Visually Communicating Climate Change Adaptation to Children is Serious Fun!

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Submitted in fulfillment of the requirements of the degree of:
Master of Design Research
March 2020
Abstract

The serious and imminent threat of anthropogenic induced climate change, and the inaction of decision makers, is driving the increasing concern children have for their future. The most prominent manifestation of this concern can be observed by children’s participation in global school strikes as students cry in the streets to have their voices heard. Since these protests, a growing demand to find novel approaches that communicate, and support children’s engagement in climate change adaptation has never been more significant. This demand reflects that children are placed outside of adaptation discourses and emphasises that children deserve to participate and author visions for their future. In response, the focus of this thesis is to experiment with creative outcomes that engage children in conversations about adaptation from a critical visual communication design perspective. The outcomes in this research experiment with games that have many unique affordances for participation where the seriousness of climate change can be approached in a playful engagement. This thesis will include practice-based research located at the nexus of community-based adaptation, critical visual communication design and serious fun. This includes the Design Away Carbon Challenge, which opened Australia’s largest one-day educational event, the Future BNE Challenge in March 2019, and the Play to Adapt game, which was included in a classroom workshop with grade seven students at the Queensland Academy of Science, Mathematics and Technology. These two events are documented in this thesis and described using semi-structured interview with facilitators, participant observations and images of the events. The creative experiments are also informed by a critical visual discourse analysis on 25 climate change adaptation frameworks. This explored how climate change adaptation discourses are visualised and identifies methods of visually communicating transformational adaptation which seeks to disrupt current visual discourses. The contribution this research has reaches beyond the design field and has implications for education, government, and non-government organisations or anyone who is seeking to engage children in the climate crisis. The imperative for this research, and any other research exploring methods of communicating climate change adaptation to children, is growing immensely as we have come to understand the implications climate change has for humans and the worlds we have created.
Statement of Originality

This work has not previously been submitted for a degree or diploma in any university. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made in the thesis itself.

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March 2020
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Acknowledgements

First, I would like to show my appreciation and gratitude toward my primary supervisor Tristan Schultz. Tristan has continually provided me with guidance, opportunities, and support to complete this work. Tristan has been an essential mentor, and friend, from 1st year of undergraduate studies, to completing Honours, and now, as a Master’s candidate. Along the way he has opened up his studio space at Relative Creative, offered opportunities to work as a tutor at Griffith University and offered commercial work to help with some of his projects. I am forever grateful for this, and it is fair to say that I wouldn’t be the designer, and person, I am today without this relationship. I would also like to thank Laini Burton who jumped on as my admin supervisor, and since then has supported me to prepare for submission and the completion of milestones. Her support along the way is greatly appreciated. I would also like to thank Beck Davis who was in this position before Laini taking over.

During this thesis, I had the opportunity to collaborate with Relative Creative, and the Queensland Academy of Science, Math and Technology (QASMT). To Bec Barnett from Relative Creative, your support and valuable guidance during the development of the Design Away Carbon Challenge for the Future BNE event was amazing. I always enjoy catching up whenever I visit and appreciate the help you have given over the years. I would also like to thank the learning team from QAGOMA, including Terry Dean and Rebecca Smith who showed interest in the project and helped me to organise a second workshop at QASMT with Sandra Davey. Thank you Sandra for letting me use your class for the Play to Adapt workshop and your help leading up to the event and post-event. I am inspired by the passion you have for engaging your class in the climate crisis.

To my fellow candidates enrolled in a Master of Design Research, Hannah Ison, Ceara Swyripa, and recently upgraded to Ph.D. candidature, Paula Hardie. I greatly appreciate the support you have offered, during milestones, trips to Relative Creative and just general conversations about design and research. I look forward to seeing what you accomplish during your candidature. I would also like to thank you all for your help during Future BNE and facilitating the Design Away Carbon Challenge, and for letting me interview you.
More personally, I would like to thank my partner Lucy Blackhall who has gone through everything with me, and helped me along the way with your advice, ideas and unwavering support. You are very much the reason why I can submit this and I am continually inspired by you in all facets of life. Also, thank you to my family who has endlessly supported me and encouraged me to go further with my studies where your support has been instrumental in where I am today. This thesis is for all of you.
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INTRODUCTION
This research is driven by two concerns; first, my concern that children will unjustly inherit the legacy of past generations, predominantly our inaction on climate change, leaving future generations vulnerable to changes in climate; and second, my concern that children’s agency to participate in discussions around climate futures are limited as a result of their exclusion from climate change adaptation discourses. This also results in the absence of their opinions, concerns and desires around climate futures. Climate change will have a transformational effect on human and natural worlds. Adaptation to climate change will be crucial in dealing with climate risks, and more broadly, the climate crisis. In response, we need to better prepare children for their future by increasing children’s participation in adaptation and inspire hope in children’s futures where ecological anxiety might manifest. This thesis will position design and games as an opportunity to approach communicating large and confronting topics, in a fun and interesting way. It will explore design methods to facilitate conversations with children in climate change adaptation discourse with experiments that merge a theoretical perspective from critical visual communication design, community-based adaptation and serious fun. The research question for this thesis is how might designers experiment with games to facilitate conversations around climate change adaptation with 12-year-old children in South East Queensland? 12-year-old children are the focal point for this research as grade seven students are yet to engage in climate change in Australian schools as per the Australian curriculum. To answer this question, this thesis will include a critical visual discourse analysis of 25 climate change adaptation frameworks, along with, creative outcomes that experiment with designed games at the Future BNE challenge and a workshop with a class of year 7 students. Two creative outcomes are produced by practice-based research and are documented with images and embedded in the text of this thesis. This introduction will briefly explain where this research has come from and how it has been shaped by the experiences of the researcher and also the significance of this research in context to the fields of study.

**Situating the Researchers Background**

This Master’s thesis began in 2018, but there have been many experiences that can be traced back which have shaped this work and brought me to this research. Some have occurred even before beginning my undergraduate studies. The most poignant was the first time I experienced vulnerability to natural disasters, and its effect on towns, communities
and individuals. This occurred in my home town before moving to Brisbane. The Bundaberg floods brought forth a stark reality; we are vulnerable to weather. In two years, Bundaberg experienced a one in one-hundred-year flood once in 2011 and again in 2013. Severe flooding led to the displacement of residents, half the town was cut off by the river as the bridges were flooded and collapsing, food had to be flown in as roads were inundated, some houses had been swept away with stunning pictures of whole houses sitting in the middle of the road. Many of the effects disproportionately affected people from lower socio-economic backgrounds as houses in flooding zones are cheaper. Insurance policies didn’t cover a lot of the damages to houses as the type of flooding was not included in most coverages leaving people economically stressed and permanently displaced and what was most cruel was that those who had finally repaired damage to their property went through it again two years later. Because of this, a lot of small local businesses closed down permanently, which affected and already struggling local economy. However, after all of the destruction of each event, I witnessed the capacity of the community to come together, something I hadn’t seen before. People working together, cleaning streets and houses of people they barely knew. A sense of resilience had manifested in the aftermath of the disaster. At this time, I struggled to understand situating this with the broader complex phenomena of climate and human settlement. These are things I would come to understand as I began my undergraduate degree and is something I carried with me throughout my studies. This ended up raising my interests of increasing resilience in response to natural disasters.

In 2013, I began my first year of university enrolled in a Bachelor of Design Futures with Honours majoring in Visual Communication Design. This course was led by design philosopher, Tony Fry. I remember during my first year, feeling unsettled and helpless by the condition the world is in, and my position of privilege in this from a European descent, white, male. During this time, I was exposed to designs entanglement with the unsustainable where I continued to engage more in understanding climate change and how traditional commercial design practices have had a critical role to play in perpetuating it. This course redirected my understanding of design and with the help of inspiring and influential tutors, including my current supervisor Tristan Schultz, I was able to mobilise a praxis where design can be equipped in a socially and environmentally responsible way. This culminated with a project during my last semester under the direction of Tristan, where
myself, and two other classmates collaborated with the National Climate Change Adaptation Research Facility (NCCARF) to undergo a design project. A design strategy was developed which merged participatory design and climate change adaptation to explore events that communicated climate risk to residents. From here the students and I were invited to attend and present at the 2016 Australian Climate Adaptation Conference in Adelaide the following year which would be in the middle of my fourth and final year of undergraduate study.

In 2016, I began an honours project which continued with my exploration into climate change adaptation where I, and another honours student, produced a pilot participatory event held on the Gold Coast in Palm beach. Similar to this research, this project was looking at how design can facilitate conversations about climate futures and risk using visual triggers. This event produced some interesting local responses to perceived climate risks. Midway through this project we attended the 2016 Australian Climate Adaptation Conference to present how design can engage in conversations with residents about risk. The attendees of this conference were predominantly from a mixture of science, engineering and government background. The people we met during this conference echoed each other in the importance of communication strategies for adaptation, and in the closing statement for the conference, the attendees were encouraged by the speaker to find ways to communicate and disseminate information, to reach more people, and to amplify adaptation efforts. After finishing my final year of undergraduate study, I had one year away from studying in 2017 where I worked as a sessional tutor teaching design lab courses at Griffith University QCA and worked on freelance projects. During this time I was struggling with the idea of working in a commercial studio, given the politics I developed during my studies. I also found it hard to find a place where I could continue to explore design and climate change adaptation. This is partly due to the funding for climate change adaptation being cut significantly by the federal government in 2017 which effected places like NCCARF and any momentum that local governments were taking to develop adaptation plans.

At the beginning of 2018, I, and some of my fellow students from honours, enrolled in a Master of Design Research program at Griffith University. This was an opportunity to continue to explore my interests in design and climate change adaptation. At the end of
2017, the Queensland Government released an online document titled *Pathways to a Climate Resilient Queensland: Queensland Climate Adaptation Strategy 2017-2033* (Queensland Government, 2017a). This document communicates a framework for climate change adaptation in Queensland, with the intention of preparing communities for current and future climate changes. The publishing of this document coincided with the beginning of my own research on exploring visual communication methods and communicating climate change adaptation. In this document, ‘people and knowledge’ has been positioned as a pathway for adaptation in Queensland which focuses on communicating knowledge of climate risks and responses (Queensland Government, 2017a, p. 18). This triggered a starting point for understanding how climate change adaptation is currently communicated in Australia, and what role visual communication design can play in this. From here this research has taken lots of turns along the way, although reflecting on this, these turns have been informed by my past experiences and the experiences documented in this thesis.

**Research Significance**

Climate change is one of the most salient existential threats to humans and future generations. In response, this research explores novel approaches to communicating climate change adaptation to children. Children are being introduced to climate change adaptation and participating in critical conversations about the change required to deal with the climate crisis. This research is significant because of the high demand from educators, parents and children for engaging and education children on climate change. This high demand also reflects the lack of progress to implement the climate crisis in the Australian curriculum at both a state and federal level. This leaves teachers, parents and children looking for information elsewhere and increases misinformation on climate change (Cutter-Mackenzie & Rousell, 2018; Sanson, Van Hoorn, & Burke, 2019). This research also makes a contributions to research in climate change adaptation where design has had little say. Communication of adaptation can be a barrier to the success and amplification of adaptation efforts. Adaptation needs to shift our perceptions of what the future will hold as a part of the psychological adaptation that everyone will have to undergo, which design will have a significant role to play (Fry, 2015, p. 61). Therefore, adaptation must resonate, and stick with the public and become part of public concern. This will require understanding the
audience and exploring innovative methods to engage many different people. This opens avenues for designers in the field of visual communication design, participatory design and games design to engage in climate change adaptation from a critical design perspective. This thesis also engages in research on community-based adaptation, where adaptation is approached at a grassroots level. This actively involves the participants in the development and implementation of strategies that increase individual and community resilience to climate impacts (McNamara & Buggy, 2016; Saurez, Mendled de Suarez, Koelle, & Boykoff, 2014; Schipper & Ayers, 2014).

**Format and Structure of Thesis**

The body of this thesis will include six chapters. The first chapter is a literature review that contextualises this research with past theories and knowledge to form a theoretical perspective for the researcher's practice. The second chapter explains the research methodologies that guide this thesis and the methods used to conduct this research. The third chapter focuses on a critical visual discourse analysis of 25 climate change adaptation frameworks to identify visual narratives around climate change adaptation, and where these narratives are situated when communicating to children. Chapters four and five details practice-based research of two creative outcomes. The sixth chapter will follow with a discussion on the results from the previous chapters and after the conclusion, an appendix will also be attached at the end of this thesis which will include ethical clearance reference number, consent forms and results from the two creative outcomes.
CHAPTER 1

LITERATURE REVIEW
This literature review will begin by situating climate change as a large scale transformative phenomenon, where climate changes, caused by anthropogenic emissions, will alter and disrupt the world we have created. This will inform a position on climate change adaptation where risk is framed as an opportunity for positive change. Lastly, I will situate and explore design practices and serious fun as a pathway for adaptation. This will go on to inform how games and play can be used to engage children on discourses of climate change adaptation. This chapter will conclude with two case studies of researchers in practice. The following diagram illustrates where this research is located between community-based adaptation, critical visual communication design and serious fun (see figure 1).

![Figure 1 Scope for Practice](image)

**Climate Change**

From our anthropogenic behaviours, it is widely acknowledged that we have transitioned toward a new geological epoch; the Anthropocene, where human influences are generating instability and even catastrophic shifts in the earth systems (Dryzek & Pickering, 2018; Steffen, Broadgate, Deutsch, Gaffney, & Ludwig, 2015; D. F. White, Rudy, & Gareau, 2016).
As documented by the Intergovernmental Panel on Climate Change (IPCC) in their 5th Assessment Report (IPCC, 2014), human influence on the climate system is clear. Anthropogenic emissions are at their highest ever and warming is unequivocal with many observed changes in climate (IPCC, 2014, p. 6). To add to this assessment, in the recently published *Global Warming of 1.5 °C* by the IPCC (IPCC, 2018), evidence shows that global warming has already increased by 1°C since pre-industrial times (IPCC, 2018, p. 4). Even the increase of 1°C, which might seem slight, has already lead to significant climate-related impacts in Australia. This includes mass bleaching events of coral reefs, extreme fire seasons including the devastating fire season at the beginning of 2020 and changes in rainfall patterns (CSIRO, 2018; IPCC, 2014). With these current impacts, future warming will contribute further towards rising-sea levels, increases in ocean temperature, ocean acidification, ice sheets melting, heatwaves and extreme weather events (IPCC, 2014, pp. 2-16; 2018, pp. 4-11). South East Queensland (SEQ), where this research is located, is particularly vulnerable to climate change impacts. SEQ is known for its high concentration of people living in coastal areas and is also the fastest growing coastal population where urbanisation is rapidly increasing (Queensland Government, 2016, 2017b). This leaves SEQ at risk from the aforementioned climate impacts, though more predominantly inundation form sea level rising, sea-level extremes, increased amount of heatwaves, increased bushfire risk and reduced rainfall (Queensland Government, 2017a). According to the IPCC, our only options of dealing with climate risk is substantial reductions in greenhouse gas emissions, including technology to remove carbon out of the atmosphere (which doesn’t exist yet), and adaptation to adjust the inevitable climate changes we will experience (IPCC, 2014, p. 8). Despite these recommendations by the IPCC, it is clear that global efforts are failing to meet the current political and scientific consensus of keeping global warming under 2°C to avoid dangerous levels of climate change and insurmountable adaptation challenges (Bendell, 2018, p. 6; Christoff, 2014, p. 207). Even if we achieve this overwhelming task, many aspects of climate change will continue for centuries (IPCC, 2014, p. 16). We are already locked in for centuries of carbon emissions in our atmosphere, resulting in centuries of sea levels rising and increased ocean temperatures (IPCC, 2014, p. 16). The small window of only 12 years to drastically reduce our carbon emissions is closing, and so is the possibility of a future with a future (Christoff, 2014, p. 211).
The challenge of climate change becomes even more precarious when we acknowledge the existential relationship between climate and human existence (Fagan, 2004; Fry, 2015; Hulme, 2017; Watsuji, 1961). As described by Mike Hulme in his book *Weathered: Culture of Climate* (Hulme, 2017), climate is a mediating condition between the human experience of ephemeral weather and cultural ways of living (Hulme, 2017, p. 4). According to Hulme, climate induces stability, in what would otherwise be a chaotic world (Hulme, 2017, p. 5). Climate change is unsettling this relationship, where once there was orderliness, there is now unpredictability. Put eloquently by Margaret Atwood, “climate change is everything change” (Hulme, 2017, p. 5). Brian Fagan also describes this connection with climate in his book *The Long Summer* (Fagan, 2004) as he argues that our relationship with the natural environment and short term climate change has always been in flux with each other and ignoring this is neglecting one of the backdrops of human experience (Fagan, 2004, p. xiv). For Tetsuro Watsuji (1961), climate is thought of as something external to human society despite when there are changes in weather, we apprehend changes in ourselves. Therefore, climate is not benign in shaping contemporary civilisation and can stimulate economic, political and social stressors, as Fagan describes even the relatively stable Holocene era stressed human societies toward adaptation with varying degrees of success (Fagan, 2004, p. xiv). “We can only imagine the death toll in a future era when climactic swings may be faster, more extreme and completely unpredictable because of human interference with the atmosphere.” (Fagan, 2004, p. 251).

For cities, and the majority of the population, the battle with climate change will be won, or lost in our urban environments. As humans increasingly settled into urban environments over the last 8000 years, these urban environments are now left vulnerable to climate impacts causing conditions of unsettlement. Unsettlement as described by Tony Fry are the environmental and social impacts that mark the end of a long period of stable climate that allowed permanent human settlement, and describes the beginning of an era of climate instability (Fry, 2011b, p. 434). Unsettlement is the unravelling of modern cities. This would include cities that have been abandoned due to repeated inundation and extreme weather events, along with heat island effects from the hot thermal mass of the city, fires and smoke pollution, conflict from food and water shortages, along with conflict as a result of large influxes of displaced climate refugees and geopolitical tension as nations deal with resource depletion (Escobar, 2018b, p. 117; Fry, 2015, pp. 9-15). Along with the physical effects is the
psychological unsettlement where we have shifted from the world we have created to being worldless, which is experienced by many existing climate, environmental and war-induced refugee’s (Kalantidou, 2013, p. 65). All of these effects are compounding and converge with other social issues such as poverty, colonialism, patriarchy and economic conditions and will affect people disproportionately. Generally those who have contributed less to climate change such as the developing world, Indigenous people and future generations (IPCC, 2018, p. 9). The evidence is mounting that the impacts of climate change will be catastrophic to our livelihood and uncontrollable levels of climate change will bring starvation, destruction, migration, disease and war (Bendell, 2018, p. 13). We must drastically reduce the number of carbon emissions we are producing globally to reduce as much change as possible and we should also prepare for inevitable change and explore adaptation. What follows focuses on climate change adaptation literature.

**Climate Change Adaptation**

**Framing Climate Risks**

As described by Ulrich Beck in his book *World at Risk* (Beck, 2009b), modern society is a world risk society where we are now overly concerned with inherited risk produced by modernity. Climate change, for example, is the embodiment of an epoch of industrialised capitalism and economic growth (Beck, 2009a, p. 8; 2009b, p. 170; Dryzek & Pickering, 2018, p. 4; D. F. White et al., 2016, p. 36). For Beck, risk is the anticipation of catastrophe and is always a future event that might occur (Beck, 2009b, p. 9). It is also something that we try to control, as Bauman describes that we attempt to gain back control in response to uncertainty about our future where control has been taken away (Bauman, 2007, p. 26). In our attempts to control risk, we are incapable of action which ultimately results in the opposite effect as we are too focused on controlling risk rather than dealing with the problem (Akama, Pink, & Sumartojo, 2018, p. 21). For example climate change is the most documented risk we have ever known, but knowing has not stimulated action, rather it has fed scepticism and denial (Akama et al., 2018, p. 21). Arguments on climate change have clouded the necessary imagination to explore new openings for politics and epochal transformations (Beck, 2014b, p. 170). Anthony Giddens describes four different types of adaptive reaction to risk; pragmatic acceptance where one accepts that large and complex
problems are too big for one to control so temporary gains are all that one can control; Sustained optimism which aligns with business as usual despite threats of the current time; Cynical pessimism which is an attempt to dampen the emotional anxieties through humour; Lastly radical engagement which is a more optimistic attitude and practical contestation to perceived dangers (Giddens, 1990, pp. 134-137). It is the later that this thesis will approach adaptation with an attempt to foster radical engagement in climate change action. This resonates with Beck’s position on how we can approach climate change from a position where we look for the good in the bad (Beck, 2009a, p. 169). In a later journal article titled How Climate Change Might Save the World (Beck, 2014b), Beck argues that to deal with climate risks we must not see them as ‘bads’ that we need to control, but rather we should see them as goods where instead he asks “what is climate change good for?” (Beck, 2014b, p. 163). Risk shouldn’t be considered an end, but a beginning where we can address the unsustainable anthropogenic behaviours which have brought us to this moment and imagine what a good Anthropocene might look like. The Anthropocene is something that we cannot escape, rather it is something we should learn to live with where social change will be required to make good of our anthropogenic conditions (Dryzek & Pickering, 2018, p. 11; Escobar, 2018b, p. 120; Fry, 2009, p. 31). This needs to involve changes in how we engage with technology, economic systems and governance.

**Climate Change Adaptation Literature**

In climate change adaptation literature, adaptation is translated by different actors for different purposes. It can be incremental or transformational (Palutikof & ebrary Inc., 2013, p. 14). In his book Adaptation to Climate Change: From Resilience to Transformation (Pelling, 2011), Pelling describes adaptation as an opportunity for social reform and the creation of new values in response to our current relationship with the environment. Pelling recognises that adaptation is a political act where decisions have power in shaping futures either in a positive or destructive way (Pelling, 2011, p. 3). There is a real danger for adaptation policy to fall into the trap of preserving our current economic institutions and destructive nature. Palutikof describes this as incremental adaptation which insures business-as-usual, where decisions are made based on managing climate impacts to ensure continued growth (Bendell, 2018, p. 13; Palutikof & ebrary Inc., 2013, p. 14; Pelling, 2011, p. 3). Along with these traps, there is an emergence of technological response as a method for dealing with
climate risk. Here technological developments with environmentally beneficial outcomes are explored rather than changes in corporate, public and political values (Coffey & Marston, 2013, p. 182). These technological pathways, as a means to save the day, suppress the political imaginary and the possibility of alternative visions for the future which take into account the seriousness of climate impacts (Beck, 2009a, p. 170; McNamara & Buggy, 2016, p. 445; Wilbert & White, 2009, p. 9). This is not to suggest that technology has no place in adaptation, but instead it needs to be a part of it rather than adaptation being dependant on it (Bendell, 2018, p. 11). To frame adaptive action from an ontological perspective, as described by Tony Fry, adaptation to climate change will require a psychological shift as well as a material shift, as adaptation will apply equally to what we are and not just the environments that we exist in (Fry, 2015, p. 51). ‘We’ have to change as climate change will unsettle the unsustainable world we have created. From this position, Fry asserts that design is central to this transition where new modes of earthly habitation will need to be imagined, one which is situated in our eternal relation to climate (Fry, 2015, p. 51). Fry described this as a third mode of earthly habitation where cities are designed from the perspective of unsettlement rather than designing for settlement. This perspective aligns with Jem Bendell’s Agenda outlined in his viral paper Deep Adaptation: A Map for Navigating Climate tragedy (Bendell, 2018). Bendell’s poignant position is that we need to approach adaptation from the perspective that social collapse is inevitable. The deep adaptation agenda emerged out of the growing concern that climate change is much worse than originally documented and the impacts of climate change are now inevitable (Bendell, 2018, p. 20). What’s required is transformational adaptation which explores the possibility of social collapse in order to explore what that might look like. For Bendell, we need to look beyond resilience as we seek to explore the values, norms and behaviours of human societies we will wish to maintain. To do this we will need to ask “how do we keep what we really want to keep? what do we need to let go of in order to not make matters worse? and “what can we bring back to help us with the coming difficulties and tragedies?” (Bendell, 2018, p. 23). Furthermore, Bendell’s position on deep adaptation is focused on soliciting hope rather than anxiety.
Communication is often overlooked as a vital component of increasing adaptation efforts. A considerable barrier to climate change adaptation includes cognitive and psychological barriers, where perceptions of vulnerability and risk do not meet the urgency of climate impacts (Palutikof & ebrary Inc., 2013, p. 14). This is a failure to communicate the relevant information where miscommunication can lead to misunderstanding or misinterpretation. Increasing the momentum behind climate change adaptation will require communication strategies that include participants in a shared exchange of knowledge, interests, concerns fears, values and priorities, as opposed to traditional, linear distributions of information (Akama, Cooper, & Mees, 2016, p. 51; Saurez et al., 2014, p. 138). The linear distribution of information such as government frameworks and community engagement involve citizens as passive spectators rather than active participants in the decision-making process and suggests that information moves only in one direction. This has been critiqued for its overt simplification of communication (Akama et al., 2016, p. 51). Beck calls this “organized irresponsibility” where the decisions are not respective of those who are affected by risks, and those who are affected have no real way of participating in decisions (Beck, 2014a, p. 76) Linear models of communication cannot solely deploy the knowledge needed to scale up adaptation efforts (Saurez et al., 2014, p. 138; Webber, Gissing, Dufty, & Bird, 2017, p. 28). What is required is more innovative methods of communication that can translate complex and formal scientific knowledge that resonates with everyday citizens (Palutikof & ebrary Inc., 2013, p. 14; Saurez et al., 2014, p. 137)

**Community-based Adaptation**

In response to top-down approaches to adaptation, which has been criticised for focusing on adaptation at a global scale, and technocentric “command and control” solutions, a field of community-based adaptation has explored dealing with place-based impacts and social drivers to vulnerability (Klepp & Chavez-Rodriguez, 2018; Saurez et al., 2014). Practitioners, researchers and donor agencies are working with those who are already experiencing the force of climate change to come up with solutions at the individual, household and community level, particularly those most vulnerable and often marginalized. This approach emphasizes the value of local knowledge, which a number of resources have argued the validity of in response to scientific uncertainty. In understanding this, the local-level change will be focused at the scale that climate impacts will be experienced (McNamara and Buggy,
This transdisciplinary approach is more adept in responding to social concerns for meshing together scientific, local and traditional knowledge (Campos et al., 2016, p. 583). This bottom-up approach also enables communities to actively take part in fostering their own ability to adapt and empower their own resilience. Within CBA literature, it has been identified that policy needs to be more community-centric for inclusive decision-making where effective knowledge flows between local-level knowledge, and government policy (McNamara and Buggy, 2016 p.454).

**Design**

Links between design and climate change adaptation begin to emerge when we highlight critical design studies and future-focused design practices that attempt to redirect our homes, cities and broader socio-ecological relationships in order to secure a future worth having. Traditionally, design has been linked with the creation of objects for commercial purposes, however, these practices often conceal the political agency that design has as a directive force on ourselves, the world, and designs entanglement in unsustainability (Abdulla et al., 2019; Fry, 2011a; Lopes 2003; Tonkinwise, 2016, p. 87). Furthermore these practices are often a product of colonialism, perpetuating a trend of the designer as an expert, replicable methods and best practices that travel the world (Akama, Hagen, & Whaanga-Schollum, 2019, p. 3). Consumerist living is dependent on design where design decisions shape the processes behind the products we use, the materials and energy used to make them, the ways we operate them daily, and what happens when we no longer need them (Thackara, 2005; Tonkinwise, 2016, p. 87). This isn’t necessarily intentional but we have designed the situations we face today (Thackara, 2005, p. 5). Therefore the conclusion is that if we humans have designed our way into these situations, we need to design our way out, however with a radically new understanding of what it means to design (Fry, 2009).

Emerging from the need for changes at every level of society, there is a growing field of critical design studies that recognise that design is not neutral in shaping the world, and our behaviours (critical design can be described as approaching design with the application of critical theories). This includes Design Futuring and Redirective Practice as described by Tony Fry (Fry, 2009), Transition Design by the design staff at Carnegie Mellon University (Irwin, Kossoff, Tonkinwise, & Scupelli, 2015), Design for Social Innovation by Ezio Manzini (Manzini, 2015), Designs for the Pluriverse by Arturo Escobar (Escobar, 2018b) and
Decolonising Design by the Decolonising Design Collective (Schultz, Abdulla, Ansari, Canlı, Keshavarz, Kiem, Martins, & Vieira de Oliveira, 2018). Designers are becoming more engaged in the climate crisis and recognise design as a crucial factor in confronting it imaginatively (Escobar, 2018a, p. 140). As described by Fry, Climate change will require design to become something more profound, as ontologically futuring practices will need to emerge that take us toward sustainment (Fry, 2009; 2011b, p. 435; 2015). Diverging from current sustainability discourses, which have been found to sustain the unsustainable, Fry defines sustainment as a vital turn in our current mode of earthly habitation (Fry, 2009, p. 47; 2015, p. 50). This includes transcending destructive practices, systems and institutions that threaten our future, towards designing that which sustains and secures our future for the kind of relational being that is opposite to the current conditions of defuturing and unsustainability (Escobar, 2018b, p. 116; Fry, 2009, p. 41). Extending on this from a Decolonizing Design perspective, design discourse is dominated by Eurocentric worldviews, therefore designing futures will need to enhance conditions where multiple worlds and knowledges, of both humans and non-humans, can flourish in mutually enhancing ways to prevent the destruction of biophysical worlds and human lifeworlds (Abdulla et al., 2019, p. 130; Schultz, Abdulla, Ansari, Canlı, Keshavarz, Kiem, Martins, & J.S. Vieira de Oliveira, 2018, p. 85). As designers are engaging in these topics, designers are becoming more collaborative by including heterogeneous communities and temporalities through participatory design methods in order to imagine and facilitate conversations about what the future could be (Escobar, 2018a, p. 140). To Facilitate these types of conversations a shift from designer as an expert to the designer as a facilitator has occurred as designers involve participants in the shaping of locally situated projects in response to global threats (Manzini, 2015). This recognises that design is not owned by professional designers but is a generalisable human practice (Fry, 2009; Manzini, 2015; D. White, 2019, p. 13).

**Ontological Design**

Understanding ontological design highlights the close and in flux relationship between humans, materials and immaterial things (Fry, 2009, p. 34). Ontological design puts into perspective the seriousness of designing and plays a critical role in the cultural change required to deal with climate change impacts (Lopes 2017, p. 174). Put simply design designs. Through our interactions with ‘things’ is the ontological designing of our being-in-
the-world as designed artefacts continue to design back onto us, modifying our desires, expectations and actions as we interpret ‘things’ (Lopes 2017, p. 176). Through our interpretation, we then act back onto the world. For Heidegger this is what ‘being’ is (Willis, 2006, p. 2). A hermeneutic circle can be a way of describing this through our ongoing interaction and interpretation with things and then our acting back onto the world (Willis, 2006, p. 3). With an understanding of ontological design, approaching climate change, we rely less on presenting people with arguments but rather seek other ways of designing things, such as the built environment, agricultural systems, transportation, etc. to materialise a world that understands its connection with climate (Fry, 2015, p. 51). Proponents of ontological design posit that this will help direct us toward new ways of existing in the world.

**Critical Visual Communication Design**

The image, as a designing thing, has a powerful role to play in the creation of new relations between human action and material conditions (Lopes 2005, p. 8). Visual communication design has a prominent role in the creation of images, and making sense of the world through our interpretation of images (Rose, 2016, p. 1). Heidegger speaks of the ontological sway of the image when he describes the world as a picture, which not only is a representation of the world but constructs how the world is conceived and interpreted (Lopes 2005, p. 12). Fry also describes this where images contribute to the operation, form, appearance and understanding of the material world (Fry, 2009, p. 3). Social semiotics seek to understand image creation practices and takes into consideration the social setting of the image creator. This gives detail to the process of image creation, or sign-making, where choices are made at the time of creation that best represent the intended meaning (Kress & Van Leeuwen, 1996, p. 10). For the visual communication designer, this includes the written, drawn, printed or displayed pieces which include shapes, lines, colours, textures and layouts to produce messages. Representation arises out of the social, psychology and history of the sign-maker, which guides these choices which are inevitably marked by power differences (Kress & Van Leeuwen, 1996, p. 11). They produce images of reality that are bound up with the interests of the social institutions that the pictures are produced in, circulated and read. They are ideological. Images are never neutral and aren’t transparent windows into the world and we must be critical of the sign-maker’s interpretation of the
world, what is made visible or invisible, and what is forgotten or remembered (Lopes 2005, p. 15; Rose, 2016, p. 3). Humans have to be able to make decisions based on the information we receive, produce and exchange, and we have to be prepared to act based on such information. This all speaks to the power of the image as a deeply political artefact and power it has to determine how we behave, and act in the world (Fry, 2011a; Lopes 2003). Therefore, the question becomes how do images either design us towards sustainable futures or negate possible sustainable futures (Lopes 2005, p. 8)? Especially when current methods of communicating climate change adaptation are predominantly images within government frameworks, which adhere to a position of power and work for the interest of that institution. As our climates change, visual communication design will become central to adaptation, as adaptation is as much a cultural project as it is practical (Fry, 2015, p. 64). As described by Fry this has an important semiotic value of shifting the perceptions of what the future will bring, to drive action, and also contribute to the psychological adaptation required to (Fry, 2015, p. 64).

**Community-based Adaptation by Critical Visual Communication Design**

There are very prominent connections between community-based adaptation and participatory design as both strive to deal with problems by including those who are affected in the process. Leading critical designers are asking questions of “what type of world do we want to build?” and “what type of futures we want?”. For Ezio Manzini, these questions should be more focused on how can designers facilitate other people’s visions that meet social needs and social sustainability (Ehn, Nilsson, & Topgaard, 2014, p. 7; Manzini, 2015, p. 2)? Design for social innovation is a design movement that emphasizes everyone is a designer (Manzini, 2015). We find ourselves in a world of constant transformation that will require us to design and re-design our existence. This shifts design out of the studio, and out of the classic design professions, and into a position where design experts use their skills to cultivate the visions and desires that address social needs, construct alternative cultural visions and bring into existence new forms of social relationships (Manzini, 2015, p. 5). The designer now acts as facilitator and mediator rather than an expert, where the designer’s occupation is to facilitate life projects (Manzini, 2015 p.5). These techniques incorporate participatory design methods, where local knowledge production through the use of visual tools, and collaborative prototyping are fundamental (Ehn et al., 2014, p. 7). These
methodologies aren’t new and come from a lineage of worker’s struggles in Scandinavia during the 1970s. In response to the use of computers and technology in the workplace, action-researchers and trade unions worked collaboratively to draw upon the worker’s local knowledge through prototyping, to find solutions (Ehn et al., 2014, p. 7). Today participatory design goes beyond the workplace, and into public spaces and deals with social, political and environmental problems (Ehn et al., 2014, p. 7). Visual tools during participatory design workshops are used as a means of making what is being discussed visible and tangible (Manzini, 2015, p. 134). These are specifically designed to prompt, support and trigger social conversations to help deal with complex problems and draw things together (Barnett & Schultz, 2015; Schultz, 2019, pp. 170-184). Akama, Cooper, Vaughan, Viller, Simpson, and Yuille describe them as playful triggers which facilitate interaction among people and generates receptive modes of interaction through their tactile visual, and playful qualities (Akama et al., 2007; Akama & Ivanka, 2010). Another way of describing them is scaffolds for experience, where temporary and moveable pieces support what needs to be accomplished (Sanders, 2002). Scaffolding also has origins in education and psychology, where learning is supported by temporary structures that enable problem-solving and collaborative learning (Akama & Ivanka, 2010, p. 12). These tools are recognized for their encouragement of play, fostering communication and articulating complexity and implicit knowledge.

**Experience Design**

Experience is something fuzzy when it comes to design, however it is something philosophy scholars have explored deeply, including Husserl, Heidegger and Gadamer among others (Benz, 2015, p. 14). Experience is finding its way into design discourse focused with the experience of products, such as digital interfaces, that positions the human at the centre of interaction. From a phenomenological perspective, experience is more focused on our living of life and our interactions with the world, which is also described previously as ontological design, where absorption of these events adds to our cumulative experience of the world (Benz, 2015, p. 13). This shifts the designer’s emphasis to also take into consideration experience and meaning rather than just function and semiotics (Escobar, 2018b, p. 35). Experience design is a meshing together of a variety of objects, interactions, spaces and information designed specifically for a user. This isn’t discipline-specific, rather it draws on many disciplines to facilitate this entwinement and
uses different types of artefacts, sounds and senses to create an experience (Benz, 2015, p. 27).

**Education and Climate Change**

As described previously, climate change impacts will be felt disproportionately and unequally. As a result of the growing concern around climate change, children are becoming more aware and expressing concern and fear (Sanson et al., 2019, p. 203). In a survey of 7 to 24-year-old Australians, 96% considered climate change a serious problem, 89% were worried about its effects and 70% feel that their opinions on climate change are not taken seriously (Sanson et al., 2019, p. 202). In response, youths have taken matters into their own hands in a number of ways. Greta Thunberg is one example of a student who initially began striking from school every Friday, which eventually resulted in a global movement of children striking from school in March and September 2019 (Klein, 2019, pp. 7-16). In South East Queensland, protest were held in Brisbane with over 30000 participants, Gold Coast with 4000 and Sunshine Coast with 3000. This march launched children’s voices into public awareness as they try to grapple with political inaction. Early childhood advocates have previously cautioned against learning about climate change because of the ‘doom and gloom’ aspects, the size of the problem and children’s culpability (Eames, 2017, p. 100). As described by Sanson, Van Horn, and Burke (2019), an important method for dealing with children’s anxiety is action. By building student’s resilience, self-efficacy and agency and encouraging and supporting their involvement in activities to both mitigate and adapt to climate change, students can build positive adaptive capacities (Sanson et al., 2019, p. 207). Underpinning change through mitigation and adaptation is education (Eames, 2017, p. 100). This needs to go beyond raising awareness toward participatory methods that draw on local knowledge and experiences (Eames, 2017, p. 100).

**Climate Change Education in Australia**

In Australia, Climate change education is relatively undertheorized. In a review of climate change education literature by Cutter-Makenzie and Rousse (2018), climate change education research has focused on students scientific understanding of climate change where scientific studies have been found as largely ineffective in changing students
perceptions, attitudes and behaviours, and also downplays the ethical implications of climate injustice (Cutter-Mackenzie & Rousell, 2018, pp. 91-92). Upon review of the Australian Curriculum to see how climate change and adaptation is mentioned, in the Australian foundation to grade ten curricula, climate change is only briefly mentioned three times in Geography learning areas. In secondary senior study's climate change is found in Geography, Humanities, and Science with some not being compulsory. Climate change adaptation is not mentioned at all in the curriculum. Cutter-Makenzie and Roussel argue that climate change shouldn’t just slip into one of these subjects of the curriculum such as geography or science (Cutter-Mackenzie & Rousell, 2018, p. 101). Instead the emergence of climate change subjects with the potential to increase the voice of students and have a genuine activation of children’s political agency must manifest.

**Critical Pedagogy**

As described before, education is a central component of re-imagining and transforming current unsustainable behaviours (Elliott & Davis, 2009, p. 66). Equipping children with the skills to deal with these impacts will require the adoption of critical pedagogy, as described by Paulo Freire, to attain the critical capacity to deal with the reality they face (Freire, 1986, p. 6). Current universal educational institutions, as argued by Illich, suppress the imagination of students, where our imaginations are ‘schooled’ into accepting a position of service within capitalist and consumer society. This leads to the institutionalised values of physical pollution, social polarisation and psychological impotence (Illich, 1971, p. 2). Freire argues that if we do not actively intervene in reality, then we are carried along in the wake of change. We can begin to foster critical attitudes via critical education by giving students the courage to discuss the problems we face and intervene actively to conceptualise new realities in the face of a new epoch, instead of handing over decisions to others (Freire, 1986, p. 15). This makes room for a critical pedagogical approach to communicating climate change and adaptation with children, where students have the means to reflect critically on their futures. This would require us to move beyond education on environmentalism towards education of sustainment, where students are equipped with the skills and attributes required to become change agents, and design/organise their own lives in response to climate changes (Elliott & Davis, 2009, p. 67). There has been little research documenting this, where the impacts of children and young people’s lives are explored in
relation to climate changes, or how current early childhood education might contribute towards negating unsustainable ways of living (Elliott & Davis, 2009, p. 67). Visual communication design has a role to play in this, where designers will seek to create suitable, engaging spaces to appeal and increase the effectiveness of learning (Kelly, 2015, p. 401).

**Climate Change Games**

Play has unique affordances to engage people on topics like climate change. It is immersive and played out in a space where decisions are free to be explored and meaning can emerge for the sake of pleasure, discovery and competition (Angel, LaValle, Iype, Sheppard, & Dulic, 2015; Eisenack, 2012; Saurez et al., 2014). There are prominent links between experience design and play, where designed experiences can foster learning by doing, rather than absorption of information in traditional reading or lecture formats (Eisenack, 2012, p. 330). Saurez makes this link between games and experiential learning, where knowledge is created through carefully crafted experiences (Saurez et al., 2014, p. 139). The learner comes into direct contact with the realities that are being studied where from a phenomenological perspective, absorption of these events adds to our cumulative experience of the world (Angel et al., 2015, p. 2; Benz, 2015, p. 13; Saurez et al., 2014, p. 139). In recognising play’s affordances, games are now explored in fields of science, education and climate change communication as a means of communicating large and serious themes. Serious Games separate themselves from games for entertainment toward games for pedagogical intent. These types of games have grown in popularity over the past decade. Serious games have thought-out educational purposes where pedagogy is infused into gameplay experience (Angel et al., 2015, p. 1; Tsekleves, Cosmas, & Aggoun, 2016, p. 165). The plethora of research on serious games has detailed the many affordances serious games provide for participants when dealing with large and complex problems (Angel et al., 2015; S. Candy, 2018; Eisenack, 2012; Eriksen, Brandt, Mattelmäki, & Vaajakallio, 2014; Rumore, Schenk, & Susskind, 2016; Saurez et al., 2014). This includes immersions into realistic situations, increasing the confidence to explore novel ideas within a safe space, and test decisions without having real-world consequences. As a participant, this fosters knowledge sharing and negotiation between players, engages a rich repertory of problem-solving techniques that emerge or build from interactions (Angel et al., 2015). Serious Fun is another discourse emerging in the field of community-based adaptation led by Pablo
Suarez which explores meaningful ways of communicating climate change adaptation knowledge compressed into the notions of fun (Saurez et al., 2014, p. 140). There are many synergies between serious fun and serious games, although serious fun is a pragmatic approach to adaptation, often with those most vulnerable to climate change in developing countries. This emerged from attempts to communicate local climate changes and approaches to adaptation with local communities and farmers. Serious entertainment, as briefly described by Tony Fry, explains that being political is a commitment to being serious, which is under threat by entertainment where everything needs to entertain. Entertainment destroys or deflects the application of the mind to the critical and conceals emergency where there is a pressing need for serious entertainment (Fry, 2011a, p. 122).

**Researchers in Practice**

This research will reference the work of researchers in practice Pablo Suarez and Yoko Akama as examples of participatory climate change adaptation where games and visual communication techniques are used.

**Case Study 1: Community-Based Adaptation Researchers in Practice Pablo Saurez**

Pablo Suarez (2014), associate director of research and innovation at the Red Cross Red Crescent Climate Centre explores games that communicate climate change adaptation where participants are making adaptation measures with decisions that bare certain consequences. Suarez, and his team at the climate centre, work with people who would otherwise be left to deal with climate change by themselves. Games are used as a method to investigate a range of adaptation choices, while also increasing resilience by enhancing the participant’s ability to anticipate future scenarios. Through this learning approach, conditions are fostered in which members of the community are able to take charge in designing their own response, where the action is in the hands of the participant (Saurez et al., 2014, p. 143). Suarez uses various visual tools to facilitate games, for example a player will win or lose beans depending on the participant’s choice of crops (drought-proof, flood-proof or no disaster protection) where dice will be thrown to determine the amount of rain. Their decisions on what to invest their beans in will impact their total bean count at the end of the game. Furthermore, participants will have the option of sharing beans when other
players run out. This example simulates the need for farmers to plan ahead when choosing their crops and trial which options are best to implement. The methods and techniques from this case study, including the gamification of adaptation strategies and tactile pieces to facilitate the game, have been applied to the creative experiments in this thesis. These methods have been highlighted because of their ability to communicate complex information in an engaging way and foster conversations with people who are often left out. This includes subsistent farmers in developing nations or local residents of a small town. The creative experiments have extended on these ideas by exploring how visual communication design techniques can facilitate the communication of complex information via designed materials. These visual communication methods have given the children tools to introduce and navigate climate change adaptation.

**Case study 2: Designers in Practice Yoko Akama**

Yoko Akama’s (2010) work on communication frameworks for bushfire preparedness is another example of working with local residents using playful triggers. During a participatory workshop, playful triggers were used to visualise community connections and promote communication between community members in preparedness for the bushfire season. This generated knowledge of ‘community in place’ and increased their awareness of others living in their area, and the environment at risk. Before this, participants had little knowledge of their neighbours and geographical area. Through the participatory workshop, knowledge was visualised, using playful triggers, where participants formed a strong understanding of the importance of collective neighbourhood planning for informing individual bushfire plans. The methods and techniques of using playful triggers during a participatory event has been applied to the creative experiments where playful triggers were used to facilitate the children’s experience and encourage participation from the groups to work together and explore climate futures. This research has moved away from the types of playful triggers Akama uses, which includes small toys, buttons, bolts, etc and explored tactile designed pieces, including laser etched blocks, where visual communication methods have been introduced to layer these artefacts with information and playful qualities. These tools are scaffold’s where playful triggers facilitate conversations and the completion of the game.
Conclusion

This chapter has included a literature review that has placed this research at the centre of community-based adaptation, critical visual communication design and serious fun. This perspective informs the practice-based research outlined in the following chapters which sought to engage children on climate change adaptation by critical visual communication and game design practices to foster notions of fun, while dealing with a large and convoluted topic. Climate change is as a transformational ongoing event that requires climate change adaptation focused on adaptation of our behaviours, as well as our built environments. This led to the framing of critical visual communication design to describe the practices found in this thesis. As described, links between design practices and climate change adaptation are beginning to emerge as design is situated as something more profound and serious. In the last section, which is focused on education and climate change is linked to young people’s concerns on climate change and describes how they are currently engaged in climate change adaptation discourses. It is then concluded that games can be used for educational purposes, and to potentially communicate climate change adaptation to children.
CHAPTER 2

RESEARCH METHODS
This chapter will outline the methods applied to investigate the original question: how might designers experiment with games to facilitate conversations around climate change adaptation with 12-year-old children in South East Queensland? This will include practice-based research, a critical visual discourse analysis, as well as a semi-structured interview, participant observation and interpretation of materials produced by students while participating in the creative experiments. This chapter will also illustrate practice via a hermeneutic diagram and reference ethical clearance for the two creative outcomes.

Research Methodology

This thesis uses hermeneutic phenomenological research to interpret how climate change adaptation games can facilitate, and engage 12-year-old children in climate change adaptation discourses. This research is not concerned with proving facts, instead, it is focused on designs ability to foster conversations around adaptation. Phenomenology as a discipline focuses on understanding people’s perception of the world as a lived experience where a hermeneutic cycle can be used to generate an interpretation of phenomena. This is based on the researcher’s position that our interpretation of the world is plural across different cultures and places. The planet is singular, but the world is plural for it is formed and seen indifference (Fry, 2012, p. 130). Hermeneutic Phenomenological research allows knowledge to emerge with subjective interpretations of experience and the stories we tell of that experience (Kalfe, 2011, p. 186). As described by Narayan Prasad Kalfe, hermeneutic phenomenological research is an approach to research that is concerned with experiences, and highlighting details that might be taken for granted with the goal of making meaning and achieve a sense of understanding (Kalfe, 2011, p. 191). There are no recommended methods to generate data, but qualitative research methods such as interviews and observations are appropriate to generate the life-world stories of the participants. Data analysis requires a hermeneutic circle of reading, reflective writing and interpretation in a rigorous, and deeply rich fashion to contribute towards creating new knowledge (Kalfe, 2011, p. 195).

Methods

Practice-based Research
This research engages in practice-based research to produce two creative experiments that explore the researcher’s question which is how might designers experiment with games to facilitate conversations around climate change adaptation with 12-year-old children in South East Queensland? As described by Linda Candy, practice-based research is an inquiry to gain new knowledge by both undertaking practice, and outcomes produced by practice (L. Candy, 2006, p. 2). This is also described by Donald Schon in his book *The Reflective Practitioner* (Schön, 1983), where practice can generate new understandings of experience as the practitioner becomes researcher when they reflect on the phenomena before them (Schön, 1983, p. 68). This process will be documented with images and written text in chapter’s four and five. These chapter’s will describe two events, where 12-year-old students participated in creative experiments. The first outcome is the Design Away Carbon Challenge. This game opened the Future BNE Sustainable City Challenge held by Relative Creative and Brisbane City Council. This event is Australia’s largest one-day educational event where, of the 650 students attending the event, 200 students participated in this game. A Semi-structured interview with the four facilitators who ran the game were used to gather their insights and experiences while running this game. After this event, a period of reflection and interpretation led to a second creative outcome, the Play to Adapt Workshop, held with a class of 28 grade 7 students at the Academy of Science, Mathematics and Technology. This workshop is a deeper engagement where the students completed two activities over a one hour class. During this workshop, observations of the students were documented in field notes and images of the students participating in the designed games.

**Participant Observation and Semi-structured Interviews**

The two experiments created during the researcher’s practice are participatory, where students played games that have the intention to facilitate conversations and investigations into climate futures. These games can be seen as scaffolds for participatory design events focused on designing adaptation plans for cities. To describe the experience of the students while participating in these games, methods of Participatory Action Research (PAR) will be used, including participant observation and semi-structured interviews. Here, I am critical of using PAR to describe the research methods throughout this thesis, where this type of research often involves participation at every stage of research, from the participant’s role in setting the agenda of inquiry, to participation in data collection and analysis and to the
participant’s control of the outcomes (Mctaggart, 1991, p. 171). Instead, methods to generate data, which are found in PAR as described by Cathy Macdonald (2012), will be used to describe the participant’s experiences. Participant observation can be described as the researcher’s immersion in the setting, hearing, seeing, and experiencing the reality of the social situation with the participants. This will require noting and recording of events, behaviours, and objects in the social setting through the use of detailed and comprehensive field notes (Macdonald, 2012, p. 42). Semi-structured interviews are a method of asking questions that uses an interview schedule, though also allows for some flexibility in the interviewee’s questions during the interview.

**Critical Visual Discourse Analysis**

To inform the decisions made during practice-based research, firstly, a critical visual discourse analysis on climate change adaptation frameworks was conducted. Climate change adaptation frameworks produced by governments are often visual artefacts and manifest how adaptation will be approached. Critical visual discourse analysis is an investigation into how visual communication design and images structures how we think about climate change adaptation. A method for analysis will enmesh three key texts on discourse analysis from different fields: environmental discourse (Dryzek, 2013), visual discourse (Rose, 2016) and visual communication design discourse (Kress & Van Leeuwen, 1996). 25 adaptation frameworks from Australia and OECD countries will be analysed to situate how we currently visually communicate adaptation and how these images communicate particular discourses. This will also frame who is missing from these discourses. The methods used in this discourse analysis will be described further in chapter three.

**Research Diagram**

This diagram is a visual representation of how the research will be conducted in a hermeneutic spiral. This illustrates how the researcher has performed research in an open-ended cycle of reading, reflecting and interpretation, as described in the research methodology (See figure 2).
Research Ethics

Ethical clearance was granted by Griffith Research Ethics committee to conduct semi-structured interviews and participant observations. Their reference number is: Semi-structured interviews: GU Ref No: 2019/209, Participant observation: GU Ref No: 2019/930. Ethics approval and permission forms can be found in the appendix (See Appendix D and E).
CHAPTER 3

CRITICAL VISUAL DISCOURSE ANALYSIS
This chapter investigates the visual discourse located in climate change adaptation frameworks. The intention of this is to inquire how the images found in climate change adaptation can construct the way we think about climate change adaptation, and our future, in response to climate change impacts. Climate change adaptation frameworks produced by governments were selected because they are often the dominant method for communicating adaptation, as well as being very visual artefacts that have been designed to communicate climate change adaptation. They are often communicating to both other government bodies and also the public in order to disseminate how they are approaching climate change. Therefore, what is in these documents also manifests in the real world, therefore the power found in these documents are critical in shaping our future. The frameworks which were collected to conduct this analysis are sourced from government websites in Australia and OECD countries. This chapter will firstly develop a critical visual discourse framework by reviewing literature and then identifying methods used to conduct critical discourse analysis and visual discourse analysis. The results from this analysis will be documented and then followed by a discussion.

**Critical Visual Discourse Analysis Framework**

In what would otherwise be considered neutral and informative modes of communication, critical discourse analysis explores the power behind groups of statements, either spoken or written (including newspaper reporting, government publications, science reports etc.) (Kress & Van Leeuwen, 1996, p. 13). For the most part, critical discourse analysis has focused on written or spoken language, although with the proliferation of visual design as a form of language, images have become as equally significant in their contribution to understanding discourse (Kress & Van Leeuwen, 1996, p. 13). Discourse is deeply political and powerful, not by means of repression or a set of rules, but in the structuring the way a thing is thought, and how we behave and act based on that thought (Dryzek, 2013, p. 9; Rose, 2016, p. 142). Discourse is everywhere, there are many different forms of discourses though some are more dominant than others. For example, there are many environmental discourses ranging from ecological modernisation which refers to a restructuring of the capitalist political economy in more environmentally friendly ways to green consciousness, which seeks new human sensibilities that are less destructive to nature (Dryzek, 2013, p. 13). Discourses and institutions are very effective at establishing what is referred to as hegemony, articulating
certain particular views of the world as common sense (D. F. White et al., 2016). In
government frameworks, discourses seek to maintain economic growth, so environmental
discourses that maintain a level of economic growth are more dominant (Coffey & Marston,
2013, p. 182). Visual images will be essential to understanding discourse, as images render
the world in visual terms, though this rendering might adhere to the interest that some
discourses can progress (Rose, 2016, p. 143).

What follows is a critical visual discourse analysis of climate change adaptation frameworks
will be conducted to understand how images within these frameworks fall into certain
discourses which either prepare us for the change required to deal with climate change or
negate possible futures. 25 climate change adaptation frameworks will be collected, and
sourced online, from around the world to conduct this analysis. This is due to these
frameworks being a predominant way of visually communicating climate change adaptation
that contains visual images. To conduct this analysis, three key texts will be used to form a
method. This will include John Dryzek’s: The Politics of the Earth (Dryzek, 2013), as a detailed
description of existing environmental discourses; Gillian Rose’s Visual Methodologies (Rose,
2016) which details a method for conducting visual discourse analysis; and Gunther Kress
and Theo Van Leeuwen’s Reading Images: The Grammar of Visual Design (Kress & Van
Leeuwen, 1996), which will be used from a visual communication design perspective of
understanding patterns of representation to critically analyse images. It is important to say
here that this discourse analysis is an interpretation of language and images and I am not
revealing any truths. I have made choices in what to discuss and focus on and this comes
from my position and the position of this thesis which is to understand how we can help
amplify adaptation efforts and mobilise action by using critical visual communication design
methods.

Method

The method that will be used to complete this discourse analysis will be an adaptation and
enmeshing of the three key texts as described above. To begin, the collected government
frameworks will be categorised based on the basic entities of the visual images and design.
For Dryzek, the basic entities are the understanding that different discourses see different
things in the world (Dryzek, 2013, p. 17). By categorising these documents in this way, we
can begin to analyse how specific types of images might be consistent in different types of discourse. For example, images that view the city as unchanged vs. images that visualise the city under threat from natural disasters. To do this Kress and Van Leeuwen’s patterns of visual representation will be used to examine images and categorise based on their representations. Once this has been completed, the following steps, as described by Rose, will be used to examine the visual discourse within each category of visual representation identified in the previous step. This includes:

- Looking at sources with fresh eyes
- Immersing yourself in your resources
- Identifying key themes
- Examining their effects of truth
- Paying attention to their complexity and contradictions
- Looking for the invisible as well as the visible
- Paying attention to details

**Looking at the sources with fresh eyes** will require forgetting all existing preconceptions about the material. Then the researcher will begin to **immerse themselves into the materials**, this will include reading and re-reading each text; looking and looking again at the images. Once familiarised with the material, **key themes will be identified** throughout the documents, then images and texts will be codified to form clusters of images based on these reoccurring themes. Clusters will be analysed to find meaning in, and between each group. As a part of this inquiry into meaning, the researcher will also **look for claims to truth** or to scientific certainty or to the natural way of things, where visual and textual devices are used to claim truth to highlight the processes of persuasion. The researcher will then look for any contradictions to identify the multiplicity of arguments that can be produced in its terms. Lastly **Looking for the invisible as the visible** to read into what has not been seen as well as what is visible to identify what has been left out.

**Climate Change Adaptation Frameworks**

This method will be applied to the following 25 frameworks:
<table>
<thead>
<tr>
<th>Local</th>
<th>Australia</th>
<th>Other OECD Countries</th>
<th>First Nations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• <strong>Brisbane</strong>. Green Clean and Sustainable 2017-2031 (Brisbane City Council, 2017)</td>
<td>• <strong>Chicago</strong> Climate change adaptation strategies (Chicago Climate Task Force, 2017)</td>
<td>• <strong>Chicago</strong> Climate change adaptation strategies (Chicago Climate Task Force, 2017)</td>
</tr>
<tr>
<td></td>
<td>• <strong>Fremantle</strong> Climate Change Adaptation Plan (City of Fremantle, 2011)</td>
<td>• <strong>Durban</strong> Climate Change Adaptation Planning (Lewis, 2010)</td>
<td>• <strong>Durban</strong> Climate Change Adaptation Planning (Lewis, 2010)</td>
</tr>
<tr>
<td></td>
<td>• <strong>Melbourne</strong> Climate Change Adaptation Refresh 2017 (City of Melbourne, 2017)</td>
<td>• <strong>London</strong> Managing risks and Increasing resilience (Alex Nickson, 2011)</td>
<td>• <strong>London</strong> Managing risks and Increasing resilience (Alex Nickson, 2011)</td>
</tr>
<tr>
<td></td>
<td>• <strong>Sydney</strong> Adaptation to Climate (City of Sydney, 2016)</td>
<td>• A stronger, more resilient <strong>New York</strong> (The City of New York, 2013)</td>
<td>• A stronger, more resilient <strong>New York</strong> (The City of New York, 2013)</td>
</tr>
<tr>
<td></td>
<td>• <strong>Darwin</strong>: Climate Change Adaptation Strategy (City of Darwin, 2011)</td>
<td>• <strong>Istanbul</strong> Climate Change Action plan (Development, 2018)</td>
<td>• <strong>Istanbul</strong> Climate Change Action plan (Development, 2018)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• <strong>Johannesburg</strong> Climate Change Strategic Framework (Ecometrix Africa, 2015)</td>
<td>• <strong>Johannesburg</strong> Climate Change Strategic Framework (Ecometrix Africa, 2015)</td>
</tr>
<tr>
<td>State</td>
<td>• <strong>ACT</strong> Climate Change Adaptation Strategy (ACT Government, 2016)</td>
<td>• <strong>California’s</strong> Climate Adaptation Strategy (California Natural Resource Agency, 2018)</td>
<td>• <strong>California’s</strong> Climate Adaptation Strategy (California Natural Resource Agency, 2018)</td>
</tr>
<tr>
<td></td>
<td>• <strong>Queensland</strong> Pathways to a climate resilience (Queensland Government, 2017a)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• <strong>South Australia</strong>: Prospering in a Changing Climate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National/country/continent</td>
<td>Australia</td>
<td>Bangladesh</td>
<td>Indonesia</td>
</tr>
<tr>
<td>----------------------------</td>
<td>-----------</td>
<td>------------</td>
<td>-----------</td>
</tr>
<tr>
<td></td>
<td>National Climate Resilience and Adaptation strategy</td>
<td>Climate Change strategy and Action Plan (Government of the People’s Republic of Bangladesh, 2009)</td>
<td>Indigenous people and climate change adaptation in Asia (AIPP, 2012)</td>
</tr>
<tr>
<td></td>
<td>• Victoria’s Climate Change Adaptation Plan (Victoria State Government, 2017)</td>
<td>• Brazil Mitigation and Adaptation to climate change (Inter-American Development Bank, 2011)</td>
<td>• Climate change Adaptation activities in India (Mitra, 2008)</td>
</tr>
<tr>
<td></td>
<td>• Western Australia: Adapting to our changing climate</td>
<td>• The EU Strategy on adaptation to climate change (European Commission, 2013)</td>
<td>• Asia Pacific Emerging climate change Adaptation issues (Asia Pacific Adaptation Network, 2015)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Climate change Adaptation activities in India (Mitra, 2008)</td>
<td>• Belgian National climate change adaptation strategy (National Climate Commission, 2010)</td>
</tr>
<tr>
<td>Country</td>
<td>Document Title</td>
<td>Source</td>
<td></td>
</tr>
<tr>
<td>---------</td>
<td>--------------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>Third National Communication (Egyptian Environmental Affairs Agency, 2016)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ukraine</td>
<td>Adapting to change (WWF Danube Carpathian Programme, 2017)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>Local Climate Change Adaptation (Centre for Regional Research Hosei University, 2017)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Results**

Themes have been identified throughout these documents based on recurring words and images. This lead to a coding process where the documents were examined and each image assigned a key theme and annotations added to how these themes are represented. The keywords and the number of times they were tagged in these frameworks are as follows: city 180, environment 140, climate change 78, adaptation 46, people 115. Some of these words occur quite often throughout the documents, for example, city and environment clusters were the most recurring in all of the documents, though some words occur less frequently, nonetheless are just as important to understand (Rose, 2016, p. 146). What follows is an analysis of the coding process.
Chapter 1
Introduction

Brisbane is a New World City of light and
subtropical color. The natural world under
the city’s liveliness and its reputation as such
the world’s most viable, green and healthy of
the 21st century. This is no mere claim. We
need the growth of Brisbane, its green and
diverse culture, its architecture and
diversity, its economic and
environmentally friendly.

The question is not whether Brisbane
can continue to thrive or
our world can survive. The question is
whether we can thrive in a world
that is sustainable and
environmentally friendly.

Next steps

The #Future50 aims to accelerate innovation for cities, engaging communities
and experts in cities such as Dublin, Copenhagen, Sydney, and
Melbourne. It aims to develop a global, integrated
framework to support cities in the transition
to a sustainable and
environmentally friendly future.

Conclusion

In a world where cities are
the largest and fastest
growing population
clusters, we need to
adapt and respond
to the challenges of
our time. Brisbane,
with its unique
characteristics and
vision for the future,
offers a model for
different and
sustainable
city development.

The Future 50 project is
a global initiative that
aims to support cities
in the transition
towards a sustainable
and
environmentally friendly future.
City Cluster

The city is the battleground for mitigation and adaptation as the majority of the world’s populations live in cities which are vulnerable to the impacts of climate change. There are prominent methods of how the image of the city is represented across these frameworks, which include photographs and illustrations of urban environments. These representations vary between illustrating the city in a stable relationship with climate and marginally disrupted by weather events.

Figure 3 City Cluster: Stable Climate

The most consistent form of representation of the city across each of the documents shows the city unaffected by weather events where the climate is stable (see figure 3). The city is strategically situated and framed in a harmonious relationship between weather and the natural environment. Clear blue skies meet the modern geometric buildings, covered in glass reflecting the sky to propose a seamless transition between environment and man-made environment.
Furthermore, the city is often framed within the green, lush and natural environments to establish a relationship between the built and natural environment where economic activity does not affect the natural environment and vice versa (see figure 4). Out of all the frameworks analysed, this is most prominent in the Brisbane Clean, Green, Sustainable (Brisbane City Council, 2017) framework where all images are strategically framed with green, natural foliage in the foreground and the city in the background. This gives the illusions that the man-made environment is a natural environment where one never feels as though they are in a city rather they find themselves in the natural environment when in the city.
To contrast this, a small number of frameworks incorporate images of the city experiencing past weather events that have previously impacted the city (see figure 5). This includes bush fires, flooding and the destruction of infrastructure. These images begin to offer insights into the physical impacts of extreme weather events on the built environment where some frameworks have connected these images with climate change, and others with adaptation to natural events.

![Figure 5 City Cluster: Graphics Representation of the City](image)

The third type of representation, which is also the least common, is graphics of a fictitious city made by a person using design software (see figure 6). Interestingly, the person who created these images have total control of how the city of the future is viewed. Green technology is riddled throughout modern buildings surrounded by large swathes of green shapes. Climate here is also stable, representing that the future is here and we managed to deal with climate change by implementing green technologies to reduce our carbon footprint.

The representations in these clusters hide the transformative nature of climate change where climate is represented in a stable condition. What’s hidden is the destabilisation of the city as a liveable entanglement of systems that constitute our daily lives as systems begin to fail under the stress of an environmental catastrophe. This includes energy, transportation, food, waste, sewerage, infrastructure, etc. Climate is visualised as something not changing, and persuades us of the truth that the future of the city is guaranteed and not requiring urgent new imaginings of what the city needs to be in response to a changing climate.
Environment Cluster

Visuals of the natural environment are prominent throughout the majority of the frameworks and are consistent with how they are represented. Here the representation of natural environments includes images of natural habitats (forest, bushland, beaches, ocean) Natural spaces in the city and animals. All three of these types of images inscribe/reinforce a particular relationship with the natural environment. All images are of native places and animals localising rather than showing places from far away.

Figure 7 Environment Cluster: Natural Environment In Pristine Condition

The first type of images are representations of the natural environment in pristine conditions which one might see in an advertisement for a tourism campaign (see figure 7). Lush green foliage, clear blue skies, and crystal blue water give the feeling that these places have been untouched by humans for centuries. Thriving and living as a haven of ecological preservation. The organic shapes and colours of the mountains, rivers and trees as they stretch across the images feed into this feeling of living and natural places. People are seldom present in these shots unless to show the conservation practices as we replant trees or maintain the health of ecosystems.
The second types are natural environments found in the city (see figure 8). These often engineered natural environments create the perception of a relationship of cities as fostering and nurturing natural ecosystems within an urban environment. These organic forms are either framed as independent from the city or contrasting the modern built shapes.

The third type of images show animals found in the natural environment (see figure 9). Native to the places each framework is situated (for example Australian Animals in Australian frameworks), the images represent native animals in their natural habitat outside of the city in pristine environments as described previously. These images are a celebration of unique species such as Kangaroo and Koalas. What’s hidden by these images are the impacts that climate change has on animals. The Bush fires wiping out habitats (an example
of a powerful image comes to mind where a firefighter is giving koala water after being in a bushfire) or the clearing of land for agricultural purposes/urbanisation. Animals are seldom represented as thriving in the urban environment.

These images hide the consequences of anthropocentric behaviours on the natural environment and the mass extinction occurring. This also hides our reliance upon the natural environments for survival and fosters truths that humans and nature can co-exist as per our current relationship with it. No links are made between the impacts that cities have on environmental damages, our reliance on nature beyond the liveability of our cities, or that natural weather events are the environment.
**People Cluster**

The psychological effect climate change will have on humans will be one of the major challenges of the 21st century as changes disrupt and unsettle people’s lives. How people are visualised will not only be important to understanding how climate change can affect our being, but how everyone can approach adaptation whether that is involved in the planning and design phases or the implementation of strategies. There are three different representations of people found across these frameworks, where it is also interesting to compare images from western countries compared to non-western as adaptation is put into the hands of residents rather than relying on government bodies.

![Figure 10 People Cluster: Business as Usual](image)

The first category shows people and current socio-cultural relationships with climate, and the urban environment (see figure 10). People are represented as uninterrupted by climate change as their behaviours are unchanged. What becomes hidden is the need to change how we behave to adapt to climate changes. For example, people sitting in sunny, urban environments, un-protected hides the city as uninhabitable during the day as the heat islanding effect increases the already increased temperatures in the city. Or the sunny, grassy patch by the river where people lay in the sun won’t be affected by drought drying and killing the grass and sea levels rising where that area was just inundated when a storm hit and is now a muddy swamp. Can we use these spaces in the future?
The Second type shows people participating, although this also is represented in varying degrees. For example, images from the Brisbane (Brisbane City Council, 2017), Chicago (Chicago Climate Task Force, 2017), and South Australian (Government of South Australia, 2012) frameworks for example show people participating in disposing of waste, clean-up, and maintenance of the environment or riding bicycles. This reduces adaptation to making small decisions throughout our day that will have a greening effect on the natural environment.

To contrast this, images from the Victoria (Victoria State Government, 2017) and Sydney (City of Sydney, 2016) frameworks show people participating in the planning, organising, and implementation phases. At a glance it is hard to tell if these people are local community
members, experts such as scientists, engineers or designers or if they are government/decision-makers.

![Figure 13 People Cluster: Participating in Disaster Recovery](image)

Lastly people are also represented as participating in the clean up after a natural event such as flooding. This can be seen in the New York (The City of New York, 2013) framework.

Visually showing people participating in the planning process shows a more democratic approach to adaptation and represents that adaptation needs to involve as many people as possible. Representations of people behaving as normal hides the disruptive changes in climate giving the illusion that we can continue to be in these places and spaces unaffected.
Climate Change Cluster

Within these frameworks, there is a varying degree of acknowledgment of the seriousness of climate change. Some frameworks communicate climate change with the use of infographics to present scientific information in an accessible way. Representations range from the communication of how greenhouse gases trap heat and warm the planet, to representing the physical impacts of climate change such as temperature increases, drought, sea levels rising, etc. Icons are used to represent each impact and colours vary between frameworks and are not consistent.

Climate change can also be represented in images that show the physical impacts of climate variability. This is represented as here as drought, flooding, etc.
Adaptation Cluster

Figure 16 Adaptation Cluster: Green Technologies

Adaptation, as a prominent focus of these frameworks and is represented in varying ways. There are examples of green technological solutions that focus on more ‘sustainable’ products/services found in figure 16.

Figure 17 Adaptation Cluster: Conceptual Renderings

There are also conceptual renderings of urban environments adapting to climate impacts such as flooding (see figure 17). This is found in the New York (The City of New York, 2013) adaptation framework where renderings show changes to the riverfront that take into consideration rising sea levels and storm surges.
There are a few exceptions where some frameworks, like the Bangladesh (Government of the People’s Republic of Bangladesh, 2009) framework show innovative adaptation approaches to growing food, for example floating gardens.

Similar to the climate change cluster, adaptation is also represented by a mixture of infographics that describes the steps and processes for conducting adaptation.
**Design Cluster**

The researcher also investigated how design and communication would be mentioned in these documents. Design was described in these documents from an urban design perspective where urban environments are designed to deal with climate events. For example:

“A built form and infrastructure that is planned ahead and designed for changing circumstances, embodies redundancy and resilient design, supports emergency actions and to recover as cost-effectively and quickly as practicable.” (Brisbane City Council, 2017)

“Introduce mandatory requirements to planning for new estates in Territory Plan and Sub-division guidelines and design standards that reflect leading practice with regard to future climate change scenarios.” (ACT Government, 2016)

“Building codes and other design standards for commercial and residential structures and many other infrastructure investments do not address climate change impacts” (Asia Pacific Adaptation Network, 2015)

Or design is described as designing policy.

“The recently enacted National Water Act 2013, based on the National Water Policy, is designed for integrated development, management, extraction, distribution, usage, protection and conservation of water resources in Bangladesh.” (Asia Pacific Adaptation Network, 2015)

**Communication Cluster**
When exploring communication, this is either mentioned in relation to communication services, such as infrastructure or the communication of climate change science to the public

“communications and education to raise public awareness about climate facts, real impacts, and real opportunities” (Queensland Government, 2017a)

**Discussion**

Visual discourses on climate change adaptation can be identified based on how the following key themes are represented: city, environment, people, climate change and adaptation. Changes in how these key themes are visualised can result in different discourses. For example, the city can be visualised as either vulnerable or robust to climate impacts if the city is shown under threat from weather events or unaffected; or the environment, which we depend on for survival, can be represented as under threat from human activity and climate changes or in a pristine and protected condition. Depending on how these key themes are represented will determine the level of change needed in our behaviours. Therefore, the visual discourse found in these documents illustrates the urgency for adaptation and approaches to adaptation.

**Effects of Truth**

The truths found in these documents, as described by Rose, are that cities can manage climate impacts where incremental change is appropriate in dealing with impacts. It is apparent that the images at play in these documents visualise climate as a variable, outside of society, where climate change is an external shock to a well-functioning machine (Klepp & Chavez-Rodriguez, 2018, p. 42). This cartesian dichotomy denies the basic idea that climate is an integral part of society (Klepp & Chavez-Rodriguez, 2018, p. 42). This belief runs deep in western dualism where nature is separate from humans (D. F. White et al., 2016, p. 19). When we represent climate change with images of physical impacts, adaptation can be reduced to dealing with manageable physical effects, rather than a social crisis that requires transformational change. This is apparent across most clusters; such as the city cluster,
where urban environments and climate are harmoniously existing together, the people cluster, where our daily habits are unaffected by climate change and the climate change cluster where climate change is visualised as physical impacts on the city. The Adaptation cluster is the most telling of this discourse. The adaptation cluster had the least amount of images tagged leading to the belief that change is minimal. When adaptation is visualised, it is predominantly visualised as adapting parts of the city to prepare for the impacts of climate change or implementing green technologies such as solar systems, wind farms and electric cars. These developments follow Palutikof’s description of incremental changes to climate impacts (Palutikof & ebrary Inc., 2013), and falls within the discourses of ecological modernisation where technological solutions are explored instead of transformational change (Coffey & Marston, 2013; Dryzek, 2013). These images give truth to the possibility that we have a future on our current trajectory and deny the need and possibility of exploring alternative visions of sustainable futures. It is also important to acknowledge that there are some differences across some of the frameworks. For example, the Brisbane. Clean, Green, Sustainable (Brisbane City Council, 2017) framework, where images show a thriving city with pristine weather, only mentions climate resilience/climate change 23 times and adaptation 11 times. To contrast this, it mentions sustain/sustainable/sustainability 192 times. The New York Resilient City (The City of New York, 2013) framework is noticeably opposite, and is unique in this case, as images visually describe how climate can impact the city and their daily habits by showing an in-depth photo story of the events surrounding hurricane sandy. Climate change is mentioned 385 times in this framework.

Adaptation by Who?

There are also differences in how adaptation is visualised outside of western frameworks. For example in the Bangladesh and the Asia Pacific (Asia Pacific Adaptation Network, 2015) frameworks, adaptation is shown to be more community-based and informal (see figure 18), instead of top-down technological approaches. To contrast this, in western frameworks, adaptation is a top-down approach where participation in adaptation is shown as people participating in government initiatives/programs such as protecting natural environments (planting and bush regeneration), engaging in sustainable practices (recycling, cleaning rubbish) and recovery efforts after a disaster. Participation of community in adaptation planning is ambiguous, for example in Sydney (City of Sydney, 2016) and Victoria (Victoria
State Government, 2017) framework, there are images of people participating in the planning for adaptation though it isn’t clear who is participating (government, NGOs, residents?). This top-down approach to adaptation suggests that frameworks within Australia follow discourses of administrative rationalism where decisions are left to the ‘experts’ which is at the nexus of science, professional administration and bureaucratic structures. This would also suggest why adaptation can carry certain agendas, for example governments in capitalist societies have a role to fulfil: ensuring economic growth (Dryzek, 2013, p. 13). Dryzek argues that democratic pragmatism can disrupt administration as this relies on a number of different voices, perspectives and approaches to environmental problems (Dryzek, 2013, p. 21).

**Adaptation for Who?**

As described by Rose, discourse analysis also entails paying attention to certain aspects of the social context of discourse production. This includes the audience assumed by images and text. The same visual images may be quite different depending on the audience (Rose, 2016, pp. 166-167). Kress and Van Leeuwen describe a visual literacy that might seem oversimplified for adults is highly engaging for children (Kress & Van Leeuwen, 1996, p. 21). Therefore, the reviewed documents also must be critiqued for their capacity to reach a larger audience, and their potential to exclude many demographics. The accessibility of these frameworks are also questionable where these frameworks can only be found on government websites. This may seem appropriate if this was purely for government use, but frameworks are also intended for the public, specifically for residents concerned in decisions made by their government (Burnside-Lawry, Akama, & Rodgers, 2013, p. 30). This form of engagement is a part of the governments traditional one-way model of communication, which views community to be a uniform group of individuals which is highly problematic and reductive, this also includes community engagement programs (Webber et al., 2017, p. 28). The audiences who are notedly absent from these frameworks, and who are also most vulnerable to the effects of climate change, are children and Indigenous people, along with their voices, desires, and concerns. This is described by cutter Mackenzie and Rousell when discussing the numerous social justice issues Indigenous people and children will experience climate changes (Cutter-Mackenzie & Rousell, 2018, p. 91). This is also evident where there is only one adaptation framework written from an Indigenous perspective (AIPP, 2012).
Where to from here?

By completing a critical visual discourse analysis, this chapter illustrates how discourses are visualised in these frameworks and images used in these documents are not neutral and construct how we think about climate change adaptation. This also manifests in the real world how we approach adaptation. From here, the results from this chapter will inform the creative experiments produced during practice in the following ways. There is a need for visual communication methods that visually communicate transformational adaptation discourses which take into consideration the seriousness of climate change as a global phenomenon and describe the existential threat to humans and the world we have created. These discourses should also include discourses where design has a central task to mobilise public concern and amplify adaptation efforts. As a means to disrupt these discourses, more democratic methods of mobilising other people’s voices and knowledge can disrupt discourses of administrative rationalism. Furthermore this analysis highlights that children need to be engaged in these discourses as they have been left out of conversations that concern their future.

Conclusion

To conclude, this chapter documents the results from a critical visual discourse analysis of 25 climate change adaptation frameworks. During this chapter, a method for conducting a critical visual discourse analysis was established. Each framework was categorised based on where they are from including Australian frameworks, OECD frameworks and Indigenous frameworks. The results from the discourse analysis were documented as well as a discussion on the results. The intention of conducting this critical visual discourse analysis is to investigate how climate change adaptation is visualised and how these types of visualisations perpetuate certain discourses around climate change adaptation. This has led to describing ways to disrupt these discourses as a means to amplify adaptation efforts. This has helped to inform the researcher’s practice which will focus on introducing adaptation discourses to 12-year-old children. These creative experiments will be described in the following chapters.
CHAPTER 4

DESIGN AWAY
CARBON CHALLENGE
The Design Away Carbon challenge is a participatory game focused on incremental adaptation to reduce the carbon emissions of a fictitious city and explore manageable changes to deal with climate change (Palutikof & ebrary Inc., 2013, p. 10). This game was the opening challenge of the Future BNE challenge held in March 2019 during the World Science Festival in Brisbane City Hall. This chapter will explain this game, which is the first creative experiment produced during practice-based research, with images and text, showing the concept development, trials, design process, and making of the physical game. The documentation of the games will also demonstrate how the theoretical perspective established in chapter one has informed the decisions made in practice. This chapter will also include a semi-structured interview with the facilitators of the game to describe their interpretation and experiences while facilitating. Results from the materials that the students produced while participating will also be synthesised and visually described.

**Future BNE 2019**

The Future BNE Challenge is Australia’s largest one-day educational event with over 650 grade seven students participating in a future orientated, design challenge. This event is held by Brisbane City Council and designed/facilitated by Relative Creative (Relative Creative, 2019a). The researcher has participated in this event, working as a facilitator for the past three years. In 2019, the topic for the Future BNE Challenge had shifted from water security to designing for a sustainable city. I was fortunate that Tristan, both my supervisor and founder of Relative Creative, asked me to contribute a creative outcome to open the event and engage students prior to the main design challenge.
Conceptual Development

At the beginning of this project, a brief was given by Relative Creative and Brisbane City Council to design an opening challenge that followed the topic of the event, and also met Brisbane City Council aims and objectives, as detailed in the *Brisbane. Clean, Green, Sustainable 2017-2033* (Brisbane City Council, 2017) framework. This document discusses the future vision of Brisbane city and the various initiatives by the council to increase the sustainability of Brisbane city. This game had to navigate this framework while also bringing a level of criticality to the contents of the document (this framework is also included in the previous chapter). The initial concept for the opening challenge was focused on the conceptual creation of adaptation strategies. In this initial idea, students would go around to different stations and develop a strategy to deal with specific climate impacts, record their strategy on a “city blueprint” and place the blueprints on the walls around the room. This had to be refined into a much shorter engagement and rely less on conceptual ideas as the main challenge would focus on this throughout the day. There were also elements of fun missing from this activity. Upon reflection, and guidance from Relative Creative, the opening challenge shifted gears. This led to a game where students had to reduce the carbon emissions of a city. As described in the previous chapter, the discourse found in the Brisbane Green clean and sustainable framework is closely related to ecological modernisation discourses, where green technologies are implemented to deal with environmental problems (Coffey & Marston, 2013; D. F. White et al., 2016). As described in chapter one, adaptation will require changes in our behaviours in response to changes in climate, rather than preserving current economic and political systems that contribute to climate change (Beck, 2014b; Bendell, 2018; Fry, 2015). Incremental adaptation can fall into the trap of preserving a current destructive relationship with the environment, however, this game will demarcate itself from ecological modernisation by encouraging the students to explore incremental adaptation as behavioural change to reduce emissions, rather than focusing on solely green technologies (Beck, 2009a, p. 170; McNamara & Buggy, 2016, p. 445; D. F. White et al., 2016, p. 9). Initial sketches of the game show a board that had different pieces that could be swapped to build a city (see figure 21).
**Pitch to Brisbane City Council**

As the Future BNE challenge is a Brisbane City Council and Relative Creative event, they both required a proposal for approval. This process was collaborative with Bec Barnett, co-director of Relative Creative, who helped to make sure the decisions made align with their objectives. The proposal was approved without the need to make further changes. Below is an image of the proposal (see figure 22). The full document can be found in the appendix (See appendix A).

![Figure 21 Concept One Pager from Confirmation](image1)

![Figure 22 Design Away Carbon Proposal for Relative Creative and Brisbane City Council](image2)
Design

Game Design

As described in chapter one, when reviewing literature on climate change games, there are many affordances serious games have when opening up conversations about climate change adaptation. Elements of gamification, such as rules, were introduced to convert the designing of a low carbon city into a playful experience (Saurez et al., 2014). The rules required students to reduce the carbon emissions of a fictitious city by swapping out the different services that make up the city (e.g. cars, landfill, housing) with lower carbon-emitting services. These pieces would later be described as blocks. Each block had different ratings which were based on their percentage of Australia’s cumulative carbon emissions (for example transportation accounts for X% of our total carbon emissions). While prototyping and testing the game, more rules were discovered to help guide the students. This included having a city already set up so they could see an example of what to include, the students also had to have at least one of every type of block to make sure the city will function, and a time limit of 2 minutes to complete the game. The board was designed to have a city that was 150% over their emissions target, which was sitting at 250%. The students had to get the city back to 100%.

Trials

The initial designs of the game underwent various trials to test the game at various stages of the conceptual and design stages. These trials were conducted with other designers and the Relative Creative team.

Visual Communication Concepts

Much like a game, the board, along with all the pieces, were specifically designed to be playful and targeted toward 12-year-old children. Here, visual communication design methods were used to encourage play while the pieces were also designed to support and trigger conversations to help deal with the problem the students were trying to solve (Barnett & Schultz, 2015; Manzini, 2015; Schultz, 2019). When designing the blocks, the
agency of the blocks were taken into serious consideration as the information on each of the blocks would inform the decisions throughout the game (Eriksen et al., 2014). The design of the blocks also had to be simple as these materials are required to bring forth new ways of thinking about the city. For Rose, these images are critical for making sense of our world (Rose, 2016). Taking this into consideration, simple iconographic representations of each of the sectors with line art was best used here to increase the legibility of the blocks.
Figure 25 Finalised Board Design’s with the type of circle visualisation

Figure 26 Block Designs
Each of the blocks also belong to a sector (energy, waste, transportation etc.) which was visually linked by colour. The board also has visual elements to help the participant explore the links between each of the sectors and visualise how each system relies on each other. The students could choose whether to interact with the graphics or not, as this would not be detrimental to completing the game. These designs were based on Manuel Lima’s *Book of Circles* (Lima, 2017) where information is visualised showing the interconnectedness of knowledge, and in this case, the systemic nature of the city. Four versions of this game were created with each board having a different circular visualisation (figure 25). Previous to this, designs were more structured and grid-like, but this exploration led to more random and playful placements of the blocks. Visual elements from the main event were also incorporated to tie the game in with the Future BNE event. These visual elements were designed by Relative Creative and incorporated into the overall board design. Once the initial design sketches had been completed, the designs were refined and finalised in Adobe Illustrator.

**Materials**

In chapter one, literature situates the importance of visual tools as a means to make what is being discussed visible and tangible and also trigger conversations to help deal with complex issues. Therefore, the materiality of the game pieces were taken into consideration as they generate modes of interaction through their tactile, visual and physical qualities (Akama et al., 2007; Akama & Ivanka, 2010). The pieces also had to be more sturdy than paper/cardboard. It had to look like a game. Initial concepts explored the idea of 3d printing each of the blocks, however, this would take too long as the number of pieces for each game needed to be multiplied by four for each board. Laser cutting/etching was explored as a way of printing onto different materials as this required much less time. Wood was explored as a low-cost material, specifically Tasmanian oak for the blocks, and plywood for the base. The wood had a tactile quality as you can feel the grain and the roughness of the blocks. The texture in the plywood also signified a topographical map as the waves in the wood looked like terrain. The burnt wood while laser etching the graphics represents the destruction in order to create the city, the natural vs. human-made environments. There is also a connection to trees and carbon emissions which gives another added layer of meaning. To introduce colour, painting the blocks and the board was explored. The blocks had to be
coloured based on the service category so the students could easily identify the different sectors. Colours were based on the colour palette of the overall event. The size of the games also had to be considered as groups of 10 students would be playing at once. The plywood for the board is 800mm x 800mm. This would sit inside 1m x 1m trays provided by Relative Creative that were used for their See Change Sand Tracks project (Relative Creative, 2019b). This would allow space in the trays for the blocks to sit around the board.

**Fabrication**

**Laser etching**

The first laser etching session was an induction. The technician showed how to use the printers and the programs. This included how to set up files from Adobe and transfer them to the laser etching program where the strength and speed of the laser could be configured. This had to be based on the type of wood used where some woods burn more easily and others require stronger power and slower speeds. This induction is where the combination of laser etching onto painted wood was explored. In this case, the clarity of the icons and the board and the blocks were compromised where the wood burnt darker when painted first. The blocks and the board were then laser etched without paint. Blocks were painted on opposite sides in accordance with the different services. The next sessions focused on laser etching the board. The laser etching machine is 700mm by 400mm so the plywood boards had to be cut up into 400mm x 400mm to fit in the machine. The boards would then be placed together to create the 800mm x 800mm board. The graphics on the boards were divided into four 400mm segments and had to line up with the other boards. Once I had finalised the type of wood and the settings of laser etch, I could push play and etch the 16 boards. Each board takes 40 mins to print which required multiple sessions. The blocks were laser etched in 400mm x 90mm planks of Tasmanian oak where I could print 5 blocks per plank and cut them with a mitre saw after laser etching. 120 blocks were printed and 4 boards were created all up.
Construction

After laser etching, the blocks needed to be cut to size. First, the back and sides of the planks were painted, then cut once dried. The edges of the blocks then had to be sanded to smooth out the roughness of cut pieces of wood. Once smoothed the new edges were painted. All the edges were then sanded again to give the blocks a smooth feeling.

Figure 27 Setting up Illustrator files in Laser Etching Software. From here settings can be adjusted to change the type of burn in the wood.

Figure 28 Each board is broken into 4 individual pieces which are laser etched individually. This images shows one of the panels being laser etched.
Figure 29 This picture shows how each of the board join up to make 1, 800mm x 800mm board.

Figure 30 Image of the four boards once laser etching had completed.
Figure 31: To make the blocks, Tasmanian Oak is cut prior to laser etching to fit into the laser cutter.

Figure 32: Shows the blocks being laser etched. In one panel four blocks were laser etched.
Figure 33 shows the blocks after finishing laser etching.

Figure 34 After laser etching, each of the panels were painted based on their block category.
Figure 35 Panel finished being painted prior to being cut into individual blocks

Figure 36 Image of one of the blocks after being cut. The blocks then had to be sanded in order to smooth the rough edges
Figure 37 Image of the blocks sanded ready to be painted again

Figure 38 Finished painted blocks
Figure 39 After all the blocks were painted, this image shows the game set up with all the pieces. This game sits inside trays provided by Relative Creative which was used in a previous project. Blocks sit outside the board where students would have access from.

Figure 40 Trial to illustrate the game once all the blocks are in play.
**Facilitators Briefing**

Prior to the event the facilitators were given a document informing them about the game, what the rules were and also a guide on what to say to set a tone for the game. Below is an image of the toolkit and can be found in the appendix (see appendix B).

![Figure 41 Future BNE Challenge Facilitators Guide](image)

**The Design Away Carbon Game at Future BNE 2019 Results**

So far, this chapter has described the designing and making of the Design Away Carbon Challenge. What follows is a description of students playing the game at the Future BNE event based on a semi-structured interview with four facilitators after the event. Each year Relative Creative hire design facilitators to help with the main event. For this activity I was able to borrow four of the facilitators where the four games had one facilitator assigned to each. I would then help the facilitators move the trays around to the different groups and document the games by taking photos. These interviews help to describe the facilitators’ experiences while facilitating the game. What follows is a description of their experiences including quotes from the interview transcript.

Entering Brisbane City Hall, the sheer size and magnitude of the event became clear as a room full of 65 tables, enough to fit 650 students, a large screen and stage that would fit in a stadium, made the 1x1 meter games feel comparatively small. The trays with the games
in them were set up and positioned on top of the tables where the main event was already set up. The trays would move around the room from table to table as groups started to pour into the auditorium. 4 facilitators, 1 for each station, waited as they entered and then moved the trays to the schools who had already shown up. The facilitators would approach the groups and say “do you want to do an activity about carbon emissions?!” and to the surprise of the facilitators, the group’s response generally was “yeah! Please can we!”. 

![Figure 42 Groups being briefed by Facilitator](image1)

![Figure 43 Groups planning their city](image2)
Figure 44 Groups placing blocks on the board

Figure 45 Groups rapidly placing blocks
Figure 46 Facilitators tallying the groups score

Figure 47 Facilitator helping student to make changes
Figure 48 Students adding up their scores

Figure 49 Students moving blocks around the board
Game descriptions

As described by the facilitators, the tone of the game matched the grandeur and excitement of the physical environment and the tone of the event. As the game moved around the room, the theatricality of 4 large 1m x 1m metre trays filled with colourful blocks got the children excited. “Honestly they just got really excited seeing the huge physical box and all the cool little pieces they were like “oh what’s that?!?” really wanting to do the challenge”. This speaks to the visual playfulness of the game as described in chapter one as the playfulness of visual tools are described for their capacity to generate interest and engagement amongst the participants. The boxes would be lifted over the student’s head to place on the table “we almost hit kids in the head” which they loved. As the boxes are set on the tables the facilitators would then brief the students on the challenge where one facilitator remarked that “I think the more excited you were the more excited they were”. Facilitator 1 said “It was easy to get students excited with the prompts at the beginning particularly with the 2 minutes even though a lot of them completed it faster than 2 minutes. Due to the quickness of the activity, it was easy to create urgency around it”. This created an atmosphere where students were standing, yelling, grabbing, swapping, testing and stacking. The groups would stand around the edges of the game and everyone would participate. “I mean you look at the table and it had access for everyone on all sides so it was like straight in hands on the blocks”. Eisenack (2012) describes this as the immersive experience that games can offer where students feel safe to explore different ideas (Eisenack, 2012). The groups also interacted with the tactile qualities of the game as they touched and played with the blocks in their hands and rubbed the laser-etched board. The facilitators used the designs on the board differently as well, some facilitators let the students randomly replace each block while facilitator 1 replaced each block with their counterpart emphasising the redirection of each block. Once the students had finished the game the facilitators would then add up the scores. “they were anticipating the result when I was scoring” said Facilitator 1. The facilitators only had a few instances where the groups went over the target. Some facilitators commented on the difficulty of the game saying “I would say it was on the easier side” though as facilitator 1 and 4 acknowledged

“I think what worked well for all the groups... it was challenging enough that they had to be on the ball but not too challenging that they gave up,
so I think it was good for the groups. It was a good balance between having that pressure of the time and discussing what they were going to do”

Commenting on their ability to understand the blocks, there was a general consensus that the students knew what each of the blocks meant, and generally weren’t “surprised by product-related things like solar panels and like cars but were more surprised at things that weren’t innovative product-centric designs... like vegetation, compost, cycling, walking, public transport things that they know exist but are not sexy and innovative” though by doing the game gave the students an “alternative perspective on what the future could be rather than flying cars and less product-centric”. These themes were present throughout the day during the main event as well which the facilitators had to negotiate with.

Facilitating Conversations

Not only did the game create a “sense of urgency” and “excitement” as described by facilitator 1, but it also prompted the groups to “share and interact with each other”. As described in chapter one, the tangible blocks allowed for conversations to occur through the act of placing blocks on the board and swapping out blocks, the groups practiced a level of negotiation and knowledge sharing where they debated which block and had to communicate to each other why one block over another, in order to reach the target. Angel describes this as knowledge sharing and engagement in a rich repertory of problem-solving techniques that emerge while interacting with the tangible pieces and the playfulness of the game (Angel et al., 2015). This was described by facilitator 2 where the game is “flexible enough for all skill and knowledge levels so if they did want to have the critical conversations they could...I also had a couple of groups that spent ages just discussing each section so they took about a minute doing that then a minute picking them (blocks). So I had one or two groups that took the whole two minutes but were just discussing the whole time”. An example of this is when students would say “oh I have this one let’s swap” or “no, no, no, we should put this one there”. The game also opened up conversations between the facilitators and the students where the facilitators would prompt the students to think about their city design, if it is functional or do they have to rethink their designs. An example of this as described by facilitator 2:
“Yeah the prompt that I did with most for my groups because they again just put the bikes in and like walking and at the end I was like where are you located, did you walk here? Could you walk here? Could you cycle here? Some of them were 45-50 minutes on a bus away or a car so I was like think about what other methods of transport are necessary to get around. You can’t necessarily go around everywhere on a bike if you’re travelling long distances so what’s the most sustainable and most appropriate, I guess for an actual city…”

Though this also prompted interesting conversations about re-imagining what the city needs to be in order to drastically reduce our emissions. The facilitators also commented saying that the sense of urgency that was created at the start of the game created an atmosphere of finishing the game as fast as possible though the game needs to be finished as fast as possible while taking into consideration the criticality of their decisions.

“I think that was a pretty good prompting point too, because I got a group who had like 75 and that was the thing I said was could you only walk and ride, could you have done that today, could you do that every day and most of them would be like not realistically” Facilitator 2

“for those students who were working faster under the urgency of the game it needed just a second round of prompting to get them to think critically about the services” Facilitator 1

This was felt with some games where students would place down blocks that were obviously lower in their emissions. As described by facilitator 1 “rather than like as a sense of urgency, a sense of care was needed as well so like, be careful we can only do this once... so it slows them down a little bit...”. The students would also ask about the ratings of blocks. This was described as learning points by facilitator number 1, where students would have moments of surprise as they found out something new about a block that they thought was higher or lesser. This speaks to the pedagogical qualities that are described in the literature on serious games where pedagogical intent is carefully designed and crafted into playful experiences.
“So I often would say how much carbon do we think is emitted from walking as a form of transport and everyone would be like “None!” and then I would go on tallying and they would notice I would put a 5 for the bike and they would go “hey hang on a second there is no carbon emitted from the bike and then I would use that as a learning point to talk about the materiality of the bike where the bikes are made and the way we might not repair a bike and then waste the bike and then it was an instant “oh yeah true”.

Another learning point that came from surprise was:

“A student kept their car block on the transportation and they rebutted by saying we have electric cars so, it was that Tesla and they all know what Tesla is and they were excited about that. So it was a learning point same as the apartment public, transport can carry more people...whether or not it’s eco-friendlier it’s all about population increase and moving around the city and urban space.”

Another example was when explaining to students that we can reduce the amount of carbon in the air just by planting trees. Facilitator 4 commented “I had that too, one student was like how is this one minus 5? Facilitator 1: “yeah that was another, and I remember explaining something about oxygen and carbon dioxide being sucked from the air”.

To conclude the interview with the facilitators, I prompted them to give general feedback and comments. Facilitator 1 concluded by saying the game was a “good ice breaker for the main event” and that it set a tone for a type of design facilitator relationship with the students and teachers. Facilitator 1 went on to describe how the students got used to them being in a facilitator role where the students could be “led, directed, redirected and guided”. Other comments by the facilitators included having more colours on the main board to help with visual hierarchy. These comments concluded the interview.
Rating Card Results

During the game, the facilitators tallied the student’s score on a rating card. This had the rating of each block as well as space for the facilitator to tally up the group’s score. 20 cards were collected after the event where around 200 students participated in the game. The following figures illustrate the different blocks used by the students while designing their cities during the challenge and which blocks emerged more commonly (see appendix for larger images of the results).

![Figure 50 Blow up image of one of the boards with a score of 90%](image)
Figure 51 Visualisation of the results
Figure 51 illustrates the types of blocks used by all of the groups. The most used block is the recycling block where every group used it at least once. For each sector, students generally identified the lower carbon emitting blocks which were the most common used, including solar energy, composting as a waste method and cycling as a mode of transportation. The least used blocks were non-renewable energy and cars. The students also used the urban spaces blocks the least out of all the sectors which include parks, productive spaces and vegetation.
Figure 52 illustrates the carbon emissions form each group. Three groups just met their carbon emissions target by sitting directly on 100%, however most groups were close to going over their targets. The lowest a group got was group 9 who got their emission down to 55% and group 5 and 6 who got their emissions to 60%. No groups got their emissions under 50%.
Conclusion

This chapter has described the results from the first creative experiment, The Design Away Carbon Challenge. Firstly, this included unpacking the concept of the game, the process of pitching the game to Brisbane City Council, the design of the different pieces, and making the physical pieces. This chapter has also described the Future BNE challenge where the Design Away Carbon Challenge opened the event before the main design challenge. The opening challenge is described by the facilitators who ran each of the four games to describe their experiences while facilitating by conducting semi-structured interviews with the four facilitators after the event. A discussion on the results from this chapter will be saved for chapter six where a broader discussion about the results from both games in context with the research question and other results, including the literature review and critical visual discourse analysis.
CHAPTER 5

PLAY TO ADAPT
After the Future BNE Challenge in early 2019, I explored a second creative experiment focused on communicating transformational adaptation discourses in a classroom environment. As explained in chapter two, transformational adaptation will require social reform and the development of new values in response to our current relationship with the environment (Palutikof & ebrary Inc., 2013, p. 10; Pelling, 2011, p. 3). This creative experiment materialised into a workshop featuring a second game, titled Play to Adapt, which diverges from the Design Away Carbon Challenge in both content and form. What follows is the description of a workshop held with a class of 28 year seven students at the Queensland Academy for Science, Mathematics and Technology in Brisbane. This chapter will describe the conceptual development, designing and making of the physical game. This chapter will also include a synthesis of participant observation as the researcher conducted observations to interpret the children’s experiences during this workshop. During this workshop, students created adaptation strategies that will also be visually communicated and included in this chapter.

**Conceptual Development**

This creative experiment is an open brief where adaptation is explored from a more critical position than the Design Away Carbon Challenge. There were however some guiding ideas that this workshop would follow. This includes communicating the need for adaptation to climate impacts, communicate risk in the city as a means to critically reflect on what needs to change, and explore different ways we can adapt with a focus on designing with climate instead of controlling risk (Akama et al., 2018; Bauman, 2007; Beck, 2009b; Fry, 2015, p. 54). There were some initial investigations of how the previous game, the Design Away Carbon Challenge, could be adapted, but there were too many changes and new materials required to justify this direction. Around this time, I had come across Jem Bednell’s paper on Deep Adaptation, which explores the idea of transformational adaptation where societal collapse is inevitable (Bendell, 2018). Bendell’s paper, however confronting, calls for hope when exploring alternative futures, similar to Beck’s position on *How Might Climate Change Save the World* (Beck, 2014b), as discussed in chapter one. This game would attempt to focus on this type of transformational adaptation where a playful experience might have an opportunity to incite optimism while discussing uncertain climate futures. The idea of social collapse resonated with the game Jenga, where a block is removed from a stack of blocks
making the stack susceptible to collapse. Initial exploration of this game focused on how you could adapt a Jenga stack to prevent it from falling over. I prototyped a version of this game where students would replace certain blocks in Jenga to prevent it from falling over. However given the amount of time I had for the workshop, I had room to expand on this further where the students could make their own strategies to prevent the tower from tipping over.

**Game descriptions**

This game includes two activities. In the first activity, students will work in groups to rapidly create as many adaptation strategies as they can by using the visual tools to help them (Manzini, 2015). This activity was inspired by the speculative futures card game ‘Thing From the Future’ designed by Stuart Candy (S. Candy, 2018). To play Thing From the Future, Participants would select a card from four different categories to prompt the participants to critically speculate and explore a product or thing from the future. To emulate this, the first game would put together different blocks from four different categories to create an adaptation strategy. The four different categories are climate impacts, city sectors, an adaptation strategy and type of adaptation. The students would then document this strategy on an ‘adaptation template’. After the first game, the students will come together and use their strategies to prevent climate impacts on a city in a Jenga style game where climate events will remove blocks from the Jenga stack unless the students have strategies to prevent that block from being removed.

**Design**

**Game Design**

To help create an immersive and playful experience while communicating adaptation, as described in chapter one when reviewing literature on serious games, rules were established for both games (Angel et al., 2015, p. 1; Tsekleves et al., 2016, p. 165). During the first activity the groups have to include at least one of each block to create an adaptation strategy. The groups will have 20 minutes to make as many strategies as they can by connecting and reconnecting as many different combinations. Strategies also need to make
sense, for example making sure the adaptation you have selected will address the risk you have identified when putting together the climate impacts and city sector blocks. For the second activity, the groups will take turns rolling a dice with climate impacts on each side, if the groups have an appropriate strategy to deal with the climate impact they have rolled, the group don’t have to take a block from the Jenga stack. They will tell the class their strategy and place it on the ground around the Jenga stack. If the students don’t have an appropriate strategy, they would take a block from the stack. This continues until the stack falls over and the teams with the least amount of blocks will win that game.

**Visual Communication design**

When designing the pieces for the first activity, there was an emphasis on how to best visually communicate the different categories and also the connectivity of the different pieces. The intention is to show how climate impacts can affect many different sectors and while putting together different blocks, they might come across something new (Akama & Ivanka, 2010; Barnett & Schultz, 2015; Manzini, 2015; Schultz, 2019). This describes the visual tools as a method of generating new knowledge in a collaborative manner (Ehn et al., 2014). The pieces took on a hexagon shape so that each block could connect together. Students could fit together one piece from each category to make a strategy, and build this strategy with multiple pieces to create a more robust strategy. The shape of the pieces should allow making lots of connections but also have a playful feel. As described previously there are four categories for each block and then different blocks in each category. The blocks include all the information that is needed to complete the game, and is communicated visually (Akama et al., 2007; Akama & Ivanka, 2010; Sanders, 2002). For example climate impacts include heatwaves, sea levels rising, drought, bushfire, flooding and extreme weather events. The city sector category included water, housing, energy, transportation, food and humans. To visually communicate what each piece is, the climate impacts and city sector categories include a visual representation on one side and then a description on the other side. On the climate impacts category, the descriptions describe the climate phenomena and the expected impact of each block. In the city sector, the description describes the vulnerability of that sector to various climate impacts. This will help the students to identify risk. The adaptation blocks are text-based descriptions of various adaptation strategies. The information for all the blocks are taken from IPCC
adaptation reports, Climate Council reports, CSIRO and other various frameworks. The information taken from these documents aligns with discourses around transformational adaptation (Palutikof & ebrary Inc., 2013; Pelling, 2011). The second activity was quite simple. Each block in the Jenga stack resembled a component of the city. For example Energy infrastructure, schools, roads, etc. These blocks have a description on each block and coloured based on the climate impacts on the dice. The dice has a colour on each side and the same visual representation of the climate impacts from the first activity.

Figure 54 Visual development of climate impact blocks

Figure 55 Visual development of city blocks

Figure 56 Visual development of adaptation block


**Materials**

Taking into consideration the materiality and playfulness of the blocks, as discussed in chapter four, when describing the materiality of the visual tools used in the Design Away Carbon Challenge informed the decision of the materials used in this game. Plywood would be used to make the hexagon pieces and each block is painted based on their category. This increased the tangibility of the pieces especially when putting the pieces together, as opposed to using cardboard or paper (Manzini, 2015). Laser cutting and etching will be used again on 9mm A grade Plywood to create the hexagon pieces by laser etching the graphics and then laser cutting the individual hexagons out of the plywood sheet. Prior to going through the laser cutter, the plywood was painted both sides based on their category. For the second activity, structural timber was used to make a giant Jenga set. The structural wood was cut into smaller pieces and painted based on the colours of the dice before laser etching the city component onto each block.

**Fabrication**

The process for making the blocks is consistent with the Design Away Carbon Challenge and followed what was learned the first time. Making the hexagon blocks began with an initial test of materials to see how they would cut and laser etch (see figure 59). This was important to establish the settings to be used during the whole process, especially to test the paint, as last time the settings burnt the wood. Instead, the settings were programmed so that when etching, the laser would only remove the paint and not burn the wood. This would reveal the wood as a light colour, and especially on the blue and purple pieces the text looked white which contrasted the darker colours well. This helped with the legibility of the text but also the graphics as a dark burn would reduce the contrast between the paint. When
laser cutting the blocks, a black burn charred the edges to make the edges of the hexagons edges look like they were black. This gave a nice finish and looked less like wooden blocks. Once the initial test was complete, all the sheets of plywood were painted on both sides. The first session was an 8-hour session where the blue pieces were first laser etched and then cut. Laser cutting the hexagon pieces reduced time spent on cutting and sanding. The second activity began by cutting 1 4.8m structural pine into 210mm blocks. Each block was sanded back to smooth out the rough surface and then each block was painted. The blocks were sanded back again to make them smooth enough to pull out of a Jenga stack as the paint made the blocks sticky. The pieces were then laser etched with their city sector. To make the dice, a smaller cube was cut from a 1mx70mmx70mm plank of pine wood. Each side was painted with different colours that matched the coloured blocks in the Jenga stack. This was also laser etched on each side with a different climate impact.
Figure 58 Prior to Laser etching each board was painted

Figure 59 Trial laser etching. Settings were adjusted to lightly burn the wood so that only the paint is removed
Figure 60 First laser etching session

Figure 61 Adaptation blocks after laser etching
Figure 62 Climate impacts blocks being laser etched

Figure 63 Adaptation method blocks being laser etched
Figure 64 City Sector block being laser etched

Figure 65 Climate impacts and city sector blocks
Figure 66 Laser etching information onto the back of the climate impacts blocks that describe the impacts

Climate change impacts on the food system include decreases in food yields, impacts on food distribution and transport, increase in food prices and economic impacts. This could lead to health impacts and malnutrition.

Figure 67 Description of how climate change will impact the food sector laser etched on the back of a city sector block
Figure 68 Blocks for 1 game. 5 games were created

Figure 69 Trials
Figure 70 Once finished, each game was taped up ready for the workshop

Figure 71 Jenga blocks were cut into smaller blocks and then painted
Figure 72 Climate Impacts dice painted

Figure 73 Jenga Blocks being laser etched
Pitch To The Queensland Academy of Science, Mathematics and Technology

After forming a relationship with a teacher at the Queensland Academy of Science, Mathematics and Technology pitching the idea of this workshop was quite easy as the teacher and the school were receptive to the idea. To approve this workshop I sent through a package describing the event and then ethical clearance permission forms for the students. The school took care of the rest. All of the students returned their permission forms and were able to participate (see appendix for permission forms). The image below is the front cover of a proposal sent to the school. The full proposal can be found in the appendix (Appendix C).

![Play to Adapt proposal](image)

The Play to Adapt Workshop

So far this chapter has described the researcher’s practice while creating the second creative experiment. What follows is an interpretation of the Play to Adapt workshop held with a class of 28 year 7 students. This section will describe the event based on participant observations conducted by the researcher. This was documented on the day via
photography and in-depth field notes. The observations describe the event and how the students interacted with the games and the types of conversations the students were having.

**Briefing the students**

Held in a classroom at the Queensland Academy for Science, Mathematics and Technology, a high school based in Brisbane, Indooroopilly, the Play to Adapt event was organised and co-facilitated with a teacher and held during a scheduled science lesson. Prior to the class starting, I set up the classroom by placing the first activity on 5 tables and then placing the second activity in a side room which is used as a small amphitheatre with a projector. This room was also attached to some other classrooms. The students started to move into the classroom as the lesson was about to start. As the students entered the room they were handing their permission forms to the teacher. The teacher then began by making sure that the students had handed in their permission forms. She also introduced me and explained what research is, how research is conducted and that they were a part of that research. After we had gotten verbal permission from the students that they were willing to participate, the teacher allowed me to take over the class. “Good morning everyone, thank you so much for having me today… your teacher tells me that you all like to play games, is that right!?”. The students responded “yes!”. “Well I have a challenge for you, I need your help. In Brisbane we’re expected to experience climate impacts now and into the future and I need you to come up with ideas on how we’re going to tackle these impacts”. As the facilitator for the day, I tried to establish a tone for the workshop so the children would feel excited and enthusiastic about the class and make the students feel like they are about to do something and be a part of solving a problem. To begin with, it became clear that the students understood what climate change is. I didn’t intend on questioning the class yet because time was limited, but regardless I probed to see what their understanding of climate change is by openly asking the class “so what is climate change?”. The students were a bit shy and didn’t respond straight away until the teacher prompted them further saying “come on class, who knows what climate change is?”. One student described carbon emissions creating a warming effect in our atmosphere. I then went on to ask if anyone knew what adaptation was, another student answered from a biological perspective describing how an organism will adapt and change over long periods of time. I described to
the class that “adaptation to climate change is a little bit different. Adaptation to climate change will require us to change, not biologically but behaviourally by re-designing our city to deal with climate impacts. This is because climate change is happening really fast.” After this introduction to climate change adaptation, I then reiterated that this class will help me with my research. Prior to the class, I decided as a primer, it would be effective to play the Jenga game first without adaptation strategies to show them how an un-prepared city would respond under climate pressure. This is also a fun activity and would set the tone for the rest of the class.

Playing Climate Jenga

As the class moved into the room some of the students whispered to each other “Jenga” where they knew by looking at the game what it was. I asked them if they knew what this game was and they all responded “Jenga!”. I explained that this game is a little bit different from Jenga. “Normally in Jenga, you have more control over your decisions about which block you can take, you can determine which is the less risky block to take. But in this game, your ability to choose will be restricted by a dice.” Here I held up the dice that the students would be using. “Your control has been reduced and your options are limited”. I then also explained to the class that each of these blocks represents a different sector or system which made our city work. It allows us to move around the city, to access clean water, access to energy, the internet, etc. “This city (the Jenga stack) is not prepared, where climate impacts will have serious consequences for your city”. In their groups one person from each group was instructed to come up and take a turn at rolling the dice and taking a block. To begin with, the students did seem somewhat reserved. This might have to do with one student having to make a decision in front of the class that might have a huge impact on their city. After a couple of turns, it wasn’t long until the students started yelling out to each other which blocks to take, “no, no, no, not that one” “take the other blue one!”. You could feel the sense of the panic the students had. At any moment their city could collapse. After one round we stopped and looked at the blocks that had been removed from the stack so far. I asked the student to imagine their day and how the blocks that had been removed could affect how they would get to school, affect their homes, their school, etc. After this reflection, the following rounds saw increases in the severity of climate impacts where two students per group would roll the dice. The room filled with yelling and giving advice. The
student who was removing the block would start to touch one block and the room would fill with noise. When the student had committed, the room filled with suspense and suddenly became quiet, and then a sigh of relief and laughter. The middle of the structure is thinning out and looking more precarious the students knew that the next roll would probably be the last. Finally when the Jenga stack collapsed the groups laughed and applauded. “oh no your city has collapsed!” I yelled to the class. As the students were participating in this game, which slowly grew from silence and hesitation into yelling and suspense, speaks to the immersive affordance that games have as described in chapter one (Angel et al., 2015; Eriksen et al., 2014; Rumore et al., 2016). Finally, when the tower had collapsed the students could then take a reflective moment to understand what that meant.

Figure 75 Climate Jenga game set up
Adaptation Planning

After we finished the Jenga game, the students then moved back into the classroom and sat at their group’s table. The students were briefed on the game and what each of the blocks were. The students were first instructed to look at the information on the red blocks (climate impacts) and then the yellow blocks (city sector). Some groups split up this task where the
students individually read the blocks and then started to share information and describe what each block said. Students would hold a block and speak to it with their group showing them the block. In most cases, the students started to read the blocks and intuitively started connecting different blocks together. The class started silently as the students were reading the blocks but then the room filled with noise as the students started to discuss each block. As the class filled with discussion, I prompted the students to start connecting the red and the yellow blocks. There were different ways of placing the blocks down. Some groups started by spatially organizing the blocks on the table where they would place each of their yellow blocks away from each other and started matching some red blocks. Another began by simply building from one block by adding more and more blocks. A unique way of organizing the blocks by one group included placing a red block at the centre and placing a yellow block all around it and the blue blocks on the outside. This formed clusters and visualized their adaptation plans in an interesting way, like a visualisation design where it shows how each block is inter-connected. As the students were connecting the red and yellow blocks, they began to start finding blue blocks that could fit. Some students either began by selecting a blue block and finding the other blocks that could match or as they continued to read the blocks they would remember a block they had previously picked up and connected those blocks together. As time went on the connections grew bigger and bigger. One student asked another “how does flooding affect water?” “You can’t drink floodwater” the other replied. More conversations like this emerged especially when blocks that the students didn’t intend to touch each other also started to foster conversations. One student asked me as I was passing by “drought is next to flooding? How do these blocks effect each other?” I then went on to describe that “dry compacted soil would likely lead to flash flooding during heavy rainfall” “oh okay!” the student replied. I continued walking around and asked a group how they were going? “We’re placing things in clusters at the moment and then we’re going to join everything up in the end”. Here the students were talking about clustering the individual city sector blocks. I asked the group to describe what they had found so far. “So far we have looked at housing and how that will be affected by rising sea levels as well as flooding and food. We are going to use the retreat block to move people away from flooding and I think the floating gardens block is a cool idea to grow food in flooded areas.” Another student in the same group said “I’m looking at transportation… on the (transportation) block it said that roads will be damaged from certain effects. At the moment I have the flooding block and road adaptation block.” As I continued to walk
around, another group was playing with the blocks in a unique way where they were stacking them like dominoes. The students said they were “forming the dominoes up to visualise a chain effect”. “Is anyone doing heatwave?” another group member asked “I’m doing heatwaves and food”. I talked to another group and asked what they have been looking at. “We’re finding lots of links at the moment, it seems like everything is connected.” I asked the student to describe some of the blocks they have and one of the students replied “we have most of the yellow blocks linked with the red blocks and we’re moving them around as we find some more that link. So we have the housing block with extreme weather events and the repurpose block for emergency shelters. The housing block is also linked to bushfires and the fire management block. We also have the water and flooding block with the repurpose and water storage block.”. The group continued to describe each of the blocks. As the students were beginning to build momentum with their adaptation plans and the connections were growing, I then encouraged the students to start documenting and writing down their individual adaptation strategies on their adaptation templates. I reiterated that these would be used during the next activity and that they should create as many as they can to win the next challenge. From here, urgency began to build with in the groups. Students were breaking up the task of writing the adaptation strategies while the others kept exploring the blocks. “Quickly get this down!” a member from one group said. Finally, I yelled to the students that we had finished and everyone had to stop what they were doing. Unfortunately at this stage of the workshop, we had run out of time to complete the last challenge. This would have been a great way to resolve the class especially to reward the student’s hard work. Instead we counted the groups who had the most strategies and declared a winner that way.
Figure 78 Students reading blocks

Figure 79 Groups making connections
Figure 80 Groups working through each block

Figure 81 Groups building more complex connections
Figure 82 Groups documenting their adaptation strategies

Figure 83 Groups laying the blocks out
To wrap up the class, the students were brought back into the smaller room where the students were instructed to sit in a circle. The purpose of this session was for the students to reflect on their experience and share with the group their thoughts on the game. The students were asked to reflect on what they learned during this workshop, what was it that triggered them to understand climate change adaptation and how can we improve this? I gave the class a couple of minutes to silently reflect on their answers. When sharing the students were instructed that they could share as much or as little as they wanted.

The students who answered the first question said they knew about climate change but this either gave them a deeper understanding of its impacts or understanding how to deal with these impacts. Here are some quotes all from different students:

“Prior to the workshop I knew a lot about climate change and its effects but I knew little about adaptation. Now I know equal about climate change and its effects and about adaptation methods”
“Before I knew about various climate impacts but now I know what effects they have on human lifestyle and our everyday life.”

“I knew what climate change was and its impacts, but now I know both these things in more detail and how climate change and extreme weather events may impact on humans now and in the near future”

“...humans need to change our behaviours immediately”

“climate change results in natural disasters which can affect our country’s economy, natural and manufactured environments. After what the specific affects are what they can affect and how we can resolve these problems.”

The students who answered the second question described either the Jenga tower falling over in the first activity or the hexagons matching together as helping them to understand adaptation in the second activity.

“It all made sense to me when the Jenga tower fell over because it showed how the earth is slowly falling apart and it will eventually be destroyed if we don’t help”

“The Jenga game. It told me what was important about how climate change effects the world. When I saw the tower fall I realised it was really important to make a change. It was also very fun to play”

“I think the hexagon helped me to understand the effect of climate change and adaptation as we were connecting them. It showed all the ways that humankind prevented and solved natural disasters/problems created by climate change”

“Matching up the colour-coded hexagons to symbolise humancentric solutions and adaptation to the impacts of climate change triggered me to understand climate change adaptation.”
General comments about how to improve this game focused on ways that could make the games more engaging. For a few students, they found the second activity less engaging where they thought by having some reward might encourage the students further. Other comments were generally about the size of the groups and making them smaller. Some students suggested shorter and more activities could help keep the students engaged. Also digital versions of this game as an app or on a computer were mentioned, which illuminates future research opportunities. Lastly suggestions for taking an already existing game like monopoly and making it about climate change were mentioned too.

“Shorter and more tasks. Go outside and incorporate some outdoor games for example win a game get a Jenga block”
“use games such as monopoly and turn them into a game that has information about climate change”
“Have a time limit to add the hexagons together and whichever groups finish most win a prize or have to take a quiz at the end”

After the reflection, the class ended. I thanked the students for helping me. The teacher stayed behind to help me pack up. She commented saying that she thought this was a great idea and asked if she could keep one of the games so that some of the other teachers could use the game.
Adaptation Template Results

During this game the students produced ‘adaptation templates’ which are adaptation strategies made by the students during the workshop by using the visual triggers. The following illustrations are a synthesis of those templates to show what the students created and the common types of blocks used to create adaptation strategies (see appendix for high resolution version of this image).

Figure 85 Visualisation of the students adaptation strategies produced during the game
Urban agriculture such as backyard, rooftop, and community gardens and urban farms can increase food security as it enhances local food options and reduces transport barriers.

Figure 86 Example of an adaptation strategy

Figure 87 Example of a student’s strategy that uses many blocks
Conclusion

To conclude, this chapter has described the results from a second creative experiment produced by the researcher’s practice. The Play to Adapt game focused on communicating transformational adaptation to a class of 28 year seven students at the Queensland Academy of Science, Technology and Mathematics in Brisbane. This chapter documents the designing of the game from conceptual development, game design, material choices and making the physical game. This chapter also included the description of students participating in the workshop by participant observation. Lastly the materials produced during the workshop were visually represented to show the types of strategies the children produced. The results documented in this chapter, and along with the results from the previous chapter will help to form a discussion in the next chapter.
To reiterate, the transformational nature of climate change is producing a growing concern amongst children about their future. The climate crisis will generate significant climate change adaptation challenges that children will have to face during their lifetime, and yet how children engage in climate change adaptation is largely unclear and absent (Cutter-Mackenzie & Rousell, 2018; Eames, 2017; Sanson et al., 2019). This has resulted in calls for methods of finding novel approaches to communicate climate change adaptation to children and novel approaches to communicate adaptation in general to the broader public. In response, the aim of this research has sought to explore appropriate ways of engaging children in climate change adaptation by experimenting with games and design. During the literature review, a scope for praxis was identified at the nexus of community-based adaptation, critical visual communication design and serious fun. This scope led to two creative experiments that navigate these perspectives. This chapter will discuss the results from the two aforementioned creative experiments that were described in the previous two chapters, as well as the critical visual discourse analysis in chapter three, to highlight what this means for designing and communicating climate change adaptation to children.

**Summary of Results**

To summarise the results from chapter three, climate change is visualised as physical impacts that can be managed and adaptation is shown as incremental changes to deal with climate change impacts. There is an imperative to explore methods in visually communicating the seriousness of climate change, and the change required to deal with the potentially transformational impacts, to increase public concern and mobilise action. Missing from these discourses are critical design practices engaged in climate change adaptation which are located outside of urban design and engineering disciplines. Lastly, children and Indigenous people are missing in these discourses as the frameworks are not appropriately designed for this audience and their voices are missing especially on perspectives of how to approach climate change adaptation. This thesis has experimented with designing children’s interactions. Designing interaction in Indigenous contexts has not been explored, although this presents an important piece of future research for an appropriate researcher who may find insights from this thesis useful. This chapter informed the outcomes produced during practice by highlighting how images currently visualise
adaptation and how these images perpetuate certain discourses. Therefore, these images are not neutral in visualising climate change adaptation, which will shape how we think about the future. Furthermore this analysis uncovered children as one of the groups missing from these conversations which led to practice which explored ways to engage children. From this discourse analysis creative experiments explored how to visually communicate transformational adaptation and disrupt current discourses. In chapters four and five, the results show that games and play have unique affordances to engage children in climate change adaptation. They are immersive experiences and offer a space where adaptation can be explored without consequence beyond the result of the game. Analysis of the results produced by both creative experiments illustrated the two games’ capacity to foster participation in climate change adaptation discourses. The experience of the games promoted a particular willingness to engage in the activity as the physical pieces, rules, and facilitators encouraged the students to let go and become lost in play. This also allowed the students to be introduced to new terminology and language that they might not have engaged in before. The enormity of climate change didn’t reduce their willingness, or ability to complete the game where normally this could discourage participation. This can be linked to a set of rules and a clear goal to guide them through this process. These games however can reduce the complexity of adaptation, for example the actors involved, their interests and investments and the interests of the community, but these games are focused on opening these types of discourses to children and introducing new conversations around climate change adaptation. Over time students could be introduced to these ideas to also increase the difficulty of the game. The use of materials for each of the games made tangible the information required to deal with the complex issue. As described in chapter one, Akama, Cooper, Vaughan, Viller, Simpson, and Yuille state that visual tools facilitate interaction amongst the participants and generates receptive modes of interaction through their tactile visual, and playful qualities (Akama et al., 2007; Akama & Ivanka, 2010). The games generated this receptiveness through the choices of materials which included wooden blocks, that were painted and laser etched with visual descriptions and information, and the boards for the Design Away Carbon Challenge which had laser etched information into the board. This was important for communicating climate adaptation as the blocks and boards, used in both of the games, were able to generate knowledge on climate change, climate risk and adaptation strategies for the participants to complete the game. This was documented in chapter five when the students describe connecting the
hexagon blocks. This helped them to understand climate change and adaptation as they were connecting the different blocks. It was also documented that the blocks in both of the games facilitated conversations between the students about climate change adaptation and prompt conversations between the children and the facilitators. This occurred as the students read the blocks and shared verbally what they found with their group members or passing the blocks around. The conversations could be as focused as what does this block mean, or much broader conversations such as the phenomena of climate change and its effects on the various sectors of the city. Serious games are also known for their educational purposes where learning can emerge through crafted experiences (Angel et al., 2015; Saurez et al., 2014). What was successful for these games as learning tools are moments of surprise the students had while participating. This included in the first game when students didn’t know what certain blocks were worth until their scores were revealed, they were surprised that certain blocks produced so much carbon or less than they thought. For the second game, this also occurred when the Jenga stack would topple over after too many blocks had been removed to resemble social collapse, or the hexagon blocks linking up unintentionally when making lots of connections. This brought forth connections they might not have thought of prior to the workshop. Between the two games, the outcomes (the city) produced by the students were vastly different. There are two different climate change adaptation discourses present: one focused on incremental change and the other focused on transformational change. The first game can be described as incremental changes as the blocks used to create the student’s city sit within the current status quo as Tony fry would describe designing for settlement (Fry, 2011b). The second activity began to open pathways to thinking about a more desirable future, or what Dryzek and Pickering would describe as a good Anthropocene (Dryzek & Pickering, 2018). This acknowledges that climate change will impact society and we will need to design for this future. A simple example of this is one group’s adaptation strategy that reimagines agricultural systems toward urban agricultural systems (see figure 83). Therefore a level of criticality in the types of discourses these games are based on is essential in producing games that address climate risk. The differences between the two cities are that one is more prepared for climate change than the other. This will also manifest in a real-world application where governments are engaging in particular discourses that don’t take the existential threat climate change imposes on us seriously. The two outcomes also illustrate how we can communicate adaptation in a shorter engagement that might be appropriate during an event and a longer engagement
that might be appropriate for a longer event in a school or outside a school. There is also scope to understand how these games might usefully assist long term strategic planning with adults in real-world settings, such as in developing Long-Term Low Carbon Emission Development Strategies (LT-LEDS).

**Implications**

The results of this research build on existing literature by drawing together the fields of community-based adaptation, critical visual communication design and serious fun. The most prominent implication for this research is its contribution toward an urgent call for methods that engage children more broadly on the climate crisis, where adaptation will have a significant role in finding pathways toward more sustainable futures and increase children’s resiliency and hope. These calls are partly due to questions over where children can engage in these conversations as they are predominantly being left out. This includes schools in Australia and the Australian Curriculum. This research acknowledges that children want to participate in climate action but require the tools to facilitate their agency. This research also builds on existing research that describes how games can be used for educational purposes for communicating adaptation, as described by Pablo Suarez (2014) in his description of serious fun and community-based adaptation. The creative experiments created during this research extend on this work toward engaging children on climate change adaptation with games that draw upon my own practice of visual communication design. This includes introducing designed experiences and visual triggers to facilitate conversations. Adaptation is a field that design has so far had little to say, and can be found on the fringes of critical design literature. As critical design fields, especially ontological design, continue to engage in the climate crisis, there are bridges growing between adaptation and design, including the designing of psychological adaptation.

**Limitations**

During this thesis, there were some limitations identified while conducting this research. They range from conceptual, practical and research limitations. The conceptual limitations of the first game are the restriction on the types of discourses the students engage in. Brisbane City Council has yet to implement any adaptation framework in response to the
climate crisis and is yet to declare a climate emergency. The adaptation discourse was then reduced to incremental adaptation strategies and sustainability initiatives to correlate with their initiatives. This limited the type of critical conversations I intended to engage the children in. Regardless, the facilitators did a good job of bringing a level of criticality to the game to try and encourage the students to depend less on technology and products to reduce carbon emissions. A second workshop allowed for the type of critical conversation I was hoping to explore initially. The practical limitations for both games include the number of pieces required to make each game possible. This resulted in costly materials and many hours of laser etching, painting and sanding to complete. The physical outcome and materials used did play a big role in how the students engaged in the game, so more exploration into games that don’t require highly resolved designed pieces to complete need to be explored. This might require designing games that don’t need large number of materials to complete and implement. This will need to depend on how many children will be participating. On the other hand, re-usable pieces now offer an opportunity to repeat programs across multiple schools and settings, now that the fabrication work is complete. There is room to explore more physical or shorter activities to keep the students engaged as well. Limitations in the results of the second game can be identified because we ran out of time to complete the last activity which might have produced more, unanticipated conversations. This was a learning point for me as a facilitator as this was my first time as a lead facilitator outside university courses.

Further research

Based on the results of this thesis, recommendations for further research are to continue to explore novel approaches to engaging children on climate change adaptation and amplifying adaptation efforts. This also includes exploring the role of technologies and digital tools as games to increase conversations around climate change adaptation. There is also room to expand on the research of this thesis and expand on embodied and speculative performativity as a method of generating conversations around climate change adaptation with material objects. Permanently introducing climate change adaptation games into the classroom can be one avenue of scaling up the conversations children are engaged in. This might look like toolkits that teachers have access to help run activities during classes. From here growing conversations around the climate crisis in general needs to increase, and
giving teachers and students the tools to engage in this will be central. This might include accessible resources that are standardised to reduce misinformation and the need for teachers to find information elsewhere, yet flexible enough that the information can still be locally applied. Furthermore research into implementing the climate crisis into the Australian curriculum and exploring what ways design can facilitate this from a service or transition design perspective is important, along with providing rigorous curriculum design matches to the ACARRA curriculum units. Looking at education as a whole, how can the education system adapt and be redesigned to prepare children for climate futures and implement a critical pedagogy as described by Paulo Freire (Freire, 1986). Outside of education, these games could be explored further in facilitating participatory design workshops with children by local government, service providers or NGOs looking to engage people on adaptation. There is also room to explore how games can facilitate the decision-making process for climate change adaptation for anyone looking to engage in adapting to climate impacts. Moving forward, there are exciting opportunities and scope for further research beyond the confines of this Master’s research thesis.

To conclude this discussion, This research has looked to answer how might designers experiment with games to facilitate conversations around climate change adaptation with 12-year-old children in South East Queensland? This research has described practice that has experimented with games to engage 12-year-old students in climate change adaptation discourses. This research has found that games have many qualities that make them appropriate to engage children in adaptation discourses as they can open up new terminology and conversations in a fun and interesting way and it has demonstrated how designers can experiment with these methods.
CONCLUSION
This thesis originally set out to explore how designers can engage children in conversations around climate change adaptation. This thesis began by describing the researcher’s background from undergraduate, to my initial investigation into design as climate change adaptation and through to commencing a Master of Design Research degree. The introduction also described the significance of this research where there is a growing demand for novel approaches to communicating climate change adaptation. In chapter one, I situated this research at the nexus of community-based adaptation, critical visual communication design and serious fun. This is developed by looking at literature on climate change, climate change adaptation, design and climate change education and games. In chapter two, I described the research methodology and methods used to generate data and answer the research question. Practice-based research was identified as a method for conducting practice as research. In chapter three, I conducted a critical visual discourse analysis on 25 climate change adaptation frameworks in order to investigate how the discourses in these documents are visualised. This informed decisions made while creating two creative experiments. These experiments focussed on visualising incremental and transformational adaptation discourses as a way to disrupt the current visual discourses found in adaptation frameworks and engage children who are being left out of these conversations. In chapter four, I described the first creative experiment, The Design Away Carbon Challenge, which opened the Future BNE challenge in March 2019. Students engaged in drastically reducing the carbon emission of a fictitious city by using blocks to swap city sectors for lower carbon emitting blocks. The students had to reach an emissions target in order to complete the challenge. Chapter four included documentation of the design process and a description of four facilitators experiences while facilitating the game by a semi-structured interview. In chapter five, a second creative experiment resulted in a workshop with a class of 28, 12-year-old students at the Queensland Academy for Science, Technology, and Mathematics, a high school based in Brisbane, Indooroopilly. This workshop featured the play to Adapt game where the students participated in two activities. During these activities the students engaged in conversations around climate risk in the city and the transformation adaptation required to deal with climate risk. In chapter six a discussion was held based on the results from chapters three, four and five. This described the implications of this research, limitations and recommendation for further research.
Climate change is a real and palpable threat to our future. In the short span of human history, humans have caused climate change with the successes of our industrialised and capitalist actions. As human action has brought us to this moment, our futures will be determined by human action moving forward. Adaptation to climate change will play a significant role in transforming cities and human behaviours to cope with the impacts of climate change and secure a future worth having. This cannot wait and efforts must scale up urgently. In the midst of these discussions about our future, those who are the most affected by climate change are being left out. This includes children and future generations. Children deserve to participate in adaptation, and author visions for their future. Despite this, climate change adaptation has yet to meaningfully engage children in these discussions. What’s also missing are the tools to help children navigate and author their futures in response to climate change. The creative experiments in this thesis have sought to explore this where games offer an opportunity to explore and open up conversations about adaptation to climate change while having fun. There is a lot of urgent work that needs to be done in this area as adaptation efforts and action toward dealing with the climate crisis need to be amplified and scaled up. As climate futures continue to hurdle towards us, we all need to take action.


Akama, Y., & Ivanka, T. (2010). What Community? Facilitating Awareness of Community through Playful Triggers


Centre for Regional Research Hosei University. (2017). Report on Local Climate Change Adaptation in Japan


APPENDIX
Appendix A: Future BNE Proposal

This document was given to Relative Creative for approval of the Design Away Carbon Challenge for the Future BNE Challenge.

Aim

Key Outcome

Rules

Reduce the carbon emissions of this city from 150% over capacity back to 100% and reduce the severity of future climate impacts.
Aim

As students work together, connections will be built between the various services of a city and carbon emissions. They will identify which of those services are the highest emitters and then visualise the change required to reduce carbon emissions.

Key Outcome

Students will take what they have learnt with them into the main event.

Rules

1. You have 2 minutes to complete this challenge
2. Work together to replace current block squares with as many blocks as you like
3. Make sure all six colours are present
4. Ask Facilitators to tally carbon score
5. Now that you have seen the scores, discuss how you can reduce emissions further, if needed, and you have 30 seconds to change as many as you like
6. Take what you have learnt about the city and keep it in mind during major event
Stations

- Stations are 800mm x 800mm pieces of wood with 'blocks' laser cut into the wood and coloured.
- The station is the starting point, where the city that is laser cut into the station is 250% capacity. Groups will replace the blocks on the station to get the city back to 100% capacity.
- This city represents common services that make up a city and a cities total amount of carbon emissions.

Blocks

- Blocks are 80mm x 80mm pieces of wood that have different services laser cut into them.
- Blocks are used to visualise the different components of a city.
- These replace current blocks on the stations by slotting into the laser cut squares.
- Each block will have a different rating based on their percentage of overall carbon emissions.
- Blocks are categorised and coloured where at least one block from each colour must be present on the station.
Ratings Cards

- Ratings cards are a set of paper which have the ratings of each block.
- Facilitators will use these cards to tally up their total ratings at the end of the challenge.
- Ratings Cards will be kept for data analysis.
- The other side of the ratings card will have a description of each block for the facilitator to refer to.

Step 1

The group is briefed by the facilitator that the city is currently 250% over its carbon emissions capacity. Students have to work out which blocks they want to replace to bring the city back to 100%.

Step 2

Step 3
Step 1

Groups will work together to slot replacement blocks on top of the original blocks to adapt their city and reduce their overall percentage.

Step 2

Step 3

Once students have finished, facilitators will add up their total carbon emissions. Facilitators show the ratings card with their total and the ratings of each block to the group. If the city is still over the total, the group will have a further 30 seconds to get the city back to 100%
Step 1
Once finished, Facilitators will congratulate the groups for completing the challenge and will keep the ratings card for each group. This will contribute towards research findings.

Step 2

Step 3

Ethical Clearance

This Masters project will require Ethical Clearance and permission to conduct anonymous observations, anonymous photographs and anonymous interviews with 1-2 students. Personal details of students will not be documented.

Survey Questions
“What did you think of the game?”
“What did you learn?”
Costs

**Stations**
ECOply 2400x1200x21mm
Total: $42 per station

**Blocks**
90 x 19mm x 2.4m Tasmanian Oak Dressed All Round DAR Select Grade
Total: $2 per block

**Paint**
Total: $50

**Work Hours**
$25/hour

**Laser Cutting**
Griffith University $1 per minute estimated 2 hours of printing
Total: $120

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4 x $42 stations
90 x $2 blocks
1 x $120 laser cutting
1 x $50 Paint
2hrs x $25 work hours

**Total Per Station:** $142

**Total Cost:** $568
Appendix B: Future BNE Facilitators guide

This document was given to the facilitators prior to the Future BNE event and describes how to facilitate the game, including a script, rules for the game and how to set the tone of the game.
Aim

Key Outcome

Rules

As students work together, connections will be built between the various services of a city and carbon emissions. They will identify which of those services are the highest emitters and then visualise the change required to reduce carbon emissions.

Students will take what they have learnt with them into the main event.

Aim

Key Outcome

Rules

1. You have 2 minutes to complete this challenge

2. Work together to replace current block squares with as many blocks as you like

3. Make sure all six colours are present

4. Ask Facilitators to tally carbon score

5. Now that you have seen the scores, discuss how you can reduce emissions further, if needed, and you have 30 seconds to change as many as you like

6. Take what you have learnt about the city and keep it in mind during major event
**FACILITATORS GUIDE**

- Facilitators will have one station each.
- Facilitators will get groups to participate while the schools are waiting for the main challenge.
- Encourage a game-like atmosphere and get the groups excited.
- Brief each group before they start the challenge. See example.
- Guide the groups through the challenge as per the steps.
- Once the challenge has been completed, take a photo of the station with the blocks still set up then reset the table.
- Keep each group’s “Ratings Cards” after completion.

“This cities carbon emissions are at 250% and we need to drastically reduce our emissions to get it back to 100%. This is a safe threshold for reducing the severity of climate change impacts. You have 2 minutes to replace the current blocks with the lower emitting blocks and make sure you have 1 of every colour on the board.”

**Stations**

- Stations are 800mm x 800mm pieces of wood with 'blocks' laser cut into the wood and coloured.
- The station is the starting point, where the city that is laser cut into the station is 250% capacity. Groups will replace the blocks on the station to get the city back to 100% capacity.
- This city represents common services that make up a city and a city's total amount of carbon emissions.
Blocks

- Blocks are 80mm x 80mm pieces of wood that have different services laser cut into them.
- Blocks are used to visualise the different components of a city.
- These replace current blocks on the stations by slotting into the laser cut squares.
- Each block will have a different rating based on their percentage of overall carbon emissions.
- Blocks are categorised and coloured where at least one block from each colour must be present on the station.

Ratings Cards

- Ratings cards are A5 pieces of paper which have the ratings of each block.
- Facilitators will use these cards to tally up their total ratings at the end of the challenge.
- Ratings Cards will be kept for data analysis.
- The other side of the ratings card will have a description of each block for the facilitator to refer to.
The group is briefed by the facilitator that the city is currently 250% over its carbon emissions capacity. Students have to work out which blocks they want to replace to bring the city back to 100%.

Groups will work together to slot replacement blocks on top of the original blocks to adapt their city and reduce their overall percentage.
Once students have finished, facilitators will add up their total carbon emissions. Facilitators show the ratings card with their total and the ratings of each block to the group. If the city is still over the total, the group will have a further 30 seconds to get the city back to 100%.

Once finished, Facilitators will congratulate the groups for completing the challenge and will keep the ratings card for each group. This will contribute towards research findings.
Appendix C: Play To Adapt Proposal

This document was sent to the teacher who I was in contact with which was sent to the principal of the school for approval. This was also sent to parents along, with permission slips.

![Play To Adapt](image)

Climate change adaptation is action taken to respond to climate related-risk, both present and future. What’s troubling is that children have been left out of conversations about adaptation, while they will be expected to deal with the full effects of climate change during their lifetime. So how can we prepare children and give them the skills to deal with climate futures? During the Play to Adapt game, students will create and implement adaptation strategies in response to future climate impacts in a fun and exciting activity.

<table>
<thead>
<tr>
<th>Activities</th>
<th>Activity 1: Rapid adaptation ideation</th>
<th>Activity 2: Jenga style city Adaptation</th>
<th>Time to Complete Activities:</th>
</tr>
</thead>
<tbody>
<tr>
<td>During this workshop, students will participate in 2 activities</td>
<td>During this exercise, groups will work together to rapidly create as many adaptation strategies as they can by using the visual tools provided to help them.</td>
<td>Students will come together and use the strategies they created during the first activity to prevent climate impacts on a city. To simulate this, a Jenga style game will be played where climate events will remove blocks from the stack, unless the students have strategies to prevent that block from being removed.</td>
<td>Introduction: 10 mins Activity 1: 20 mins Activity 2: 20 mins Discussion: 10 mins</td>
</tr>
</tbody>
</table>

Introduction

To begin the workshop, the facilitator will guide a conversation on climate change and climate change adaptation in order to understand the students current knowledge. A broader conversation about climate impacts Australia is experiencing might emerge from this. After a brief conversation the facilitator will lead into a briefing session about the games. To do this the facilitator will use one of the games as an example and showing the students all the pieces. Students will then be instructed to get into groups of 5 and move to the 5 games positioned around the room. From here students will begin to unpack their box and the first activity will begin.
Activity 1: Rapid adaptation building

**Aim:** During this activity, students will dig through a box of blocks and make connections between climate impacts, the city, current adaptation options and different types of adaptations.

**Group Activity:** 5-7 per group

There are four different types of blocks: weather blocks, city sector block, adaptation block and type of adaptation block.

Students will join at least 1 of each block together creating a scenario that they will write down on a card. By swapping around different blocks students will make different scenarios and write down as many as they can.

For example: I will choose a weather block, and then a city sector block that I think the weather block will affect. I will then choose an adaptation strategy that will deal with this impact and then describe the type of adaptation for example, behavioral, technological etc. After I have joined these blocks together, I will write down on a card the scenario. I will either write exactly what is on the blocks or add or give more detail to the scenario.

Activity 2: Jenga style city adaptation

**Aim:** During this activity, students will prototype their adaptation strategies and prevent the collapse of their city.

**Groups:** Staying in groups of 5-7 though during this activity the groups will come together as the whole class will participate in the one game.

A large Jenga stack of blocks will sit in the middle of the room. Each block that makes up this stack are city sector blocks. A dice with different climate impacts on each side will be thrown and the city sector block which is affected by the climate impact will be removed from the stack. The objective is to keep the stack up for as long as possible by preventing blocks from being removed.

To prevent a block from being removed, groups will race each other to find an appropriate adaptation strategy they created during the last exercise. When a group is successful, they will receive a point. The group with the most points by the end of the activity will win.

Discussion

Once the games have been completed, the facilitator will lead a discussion about the games they have played to unpack what the students have learnt during the game and how they interacted with the games.
Appendix D: Ethical Clearance Design Away Carbon Challenge

Ethical clearance code for Semi-structured interviews: GU Ref No: 2019/209 granted approval on 01/04/2019. This folder includes permission forms, signed by the facilitators, to conduct semi-structured interviews after the Future BNE Event.
Appendix E: Ethical Clearance Play To Adapt

Participant observation: GU Ref No: 2019/930 Ethics approval and permission Granted approval on 19/11/2019. This includes permission forms, signed by the parents of each student, to participate in participant observation.
Parent Guardian CONSENT FORM

Research Team
Chief Investigator: Yasser Gharbi
Brisbane Research Hub: Griffith University
Sustainability Centre, Canberra, Australia
Chief Investigator: Email: yasser@griffith.edu.au
Brisbane Contact Phone: 07 3149 3792
Sustainability Centre: canberra@griffith.edu.au

I declare below that I have read and understood the information package and in particular have read the:

- I understand that my child's involvement in the research will not be used in any marketing or promotional materials.
- I have had any questions answered to my satisfaction.
- I have read the information sheet.
- I understand that there will be no direct benefit to me from my child's participation in the research.
- I understand that participation in the research is voluntary.
- I understand that if I have any additional questions, I can contact the research team.
- I understand that I can withdraw my child at any time, without explanation or penalty.
- I understand that I may contact the Manager, Research Office, at Griffith University for more detailed information.

I agree for my child to participate in the project.

I agree for my child to participate in the project.

[Signature]

Date: [Date]

[Signature]

Date: [Date]

[Signature]

Date: [Date]
Appendix F: Design Away Carbon Challenge Results

Results from the Design away Carbon challenge (zoom in to see results)
Appendix G: Play to Adapt Results

Results from the Play to Adapt game (zoom in to see results)