper' provides chemical free hand cleaning, designed to be over 94 % recyclable and made almost entirely from recycled materials. These projects tackle problem solving at multiple levels with innovation and Ecological Best Practice at their core. Other modes don't actively encourage seeking such combinations and wider reference needs to be included. Phillip Brien's Nitrogen Seed Preservation System aims to assist developing agricultural communities around the world. They are often situated in areas prone to weather extremes, geological disasters and civil unrest, that can all lead to the destruction of the seed stock these economies rely on. This system can assist to preserve seed stock for extended periods of time by making a suitable 'atmosphere' in storage. Separating Nitrogen gas from the air using membrane separation technologies and all in a portable backpack solar powered unit. The Nitrogen generated is pumped into a sealable container to purge out all Oxygen. A moisture absorbing pack is added to the seed and the container sealed and stored in a stable, low temperature location until required. It allows much longer term storage of seed stock, uses existing technologies and is portable, solar powered, quick and easy to set up and use. Both these projects illustrate means to assist several SDGs, people in need and increase food security and health for many. Ideas like these need more exposure, collaboration and development (Lee and Brien 2011). Perhaps a new **SRD Change Global** version can be organised online for all to see. This may include 'wild ideas' from any field. Please forward any suitable projects or means of assistance.

***Figure 9**. (Slide 11) SRD Change National Exhibitors, Venues & Youth SDGs conference series.*

Fashion, one of the most polluting industries in the world, is struggling to make substantive change. Responsible Design solutions highlighted from curating eight years of exhibitions shows there are many more ethical design considerations, that can be applied within the industry. Twelve positive directions working with more responsible sustainable practices are being prepared for a workshop by SRD. These include ideas from an International Mittelmoda emerging talent award winner featuring deconstruction and up-cycling. Plus, a versatile collection of other directions including layering, knits/crochet, natural materials, low/zero waste, reversible & invertible, pattern maximising, clever cutting, indigenous and natural dyeing. All just a guide of what's possible and with never ending combinations. This can even be teamed with certified ethical and responsible accessories to complete the concept turning fashion back towards a natural balance, leaving synthetic micro-fibres 'to the dust' (Fashion and Textile Design 2021). This helps to illustrate that 'every string in your bow' needs to be used i.e., explore all possible appropriate strategies, adapting and changing the focus as required to find the optimal solution(s). One group developing this mode well is Zero Waste Design Online (2020).

Focusing on the UN SDGs, an education program began in 2016 to equip youth with solution-oriented planning skills to address the many issues confronting their regional areas. Students quickly grasped the implications of their task and applied their new skills to dynamic plans to address targets within the goals. The combined students' plans from around Australia were presented to government in 2017. The program expanded internationally, firstly to Mauritius giving both Australian and Mauritian students the opportunity to collectively workshop their SDG plans. These cross-cultural student collaborations led to much greater understanding and awareness which empowered students to approach their future with more certainty. SRD collaborated and assisted with the program and its growth, now followed by students in both hemisphere's. (Young Persons' Plan For the Planet 2017). Promotion included showing and then forwarding the first of these student plan reports to Christiana Figueres, Executive Secretary of the United Nations Framework Convention on Climate Change (UNFCCC) 2010-2016, in September 2017 and a copy was hand delivered by an Australian delegate to the UN High-level Political Forum on Sustainable Development and the SDGs in New York 2018.

Examples of Responsible Design solutions. SolarCentury (UK) led by Jeremy Leggett, who also addressed the opening of the youth program mentioned earlier, started a solar revolution for the people of the East Africas, whose days were cut short living without electricity. A solar light that could be recharged by sunlight, which could be as small as the palm of your hand, converts sunlight into electricity and in turn charges small batteries used to power efficient LED lights. This design solution has led to enhanced family and community interactions after dark, improved security for villages with the lights reaching the most vulnerable and has given young African women, with limited access to education, the ability to study at home at night. Since 2006 Africans working for UK Charity SolarAid's (2006) retail brand SunnyMoney have sold more than 2 million solar lights, operating among the poorest of the poor in East Africa, measurably improving the lives of more the 10 million people.

Delving a little further into batteries is an article showing the broad value and advantages of Responsible thinking in practice: Principles for Responsible Battery Management (Keoleian 2021). In keeping with this approach, it is worth noting that this thinking goes far beyond industrial design and into every other form of human endeavour. To name just a few: Environmental Law; Agriculture and Soil carbon building; Environmental, Social and Governance; Responsible Innovation (Pavie and Carthy 2015) and there are many more.

Society for Responsible Design ongoing research. Interesting data directions are trending from an ongoing online SRD Survey with 45 responses so far from 7 countries (Australia, UK, Canada, Indonesia, USA, Italy and Switzerland). The survey called for responses in 10 key areas of direction for the SRD. Participants were asked for written answers plus rating their position to the statements from 1 to 12. SRD should Promote and demonstrate Responsible Design as the Apex Design Mode to create our sustainable future. **84% agreement**; SRD must focus on methods to accelerate the greener circular economy, grow regenerative design and investing in clean and green super. **81% agreement**; SRD should focus on looking for & developing solutions to the world's big issues. **81% agreement** Select quotes "Climate change, UN SDGs, but start circular design/economy now to get on the road to the solutions."; SRD can just continue to develop as it has for 31 years. **94% agreement**; Without prompting Climate Change was the top reported issue. IPCC (2021). The SRD Survey (2021) continues.

It is encouraging that many sectors from government, corporate (new C02 removal prize, Elon Musk, 2021), education and beyond have all been growing an incredibly valuable discussion on sustainability.

At the Nobel Prize Summit, Dr Jane Lubchenco (2021) spoke about the oceans of the world. She related how massive they are as are their challenges, too big to ignore and not too big to fix. She inspired with multiple ways to address the challenges and confirmed the need for these to be met by us all. In addressing the major global issues, she quoted the words of John W. Gardner, "We are all faced with a series of great opportunities - brilliantly disguised as insoluble problems. This is our challenge to reveal the disguise and embrace the opportunities that we can create."

Table 3. *(Oral presentation Slide 12) Responsible Design lens considerations to create sustainable futures.*

Responsible Design 'lens' considerations to create sustainable futures

Responsible advances	Aspects not covered by most design processes	Really key for developing method & difference	HOW TO
Holistic support	Equally supports all pillars of Society, Economy & Biosphere	Better addresses long-term strategies supporting all nature, economy & society	Rebalancing current priorities
Failure removal steps	Includes all known consequences & works to address them all	Looking for past negative issues & devising strategies to deal with them	Fault finder reviews
Learn, grow & share	Encourages continuous improvement & EBP knowledge sharing	Experiments include new methods by collating & adding shared data	Inclusive growth mantra
Nature stewardship	Regenerative focus to increase number of species & habitat	Aware of natures role in design to increase biodiversity	Create opportunities for life
Reverse engineer climate	Emissions reduction & indigenous knowledge is built into all thinking	Combines global efforts to decarbonise fuels, materials & production processes	Send carbon back to geology
Backcasting issues process	Addresses & Resolves many future problems & current SDGs	Briefs are SDG aware plus long-term sensitive design	Green governance thinking
Kaleidoscopic vision	Considers multiple perspectives to resolve multiple issues	Greater reviews of Macro to Micro reveal new ideas	Pause, rest to reassess
Forward looking	Combines all for clarity of significance & purpose of actions	Designing and curating for our sustainable future today	Leadership & role sharing

the more that are included, the closer to creating sustainable futures

As identified, the Responsible Design method incorporates all available input to create the most appropriate and dynamic results. Continuous updates and innovation of ideas, processes and principles are expected for framing comprehensive solutions. Practicing this over-arching mode also requires examination of the points of bias adopted by everyone in approaching design solutions and all they encompass.

To counter challenging world issues, attention to the full purpose of Responsible Design by everyone is now needed. While we have shown the Responsible Design method, it is acknowledged more capable teams are also needed to be assembled to assess, review and maximise these efforts to achieve this goal. Application of essential criteria for Responsible outcomes as listed in Table 3 can make significant inroads to achieving this to the scale required. The more that are included, the closer the results will be to creating more sustainable solutions. Your positive action and feedback is welcomed via the emails at the start of the paper, we seek the global collective to inspire.

4. Conclusions

Our analysis shows employing the Apex Design Mode using a Responsible lens will achieve greater progress to address all wicked problems. You don't need to be a designer to participate in this process. Indeed, the greater selection of people that participate the broader, more robust and useful the result. Many of these ideas, concepts and practices may not even be found in some examples of the traditional design disciplines. They need to be.

Responsible Thinking is universally beneficial, and the Design component is simply a more creative version of it. When we share these concepts, we can build a much greater resource than by ourselves. And by ensuring that the world also shares the information, ideas and innovations it is demonstrably going to benefit the people and species of the world. Further ensuring this process transforms to the point that we are practicing all we need, to make circular economies a reality full of regenerative practices that work to repair our world.

Wider inclusion of Responsible Design will result in greater progress to sustainability in the real world with greater benefit to all the SDGs and their targets from moderate to significant levels. By providing more focus on the directions to get everyone there faster and with longer lasting resulting benefits, responsible design thinking combined with developing Ecological Best Practice will significantly accelerate progress towards resolving the crises we face. This is particularly so for SDG+Target #11.3 and even more for SDG+Target #12.8 where responsible action can further positive results.

Wake from our pre-crisis dreams, RESPECT past wisdom, embrace the CRISES of today and Responsibly Design our sustainable future, Together.

References

Biden, Joe. (2021). Remarks by President Biden at the Virtual Leaders Summit on Climate Opening Session https://www.whitehouse.gov/briefing-room/speeches-remarks/2021/04/22/remarks-by-president-biden-at-the-virtual-leaders-summit-on-climate-opening-session/ (accessed 22.04.2021).

Brown, B., Morgan, L. (1989). Poster. In: Campbell, G. (Designer), *The Miracle Planet.* Child & Associates, Frenchs Forest, Australia.

Ceschin, F., Gaziulusoy, I. (2016). Evolution of design for sustainability/ From product design to design for system innovations and transitions, *Design Studies*, Vol. 47 (November), Pages 118-163.

Citizens Declare. (2020). CitizensDeclare.org/about. https://www.citizensdeclare.org/about (accessed 30.05.2021).

Comms Declare. (2021). Comms Declare. https://commsdeclare.org (accessed 18.05.2021).

de Almeida Kumlien, A., Coughlan, P. (2018). Wicked problems and how to solve them. *The Conversation*. https://theconversation.com/wicked-problems-and-how-to-solve-them-100047 (accessed 20.05.2021).

Ellen MacArthur Foundation. (2021a). New Plastics Economy. https://www.ellenmacarthurfoundation.org/our-work/activities/new-plastics-economy (accessed 30.05.2021).

Ellen MacArthur Foundation. (2021b). What is the Circular Economy?. https://www.ellenmacarthurfoundation.org (accessed 18.04.2021).

Fashion and Textile Design. (2021). Society for Responsible Design/ Fashion and Textile Design. https://srd.org.au/fashion (accessed 30.05.2021).

Friant, M. (2021). Circularity Timeline. https://time.graphics/line/288398 (accessed 11.05.2021).

Friant, M., Vermeulen, W., Salomone, R. (2020). A typology of circular economy discourses: Navigating the diverse visions of a contested paradigm. *Resources, Conservation and Recycling*, Volume 161 (October), https://www.sciencedirect.com/science/article/pii/S0921344920302354 (accessed 11.05.2021).

International Living Future Institute. (2021). Living Building Challenge/ Certified Case Studies/ Full Living Certified. https://living-future.org/lbc/case-studies/?certs=living (accessed 29.05.2021).

IPCC. (2021). The Intergovernmental Panel on Climate Change. https://www.ipcc.ch (accessed 09.08.2021).

Irwin, T. (2018). The Emerging Transition Design Approach. https://www.researchgate.net/publication/329155155_The_Emerging_Transition_Design_Approach (accessed 21.03.2021).

Irwin, T. (2012). Design a Worldview for Social Impact: Terry Irwin at TEDxArtCenter CollegeOfDesign video. Ref. point 4:48. https://youtu.be/-te2OsCFWlc (accessed 22.04.2021).

Lubchenco, J. (2021). Our Planet, Our Future – First Academic Science Session. https://youtu.be/mogdhDEtm6E (accessed 28.04.2021).

Musk, E. (2021). $100M Prize for C02 Removal. https://www.xprize.org/prizes/elonmusk (accessed 07.05.2021).

Jinping, Xi. (2021). Full Text: Remarks by Chinese President Xi Jinping at Leaders Summit on Climate http://www.xinhuanet.com/english/2021-04/22/c_139899289.htm (accessed 22.04.2021).

Keoleian, G. (2021). Green Batteries for Green Vehicles: Principles for Responsible Battery Management in Mobile Applications. https://councilgreatlakesregion.org/green-batteries-for-green-vehicles-principles-for-responsible-battery-management-in-mobile-applications/ (accessed 26.05.2021).

Lee, B., Brien, P. (2011). SRD Change 11 National: Show Catalogue. https://www.srdchange.org.au/SrdC11catGC3webRevOpt.pdf p12 & p26. (accessed 30.05.2021).

McDonough. M., Braungart, M. (2002). *Cradle to Cradle.* North Point Press, New York.

Newton, I. (1990). Birds of Prey. Weldon Owen, San Francisco.

Monson, M. (2021). Socially responsible design science in information systems for sustainable development: a critical research methodology. *European Journal of Information Systems.* (2021) pages 1 – 31. https://www.tandfonline.com/doi/full/10.1080/0960085X.2021.1946442 (accessed 30.07.2021).

Nobel Prize Summit. (2021). https://www.nobelprize.org/events/nobel-prize-summit/2021/ (accessed 26.04.2021).

Papanek, V. (1972). *Design for the Real World*. Pantheon Ed. Bantam Books, Toronto.

Pavie, X., Carthy, D. (2015). Leveraging Uncertainty: A Practical Approach to the Integration of Responsible Innovation through Design Thinking. https://www.researchgate.net/publication/286542343_Leveraging_Uncertainty_A_Practical_Approach_to_the_Integration_of_Responsible_Innovation_through_Design_Thinking (accessed 31.05.2021).

Ramirez, M., Campbell, G., Marosszeky, A., Lopes, A., Campbell, C. (2010). ConnectED 2010 in LENS Oceania/ ConnectED2010 International Conference on Design Education, 2010. https://lensoceania.wordpress.com/publications/ (accessed 30.05.2021).

Ramirez, M., Campbell, G., Marosszeky, A., Lopes, A., Campbell, C. (2011). ConnectED 2010 paper Significant update after several more SRD Change National and International exhibitions, 2011. https://srd.org.au/wp-content/uploads/2021/06/SRD_Change_series-ConnecTED_2010-basicUpdatePaper2021s.pdf (accessed 31.05.2021).

Responsible Industry. (2014). Responsible Research and Innovation http://www.responsible-industry.eu (accessed 15.05.2021).

Rittel, H., Webber, M. (1973). Dilemmas in a general theory of planning. *Policy Sciences,* 4, 155–169. https://doi.org/10.1007/BF01405730

Seidensticker, J., Lumpkin, S. (1991). *Great Cats.* Weldon Owen, San Francisco.

Shedroff, N. (2019). *Design is the Solution.* https://nathan.com/design-is-the-solution/ (accessed 22.04.2021).

SolarAid. (2006). SolarAid international charity. https://solar-aid.org/about-solaraid/ (accessed 30.05.2021).

SRD Change National. (2011). SRD Change 11 National. https://www.srdchange.org.au/about/about.html (accessed 30.05.2021).

SRD Survey. (2021). SRD Survey. http://bit.ly/SRD_Survey_2021 (accessed 30.05.2021).

SRD weblink. (2021). Society for Responsible Design. https://srd.org.au (accessed 30.05.2021).

Yes! Magazine. (2021). Yes! Magazine/ The Solving Plastic Issue. https://www.yesmagazine.org/issues/solving-plastic (accessed 30.05.2021).

Young Persons' Plan For the Planet. (2017). Download the first Australian national plan here. https://www.planfortheplanet.org.au/wp-content/uploads/2019/11/YAPP_NatSDGp03jul18©final1.0-1.pdf https://www.planfortheplanet.org.au/media/ (accessed 28.05.2021).

Zero Waste Design Online. (2020). ZWDO. https://www.zerowastedesignonline.com (accessed 12.05.2021). (NB. Higher resolution graphics are available if requested. designoz@iinet.net.au)