



Developing an Exhibit to Promote Cultural and Environmental Awareness in CERES's Cultural Village

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An Interactive Qualifying Project

Proposal to be submitted to the faculty of the
WORCESTER POLYTECHNIC INSTITUTE
in partial fulfilment for the requirements for the
Degree of Bachelor Science

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April 29, 2016

Report Submitted to:

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This report represents the work of one or more WPI undergraduate students submitted to the faculty as evidence of completion of a degree requirement. WPI routinely publishes these reports on its web site without editorial or peer review.

Abstract

Environmental issues are becoming increasingly important on the global scale, yet are often only considered as local or national issues. The goal of this project, sponsored by CERES Community Environment Park, was to promote environmental and cross-cultural awareness through the creation of an interactive exhibit for the CERES Indonesian cultural village. Information on Indonesian environmental issues was gained through surveying the general public and roundtable discussions with Indonesian university students. An interactive, family-oriented exhibit, focused on land issues, was then prototyped and tested. Finally, a series of recommendations for the completion of the Indonesian exhibit, as well as the future development of the CERES cultural villages, were created.

Acknowledgements

Our team would like to thank a number of people for their support and help during our project. Specifically, we would like to thank:

- Shane French and Subik Baso from CERES Community Environment Park, for their fun-loving attitudes and positive approaches to work that always left us feeling motivated, and for teaching us loads of new Australian words. Without your vision and guidance this project wouldn't have been possible. Bonza!
- The entire CERES staff for putting up with our many questions, helping pilot test our design, and offering assistance.
- Kate Phillips from the Melbourne Museum, Cyrelle Fields and Rebecca Levey from the Melbourne Zoo for meeting with us and offering extremely useful advice.
- The Indonesian community for offering such incredible insight and knowledge as well as sharing your stories with us.
- Paul Bertler of Heifer International and Emily Dunnack of Old Sturbridge Village for meeting with us and offering quality information.
- Professors Holly Ault and James Hanlan, from Worcester Polytechnic Institute, for pushing us to achieve more than we thought we could, and for helping shape a very broad idea into a great final product, as well as a platform for many more IQP projects.

Without the support and input from these and many others, the team would have been unable to complete this project. We thank you for your graciousness and assistance and are pleased to present the results of our project.

Executive Summary

Background

Humans are increasingly depleting the limited resources of the planet, which is causing a number of global issues. The average global air and ocean temperatures have risen over the course of the 20th century, affecting the global climate in many ways. The year 2015 was labelled the hottest year on record, with a global temperature rise of $0.76 \pm 0.1^\circ\text{C}$ above the 1961-1990 average (World Meteorological Organisation, 2016). Environmental problems, such as this increase in temperature, are not localised issues, but affect the entire globe. Therefore, it is critical to promote both environmental and cultural education to generate cross-cultural collaboration and combat these increasing environmental problems.

The Centre for Education and Research in Environmental Strategies (CERES), located in Victoria, Australia, strives to educate individuals on both environmental sustainability and cultural awareness. Despite CERES's mission of promoting environmentally beneficial and culturally enriching ways of living, CERES has yet to connect environmental and cultural education in their cultural villages (CERES Community Environment Park, 2015). The goal of this project was to promote sustainable behaviour and environmental awareness to the visitors of CERES's cultural village, and increase cross-cultural awareness by connecting CERES's mission with the cultural villages through an interactive exhibit.

Objectives, Methods, and Findings

This project was composed of the following five objectives to fulfil the goal statement.

Objective 1: Assessing Public Awareness

A survey was developed to discover the public's awareness on environmental topics within Australia, Indonesia, Africa, and India. The project team administered 181 surveys at 3 different locations including Federation Square, Broadmeadows Shopping Centre, and CERES. Twenty-five additional culture-specific surveys were collected from members of Indonesian and African communities to develop a deeper understanding of current environmental issues in their respective cultural regions. The most commonly identified environmental issues within Australia, Indonesia, Africa, and India were those pertaining to global warming and climate

change, land, water, and people, respectively. The most common responses for methods to combat these environmental issues were changing modes of transportation and raising awareness.

Objective 2: Investigating Exhibits in Melbourne

Key informants were interviewed to gain knowledge on exhibit design. The interview discussion included how to design an exhibit, engage visitors, and create a meaningful visitor experience that encourages action. These interviews provided insight into creating intellectually stimulating interactive displays. All designs must cater to the needs of the defined target audience. The use of simple props and designs creates an interactive environment for users that is interesting and easy to create. Organising the exhibit with a common theme and a map or trail for visitors to follow allows them to direct their focus to the educational content of the exhibit. The most effective exhibit designs are those that induce cognitive, affective, and skills-based learning responses in the audience. Finally, an exhibit that establishes a personal connection with the audience, presents the problem, and introduces the solution is likely to invoke visitor action.

Objective 3: Determining the Focus Area of the Indonesian Exhibit

The information from the surveys was utilised to determine the most important environmental issues on which the Indonesian exhibit should focus. These issues were found to be those of land use, which includes deforestation, agriculture, and mining. Once the focus area of the exhibit was determined, round table discussions with several Indonesian student groups from universities around Melbourne were conducted to gain a deeper understanding of Indonesia's land use. These discussions revealed that environmental issues in Indonesia are extremely multi-faceted and often involve social and economic components. Indonesia's diverse environmental issues range from deforestation to water pollution. Industrialisation and overpopulation are major causes of Indonesia's primary environmental issues, but Indonesia has developed methods to combat their environmental problems through local solutions and government intervention.

Objective 4: Designing the Indonesian Display

Data collected from the survey analysis, meetings with Indonesian students, and the interviews with the key informants guided the design and prototyping of an interactive exhibit for the Indonesian cultural village. The design utilised the current CERES infrastructure within the Indonesian cultural village, including rice and banana plants. Upon

entering the exhibit, each visitor selects a story card that introduces him or her to an Indonesian child and presents a problem related to rice or bananas. Each card has both educational information and directions, guiding the visitor to environmental problem boards with interactive stations. These environmental problem boards include deforestation, global warming/climate change, water pollution, and mineral mining. Signs offer information regarding each problem, both in Indonesia and Australia, and explain how both countries are combatting each issue. The paths culminate at a solutions board, which offers simple and specific actions to take against each environmental issue.

Objective 5: Prototyping and Pilot Testing

Upon completion of the design, a first order prototype was manufactured and tested. The prototype was tested by 21 CERES visitors and staff members to determine the effectiveness of the learning material and the general flow of the exhibit. Participants responded favourably to all the various interactive displays including the telescopes, pledge board, flap cards and tree stump puzzle and wanted more interactive components integrated into the design. A defined footpath or map would allow visitors to navigate more smoothly. Visitors indicated that stronger connections were necessary between the information presented on the signs and story cards throughout each pathway of the exhibit. Participants expressed the desire to better connect the exhibit with other programs and features within CERES.

Recommendations

Through the background research, findings, and data analysis, the following recommendations were developed to be used by CERES and future IQP teams:

Indonesian Exhibit

- More sources of information should be added to the signs.
- Additional Indonesian cultural elements should be added to the display.
- The display should include more interactive components.
- The organisation of the exhibit should be improved.
- The exhibit should include more initiatives currently in place at CERES.

African Exhibit

- The African exhibit should include water-related issues, such as drought and water management.

- The African village exhibit should focus on one region or country in Africa.
- More surveys and meetings should be conducted within the African community.

Conclusion

The primary goal of this project was to promote sustainable behaviour and environmental awareness to the visitors of CERES's cultural village, while simultaneously increasing cross-cultural awareness. With the help of CERES staff members and visitors, Indonesian university students, and the general public, an interactive prototype for the CERES Indonesian cultural village was developed and tested. Recommendations were developed that detail what future project teams can do to complete the Indonesian exhibit and include suggestions on how to approach the design process for an African exhibit. This project serves not only as a design for use in the Indonesian cultural village, but as a staging ground for future projects in CERES's cultural villages.

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2.2 Environmental and Cultural Awareness	Anne/ Jonathan	Aryelle/Anne
2.4 Organisations Promoting Global Citizenship and Environmental Awareness	Aryelle	Cynthia
2.5 Educational Exhibits	Aryelle	Jonathan
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3.2 Objective 2: Investigating Exhibits and Cultural Diversity in Melbourne	Cynthia	Anne
3.3 Objective 3: Determining the Focus Area of Each Exhibit	Cynthia	Jonathan
3.4 Objective 4: Designing the Indonesian Display	Anne	Cynthia
3.5 Objective 5: Prototyping and Pilot Testing	Jonathan	Cynthia
3.6 Objective 6: Developing African Village Recommendations	Jonathan	Anne
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5.1 Design Specifications	Jonathan	Aryelle
5.2 Preliminary Design Ideation	Aryelle	Anne
5.3 Final Exhibit Design	Anne	Cynthia
5.4 Selection of Final Design	Cynthia	Anne
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6.1 Pilot Testing Methods	Anne	Jonathan
6.2 Pilot Testing Results	Cynthia	Jonathan

7 Conclusion and Recommendations	Cynthia	Aryelle
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1 Introduction

Humans are increasingly using up the limited resources of the planet, which is causing a number of global issues. Over the course of the 20th century, average global air and ocean temperatures have risen, affecting the global climate in many ways. The year 2015 was labelled the hottest year on record, with a global temperature rise of $0.76 \pm 0.1^\circ\text{C}$ above the 1961-1990 average (World Meteorological Organization, 2016). This global warming is largely attributed to the burning of fossil fuels. In 2013, 80% of CO₂ emissions were generated from the combustion of the non-renewable fuel sources oil and coal. The same year, 60% of the world's energy was generated through the burning of those two fuels (International Energy Agency, 2015). Besides providing energy, oil is also used to create plastic, a cheap and useful material that takes years to decompose and contributes to pollution. When plastic rubbish is mismanaged and ends up in the ocean, it eventually becomes a part of the Great Pacific Garbage Patch. This garbage patch is an immeasurable suspension of plastics in the Pacific Ocean posing a significant threat to marine life (National Geographic, 2014).

Despite these daunting statistics, it is common for people to consider environmental issues as localised problems that only affect the immediate area around the source. Air pollution is easily seen near large power plants burning coal, but it is harder to see the global effects of the same pollution after it diffuses into the atmosphere. Pollution from rubbish is noticeable in landfills, but rubbish from one country can follow ocean currents in the Pacific Ocean to other countries and eventually end up in the Great Pacific Garbage Patch (National Geographic, 2014). Many environmental problems harm not only the area around where they are created, but affect the entire globe. Issues created in other countries have far reaching effects that do not end when they encounter borders. For this reason, it is critical to promote both environmental and cultural education to facilitate cross-cultural collaboration.

Organisations like the Centre for Education and Research in Environmental Strategies (CERES), located in Victoria, Australia, strive to educate individuals on both environmental sustainability and cultural awareness. CERES Community Environment Park contains both a renewable energy park, displaying several solar power and bioreactor technologies, and four cultural villages that are used to teach Indonesian, African, Indian, and Aboriginal

cultures. CERES has had great success over the past 25 years in educating individuals on these four cultures and environmental sustainability (French, 2016).

Although CERES reaches over 400,000 visitors a year with their mission of creating environmentally beneficial and culturally enriching ways of living, the organisation has yet to connect environmental education with the programs in their cultural villages (CERES Community Environment Park, 2015). In their current state, the cultural programs are successful in educating students on respective traditions and practices from the four cultures, creating cross-cultural awareness. CERES has the unique opportunity, through their cultural villages, to present environmental issues as global problems, thereby improving the environmental education within the park while maintaining positive cross-cultural effects.

For this project, the team aimed to promote sustainable behaviour and environmental awareness to the visitors of CERES's cultural villages, which simultaneously increased cross-cultural awareness. The team produced designs for an interactive exhibit in the Indonesian village, pilot tested these designs, and generated recommendations for a similar CERES project in the African village. By creating interactive displays about environmentally friendly practices in each of the three cultures, the cultural village can promote sustainability and global citizenship in accordance with CERES's mission.

2 Background

The Intergovernmental Panel on Climate Change warns that, with the world's current global consumption of natural resources and all of the associated consequences, harm to the planet is unavoidable (UN IPCC 5th World Report, 2014). CERES, an environmental park in Victoria, Australia, believes that educating the public on living more sustainably and environmentally friendly lifestyles can help slow the effects of environmental degradation. Through this project, the current level of environmental awareness in Victoria will be assessed in order to create more beneficial and culturally enriching interactive activities for all visitors to the community environment park. This chapter will provide the necessary background information on issues regarding the environment within Australia, Indonesia, Africa, and India. It will also examine organisations that have similar ideals and goals to CERES and explore previous research on how to create engaging interactive exhibits.

2.1 Defining Key Terms

To establish a foundation based on the aforementioned key terms, these words must be defined in the context of this discussion. Below, these key terms are first defined generally and then within the context of this project.

2.1.1 Sustainability

Sustainability is broadly defined as using something without completely using it up or destroying it (Merriam Webster Dictionary, 2015). This term is generally applied in regards to environmental topics, but can also be used in reference to human relations. First, the idea of environmental sustainability is focused on allowing humans and nature to coexist in harmony now and in the future. Sustainable development allows for current population growth without compromising the potential of future generations to develop (Dessein, Soini, Fairclough & Horlings, 2015). Similarly, cultural sustainability can be defined as the development of positive long-lasting relationships between different peoples (City of Marion, 2016). These relationships are fostered to preserve diversity, including distinctive ways of life and how humans relate to the natural world. These two concepts, environmental and cultural sustainability, overlap in their connections between people and the natural world, which is a main focus of this project.

2.1.2 Culture

The term culture, in the English language, is one of the most difficult words to define. It can be applied to varying contexts, which, in turn, imply different meanings (Dessein et al., 2015). Culture can be defined as the conglomeration of religious, economic, literary, family, and traditional ideals found in a specific group of people. Just like a person, culture can change after being exposed to new ideas, religions or other cultures and philosophies. One example of this is the cultural rebirth of Europe after the intellectual, spiritual, and artistic growth during the Renaissance. This project focuses on culture in the context of people's lifestyles, which include their environmental practices and behaviour (Dessein et al., 2015). For a variety of reasons, people often find themselves living in a country different from that of their ancestors. When in a new place, many people wish to keep the traditions of their ancestors, bringing their cultures along with them to a new location. Problems occur when prejudicial judgments are made against these different cultures, and the immigrants are not accepted among the population of their new homeland. Although Australia is a melting pot of people from many different countries, there is much prejudice between the numerous cultures. One way of addressing this prejudice is to highlight and demonstrate the similarities and parallels between two cultural groups.

2.1.3 Environmental and Cultural Awareness

Awareness of an entity is more than just acknowledging its existence. A person must have a basis of knowledge and an understanding of the topic at hand to become "aware." Environmental awareness deals with the human population's sense of the environment and people's obligation to respect and protect the environment. It is critical for people to understand the sustaining role that nature plays in their lives, such that they feel a more urgent need for its preservation. With a certain level of awareness, one can extend this wisdom to others, through teaching, in hopes of creating a more sustainable environment and an environmentally aware society (Pachamama Alliance, 2016). Cultural awareness is comparable to environmental awareness in that individuals and groups must educate themselves and work to respect and protect the cultures of others in order to preserve or sustain those cultures' practices. Through environmental and cultural education, CERES allows its community to be more aware of both environmental and cultural issues.

2.1.4 Global Citizenship

Global citizenship, in the context of this project, differs from citizenship of a country. It is not a legal status that can be obtained. Global citizenship is more of a mind-set or a way of living, a conscious choice to be aware and involved with problems on a global scale. A global citizen is an individual who is aware of what is going on all around the world and wants to take action, in some form, to make the planet a better place to live (Global Citizen, 2016). Many global citizens take action through sharing knowledge and ideas about major events that are taking place in different countries, and are globally aware of numerous different issues, including cultural and environmental conflicts. CERES integrates various cultural practices into its educational programs to introduce visitors to more worldly perspectives and entice individuals towards global citizenship.

2.2 Environmental Issues and Solutions

Effects of environmental issues are felt throughout the entire world. Although nations across the globe are vastly different, environmental issues around the world have many similarities. This chapter investigates three major environmental topics: water, agriculture, and forestry. Environmental problems stemming from each category are discussed in terms of their significance in Indonesia, Africa, and India, which are then related back to the issues faced within Australia.

2.2.1 Forestry Crisis

Deforestation is one of the most prominent issues affecting the world today. Indonesia has become infamous over the years for its capacity to destroy vast tracts of forest for economic gain. Wood and vegetation products, including palm oil, have constituted approximately 10% of the total exports of Indonesia for the past ten years (Atlas Media, 2016). In the past two decades, there were only 20 million hectares of fully protected forest in Indonesia, while open land for industry was more than four times that at 85 million hectares (FAO, 2002). With this amount of unregulated timber resources open for commercial purposes, vast deforestation, biodiversity losses, erosion, and CO₂ emissions have occurred (Damette & Delacote, 2011). Some of the land is not used for production of timber, but trees are still being cut down so the land can be used for agricultural purposes (Hasegawa & Matsuoka, 2015).

Australia also faces deforestation problems similar to those that threaten Indonesia. Currently in Australia, over 5 million hectares of the Murray Darling Basin are in danger due to dryland salinity resulting from massive land clearing. At the current rate, this number is predicted to rise to 17 million hectares by 2050 (Mercer, Christesen, & Buxton, 2007). The destruction of Australia's 125 million hectares of rainforests also endangers the 2,000 diverse vertebrate animal species and 16,500 vascular plants that call these forests home. Currently over 1,000 species in these categories are on the national endangered species list (Australian Department of Agriculture and Water Resources, 2016). It was discovered in 2008 that the carbon carrying capacity of the 14.5 million hectares of eucalypt forests in Queensland, New South Wales, and Tasmania was estimated to be 33 billion tons. Since about half of these forests are no longer in existence, carbon emissions that were once absorbed by trees are being released into the atmosphere, contributing to climate change (Bradshaw, 2012). The removal of tree products also puts stress on the environment, and many products developed from trees eventually make their way to landfills. In 2010 alone, 123 million tons of carbon products originating from Australian forests were dumped into landfills (Australian Government Department of Agriculture and Water Resources, 2016). Due to the significant issue of deforestation in Indonesia and Australia, both countries have begun to implement methods to renew the forests.

2.2.2 Solutions to Forestry Crisis

Since the one of the largest causes of environmental degradation is deforestation, Indonesia has responded with both reforestation and deforestation mitigation efforts. Indonesians are creating forested areas for sustainable wood production, carbon sequestration and conservation, and site-specific microclimate niches based on topography to combat deforestation (Reyer, Guericke, & Ibis, 2009). The Indonesian government is in the process of planting 9 million hectares of new trees in the form of timber plantations to stop the destruction of forests. Their goal is to reach the 9 million mark by the end of 2016 (Obidzinski & Chaudhury, 2009).

Other methods used in Indonesia include genetically modifying trees to resist climate stressors, reforesting with seedlings from other provinces to increase genetic diversity, and tactically removing trees to promote healthy growth for the desired species (Reyer, Guericke, & Ibis, 2009). These methods of reforestation have also been implemented in other parts of the world.

Australia, in particular, is also taking action against deforestation. The Australian Department of Environment, under the National Landcare Program, has begun a major initiative to plant 20 million trees by 2020. The 20 Million Trees Project has been granted \$50 million dollars by the Australian government to help restore vegetation across Australia. Projects to plant a total of 11 million trees are currently in progress (National Landcare Program, 2016). There are also many not-for-profit organisations, such as The Greening Australia Company, that are working to restore the damaged landscapes of Australia (Greening Australia, 2016). The impact of deforestation in Indonesia and Australia, as well as the response from each country, shows the similarity in environmental issues in these two neighbouring nations.

2.2.3 Agriculture Crisis

Another focus of research is on African farming techniques in sub-Saharan Africa. There are many different ways that farming is practiced in this region, but all revolve around water and the lack thereof. A region that is dry or semi-arid typically has extremely low rainfall, and therefore when it does precipitate, all water must be used or stored. Over the years, farming in sub-Saharan Africa has supplied millions of people with food in a fairly inhospitable land. This way of life is in jeopardy due to climate change and an ever-increasing population. Climate data suggest that the average temperatures in southern Africa have been increasing around 0.12°C per decade since the 1960s (Benhin, 2008). Climate change is currently affecting Africa, making it more difficult to farm, and thus increasing poverty levels (Ikehi, Onu, Ifeanyieze, & Paradang, 2014). Regions that are projected to increase in population will grow consistently poorer, which combined with decreasing rainfall and increasing climate variability, will lead to negative outcomes.

Africa is not alone in facing this problem. Australia is encountering similar environmental complications in the agricultural sector. About 60% of Australia's land is used for agriculture, of which 90% is primarily devoted to cattle grazing (Australian Government Department of Agriculture and Water Resources, 2016). Farming practices in Australia have dramatically evolved throughout the years, from Aboriginal techniques to small family farms, and now to industrial farming. Australia is the largest exporter of agricultural products in the world with wheat and wool being the primary exports (Australian Government Department of Agriculture and Water Resources, 2016). The industrialisation of farming in Australia, combined with the limited rainfall in many regions, causes a lot of stress on the environment.

Modern agricultural practices not only consume large amounts of water, but also are the main source of water pollution. Herbicides, pesticides, and fertilisers that are commonly used in agriculture, contain nitrogen and phosphates, which reach waterways and pollute many water sources (Tsatsaros, Brodie, Bohnet, & Valentine, 2013). Excessive cattle grazing can strip the land of the roots holding the soil together, resulting in erosion. This causes large amounts of sediment to seep into rivers, contaminating bodies of water (Tsatsaros et al., 2013). The introduction of technology to the Australian agricultural industry greatly contributed to farmers' ability to have larger farms producing one specific crop, also known as mono-cropping (Australian Government Department of Agriculture and Water Resources, 2016). The use of farming machinery introduces a slew of environmental hazards, particularly CO₂ emissions that collect in the atmosphere and contribute to the greenhouse gas effect. These agricultural issues, which span both Africa and Australia, are increasing substantially over time and require immediate action.

2.2.4 Solutions to Agriculture Crisis

To combat the growing agricultural problems across sub-Saharan Africa, there are several techniques local farmers use across the continent, which could also be implemented in other countries. These techniques include planting new types of crops, using local knowledge to predict weather patterns, utilising organic fertilisers, and practicing mixed farming and multiple cropping (Borokini et al., 2014). Ninety percent of African farmers apply livestock manure as an organic fertiliser on their land (Ifejika, 2013). Farmers also actively practice afforestation and agro-forestry by planting trees to create forests where previously there were none. These trees are used as shade, wind blocks, and natural posts for fencing. On-farm water harvesting is practiced by about 81% of African farmers, where they collect water to be used for domestic purposes or irrigation (Ifejika, 2013). To increase water absorption and reduce loss of soil moisture, farmers till the soil to create rough clods and apply mulch to their fields to prevent evaporation from the ground (Creswell & Martin, 1998). Many farmers are changing the time of year that they plant, which crops they produce and how many products they support, thereby diversifying their crops (Antwi-Agyei, Stringer & Dougill, 2014). On top of being admirable for their adaptations, these farmers have a lot to offer the rest of the world.

Australian farmers are implementing several of the techniques practised by the African farmers, including organic farming, sustainable irrigation, and afforestation. The

Australian government is extremely interested in promoting sustainable farming. Many eco-friendly farming methods are promoted and even funded by the Australian government. The On-Farm Irrigation Efficiency Program, funded by the Australian Department of the Environment, evaluates different irrigation techniques for farmers and tests these methods on individual farms (Australian Government Department of Environment, 2016). Organic farming reduces the burden on the environment and non-renewable resources (Rigby and Cáceres, 2001). Figure 1 shows the increase in land area utilised by organic farming from 2001-2007. Over these six years, the demand for organic food in Australia increased six fold (Wynen, 2009).

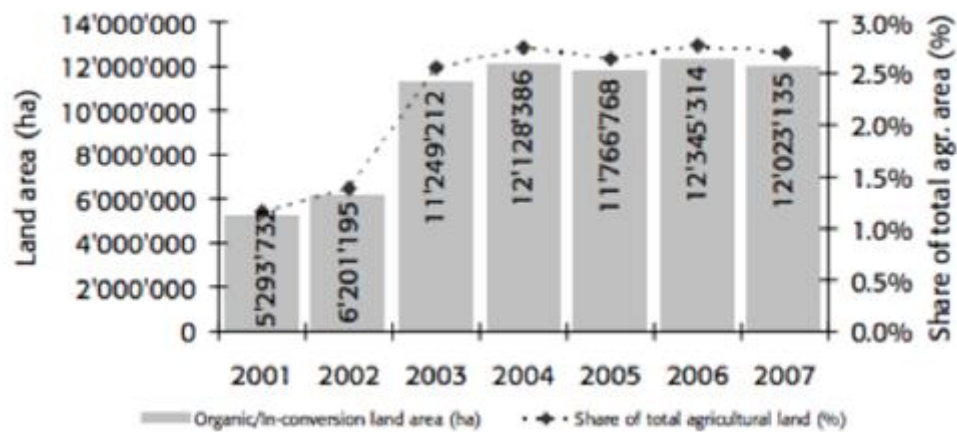


Figure 1: Organic farmland area in Australia from 2001-2007 (Wynen, 2009).

One major advocate of this type of sustainable farming is Landcare, an environmental group started by two Victorians that has blossomed into a worldwide organisation. The goal of Landcare is to encourage people to protect the natural environment and promote sustainable farming and general care of the land (Landcare Australia, 2016). Soils for Life is a not-for-profit non-governmental group that strives to educate Australians on regenerative landscape management. This organisation believes that sharing good news stories about successful farmers working to improve the land will encourage others to follow suit (Soils for Life, 2016). The similarities between the actions that both Australians and Africans are taking to combat their agricultural dilemmas demonstrate the parallels in the environmental issues in these two regions.

2.2.5 Water Crisis

Water is considered one of the most valuable resources because it is necessary to sustain life, yet this important resource is wasted and polluted on a vast scale every day. Currently, India is facing many problems related to water pollution and irregular water supplies. The primary source of water in much of north-eastern India is the Ganges River and its tributaries (Figure 2). The Ganges supplies over 400 million people with water and is the third largest river in the world by discharge. The river has great agricultural significance for local farms in the delta region. The seasonal flooding, which occurs when the Ganges spills over its banks, provides much needed irrigation and soil nutrients to the farmers in the area. The river delta is highly populated as well as agrarian, which creates a unique riparian zone (Acciavatti, 2010).

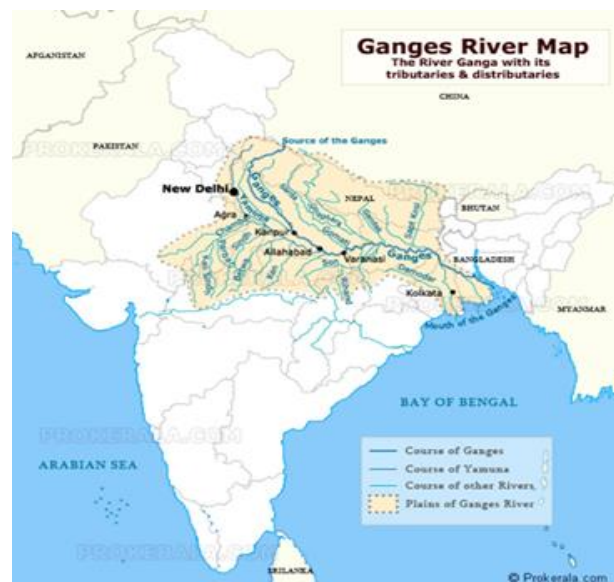


Figure 2: Map of the Ganges River and its Tributaries (Ganges River Map, 2016).

The typical cycle of dry and monsoonal seasons has sustained the population for hundreds of years. India is highly reliant on the monsoon season to supply water for nearly all purposes including agricultural and potable use. Unfortunately, about 80% of the water precipitates during just four months of the year, between June and September, leaving a highly uneven distribution of precipitation in both location and time (Diwan, 2016). Climate change has caused longer dry seasons and climate irregularity, putting more pressure on the water system (Narsimlu, Gosain, & Chahar, 2013). This disruption of natural cycles, combined with the fact that India's population is now over one billion people, is severely straining the availability of water.

India is not alone on environmental issues pertaining to water consumption, pollution, and irregular water patterns. Australians consume an average of 100 ML/year of water per capita, and extracted 64,076 GL of water from the environment in 2009-2010, with over half of this water sent directly to the agriculture sector (Lake & Bond, 2007; Year Book Australia, 2012). One of Australia's main irrigation systems is the Murray-Darling Basin (MDB). The MDB has similar significance to farming in Australia as does the Ganges in northern India. Ninety percent of the water used from the MDB river system is for irrigation. Figure 3 shows the geography of the MDB.



Figure 3: Map of Murray Darling River Basin (Wikipedia, 2016)

Flow evaluations estimated that Australians remove 11,327 GL/year of water from the MDB. The massive amount of water taken from this vital ecosystem, coupled with unpredictable rainfall, has led to longer dry periods and extreme flooding (Pittock & Finlayson, 2011). Drought is also a constant concern in arid Australia. From 2001-2009, Australia experienced the Millennium Drought. These years marked the span of the lowest median rainfall in southeast Australia. Although early rainfall data in Australia was not well recorded, this lengthy drought was estimated to be the most severe since European settlement in 1783 (Dijk et al., 2013). Water issues in both India and Australia are recognised as prevalent concerns and both nations have developed methods to approach solutions to these problems.

2.2.6 Solutions to Water Crisis

Both India and Australia are implementing various techniques to combat the increase in water use and irregular water patterns. People living in northern India have learned to adapt to the unpredictable flow of the Ganges. Farmers living in the Kumaragiri village of Tamil Nadu have been planting specific grasses on the edges of their fields to prevent soil erosion and decrease water runoff. They also use the grass as a food source for their animals (Karthikeyan, Veeraragavathatham, Karpagam & Firdouse, 2008). Throughout much of India, water harvesting is a common practice in which water is caught on roofs and is then stored in open pools, closed containers, or in the soil itself (Karthikeyan et al., 2008). This technique of water harvesting can be seen throughout the world, but is particularly applicable to Australia, where more than 20% of the population owns rainwater collection tanks (Rainwater Harvesting Association of Australia, 2016).

At this point in time, Australia is primarily combating environmental issues pertaining to water through government organisations. The Murray Darling Basin Authority (MDBA) was developed as a result of the 2007 Water Act. The MDBA monitors the basin, creates irrigation plans for it, and educates people on available water resources (Murray-Darling Basin Authority, 2016). The Australian Department of Environment has several other programs revolving around lake and river pollution such as cleaning up the Yarra River and improving the environmental health of the Tamar River in Tasmania (Australian Government Department of Agriculture and Water Resources, 2016). The people of Australia are also taking action against the water crisis by creating organisations, such as Lock the Gate Alliance. This organisation fights against inappropriate mining that damages waterways and the environment in general (Lock the Gate, 2016). Although India and Australia are both facing similar water problems, the two nations are approaching the issues in different ways and could benefit from each other's techniques.

2.3 Organisations Promoting Global Citizenship and Environmental Awareness

It is evident that the environmental crisis is a global issue, and therefore requires a global response to be adequately addressed. There are many different organisations that seek to be a part of this global countermeasure, educating people on both environmental issues and

global citizenship. These groups directly oppose climate change, and play an important role in getting people involved on a personal level.

2.3.1 Heifer International

Heifer International is a global organisation that empowers families to transform hunger and poverty into hope and prosperity. The organisation focuses its efforts on connecting underprivileged communities to promote sustainable agriculture and commerce in underdeveloped locales. Heifer's programs allow the connected communities to grow and develop together as families, invest in one another, share their knowledge and wealth, and support each other as they become more self-reliant (Heifer International, 2016)

To maintain this operation, Heifer International has farms throughout the United States both to raise awareness and to gain funding. Some Heifer farms contain cultural villages that demonstrate homes and lifestyles of various cultures around the world (Figure 4). The villages are open to the general public, and visitors to the farm are free to roam about when programs are not in session. Signage regarding each village is incorporated into the grounds to better educate self-guided visitors, and touring packets are provided that explain the different cultures in more detail. The layout of the villages is conducive to self-guided visitors as the path from country to country, through the villages, begins and ends in the same location. Other than the signage, there are no materials or displays that present information to the self-guided visitors. This is because Heifer, as an organisation, feels that facilitator-run programs are more beneficial to the learning process than interactive exhibits (Bertler, 2016). The operations of this village were evaluated and then compared to the operations of CERES's cultural villages to determine the optimal structure and framework for an interactive exhibit.



Figure 4: Chinese Hut within Heifer International's Cultural Village

2.3.2 CERES

CERES is a not-for-profit sustainability park located in East Brunswick, Victoria, on land that was previously used as a rubbish tip. Through the efforts and vision of the staff and volunteers, CERES transformed a desolate wasteland that had polluted the Merri Creek into a beautiful oasis of peace and tranquillity that boasts multiple awards (CERES Community Environment Park, 2016). Internationally, the park is renowned as a leader in both community and environmental practices and maintains its daily mission to create a place for community-based learning and development. The park focuses on expanding upon “environmentally beneficial, socially just, economically satisfying, culturally enriching and spiritually nurturing ways of living together” (CERES Community Environment Park, 2016).

CERES education holds both excursions and incursions where CERES teachers run lessons on environmental and cultural awareness to students at the park and in schools. CERES education follows a model of Heart, Head, and Hands where they touch upon emotional, cognitive, and hands-on learning in their lessons (French, 2016). The programs within the cultural villages further promote the ideals of CERES to students, teachers, and parents. These programs include lessons on the cultures of Indonesia, Africa, and India such as Indonesian Wayang and Angklung, African Drumming, and Indian Celebrations (The Sustainability Hub, 2016). Figure 5 is an image of an African dancing cultural excursion.



Figure 5: African Dancing Cultural Excursion at CERES (CERES Community Environment Park, 2016)

While these programs are very beneficial to the students of Victoria who visit the villages, the programs do not have any impact on Australia's general population because the villages are not open to the public. The villages are void of the environmental themes that are present in CERES's other programs and workshops. This project will investigate the village's potential for expansion to allow access to all guests and to better stimulate and engage these visitors through interactive displays and exhibits.

2.4 Educational Exhibits

The interactive exhibit this project created for CERES was designed for group learning to allow families to collaborate in the learning process. Generally, individuals learn through discussion, sharing experiences, memories, or asking questions. To determine which specific learning strategies are most effective in non-formal educational settings, the Philadelphia/Camden Informal Science Education Collaborative (PISEC) conducted a study on educational exhibits utilised by museums and other organisations. Through their research, PISEC determined that the optimal strategies include multimodal, multi-user, and interactive learning (PISEC, 1998).

2.4.1 Multimodal

CERES must employ multimodal learning to create successful exhibits. Multimodal learning is defined as learning that encompasses many different styles (Moreno & Mayer, 2007). The types of learning that are most beneficial for use in interactive exhibits are visual, conceptual, and associative. Visual learning occurs when individuals learn from visual

objects, such as signs, pictures, and symbols. Conceptual learning requires a higher level of processing. Through conceptual learning, individuals grasp concepts instead of simple definitions and can determine conceptual relationships and make comparisons. The ability to make comparisons and draw conclusions is important to the CERES project, as notions such as “global citizenship” and “sustainability” often require more than a simple definition to be fully grasped. Finally, associative learning results in a behaviour, which stems from an initial stimulus (Encyclopaedia Britannica, 2016). This type of learning is critical for CERES’s exhibits to be successful because visitors must be able to react to the stimuli presented by the displays to properly interact with them.

2.4.2 Multi-User

Since all age groups will utilise the interactive educational exhibits, they must incorporate multi-user features. These features stimulate conversation and social interaction so that groups of individuals of all ages can work together as a unit (Simon, 2010). A study on environmental education in Lincoln, Nebraska, showed that different age groups take in information in various ways. Adults, classified as those over the age of 18, have more developed abilities than those under the age of 13 to comprehend information and make logical connections and are more interested in current news (Lewis, 2011). These differences in information collection methods between generations were taken into consideration as the interactive exhibits were developed.

2.4.3 Interactive

Interactive learning implies that learners must perform an action to properly comprehend the lesson being conveyed. Interactive learning has gained popularity in recent years, as the public has grown tired of simply looking into glass cases and reading descriptive signage (Caulton, 1998). Today, visitors prefer physical interaction with their learning material. This experiential synergy engages the visitors through touch. However, it is imperative that the material presented in the interactive stations also mentally stimulates users (Caulton, 1998). It has been shown that interactive exhibits are more likely to draw visitors’ attention and promote critical thinking (PISEC, 1998). This type of educational exhibit prompts the users to formulate questions and utilise higher levels of thought and cognition. Additionally, interactive displays allow the user to better retain the presented information, as retention levels and hands-on learning are directly correlated (Cheslock & Schneider, 2003).

This opportunity to better instil the teachings of the park in the visitors will be capitalised through CERES's new interactive learning displays.

3 Methodology

The goal of this project was to promote sustainable behaviour and environmental awareness to the visitors of CERES's cultural village, while simultaneously increasing cross-cultural awareness. The team assessed public knowledge of environmental issues facing Australia, Indonesia, Africa, and India. The team then produced designs to prototype an interactive exhibit in the Indonesian village, pilot tested these designs, and generated recommendations for furthering this design and for a similar CERES project in the African village.

The team elected to focus on the Indonesian village because the current infrastructure in this village offered the most opportunity for developing an interactive exhibit. Despite similar opportunity for development within the African village, the team only made recommendations due to time constraints. The Indian cultural village will undergo significant changes in the near future and therefore was not considered as part of the project. However, each of the three village cultures were included in the survey to collect information for future use. The following objectives were developed to guide the team towards its goal.

Objective 1: Assess the environmental awareness of the Australian public regarding major environmental issues affecting Australia, Indonesia, Africa, and India.

Objective 2: Obtain knowledge on the design of educational exhibits in Melbourne.

Objective 3: Determine the focus area for the interactive exhibit in the Indonesian village.

Objective 4: Design the interactive exhibit for the Indonesian cultural village.

Objective 5: Prototype and pilot test the Indonesian village exhibit.

Objective 6: Generate recommendations for further development of the Indonesian village exhibit and creation of an interactive exhibit in the African village.

This chapter will discuss the methods utilised for completion of the objectives.

3.1 Objective 1: Assessing Public Awareness

The first objective was to assess the level of knowledge of the public on environmental issues affecting Australia, Indonesia, Africa, and India. The team created a survey, seen in Appendix A that was administered to 181 respondents at Federation Square, Broadmeadows Shopping Centre, and CERES Community Environment Park. The Federation Square and Broadmeadows surveys were distributed in the morning and early afternoon during both regular school days and holiday. The CERES surveys were distributed

between 9am-5pm during both school and holiday times. The survey contained several open-ended questions that asked participants to identify the most significant environmental issues in Australia, Indonesia, Africa, and India and how they rated their level of knowledge on the topics. The survey also included optional questions regarding gender, age, and ethnicity of the participants to ensure that the sample population was diverse. The survey was distributed in paper form and through face-to-face encounters.

The team also distributed culturally specific surveys, as seen in Appendix B and C to target the Indonesian and African communities in Melbourne and received 20 Indonesian and 5 African survey responses. The reasoning for this distinction was to gather information from people who are more likely to be aware of current environmental issues in their respective cultural regions. These surveys were sent out through email and Facebook by the team's contacts at CERES, who had connections to Indonesian and African communities in Melbourne. The team utilised Qualtrics survey software to organise the open-ended responses into broad environmental categories.

3.2 Objective 2: Investigating Exhibits in Melbourne

Before designing the interactive exhibit for the CERES cultural village, interviews were held with two key informants to gain knowledge on exhibit design. The team interviewed Rebecca Levey, the Interpretations Manager at Melbourne Zoo, and Kate Phillips, the Senior Curator Science Exhibitions at Museums Victoria. During the interviews, the team asked each individual about their personal experience designing educational exhibits. The interview questions focused on how to engage visitors and how to create a meaningful experience that encourages action from the visitors. The full list of interview questions and notes from each interview can be seen in Appendix D and E.

3.3 Objective 3: Determining the Focus Area of the Indonesian Exhibit

The focus area of the Indonesian interactive exhibit was based on the issues presented in the survey data, and issues raised during a series of three roundtable discussions with Indonesian university students averaging seven students per meeting. When a large number of people voiced the same environmental issue in the survey responses, but many of them lacked knowledge on the topic, the team determined there would be reason to include such an

issue in the interactive display design. Alternatively, if the surveyed population had extensive knowledge on a specific issue, it would not be necessary to develop it in great detail in the display. Deeper understanding of Indonesian environmental issues came from the roundtable discussions with Indonesian students from RMIT, Victoria University, Melbourne University, and Monash University. The most significant topics identified for Indonesian environmental issues in the survey were compared to issues raised by the Indonesian university students to ensure all major issues were covered in the exhibit.

3.4 Objective 4: Designing the Indonesian Display

The first step of the design process was the creation of design specifications that guided the brainstorming phase. These specifications were based on the information gathered from Kate Phillips, Rebecca Levey, background research discussed in section 2.4, and the team's engineering background. The team then held several brainstorming sessions to create preliminary design ideas. The content presented in the designs was based on the survey results, meetings with Indonesian university students, and objects present in the Indonesian village. Several of these ideas were refined and manipulated to develop a final design.

3.5 Objective 5: Prototyping and Pilot Testing

A preliminary physical prototype of the design was created to show proof of concept and allow for pilot testing from both visitors and CERES staff. The signs and activities in the design were set up around the village to allow people to test the exhibit with as much realism as possible while using a mock-up. Before testing, team members stressed to the participants that the exhibit was only a preliminary prototype and encouraged honest feedback based on content and ideas rather than construction of the signs and activities. Fourteen CERES visitors and seven staff members tested and evaluated the design. All 21 participants completed the pilot testing survey found in Appendix K immediately after testing. The team noted observations of these individuals as the participants interacted with the display. The pilot test results were first digitised and organised into a list sorted by question in Appendix L. From these lists, common answers were observed and compiled.

3.6 Objective 6: Developing Recommendations

Using the feedback from the pilot testing results, the team wrote a number of recommendations for future development of the Indonesian village exhibit concerning

content, layout of the design, and interactive components. Taking into consideration the Indonesian exhibit design and survey results regarding African environmental issues, the team generated numerous recommendations for the design of an African village exhibit. The African village recommendations include exhibit ideas, methods for obtaining more data and a framework for prototyping and pilot testing. Subsequent chapters discuss the data collected, its application, and the recommendations discussed above.

4 Environmental and Cultural Awareness Assessment

As a result of data acquisition and analysis, several key results emerged. This includes the most significant environmental issues in Australia, Indonesia, Africa, and India and demographic data on the surveyed population. Below is a description of the categorised survey data and key information obtained from roundtable discussions and interviews, which provided first-hand knowledge on Indonesian environmental issues and supplied information on exhibit design, prototyping, and testing.

4.1 Significant Environmental Issues and Demographic Data

The survey was broken up into demographic, free response, and multiple-choice questions. The demographic questions were included to ensure that the sample did not have a significant bias. The data collected from the seven free response questions were used to guide the exhibit design portion of the project. To analyse the environmental free response questions, the responses were organised into broad environmental categories. For example, the broad topic of land issues consists of responses such as deforestation, agriculture, and logging. If a participant identified two environmental issues for one question, such as mining and agriculture, the answer would be counted in both the mining and the land categories. All of the free response questions dealing with environmental issues were considered when choosing these broad environmental topics so that the same groupings could be used across all surveys, allowing for comparison of the data. The level of knowledge questions provided insight into the participants' self-assessments of their own awareness of environmental issues within each country, which dictated the topics on which to focus the exhibit design.

4.1.1 Sample Population Demographics

The survey asked participants three demographic questions regarding gender, age, and ethnicity. The overall gender distribution is essentially equal, demonstrating that an adequate number of males and females participated. The gender distribution at CERES reflected a larger participation by women, with 63% female respondents. This is due to the large number of young mothers who visit CERES on a daily basis. In the general public demographic, there were slightly more males than females surveyed, but the difference was not as significant as that of CERES's population.

The overall age range distribution results are slightly more varied. The percentage of the participants in the four ranges, 18-25 years, 26-40 years, 41-60 years, and over 60 years were 23%, 37%, 22%, and 15% respectively. Three percent of the sample population elected not to answer the question.

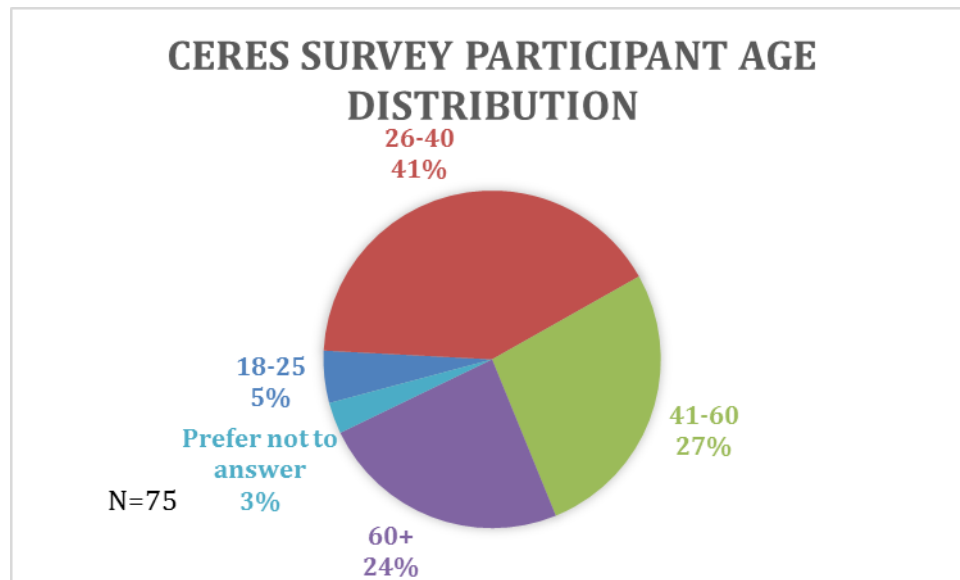
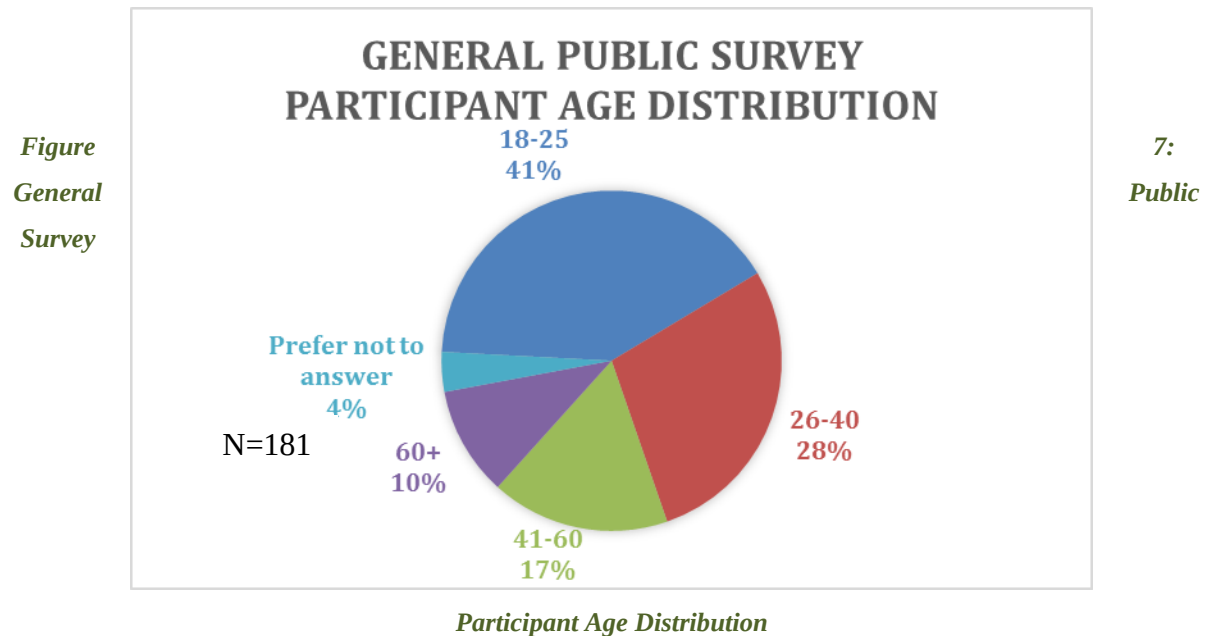


Figure 6: CERES Survey Participant Age Distribution

Overall, most survey participants were in the 26-40 age range. The largest percentage of participants in this age range were surveyed at CERES. This is an important distinction because this age range is part of the target audience for the interactive exhibit. Adults aged 26-40 would most likely accompany children who will come to visit the exhibits in the cultural villages. Forty-one percent of surveyed individuals at CERES fell within the 26-40 age bracket (Figure 6). Only 28% of the surveyed general public fell within the 26-40 age range (Figure 7). The majority of the general public surveys were administered at Federation Square where 41% of the participants were between the ages of 18 and 25. This location houses a visitor centre and is close to several universities, which could account for the larger number of young participants. The surveys were also administered on week days, when many adults were likely to be at work.

All CERES visitors were surveyed during the weekday working hours (9am-5pm). From observation, many visitors were young mothers or retirement age citizens. People of working age surveyed at CERES, who do not fall into those two groups, were mostly surveyed during lunchtime hours (11am-1pm). While these results are biased, there were a

sufficient number of participants that fell into each age bracket to make substantial conclusions for this project.



The ethnicity demographic question was chosen to be open-ended to allow individuals to classify themselves into their own ethnic categories, creating distinctions between similar ethnic groups and providing a broader range of data. The ethnicity demographic data were difficult to interpret due to most individuals' varying definitions of the term ethnicity. Ethnicity is defined as a category that identifies a group of individuals who share common customs, religions, beliefs, ancestry, traditions, or backgrounds. Survey responses from participants identifying as one of the four main demographic groups, Australian, Indonesian, African, or Indian, were grouped within their own broad ethnic categories. For example, if an individual identified as Indian, his/her survey response would not be associated with the Asian ethnic group. Based on responses, the following broad categories, seen in Figure 8, were created.

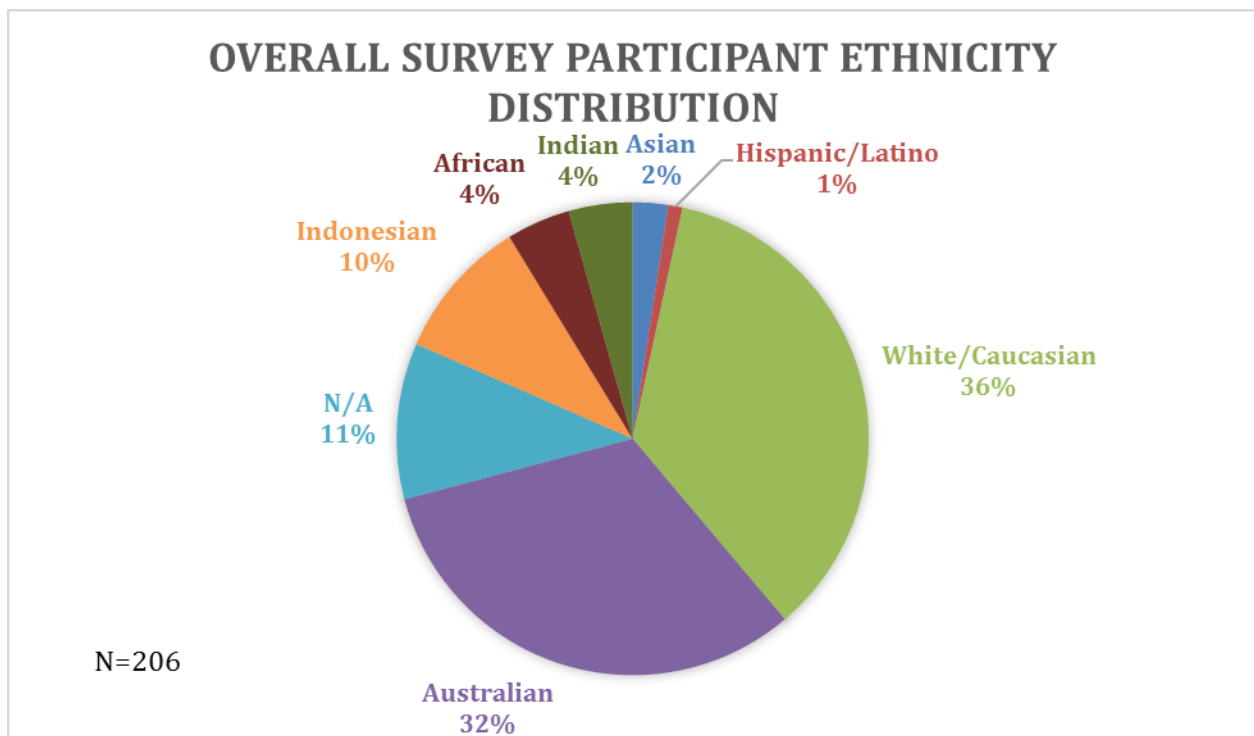


Figure 8: Overall Survey Participant Ethnicity Distribution

These data show that a broad range of ethnicities were represented in the sample size, demonstrating that a sufficient spectrum of ethnic groups were surveyed. The majority of the respondents identified as either Australian or White/Caucasian. The large number of these two groups could be due to the fact that the survey was performed in Australia where many people identify as Australian or white/Caucasian. The large number of these two groups could be due to the fact that the survey was performed in the Greater Melbourne area where 25% of people have an Australian ancestry and 60% of people have an ancestry of white/Caucasian descent (Profile ID, 2011).

4.1.2 Environmental Issues in Australia

When surveyed, each participant was asked what environmental issue in Australia they believed was the most significant. The most frequent response was global warming/climate change, as seen in Figure 9. The total length of each bar on the graph represents the number of people who voiced that issue as most significant. The three colours correspond to the varying levels of knowledge of each person who provided an answer in that category. For example, 50 of the 206 people surveyed gave answers that related to global warming or climate change. Eleven of those people considered themselves not

knowledgeable on the topic (red), 30 claimed they had fair knowledge (yellow), and 9 believed they had extensive background knowledge (green) on the issues dealing with global warming and climate change.

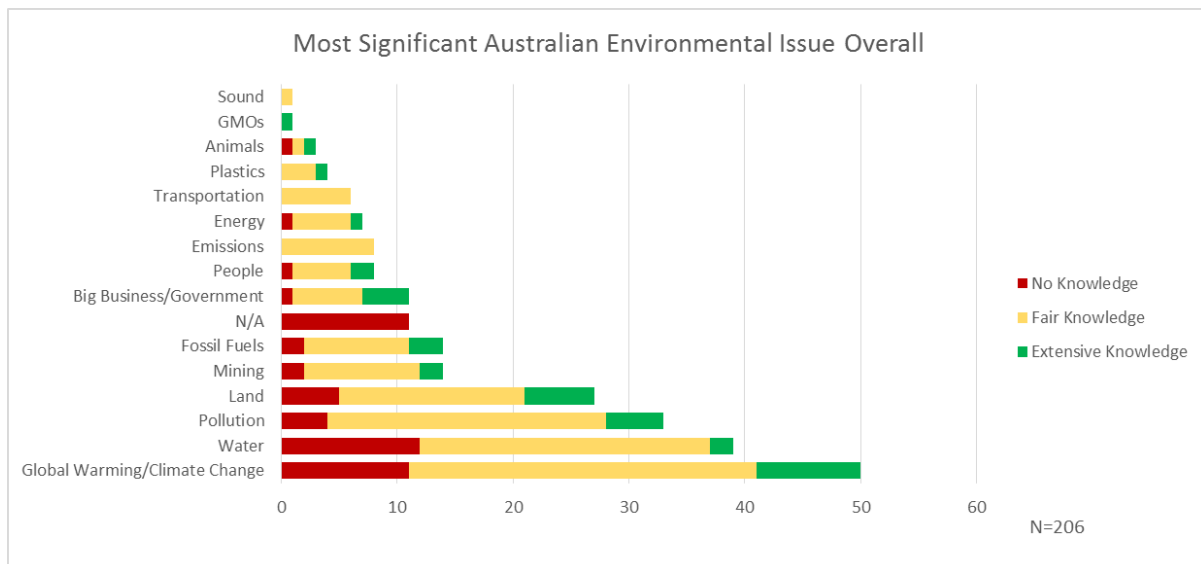


Figure 9: Most Significant Australian Environmental Issue Overall

The next two most frequent responses dealt with water and pollution with 39 and 33 responses respectively. The broad topic of water included many subtopics such as drought, Great Barrier Reef damage, and contamination of water bodies. Far fewer people believed they had extensive knowledge on issues related to water than those who felt confident in their knowledge of global warming/climate change. The major topic of pollution includes responses such as rubbish disposal and litter, but excludes specific forms of pollution such as water or air pollution, which were categorised under the water and emissions categories respectively.

Of the 206 survey participants, only 16% classified themselves as having extensive knowledge on Australian environmental issues. Twenty-one percent claimed they had no knowledge of environmental issues. The remaining 63% of survey respondents believed that they had fair knowledge. While this number is large, many participants explained that their knowledge was limited, but they would not go as far as to say they had no knowledge. Overall, global warming and climate change constituted 21% of the total responses, which was 5% higher than the next most popular response, water issues. Eighty-two percent of the 50 participants who listed global warming/climate change as the most significant

environmental issue stated that they had either fair or no knowledge on the subject. The large percentage of fair and no knowledge responses for global warming/climate change demonstrates that there is an opportunity to better educate the general public on this issue to increase their knowledge levels.

It is important, however, to show that the general public and CERES visitors vary drastically in knowledge. Below are graphs of the survey responses from both the general public and CERES visitors depicting the most significant issue in Australia.

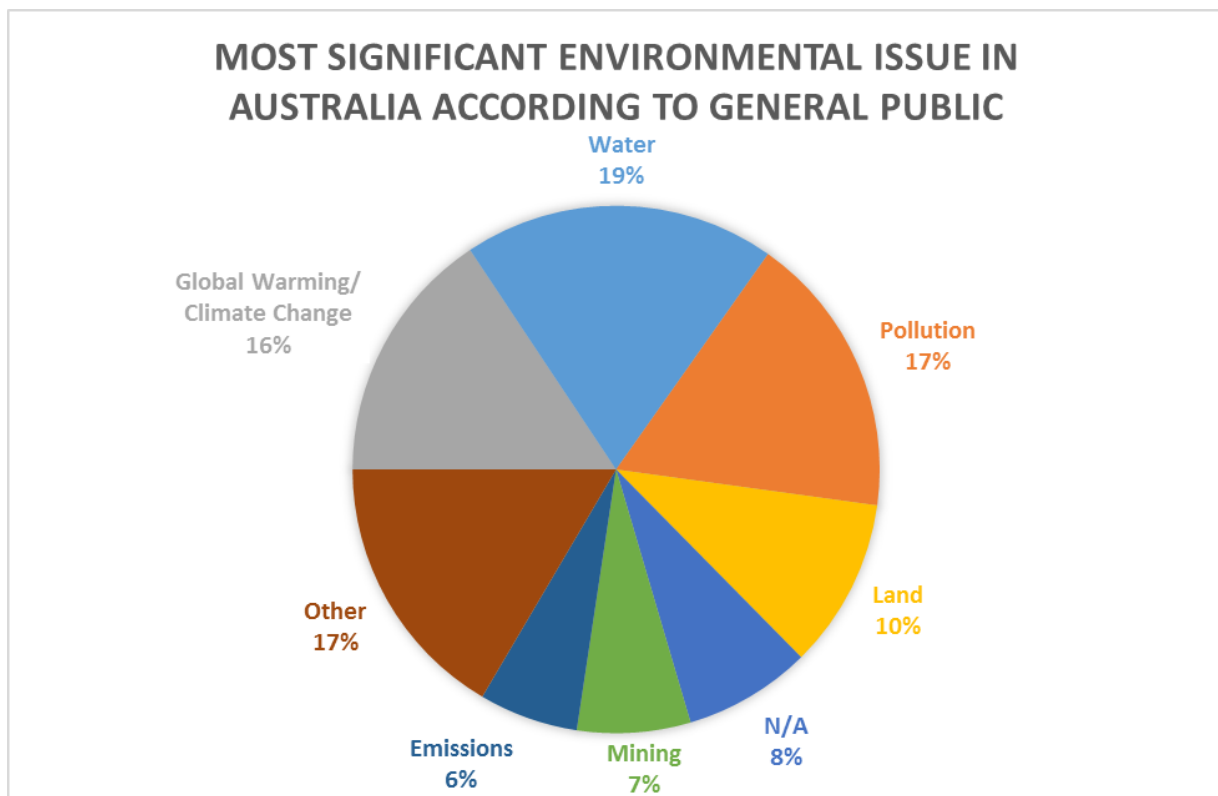


Figure 10: General Public Data on Most Significant Australian Environmental Issue

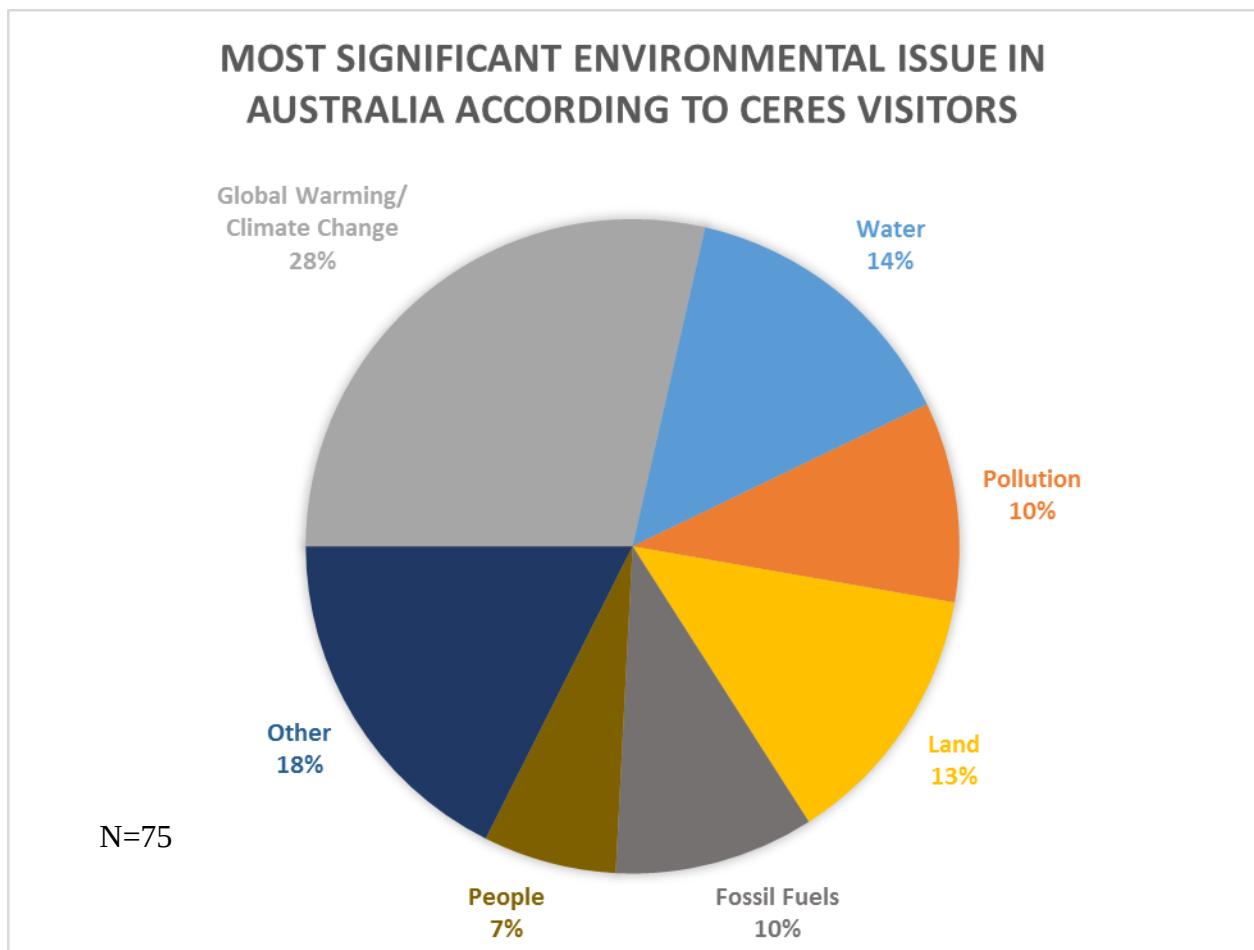


Figure 11: CERES Data on Most Significant Australian Environmental Issue

As seen in Figures 10 and 11, the most prominent issue was different depending on which group of people was surveyed. Those at CERES, who, by virtue of their visit to an environmental park, can be posited to have deeper interests in environmental issues than the general population, believe that global warming/climate change is the most significant environmental issue in Australia. The general population is more concerned with water related issues. The two graphs also show that the same four environmental issues: global warming/climate change, water, land, and pollution were the top four responses in each location. However, when all four categories from each population were separately compared with a 2-sample z-test and confidence level of 95%, the differences were determined to be statistically significant. This supports the original hypothesis that CERES visitors have different opinions on Australian environmental issues when compared to the general public.

4.1.3 Environmental Issues in Indonesia

The data gathered on Indonesian environmental issues were drawn from the general public, CERES, and members of the Indonesian community. As seen in Figure 12, the respondents identified land issues to be the most significant Indonesian environmental issue.

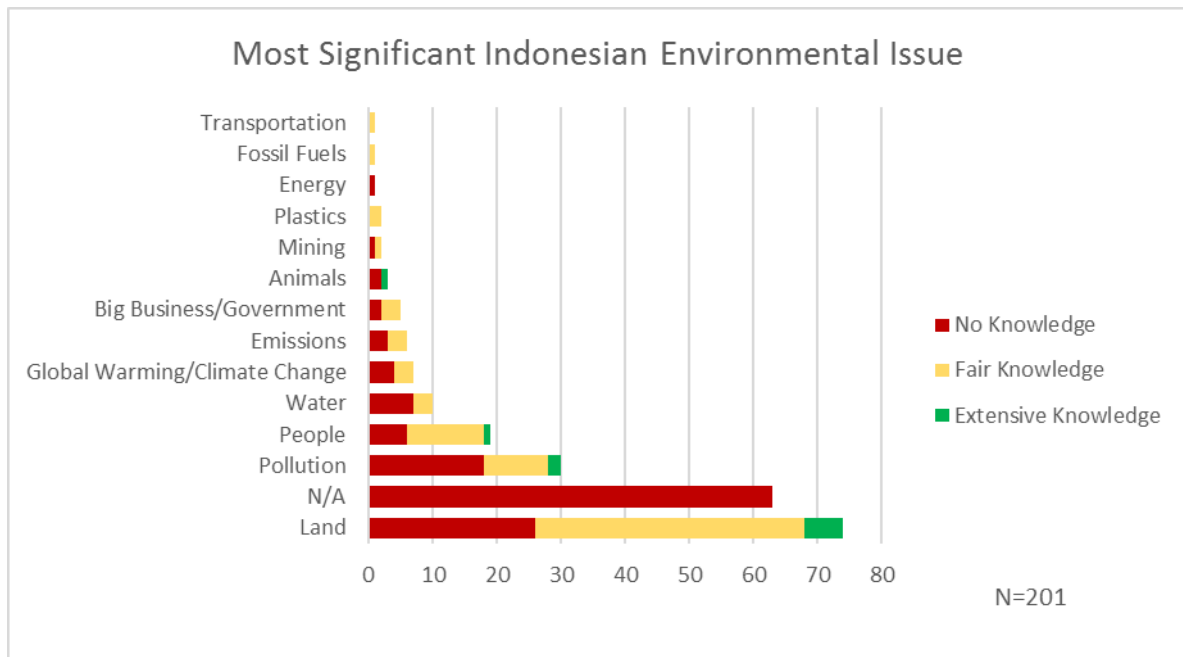


Figure 12: Most Significant Indonesian Environmental Issue

Land issues is a grouping that encompasses several related problems, including deforestation, habitat destruction, and unsustainable agricultural practices. The second most common response was that people had no knowledge of any environmental issue present in Indonesia. This infers that many members of the Australian public are in need of education on Indonesian environmental issues. The third most prevalent answer was pollution and its effects. This includes the subtopics of litter, soil pollution, and unregulated waste disposal.

Overall, 60% of the 201 respondents claimed they had no knowledge of Indonesian environmental issues. While administering surveys, it was observed that a significant number of those who provided an answer but claimed they had no knowledge seemed very unsure of the answer they provided. Only 4% of respondents claimed they had extensive knowledge on Indonesian issues. These knowledgeable individuals were mostly from the Indonesian community, with a few from CERES. Twenty-eight percent of respondents felt uncomfortable identifying a specific issue.

The responses from the Indonesian community, although a much smaller sample size, resulted in the identification of similar environmental issues. Fifty percent of surveyed

participants cited land-related issues as the most significant environmental problem, as seen in Figure 13. The next most frequent response was pollution. Land and pollution were the two most common responses for Indonesian environmental issues in both the general and culture specific surveys, as seen in Figures 12 and 13.

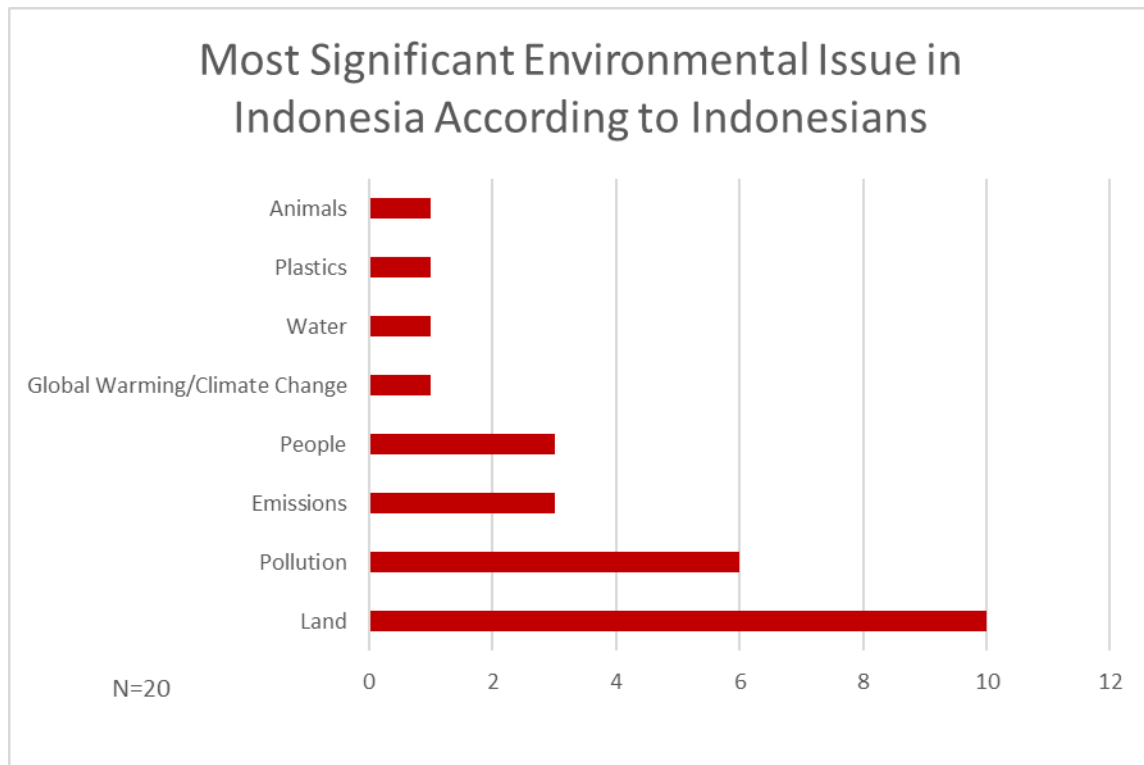


Figure 13: Most Significant Environmental Issue in Indonesia According to Indonesians

Based on the results from these 2 distinct surveyed populations, it was concluded that the Australian population should be educated on land-related environmental issues. Land issues is a topic that is relevant to both Indonesia and Australia, and many people in Australia who were surveyed were aware of the topic but had limited knowledge on the subject. Additional research, presented in section 4.2, was conducted to support these findings.

4.1.4 Environmental Issues in Africa

The top results for the most significant environmental issue in Africa included responses of no knowledge, water issues, and people issues. Forty-nine respondents could not identify a significant environmental issue affecting Africa due to either a lack of awareness, a belief that Africa is not facing any important environmental issues, or the size

and diversity of the continent. It is important to note that Africa is an enormous continent that has varied climates and cultures hosting a wide range of environmental issues. Over two-thirds of respondents claimed they had no knowledge of African environmental issues, whether they provided an answer or not. Only 36% of respondents claimed to have some level of knowledge about African environmental issues.

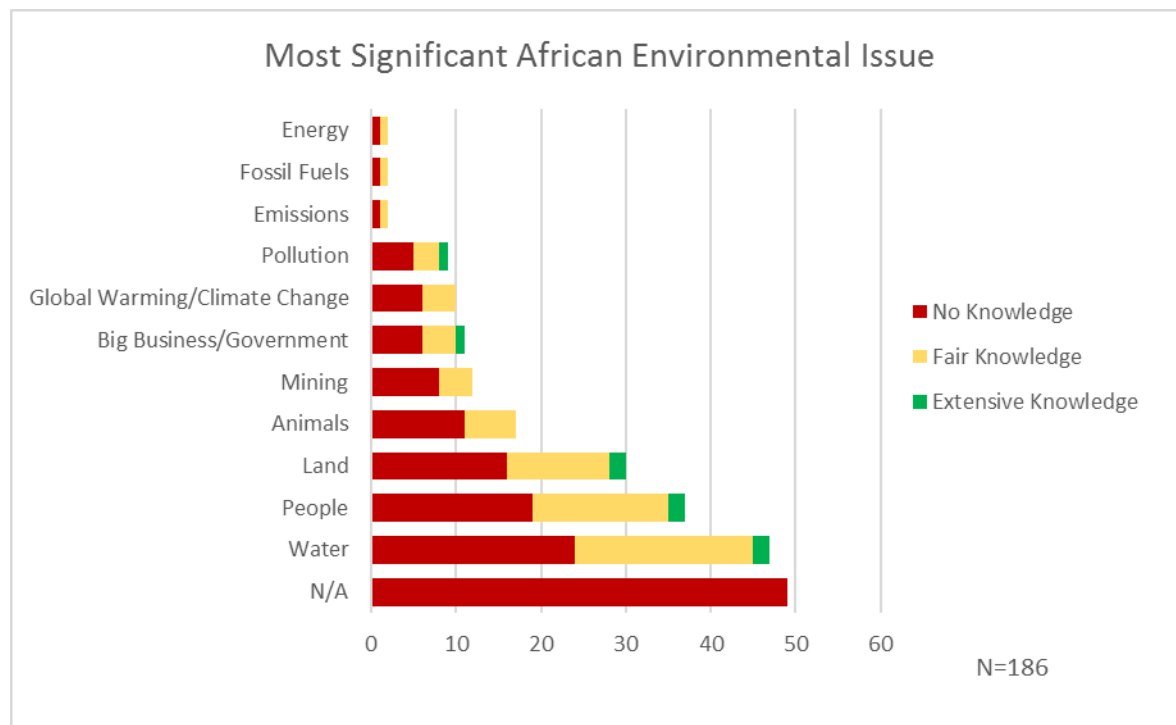


Figure 14: Most Significant African Environmental Issue

Twenty-one percent of respondents identified water related issues as the most significant environmental issue in Africa. Such responses included a lack of clean water and recurring droughts. Sixteen percent of survey respondents identified people as the most significant issue. The most frequently cited people-related issues included consequences resulting from war, disease, and lack of food. While these are not, in fact, environmental dilemmas, these issues all relate back to environmental origins. This subtle difference is crucial, as there are numerous connections between people-related and environmental problems, and the distinction of where environmental issues become people issues is difficult to define. The fact that so many connections exist supports the project goal stating the need to educate people both culturally and environmentally. With this in mind, the project considered the most significant environmental issues in Africa as water, land and animal categories. Land issues encompass desertification and poor soil quality for farming. Animal

issues were a combination of the negative consequences of damaging hunting practices and the endangerment of species from the threat of extinction.

The African community specific survey only produced five responses and therefore was not considered apart from its inclusion in the overall survey response data. Only five responses were received due to a miscommunication with the survey participants. The most significant environmental issue in Africa was based solely on data from the CERES and general public surveys and further research should be done regarding these issues before designing an exhibit.

4.1.5 Environmental Issues in India

The principal results for the Indian survey included issues stemming from people as the most commonly cited response, pollution problems as the second most commonly cited response, and water issues as the third (Figure 15).

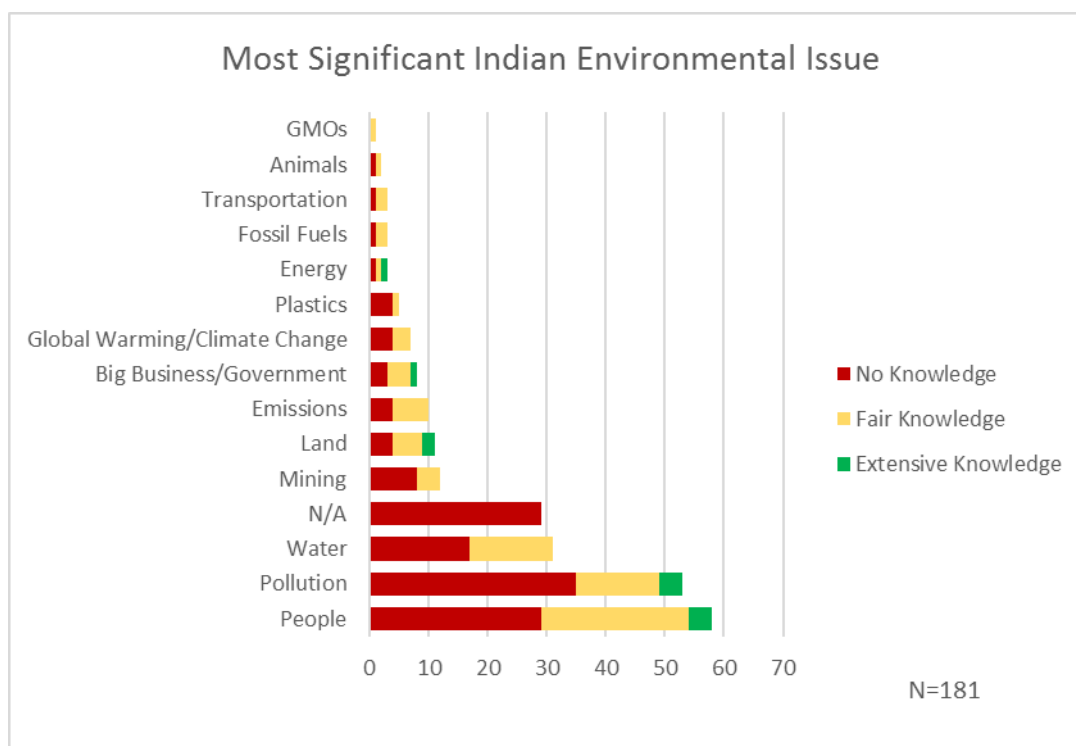


Figure 15: Most Significant Indian Environmental Issue

Issues related to people included overpopulation, hunger, health issues, and consumption of resources. Since these people related issues are not directly related to the environment, the most significant environmental issue was considered to be pollution, which included waste disposal, soil pollution, and rubbish. Water, the second most significant

environmental problem, includes drought, a lack of access to clean water, and water pollution. The third most common response was that people had no knowledge of any environmental issues taking place in India. When considering respondents' knowledge level, 60% of respondents claimed they had no knowledge of Indian environmental issues. One fifth of that 60% were respondents who did not provide a specific environmental issue. To address this significant lack of knowledge with an exhibit in the Indian cultural village, further research must be conducted regarding important environmental issues affecting India to support the survey results.

4.1.6 Ways to Combat Environmental Issues

After determining which issues the sample population considered to be the most significant, the survey asked what actions people take, or would be willing to take, to help combat these issues. The top ways to combat environmental issues, according to survey participants, is through changing modes of transportation and raising awareness of important environmental problems, as seen in Figure 11. It is important to note differences in the answers provided from different surveyed populations. The majority of CERES visitors answered the question in terms of what they are currently doing, whereas the majority of the general public answered in terms of what they could be doing. For example, many CERES visitors responded by saying they actively ride their bikes or take public transport while the general public often responded by saying that they should ride their bike or take public transport more often. In terms of raising awareness, many participants from the general public believe that talking about the issues or teaching about the issues in school is sufficient. CERES visitors also acknowledged environmental education as a way to raise awareness, but suggested more active options such as tree sitting and protesting.

CERES visitors also had different beliefs than did the general public regarding the best way to combat environmental issues. CERES visitors advocated for the conservation of resources. Their responses included wasting less energy and water, burning fewer fossil fuels, and living in a more sustainable fashion.

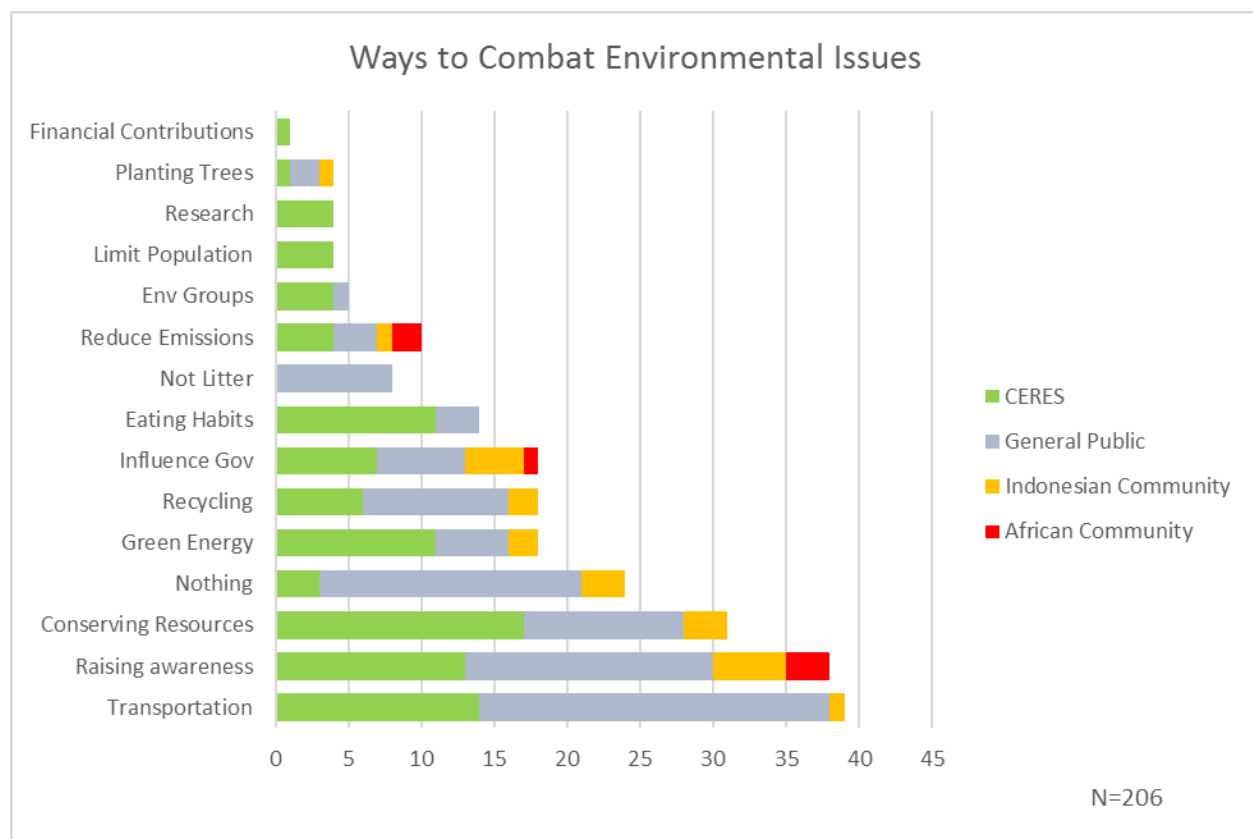


Figure 16: Ways to Combat Environmental Issues

The top 3 answers given by CERES and the general public do coincide, excluding the nothing, or no response, category. The large number of respondents claiming that they cannot do anything, or will not do anything, is alarming and reinforces the beliefs of many respondents that raising awareness is key to combatting environmental issues.

4.2 Views of Indonesian University Students

Meetings with university students provided extremely valuable information about environmental issues prominent in Indonesia as well as a highly educated population's perception of local and national solutions to those problems. In the first meeting, with six RMIT and Melbourne University students, environmental issues within Indonesia were discussed as broad, multi-faceted topics, with complex social and economic implications. For example, one student explained that deforestation is a huge problem in Indonesia, but many Indonesians are willing to cut down forests for much needed personal economic benefit. The nation is in a time of industrialisation, where money and livelihood are regarded, by many citizens, as a more critical priority than is protecting the environment. The first meeting showed the team that Indonesia's environmental issues are extremely diverse. They range

from well-known deforestation problems to water pollution. The students also brought up several local solutions to environmental problems, such as rewarding citizens for collecting waste, using the national army to help clean rivers, and utilising social media to increase awareness of issues.

In the second meeting, with Victoria University students, five PhD candidates shared information on local environmental problems from several different provinces of Indonesia. In comparison with the first meeting, this roundtable discussion delved deeper into the specific details regarding Indonesia's environmental problems and addressed the actions that are being taken by the Indonesian government and citizens to combat these issues. One major problem discussed was the negative effect of industrialisation. In Java, the most populated island in Indonesia, rice fields have been replaced with buildings, which increases flooding in the cities and creates waste management issues. In the less populated areas of Indonesia, rainforests are being cleared for factories, mines, and palm oil plantations. The development of mines pollutes waterways and harms local wildlife. Along with discussion about environmental problems found in Indonesia, the students informed the team of many current solutions in place to combat these problems. On a national level, the Indonesian government is introducing environmental awareness in school programs, requiring companies to replant trees to replace those that are cut down, and banning the export of certain mining products like coal and iron. Aside from the government, the Indonesian people are taking action to improve their land. In certain tribes, couples are required to plant trees when they wed, and trees and bamboo are commonly planted on riverbanks to prevent erosion.

The third meeting, conducted with eight PhD students from Monash University, further focused on local solutions to environmental problems, similar to the second roundtable discussion, but also investigated how Indonesian environmental issues affect the lives of citizens. One student explained how his colleague, who is a teacher, requires his students to plant trees when they turn in assignments late. The university students also described the importance of traditional Indonesian rice farm irrigation methods. Supak is an Indonesian farming technique in which rice farmers use terrace farming on mountainous landscapes and divert natural water sources to flow through all levels of the terraced farm. This farming method reuses water and adapts growing techniques to the land available for farming. Another student described how the Citarum river, a major water source, has been so

heavily polluted and built up that it often floods, affecting people who live along the river bank.

Speaking with Indonesian students was a great resource that provided valuable insight into local Indonesian environmental problems. This insight gave direction on which environmental topics to implement into the Indonesian exhibit. To gain more knowledge on the logistics of exhibit design, the team interviewed professionals with expertise in that area.

4.3 Exhibit Design Research

Interviews on exhibit design with Kate Phillips, the Senior Curator Science Exhibitions at the Melbourne Museum, Rebecca Levey, the Interpretations Manager at the Melbourne Zoo, Shane French, the Education Manager at CERES Community Environment Park, and analysis of case studies guided the development of the Indonesian exhibit.

When creating a design, both Phillips and Levey stated that the initial step in the design process is to establish the target audience, goals, and outcomes of the exhibit. In the interview, Phillips explained how the target audience affects the development of the exhibit. For example, if the target audience includes young children, safety precautions must be taken, such as eliminating sharp edges or protruding objects (Phillips, 2016). Levey explained how the desired outcomes should drive the development of the exhibit (Levey, 2016). In terms of techniques used to engage visitors, Phillips concurs with studies conducted by the Philadelphia Informal Science Education Collaborative (PISEC), which states that incorporating interactive components into exhibits engages more visitors and promotes critical thinking (PISEC, 1998). Phillips mentioned that the use of simple props produces an interactive environment that is interesting and easy to create (Phillips, 2016). Phillips also mentioned the importance of having a consistent theme throughout an exhibit to minimise confusion (Phillips, 2016).

Phillips, Levey, and French additionally explained how successful exhibits must have components that stimulate various reactions in people. Phillips and French described that the best exhibit designs are those that prompt cognitive, affective, and skills-based learning responses in the audience. This technique is referred to as the Heart, Head, and Hands Model at CERES (French, 2016). Phillips described one way to incorporate affective learning that involves turning the exhibit into a story so that visitors can connect on a personal level. Inducing an intimate connection can also entice visitors to take action to address the problem presented (Phillips, 2016). Levey explained how the zoo initially establishes a personal

connection between the Zoo's visitors and the featured animal, which acts as the face of the campaign. This is done by teaching visitors personal information about specific animals like their social interactions, favourite foods, and playtime activities to enable visitors to better relate to and bond with the animal. Once this connection has been established, the Zoo presents alarming facts regarding the chosen topic, such as the amount of habitat being destroyed to satisfy the demands of consumerism, or the amount of pollution resulting from non-recycled materials. The presentation of educational material is classified as cognitive learning, which may be presented through many different media sources. The presentation can also include interactive components to promote skills-wise learning. These components can include pulling levers or turning knobs to reveal information (Phillips, 2016).

Immediately after alarming facts are revealed, a suggested solution to the problem should be provided to call visitors to action (Levey, 2016). All of these theories and suggestions were considered and incorporated into the Indonesian village exhibit.

5 Indonesian Exhibit Design

The next step of the project required designing the Indonesian exhibit based on the knowledge gained from the survey, interviews, and roundtable discussions with Indonesian university students. First, design specifications were determined. Then, several concepts were created during brainstorming. Finally, one design was chosen and further developed into a detailed prototype.

5.1 Design Specifications

The first step of the design process was to generate a series of design specifications for the interactive exhibit. Below is a list of the specifications with the underlying rationale.

Contextual Design Specifications:

- The design must be environmentally and culturally educational
 - Reasoning: To reflect CERES's ideals and goals into the exhibit
- The design must incorporate the most significant environmental issues according to the survey data and roundtable discussions
 - Reasoning: To provide relevant and interesting information to the target audience
- The design must offer specific positive actions that people can take to combat environmental issues in Indonesia and Australia
 - Reasoning: To promote positive environmental action by the audience through suggesting simple actions within the exhibit
- The design must be culturally sensitive
 - Reasoning: To prevent an inaccurate or offensive portrayal of Indonesian culture
- The design must promote global citizenship
 - Reasoning: To achieve the goal statement of the project and align with the CERES's mission statement

Audience Driven Specifications:

- The design must be interactive
 - Reasoning: To engage the audience, particularly children, and to make the lessons and material more memorable
- The design must use multiple senses in the interactive portions of the exhibit

- Reasoning: To cater to all learning styles of visitors, particularly children
- The design must cater to a minimum age and comprehension level of a year seven student
 - Reasoning: To allow the exhibit to be understood by children, but also be compelling to adults; parents can easily explain the exhibit to preschool children
- The design must target families as the primary audience
 - Reasoning: To cater to the main demographic group of expected CERES visitors
- The design must incorporate the “Heart, Head & Hands” model of education
 - Reasoning: To be consistent with the CERES’s educational model

Functional Design Specifications:

- The design must be safe for children
 - Reasoning: To protect children using the exhibits and prevent injury
- The design must be inexpensive to construct, and prototyped with available materials
 - Reasoning: The project, at this stage, has no available budget
- The design must use current CERES Indonesian cultural village infrastructure
 - Reasoning: To lower building costs in the future and take advantage of available resources
- The design must not rely on the physical layout of existing elements within the village
 - Reasoning: To create a flexible design that will be relevant despite any potential future reorganisation of the village
- The design must be visually thematic
 - Reasoning: To generate a sense of continuity for the target audience

These design specifications guided the brainstorming and design process, and ensured that the design was useful and feasible.

5.2 Preliminary Design Considerations

Several preliminary designs were developed once the data collection phase was completed in accordance with the aforementioned design specifications. Three preliminary design concepts were considered and refined before moving forward with a detailed design. These concepts differed solely in their methods of presenting the educational material. The first of these three designs involved utilising the existing components of the village as focal

points (the rice, banana, and bamboo plants). A sign would be placed near each of these existing elements. Each sign would describe each focal point, discuss how changes in the environment affect these components, discuss what Indonesia is doing to combat the situation, and suggest how Australians can take action and make a difference in the environment. An additional display would be placed in the village to discuss land use, as this was found to be the most significant environmental issue in Indonesia according to survey responses. This display would contain interactive components and would discuss problems associated with land use, such as deforestation. This design was found to be beneficial in that it utilised existing components in the village. However, upon discussion, this design was determined to be ineffective as it did not meet all audience driven specifications. The signs of the exhibit would present too much information for younger visitors to absorb, and would therefore be inadequate for a portion of the target audience.

A second design was to develop a scavenger hunt within the village. This model utilised a pamphlet, which would contain information regarding environmental issues in Indonesia. Upon arrival, visitors would be asked to find a specific component within the village, such as the banana plants, and would learn more about the component from the pamphlet. This design was found to meet all functional design specifications and, unlike the first design, would not present excessive information on the exhibit's signage. However, it did not quite meet all of the contextual and audience driven specifications. Visitors would not acquire as much knowledge with this model, since the dense information in the pamphlet would be focused primarily on an adult audience and the activity itself would cater mainly to children. This model would not allow all participants to gain the desired educational information from the exhibit, and specific components of the exhibit were tailored to limited age groups, which did not permit families to utilise the entire exhibit.

Another preliminary design involved participants selecting their own path, or fate. Visitors would enter the village and immediately choose one of two professions--rice or banana farming. They would begin their journey at either the rice or banana plant stations, where they would read the signage regarding the crops. The visitors would then be presented with a conflict, which would introduce environmental issues that Indonesian farmers are encountering. Visitors would then choose between two options to solve the conflict, one of which would lead to an environmentally friendly result, and the other option would cause further environmental problems. If the visitor chose the environmentally friendly option,

he/she would be immediately directed to a solutions station, containing recommendations on how the individual could further help the environment. If the visitor chose the environmentally damaging option, he/she would be directed to a different station, which would discuss the problem at hand, such as mining. He/She would later be directed to the solutions station. This design was found to meet all functional and audience driven specifications. One positive aspect of this design was that it allowed different participants to travel along different pathways through the village, keeping individuals inquisitive of the other pathways and allowing them to retrace their steps to investigate the other options. However, it did not meet all contextual specifications because not all audiences would obtain the same amount of information from the exhibit. While the design allowed participants to choose their own fate, visitors would most likely choose the environmentally friendly option, as it is deemed to be the morally correct choice. By choosing the environmentally friendly decision, visitors would not visit the stations that discussed the environmental problems and would not gain a deeper knowledge of how Indonesia is being affected.

Upon further analysis and discussion, several components from each of these three preliminary designs were selected for use in the final design idea, which will be further discussed in the following section. This detailed design was judged to be most successful in presenting the desired educational material in accordance with CERES's and the team's goals.

5.3 Final Exhibit Design

The final design was developed based on several ideas from the preliminary design considerations discussed above. This section will describe the journey a visitor would experience as he/she travels through one of several possible paths through the exhibit and will explain why certain elements of the design were selected. The entire exhibit incorporates four separate paths, each focused on one of four environmental problems: deforestation, mineral mining, water pollution, or climate change. The map in Figure 17 below shows the four different paths within the village. The example discussed here will describe the deforestation path, but all four paths have a similar structure. Each path starts with a story, then teaches visitors about an environmental problem in Indonesia and how it relates to Australia, and finally informs visitors on what they can do to help address the particular environmental issue.

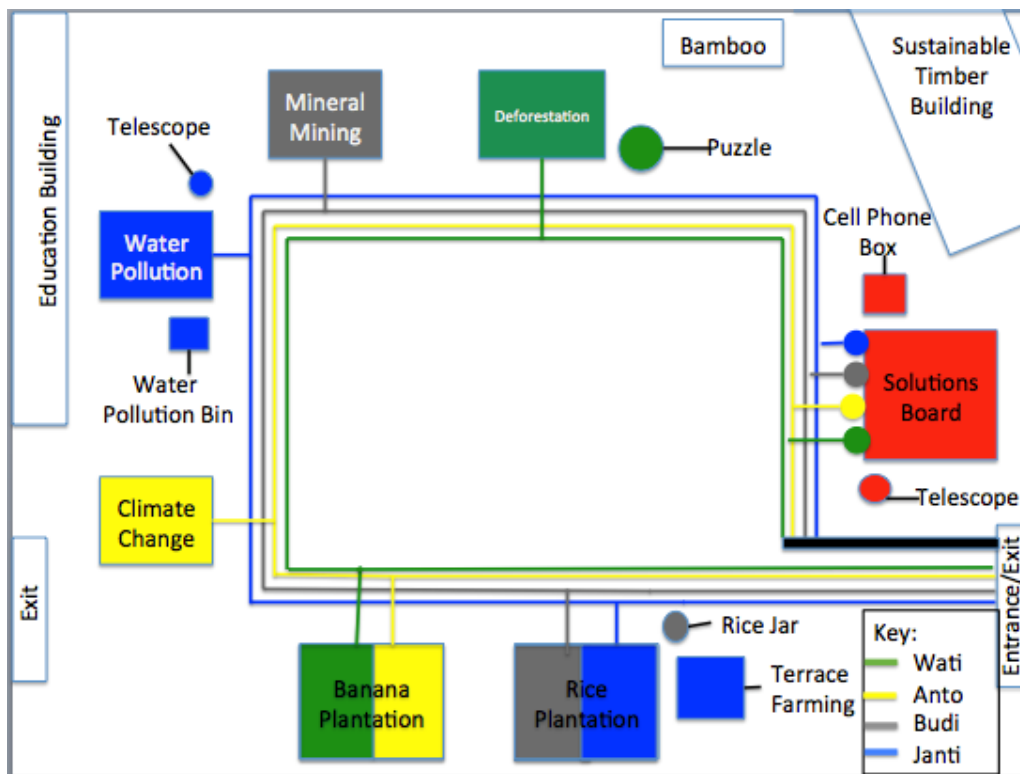


Figure 17: Map of Exhibit Design

The visitor starts at the entrance of the Indonesian village, where a welcome sign is located (see Figure 18). The visitor then chooses a story card, based on the life of an Indonesian child, to follow. The information presented on the signage in the village is related, through the story cards, to the life of typical children growing up in Indonesia.



Figure 18: Entrance sign to Indonesian Village

The childrens' stories displayed on the four story cards allow the audience to establish a personal connection with the character who is impacted by the environmental issue and increase the cultural awareness of the audience. Storytelling manipulates complicated ideals and allows individuals to obtain abstract or symbolic meanings from these ideals (Davies, 2007). The story card presents the child as the protagonist, then introduces his/her family, and gradually expands to the broader societal, cultural, and environmental realms of the world. The use of storytelling was developed after reflecting on the interviews with Kate Phillips and Rebecca Levey, both of whom emphasised the importance of engaging an audience with personal connections (Phillips, 2016; Levey, 2016). Children were chosen as the main characters on the story cards because the target audience of the exhibit is families with young children. The particular stories were selected based on items available in the village, statistics on common Indonesian occupations, and survey results. Two stories were created around farming families because 39% of the Indonesian workforce is in the agricultural sector (InterNations, 2016). Creating stories about farmers allowed for a simple connection to the rice and banana plantations and was backed by the survey results, which indicated that land was the most significant environmental issue in Indonesia. Another story was based on small business owners who relied on selling produce, including bananas, for a living. This occupation was applicable because of the connection to the banana plantation and the statistic that 48% of the Indonesian workforce belongs to the service sector (InterNations, 2016). The final story was focused on landowners because it was easily relatable to rice crops. These stories were also based on real life experiences discussed in the meetings with Indonesian university students.

Having now entered the village, the visitor chooses Wati's card, shown in Figure 19, and reads about Wati's life as part of a banana farming family.

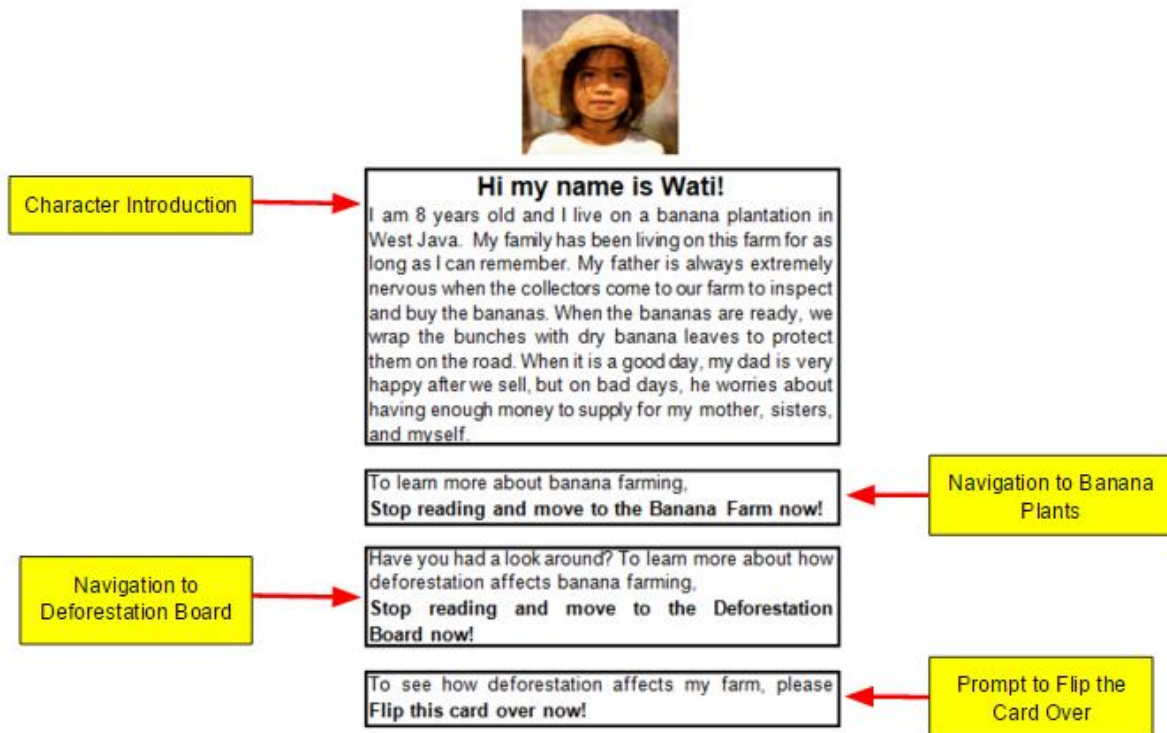


Figure 19: Front of Wati's Story Card

Then the visitor is guided to the banana plantation, where he/she learns about banana farming in Indonesia (Figure 20).

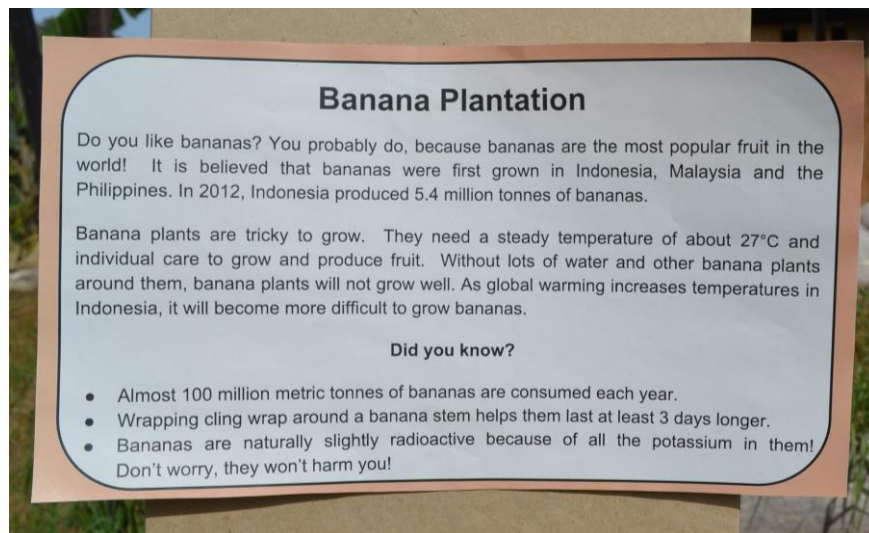


Figure 20: Banana Plantation Sign

The banana and rice plants were selected as starting points based on their availability in the Indonesian cultural village and for their significance in the lives of the Indonesian population. This connection was discovered through research and discussions with

Indonesian students. Bananas originated from Indonesia, Malaysia and the Philippines (Tropical Permaculture, 2016) and will become significantly harder to grow as temperatures rise due to global warming and climate change. Rice is the most prominent crop in Indonesia, grown by 77% of Indonesian farmers (Ricepedia, 2016). An average Indonesian will eat 114 kg of rice per year (Indonesia Investments, 2016). Both of these plants are important to the Indonesian culture and were consequently utilised as a segue to present significant environmental issues affecting Indonesia and Australia in this exhibit.

After learning about bananas, the visitor is guided to the deforestation sign on the opposite end of the village. Once there, the visitor learns about deforestation problems in Indonesia and how they relate to Australia. At this sign, the visitor is encouraged to learn about sustainable wood cutting methods through an interactive puzzle. The puzzle shows the visitor the difference between conventional wood cutting methods, which waste portions of the tree, and radial wood cutting methods, which use the entire tree. This station also explains what Indonesia is currently doing to help combat the problem of unsustainable woodcutting.



Figure 21: Deforestation Sign

The four environmental problems, including deforestation, global warming/climate change, water pollution, and mineral mining, were all selected based on survey results and information shared by the university students. Research was done on the topics highlighted by the survey results to further support the data.

Land issues were the most common answer provided on environmental issues affecting Indonesia, according to the survey results described in Chapter 4. Deforestation, included under this large unifying topic of land, was highly recognised by the Indonesian university students. Additional research revealed that Indonesia is home to 10% of the world's rainforests, but Indonesia's forests are being cut down at the fastest rate in the world (Heath, 2014). Approximately 840,000 hectares of forest were cut down in 2012 alone (Vidal, 2014).

Global warming and climate change are seen as the most significant environmental issues affecting Australia according to surveys of the general public. This is not just an issue in Australia, but affects the entire earth. Further research supported the validity of these survey results, marking the year 2020 as the year in which irreversible climate change will

affect Manokwari, Indonesia. Effects on Jakarta will likely follow by 2029 (Bettinger, Miles, & Fisher, 2013).

Water pollution was a key issue stressed in the roundtable discussions with Indonesian students. Survey results from the general public and the Indonesian community both presented pollution as the second most significant environmental issue in Indonesia. These results were reinforced with research performed on Indonesia's waterways, which include the Citarum River. This river flows through Jakarta and is the most polluted river in the world, containing so much trash that the water is not visible (Worst Polluted, 2016). Approximately 3.2 million tonnes of trash from this river float out to the ocean each year (The Jakarta Post, 2016).

Mining was also a major topic presented at the roundtable discussions with the Indonesian university students. The students told of large companies moving in and offering better wages to those willing to work in mines. These mines are harmful to the environment, causing pollution and deforestation. After further investigating this issue, it was discovered that these mines excavate farmland and contribute to contaminating various bodies of water, making them too acidic for fish and plant life (Ives, 2015). Mineral mining is a considerable issue due to the large number of illegal mines and the presence of the world's largest gold mine in Indonesia (Jamasmie, 2016). These mines produce the metals necessary for mobile phones utilised by millions of individuals throughout the world. These four topics presented in the exhibit encompass the major issues presented by the survey data and the roundtable discussions.

Once the visitor has read the display and utilised the interactive puzzle, the story card prompts the individual to turn their card over to read about how deforestation affects Wati's life on the banana farm.

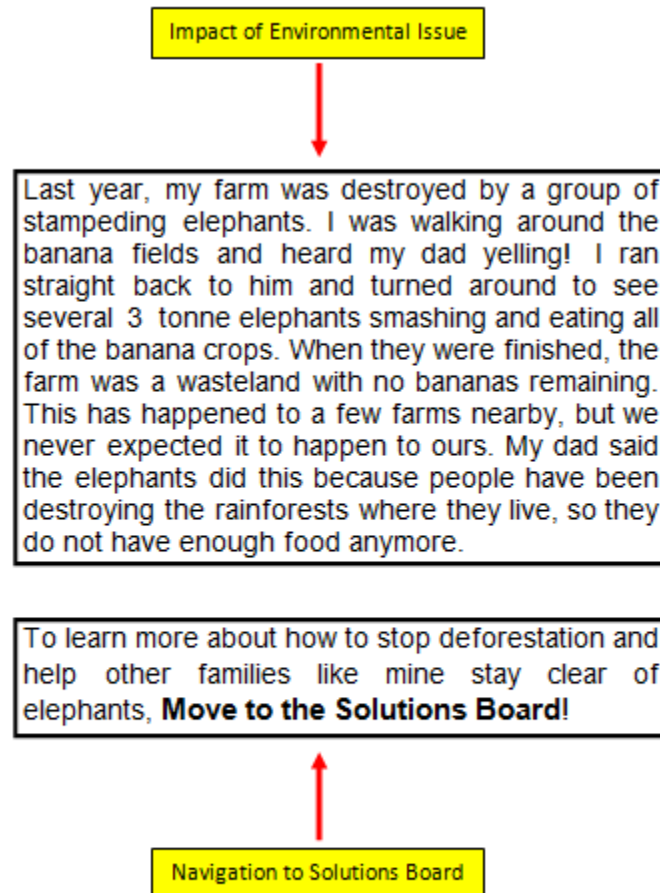


Figure 22: Back of Wati's Story Card

Finally, the card guides the visitor to the solutions board to learn about what he/she can do to combat deforestation in Indonesia and Australia.

The solutions board presents actions that the visitor can take to combat deforestation and the three additional environmental issues presented on the other paths. The board also utilises interactive components and graphics to draw visitors' attention. Levey stressed the importance of showing visitors how they can make an impact so that they are more willing to act (Levey, 2016). One idea Levey presented was to have visitors make a promise publicly (Levey, 2016). For this reason, a whiteboard with the words "I pledge to help the environment by..." was included between the solutions signs. A plastic drinking bottle with an "ingredient" label is portrayed to emphasise the amount of greenhouse gases emitted and amount of oil used to create plastic water bottles in Australia each year. By using reusable

water bottles, the 600 million tonnes of greenhouse gases and 460 barrels of oil used in production of plastic bottles can be decreased (Kingston, 2012). To reduce the impact of mining, a bucket to donate old mobile phones is provided so that the minerals from recycled phones can be reused. Recycling old mobile phones is significant in that the minerals within that phone do not need to be mined, but instead can be reused. A sign prompting visitors to look through a telescope to a solar panel highlights the use of renewable energy. A bag of tree seeds placed on the solutions board encourages visitors to take seeds home to help fight deforestation in Australia. Deforestation can be positively affected if demand for the logged trees decreases. A URL link to a company that sells sustainably cut timber is provided so that Australians can purchase wood from specific vendors in Australia that do not obtain wood from unsustainably logged forests. For comparison, pieces of merbau and bamboo flooring are included to elicit tactile interaction, as seen in Figure 24. Merbau is a type of wood that is endangered because of logging and takes 75 to 80 years to grow (Decking Melbourne, 2016). Bamboo, which can grow in 3 to 5 years, is a much more sustainable alternative that visitors should consider (Marshall, 1992). The goal of presenting all of these solutions is to show visitors that their actions can make a difference for the environment both in Australia and Indonesia. Simple solutions were chosen for the board because Levey explained that people become easily overwhelmed when presented with a complex task (Levey, 2016). Phillips also mentioned the importance of having simple objects to attract visitors' attention (Phillips, 2016).

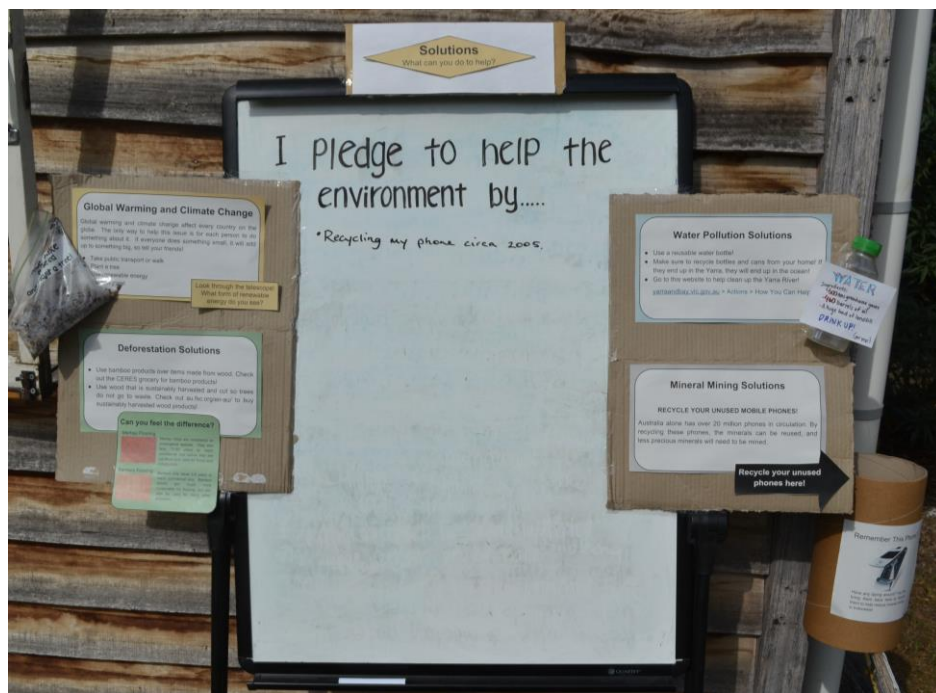


Figure 23: Solutions Board

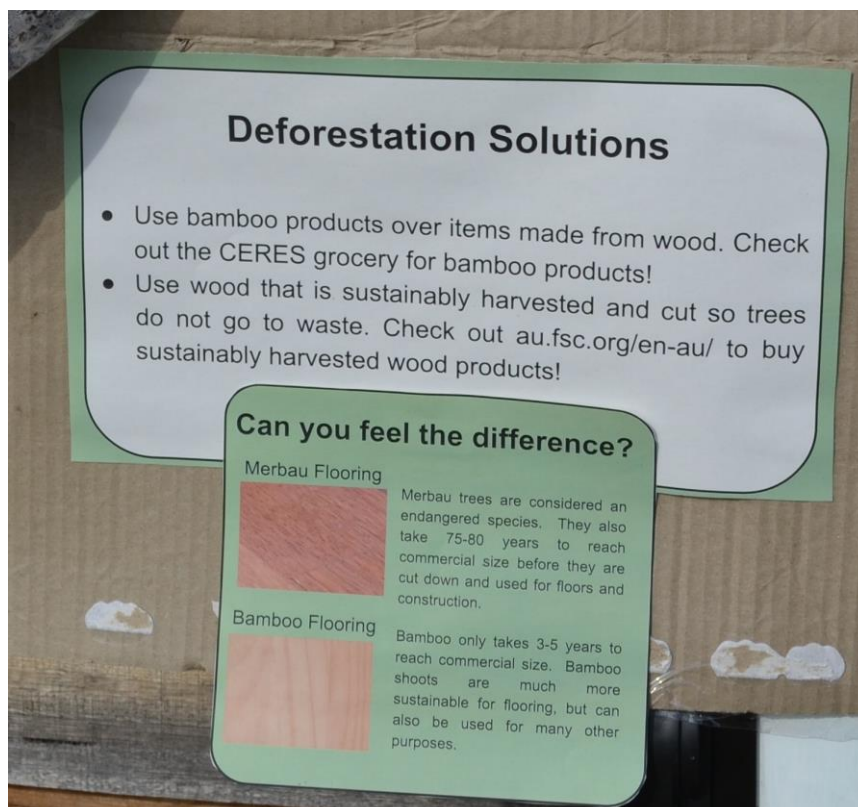


Figure 24: Deforestation Solutions Board

The solutions board is the last station of the exhibit. After completing the journey, the visitor can return the card and leave the village or choose a second card to follow a new path.

Field research was also taken into consideration when choosing the overall design aspects of the exhibit. The exhibit was designed to first establish an emotional connection with visitors, then explain the problems that are occurring, and finally conclude with showing visitors what they can do to help address environmental issues. This technique of engaging the audience with relatable material, then presenting alarming facts and solutions to the problem is utilised by the Melbourne Zoo to engage their audience and promote action (Levey, 2016).

The design also followed an outline used by both the Melbourne Museum and CERES educational programs. The exhibit connects with visitors on three methods of learning: emotional, cognitive, and skills-based (Phillips, 2016). CERES refers to this technique as the Heart, Head, and Hands model. The stories are targeted at visitors' hearts, the information presented on the signs engages visitors' heads (i.e. their minds), and the interactive activities throughout the exhibit encourage visitors to use their hands.

6 Testing the Prototype

Upon completion of designing and manufacturing the displays and interactive stations, the prototype was tested. The content of the designs was tested by the visitors and staff of CERES Community Environment Park to determine the effectiveness of the learning material and the general flow of the exhibit and establish proof of concept.

6.1 Pilot Testing Methods

After the prototype was finished, the signs and activities were set up around the village to allow people to test the exhibit. Fourteen CERES visitors, including families, and seven CERES staff pilot tested the exhibit. Each person chose a card at the entrance of the village and followed one or more paths. The participants were observed by members of the team and asked several questions when they completed the trial. The survey that each subject completed can be found in Appendix K. Before testing, team members stressed to the participants that the exhibit was only a preliminary prototype due to the limitations of time constraints and budget and encouraged honest feedback based on content and ideas rather than construction of the signs and activities. The survey asked participants what they liked and disliked about the exhibit as well as which interactive activities were their favourite and which should be changed. The survey also asked about any recommendations for improvement of the design.

6.2 Pilot Testing Results

Overall, the results of the pilot testing were positive with all participants giving constructive feedback on the actual design and main premise of the exhibit. Many testers took a particular liking to the interactive aspects that required them to lift flaps and enjoyed the connections made between the facts and personal stories. Most CERES visitors also claimed that there were no components of the design that they particularly disliked. CERES staff felt that stronger connections were necessary between the information presented on the signs and story cards throughout each pathway of the exhibit. Comments were also made to include more pictures, which should be considered for future iterations. Some CERES staff felt that the solutions board information was overly crowded and should be spread out.

Recommendations from the testers included adding interactive exhibits, such as a model of terraced rice farming. Indonesian words and phrases should be incorporated into the design to

allow for additional cultural immersion. Requests were also made to strengthen the connection between certain personal stories and the problem at hand, specifically between Anto, a character on a story card, and global warming. This feedback was utilised to provide specific changes that could be made for future iterations of the prototype.

7 Conclusion and Recommendations

The proceeding section of the report summarises the entirety of the project and compares the final deliverables to the project's main goal. A set of recommendations, developed throughout the course of the project, have also been included to further guide the advancement of the CERES cultural villages.

7.1 Conclusion

The primary goal of this project was to enhance environmental awareness for visitors to CERES by developing an interactive educational exhibit to be used in the CERES Indonesian cultural village that incorporated CERES's environmental mission. Utilisation of the cultural villages could thus be extended beyond visiting school groups to the general public. This goal was achieved by a series of steps culminating in a functional design that can be developed further by CERES or a future IQP team.

To start, information about which environmental issues were most significant in Australia and Indonesia was gained through the administration of surveys to various groups throughout Victoria. Information on how to approach the design process was found through interviews with local experts, including individuals from the Melbourne Zoo and Melbourne Museum. The Indonesian perspective was acquired through roundtable meetings with local Indonesian community members. Through data analysis and comparison with the roundtable discussions and interview data, content was generated for the exhibit, and a design was created using current cultural village infrastructure. This design was piloted tested with CERES visitors and staff, which generated feedback for use in future development and completion of the exhibit.

7.2 Recommendations

Based on the evaluation of the prototype, several recommendations were formulated to complete the design of the exhibit. The recommendations detail what future project teams can do to complete the Indonesian exhibit and include suggestions for how to approach the design process for an exhibit in the African cultural village.

7.2.1 Indonesian Exhibit

- **Future iterations should include more visuals.** Since several individuals from the pilot test, and both Levey from the Melbourne Zoo and Phillips from the Melbourne Museum, stressed the importance of images, the final exhibit should include more photos (Phillips, 2016; Levey, 2016). Having an image in addition to, or in place of, some of the text will draw the attention of more viewers and captivate the audience. Pictures, especially of people, tend to create a more empathetic reaction, which could improve the likelihood of visitors taking action on environmental problems (Levey, 2016). All pictures should have labels associated with them, so the audience is aware of what the picture is depicting.
- **More information sources should be added to the signs** so visitors can easily learn more about a topic if they wish. Links to more in-depth information give visitors the opportunity to delve further into a topic that sparks their interests. This recommendation would allow the exhibit to be informative to people with varying levels of environmental knowledge and would thus reflect the survey results, which stated that both the general public and CERES visitors have varied levels of knowledge on Indonesian and Australian environmental issues.
- **Additional Indonesian cultural elements should be added to the display**, such as Indonesian words and phrases. This would increase the cross-cultural awareness between the Indonesian community and the general public of Australia and create more cultural immersion. Connections between Australian and Indonesian cultures and actions could also be improved, particularly in relation to the Yarra and Citarum rivers.
- **The display should include more interactive components.** One suggestion was the creation of a display that depicts the water distribution used in the irrigation of rice fields. Another suggested interactive component was a display of tools used to harvest rice crops. This would improve visitor understanding of harvesting methods and capture visitor attention with simple objects as Phillips suggested (Phillips, 2016). An additional recommendation for the interactive component is to increase the interactive capabilities of the story cards. Currently, these cards have only one photo and text on them, but they would be more intriguing if they required visitors to fold and manipulate them to find out where to go next. It is also important to consider the

construction of all interactive designs when building the final exhibit. As Phillips expressed, these designs should be made child-proof and able to withstand stress from both humans and nature, as they are outdoors (Phillips, 2016).

- **The organisation of the exhibit should be improved.** In the future, the exhibit should follow a defined footpath, directing visitors around the village so that they can easily find the signs. Another idea was that the cards could have a map of the cultural village. Future iterations of the signs should also utilise a better colour coordination scheme with the story cards so visitors can easily find the next sign. These recommendations were developed from the results of the pilot testing surveys, where testers expressed their confusion on which station to visit next.
- **The exhibit should include more initiatives currently in place at CERES** to better connect the exhibit to CERES's goals and actions. This could include the water program, the renewable energy park, and the chook app.

7.2.2 African Exhibit

- **The African exhibit should include water-related issues, such as drought and water management.** This conclusion is based on the survey data gathered and analysed from the general public and CERES surveys. In terms of the African village, this could entail revitalising the water well that is currently in the village. Interactive activities and signage should be developed to incorporate the water well, such as a pumping station to allow children to help irrigate local plant life around the village.
- **The African village exhibit should focus on one region or country in Africa.** Africa is an enormous continent that has a variety of climates and cultures. Focusing the exhibit on one specific region would allow the design to be more in depth on the cultural and environmental issues in that region.
- **More surveys and meetings should be conducted within the African community.** The Indonesian specific surveys and roundtable discussions added vast amounts of insight to the initial survey response data. Similar meetings and surveys performed within the African community would allow for additional insight into the environmental issues affecting the continent.
- **Discussion between the next WPI IQP team and the CERES staff should begin early in the project preparation phase.** This discussion should include consideration of the layout, presentation methods, and themes from the Indonesian

cultural village as well as the exhibit content. In this way, the exhibit developed within the African village can be modelled on the exhibit within the Indonesian village to create a thematically cohesive experience between the cultural villages' interpretive methods.

With these recommendations, future IQP teams, or CERES itself, have the guidance to both improve the Indonesian exhibit and develop the African exhibit. This project serves not only as a design for use in the Indonesian and African cultural villages, but as a staging ground for future projects. This project has opened up the CERES cultural villages to extend beyond the reach of cultural education and has given CERES visitors the opportunity to become global citizens through their increased environmental and cultural awareness.

References

- A Parks Victoria Litter trap on the river catches floating rubbish.* (2009). Retrieved from https://en.wikipedia.org/wiki/Yarra_River#/media/File:Litter_trap.jpg
- Abdollahi, A., Amir, A., & Fardin, B. (2015). Zoning the Quality Assessment of Marvdasht-Kherameh plain's ground water as Agricultural Water usage by Geographical Information System (GIS). *Biological Forum*, 7(2), 103.
- About Bananas.* (2016). *Fairtrade Foundation*. Retrieved 20 April 2016, from <https://www.fairtrade.org.uk/en/farmers-and-workers/bananas/about-bananas>
- Acciavatti, A. (2010). Changes of State: Slow-Motion Trauma in the Gangetic Plains of India. *Architectural Design*, 80(5), 44-49. doi:10.1002/ad.1132
- Agriculture Sector of Indonesia - Indonesian Agriculture Products | Indonesia Investments.* *Indonesia-investments.com*. Retrieved 20 April 2016, from <http://www.indonesia-investments.com/culture/economy/general-economic-outline/agriculture/item378>
- Ancestry | Greater Melbourne | profile.id.* (2011). *Profile ID*. Retrieved 29 April 2016, from <http://profile.id.com.au/australia/ancestry?WebID=260>
- An elementary school student.* (2006). Retrieved from https://en.wikipedia.org/wiki/School_uniforms_by_country#/media/File:Anak_SD_di_Ciwidey.jpg
- Antwi-Agyei, P., Stringer, L. C., & Dougill, A. J. (2014). Livelihood adaptations to climate variability: insights from farming households in Ghana. *Regional Environmental Change*, 14(4), 1615-1626. doi:10.1007/s10113-014-0597-9
- Atlas.media.mit.edu. "OEC - Indonesia (IDN) Exports, Imports, And Trade Partners". N.p., 2016. Web. 1 Mar. 2016.
- Australian Bureau of Statistics. (2010). *Australian Social Trends*. Australian Bureau of Statistics.
- Australian Government. (2016). *Australian farming and agriculture – grazing and cropping | australia.gov.au*. Retrieved 10 February 2016,

from <http://www.australia.gov.au/about-australia/australian-story/austn-farming-and-agriculture>

Australian Government Bureau of Meteorology,. (2010). *Annual mean temperature anomalies for Australia*. Retrieved from <http://www.bom.gov.au/climate/current/annual/aus/>

Australian Government Department of Agriculture and Water Resources. (2016). *Australia's Forests*. Retrieved 10 February 2016, from Australia.gov.au,. (2016). Australian farming and agriculture – grazing and cropping | australia.gov.au.

Australian Government Department of Environment. (2016). *Improving On-farm Irrigation Efficiency*. Retrieved 11 February 2016, from <https://www.environment.gov.au/resource/improving-farm-irrigation-efficiency>

Australian Government Department of the Environment and Heritage. (2005). *Educating for a Sustainable Future* (p. 2). Carlton South Vic 3053 Australia: Curriculum Corporation. Retrieved from <http://www.environment.gov.au/system/files/resources/1b93d012-6dfb-4ceb-a37f-209a27dca0e0/files/sustainable-future.pdf>

Banana Facts for Kids. (2016). *Science Kids*. Retrieved 20 April 2016, from <http://www.sciencekids.co.nz/sciencefacts/food/bananas.html>

Barichello, R., & Patunru, A. *Home | Choices Magazine Online*. Choicesmagazine.org. Retrieved 20 April 2016, from <http://www.choicesmagazine.org/magazine/article.php?article=76>

Benhin, J. K. A., & Benhin, J. K. A. (2008). South African crop farming and climate change: An economic assessment of impacts. *Global environmental change*, 18(4), 666-678. doi:10.1016/j.gloenvcha.2008.06.003

Bertler, P. (2016). Heifer Director of Education Interview. Heifer Farm Rutland, MA.

Bettinger, K., Miles, W., & Fisher, M. (2013). Indonesia in 2028: Permanent and Irreversible Climate Change. *Jakarta Globe*. Retrieved from <http://jakartaglobe.beritasatu.com/news/indonesia-in-2028-permanent-and-irreversible-climate-change/>

- Bradshaw, C. J. (2012). Little left to lose: deforestation and forest degradation in Australia since European colonization. *Journal of Plant Ecology*, 5(1), 109-120.
- Borokini, T., et al. (2014). "Adaptation Strategies to Combating Climate Variability and Extremity among Farmers in Selected Farm Settlements in Oyo State, Nigeria." *Albanian journal of agricultural sciences* 13(3): 32.
- CAIT: WRI's climate data explorer. (2012). *World Resources Institute*. Retrieved 20 April 2016, from [http://cait.wri.org/historical/Country%20GHG%20Emissions?indicator\[\]=Total%20GHG%20Emissions%20Excluding%20LandUse%20Change%20and%20Forestry&indicator\[\]=Total%20GHG%20Emissions%20Including%20LandUse%20Change%20and%20Forestry&year\[\]=2012&sortIdx=1&sortDir=desc&chartType=bars](http://cait.wri.org/historical/Country%20GHG%20Emissions?indicator[]=Total%20GHG%20Emissions%20Excluding%20LandUse%20Change%20and%20Forestry&indicator[]=Total%20GHG%20Emissions%20Including%20LandUse%20Change%20and%20Forestry&year[]=2012&sortIdx=1&sortDir=desc&chartType=bars)
- Caulton, T., & Ebrary Academic, C. (1998). *Hands-on Exhibitions: Managing Interactive Museums and Science Centres*. New York: Routledge.
- Cellia, C. (2012). *Discover Wet Rice Cultivation in Indonesia: Wet Rice Cultivation in Indonesia*. Retrieved 20 April 2016, from <http://wetricecultivationinindonesia.blogspot.com.au/2012/11/wet-rice-cultivation-in-indonesia.html>
- CERES Community Environment Park. (2016). *About*. Retrieved 12 February 2016, from <http://ceres.org.au/about/>
- Chand, S. (2014). *Cultivation of Rice: Suitable Conditions Required for the Cultivation of Rice (6 Conditions)*. *YourArticleLibrary.com: The Next Generation Library*. Retrieved 20 April 2016, from <http://www.yourarticlelibrary.com/cultivation/cultivation-of-rice-suitable-conditions-required-for-the-cultivation-of-rice-6-conditions/25491/>
- Cheslock, N. & Schneider, B. (2003). *Measuring Results*. San Francisco, California: Coevolution Institute. Retrieved from http://pollinator.org/PDFs/webmaster_pdf_final.pdf.
- Citarum River*. (2012). Retrieved from <http://www.taringa.net/post/ecologia/14146193/El-río-mas-sucio-del-mundo.html>

Climate Change - Indonesia | World Resources Institute. World Resources Institute.

Retrieved 20 April 2016, from <http://www.wri.org/our-work/project/forests-and-landscapes-indonesia/climate-change-indonesia>

Creswell, R., & Martin, F. (1998). *Dryland Farming: Crops & Techniques for Arid Regions*.

Crops For Drylands. Retrieved 11 February 2016, from <http://cropsfordrylands.com/wp-content/uploads/Dryland-Farming-Crops-Tech-for-Arid-Regions.pdf>

Cultural Sustainability | City of Marion. (2016). *Marion.sa.gov.au*. Retrieved 4 April 2016, from <https://www.marion.sa.gov.au/page.aspx?u=142>

Damette, O., & Delacote, P. (2011). Unsustainable timber harvesting, deforestation and the role of certification. *Ecological economics*, 70(6), 1211-1219.
doi:10.1016/j.ecolecon.2011.01.025

Davies, A. (2007). *Storytelling in the classroom*. London: Paul Chapman Pub.

De Boer, C. (2010). *Indonesian girl*. Retrieved from <https://www.flickr.com/photos/cuno/4916127846>

Department of Environment. (2016). *Understanding climate change* | Department of the Environment. Retrieved 12 February 2016, from <https://www.environment.gov.au/climate-change/climate-science/understanding-climate-change>

Dessein, J., Soini, K., Fairclough, G., & Horlings, L. (2015). Culture in, for and as Sustainable Development. In *COST European Cooperation in Science and Technology* (pp. 20-25). University of Jyväskylä, Finland: University of Jyväskylä. Retrieved from <http://www.culturalsustainability.eu/conclusions.pdf>

Diwan, P. (2016). *PIB Press Releases*. *Pib.nic.in*. Retrieved 10 February 2016, from <http://pib.nic.in/feature/feyr2002/fsep2002/f200920021.html>

Dijk, A. I., Beck, H. E., Crosbie, R. S., Jeu, R. A., Liu, Y. Y., Podger, G. M., ... & Viney, N. R. (2013). The Millennium Drought in southeast Australia (2001–2009): Natural and human causes and implications for water resources, ecosystems, economy, and society. *Water Resources Research*, 49(2), 1040-1057.

- Dunnack, Emily. (2016). Old Sturbridge Village Interactive Exhibits. WPI.
- EcoTarium. (2016). *About Us*. Retrieved 12 February 2016, from <http://www.ecotarium.org/about-us>
- Encyclopedia Britannica. (2016). *Associative learning*. Retrieved 12 February 2016, from <http://www.britannica.com/topic/associative-learning>
- Environmental Protection Agency. (2016). *Learn About Sustainability | Sustainability | US EPA*. Retrieved 12 February 2016, from <http://www.epa.gov/sustainability/learn-about-sustainability#what>
- FAO Corporate Document Repository,. *Proportion Of Indonesia's Total Export Revenues For Industrial Products In 1997*. 2016. Web. 18 Feb. 2016.
- French, S. (2016). CERES Community Environment Park.
- Friedrich, J., Ge, M., & Damassa, T. (2015). *Top 10 Greenhouse Gas Emitters: Find Out Which Countries Are Most Responsible for Climate Change*. EcoWatch. Retrieved 20 April 2016, from <http://ecowatch.com/2015/06/24/greenhouse-gas-climate-change/>
- Ganges River Map [The river Ganga with its tributaries and distributaries]*. (n.d.). Retrieved March 1, 2016, from <http://www.prokerala.com/maps/india/ganges-river-map.html>
- Gbetibouo, G. A., Ringler, C., & Hassan, R. (2010). Vulnerability of the South African farming sector to climate change and variability: An indicator approach. *Natural Resources Forum*, 34(3), 175-187. doi:10.1111/j.1477-8947.2010.01302.x
- Ghosh, D., & Biswas, J. K. (2015). Impact of jute retting on native fish diversity and aquatic health of roadside transitory water bodies: An assessment in eastern India. *Inżynieria Ekologiczna*, 16(4), 14-21. doi:10.12911/22998993/59342
- Giller, K. E., Giller, K. E., Tittonell, P., Rufino, M. C., & van Wijk, M. T. (2011). Communicating complexity: Integrated assessment of trade-offs concerning soil fertility management within African farming systems to support innovation and development. *Agricultural systems*, 104(2), 191-203. doi:10.1016/j.agsy.2010.07.002
- Global Citizen,. (2016). *Who We Are*. Retrieved 12 February 2016, from <https://www.globalcitizen.org/en/about/who-we-are/>

- Great Pacific Garbage Patch*. (2014). *National Geographic Education*. Retrieved 21 April 2016, from <http://education.nationalgeographic.org/encyclopedia/great-pacific-garbage-patch/>
- Greening Australia,. (2016). *About Us - Greening Australia*. Retrieved 11 February 2016, from <https://www.greeningaustralia.org.au/about-us>
- Growing Bananas - How To Grow Banana Plants And Keep Them Happy. Tropical Permaculture*. Retrieved 20 April 2016, from <http://www.tropicalpermaculture.com/growing-bananas.html>
- Harvey, F. (2016). Eat less meat to avoid dangerous global warming, scientists say. *The Guardian*. Retrieved 24 April 2016, from <http://www.theguardian.com/environment/2016/mar/21/eat-less-meat-vegetarianism-dangerous-global-warming>
- Hasegawa, T., & Matsuoka, Y. (2013). Climate change mitigation strategies in agriculture and land use in Indonesia. *Mitigation and Adaptation Strategies for Global Change*, 20(3), 409-424.doi:10.1007/s11027-013-9498-3
- Heath, J. (2014). *Environmental regulation in Indonesia: Getting to green » Corrs Chambers Westgarth*. *Corrs Chambers Westgarth*. Retrieved 20 April 2016, from <http://www.corrs.com.au/thinking/insights/environmental-regulation-in-indonesia-getting-to-green/>
- Heifer International. (2016). *World Hunger and Poverty - Heifer Mission*. Retrieved 12 February 2016, from <http://www.heifer.org/about-heifer/index.html>
- Heifer International - Heifer Farm. (2016). *Heifer Farm - Volunteer Work Program*. Retrieved 12 February 2016, from <http://www.heifer.org/what-you-can-do/experience-heifer/heifer-farm/index.html>
- Ifejika Speranza, C. (2013). "Buffer capacity: capturing a dimension of resilience to climate change in African smallholder agriculture."
- Ikehi, M., Onu, F., Ifeanyieze, F., & Paradang, P. (2014). *Farming Families and Climate Change Issues in Niger Delta Region of Nigeria: Extent of Impact and Adaptation Strategies*. *Agricultural Sciences*. Retrieved 11 February 2016, from http://file:///C:/Users/Jonathan/Downloads/AS_2014102914131784.pdf

- Improved sanitation facilities (% of population with access) | Data | Table.* (2016). *The World Bank*. Retrieved 20 April 2016, from <http://data.worldbank.org/indicator/SH.STA.ACSN>
- Indonesia - Ricepedia.* (2016). *Ricepedia.org*. Retrieved 20 April 2016, from <http://ricepedia.org/indonesia>
- Indonesia country profile - BBC News.* (2016). *BBC News*. Retrieved 20 April 2016, from <http://www.bbc.com/news/world-asia-pacific-14921238>
- Indonesia Facts, Facts about Indonesia. Maps of World.* Retrieved 20 April 2016, from <http://www.mapsofworld.com/indonesia/facts.html>
- Indonesia Forestry Outlook Study.* (2009) (2nd ed.). Bangkok. Retrieved from <http://www.fao.org/docrep/014/am608e/am608e00.pdf>
- International Energy Agency. (2015). *Key World Energy Statistics 2015*. *International Energy Agency*. Retrieved 26 April 2016, from <https://www.iea.org/publications/freepublications/publication/key-world-energy-statistics-2015.html>
- International Forestry Research (CIFOR). *Journal of environmental management*, 74(2), 111-126. doi:10.1016/j.jenvman.2004.08.013
- Ives, M. (2015). *Indonesian Coal Mining Boom Is Leaving Trail of Destruction by Mike Ives: Yale Environment 360*. *Yale Environment 360*. Retrieved 20 April 2016, from http://e360.yale.edu/feature/indonesian_coal_mining_boom_is_leaving_trail_of_destruction/294/
- The Jakarta Post,. (2016). Indonesia second biggest marine pollutant, after China. Retrieved from <http://www.thejakartapost.com/news/2015/11/06/indonesia-second-biggest-marine-pollutant-after-china.html>
- Juana, J. S., Kahaka, Z., & Okurut, F. N. (2013). Farmers' Perceptions and Adaptations to Climate Change in Sub-Sahara Africa: A Synthesis of Empirical Studies and Implications for Public Policy in African Agriculture. 2013, 5(4). doi:10.5539/jas.v5n4p121

- Karthikeyan, C., Veeraragavathatham, D., Karpagam, D., & Firdouse, S. A. (2008). Native ecological techniques for economizing water usage in dry farming in Tamil Nadu. *Indian journal of traditional knowledge*, 7(4), 627-629.
- Khan, M. R., Voss, C. I., Yu, W., & Michael, H. A. (2014). Water Resources Management in the Ganges Basin: A Comparison of Three Strategies for Conjunctive Use of Groundwater and Surface Water. *Water Resources Management*, 28(5), 1235-1250. doi:10.1007/s11269-014-0537-y
- Kid-Boy-Male- Young-Child*. (2016). Retrieved from <https://pixabay.com/en/kid-boy-male-young-child-633410/>
- Kingston. (2012). *Bottled Water - Cool Australia*. *Cool Australia*. Retrieved 28 April 2016, from <http://www.coolaustralia.org/bottled-water-secondary/>
- Komatsuzaki, M., & Syuaib, M. (2009). A Case Study of Organic Rice Production System and Soil Carbon Storage in West Java, Indonesia. *Japanese Journal Of Farm Work Research*, 44(3), 173-179.
- Kratochvil, P. (2016). *Close-up of rice grains*. Retrieved from <http://www.freestockphotos.biz/stockphoto/5730>
- Lake, P. S., & Bond, N. R. (2007). Australian futures: freshwater ecosystems and human water usage. *Futures*, 39(2), 288-305.
- Landcare Australia,. (2016). *What Is Landcare? | Landcare Australia Limited*. Retrieved 11 February 2016, from http://www.landcareonline.com.au/?page_id=26
- Lewis, M. (2011). Educating Young Adults About Sustainable Development.
- Levey, R. (2016). Designing Exhibits at Melbourne Zoo. Melbourne Zoo.
- Lock the Gate. (2016). *About Us*. Retrieved 28 February 2016, from http://www.lockthegate.org.au/about_us
- Mahapatra, S. (2016). *Indonesia Plans To Set Up Renewable Energy Utility*. *CleanTechnica*. Retrieved 20 April 2016, from <http://cleantechnica.com/2016/01/12/indonesia-plans-set-renewable-energy-utility/>

- Mangili, D. (2015). *Banana trees felled by Cyclone Olwyn*. Retrieved from <http://www.abc.net.au/news/2015-11-30/impact-of-two-degrees-warming-on-farm-production/6981044>
- Mariyono, J. (2008). Direct impacts of integrated pest management on pesticide use: a case of rice agriculture in Java, Indonesia. *Pest Management Science*, 64, 1069-1073.
- Marshall, J. (1992). *Farming Bamboo. The Archives of the Rare Fruit Council of Australia*. Retrieved 20 April 2016, from <http://rfcarchives.org.au/Next/Fruits/Bamboo/FarmingBamboo9-92.htm>
- McDonnell, T. (2015). *This could be the worst climate crisis in the world right now*. *Mother Jones*. Retrieved 19 April 2016, from <http://www.motherjones.com/environment/2015/10/indonesia-climate-change-fires-palm-oil-el-nino>
- MDBA. (2016). *Basin salinity management 2030 | Murray-Darling Basin Authority*. Retrieved 11 February 2016, from <http://www.mdba.gov.au/publications/mdba-reports/basin-salinity-management-2030>
- Merbau Decking – Why It's Unsustainable*. (2016). *Decking Melbourne*. Retrieved 20 April 2016, from <http://www.decking-melbourne.com.au/decks/timber-sustainability/merbau-decking-why-its-unsustainable/>
- Merbau Floor*. Retrieved from <https://commons.wikimedia.org/wiki/File:MerbauFloor2.jpg>
- Mercer, D., Christesen, L., & Buxton, M. (2007). Squandering the future—Climate change, policy failure and the water crisis in Australia. *Futures*, 39(2), 272-287.
- Moreno, R., & Mayer, R. (2007). Interactive multimodal learning environments. *Educational Psychology Review*, 19(3), 309-326.
- Mungai, N. W. (2014). Critical review essay: sustaining native biodiversity through conservation and nature-friendly farming. *Rural Society*, 23, 198+.
- Murray-Darling Basin Authority. (2016). *MDBA*. Retrieved 15 February 2016, from <http://www.mdba.gov.au/>

- Narsimlu, B., Gosain, A. K., & Chahar, B. R. (2013). Assessment of Future Climate Change Impacts on Water Resources of Upper Sind River Basin, India Using SWAT Model. *Water Resources Management*, 27(10), 3647-3662. doi:10.1007/s11269-013-0371-7
- National Landcare Program,. (2016). *20 Million Trees | National LandcareProgramme*. Retrieved 11 February 2016, from <http://www.nrm.gov.au/national/20-million-trees>
- Newsham, A. J., Newsham, A. J., & Thomas, D. S. G. (2011). Knowing, farming and climate change adaptation in North-Central Namibia. *Global environmental change*, 21(2), 761- 770. doi:10.1016/j.gloenvcha.2010.12.003
- Nurfatriani, F., Nurfatriani, F., Darusman, D., Nurrochmat, D. R., & Yustika, A. E. (2015). Redesigning Indonesian forest fiscal policy to support forest conservation. *Forest policy and economics*, 61, 39-50. doi:10.1016/j.forpol.2015.07.006
- Obidzinski, K. and M. Chaudhury (2009). "Transition to Timber Plantation Based Forestry in Indonesia: Towards a Feasible New Policy." *International Forestry Review* 11(1): 79-87.
- The Observatory of Economic Complexity,. (2016). *Products exported by Indonesia (2013)*. Retrieved 28 February 2016, from http://atlas.media.mit.edu/en/visualize/tree_map/hs92/export/idn/all/show/2013/
- Old Sturbridge Village. (2016). *About Us - Old Sturbridge Village*. Retrieved 12 February 2016, from <https://www.osv.org/about-us>
- Old Sturbridge Village Education. (2016). *Education Programs - Old Sturbridge Village*. Retrieved 12 February 2016, from <https://www.osv.org/education>
- Pachamama Alliance,. (2016). *Pachamama Alliance | Protecting the source, inspiring the future*. Retrieved 12 February 2016, from <http://www.pachamama.org/environmental-awareness>
- Pasaribu, S., & Routray, J. (2005). Performance of Farmer-managed Irrigation Systems for Rice Production in East Java Province, Indonesia. *International Journal Of Water Resources Development*, 21(3), 473. <http://dx.doi.org/10.1080/07900620500139192>

The Philadelphia-Camden Informal Science Education Collaborative (PISEC). (1998). Family Learning in Museums: The PISEC Perspective. Philadelphia, PA: The National Science Foundation.

Phillips, K. (2016). Design Process at Melbourne Museum. Melbourne Museum.

Pirard, R. (2008). Estimating Opportunity Costs of Avoided Deforestation (REDD): Application of a Flexible Stepwise Approach to the Indonesian Pulp Sector. *International Forestry Review*, 10(3), 512-522. doi:10.1505/ifor.10.3.512

Pittock, J., & Finlayson, C. M. (2011). Australia's Murray–Darling Basin: freshwater ecosystem conservation options in an era of climate change. *Marine and Freshwater Research*, 62(3), 232-243.

Population of Indonesia. Indonesia Investments. Retrieved 20 April 2016, from <http://www.indonesia-investments.com/culture/population/item67>

Potts, J., Lynch, M., Wilkings, A., Huppe, G., Cunningham, M., & Voora, V. (2016). *The State of Sustainability Initiatives Review 2014* (1st ed., pp. 97-100). International Institute for Sustainable Development. Retrieved from https://www.iisd.org/pdf/2014/ssi_2014.pdf

Production Statistics - Crops, Crops Processed. (2015). *Knoema*. Retrieved 20 April 2016, from <http://knoema.com/FAOPRDSC2016R/production-statistics-crops-crops-processed>

Purnomo, H., Mendoza, G. A., & Prabhu, R. (2005). Analysis of local perspectives on sustainable forest management: an Indonesian case study.

Race, D., Bisjoe, A. R., Hakim, R., Hayati, N., Julmansyah, Kadir, A., . . . Suwarno, A. (2009). Partnerships for Involving Small-Scale Growers in Commercial Forestry: Lessons from Australia and Indonesia. *International Forestry Review*, 11(1), 88-97. doi:10.1505/ifor.11.1.88

Rainwater Harvesting Association of Australia. (2016). *Rainwater Harvesting Association of Australia*. Retrieved 26 April 2016, from <http://www.rainwaterharvesting.org.au/>

- Ratcliff, T. (2008). *Indonesian Girl with Hat*. Retrieved from Production Statistics - Crops, Crops Processed. (2015). Knoema. Retrieved 20 April 2016, from <http://knoema.com/FAOPRDSC2016R/production-statistics-crops-crops-processed>
- Rawlinson, J. (2006). *banaue rice terraces*. Retrieved from <https://www.flickr.com/photos/london/319347366>
- Reyer, C., Guericke, M., Ibisch, P. L.. (2009). "Climate change mitigation via afforestation, reforestation and deforestation avoidance: and what about adaptation to environmental change?" *New Forests* 38(1): 15-34.
- Rigby, D., & Cáceres, D. (2001). Organic farming and the sustainability of agricultural systems. *Agricultural systems*, 68(1), 21-40.
- Rice Facts*. (2016). Retrieved 20 April 2016, from http://www.usriceproducers.com/files/187_Rice%20Facts.pdf
- Rice Production Indonesia*. (2015). *Indonesia Investments*. Retrieved 20 April 2016, from <http://www.indonesia-investments.com/business/commodities/rice/item183>
- Savage, S. (2010). *Climate Change Kills Coral Reefs*. Retrieved from http://adventuresofedthebear.blogspot.com.au/2010_05_01_archive.html
- Simon, N. (2010). *The Participatory Museum*. Santa Cruz, California: Museum 2.0.
- Soils For Life,. (2016). *About | Soils for Life*. Retrieved 11 February 2016, from <http://www.soilsforlife.org.au/about.html>
- Sunderlin, W., & Resosudarmo, I. (1996). *Rates and Causes of Deforestation in Indonesia: Towards a Resolution of the Ambiguities* (1st ed.). Bogor: Center for International Forestry Research. Retrieved from http://www.cifor.org/publications/pdf_files/occpapers/op-09n.pdf
- Suprayogi, B., Sugardjito, J., & Lilley, R. *Management of Sumatran elephants in Indonesia: Problems and challenges - Bambang Suprayogi, Jito Sugardjito and Ronald P.H. Lilley*. *FAO Corporate Document Repository*. Retrieved 20 April 2016, from <http://www.fao.org/docrep/005/ad031e/ad031e0l.htm>
- Sunderlin, W., & Resosudarmo, I. (1996). *Rates and Causes of Deforestation in Indonesia: Towards a Resolution of the Ambiguities* (1st ed.). Bogor: Center for International

- Forestry Research. Retrieved from
http://www.cifor.org/publications/pdf_files/occpapers/op-09n.pdf
- Sustainable. (2016). *Merriam-Webster Dictionary*. Retrieved from <http://www.merriam-webster.com/dictionary/sustainable>
- The Sustainability Hub. (2016). *Cultural Excursions*. Retrieved 12 February 2016, from
<http://sustainability.ceres.org.au/program/student/excursions/cultural/>
- Thompson, H. (1999). Social forestry: An analysis of Indonesian forestry policy. *Journal of Contemporary Asia*, 29(2), 187-201.doi:10.1080/00472339980000311
- Torri, M. C., & Herrmann, T. M. (2011). Spiritual beliefs and ecological traditions in indigenous communities in India: enhancing community-based biodiversity conservation. *Nature and Culture*, 6, 168+.
- Tranter, B. (2010). Environmental activists and non-active environmentalists in Australia. *Environmental Politics*, 19(3), 413-429.
- Tsatsaros, J. H., Brodie, J. E., Bohnet, I. C., & Valentine, P. (2013). Water quality degradation of coastal waterways in the wet tropics, Australia. *Water, Air, & Soil Pollution*, 224(3), 1-22.
- UNH researchers find African farmers need better climate change data to improve farming practices. (2012, April 2). *Space Daily*. Retrieved from
http://go.galegroup.com/ps/i.do?p=ITOF&u=mlin_c_worpoly&id=GALE|A284944148&v=2.1&it=r&sid=summon&userGroup=mlin_c_worpoly&authCount=1#
- United Nations Intergovernmental Panel on Climate Change (IPCC) 5th World Report. (2014). *Climate Change 2014; Impacts, Adaptation and Vulnerability: Chapter 25. Australasia* (IPCC, Trans.). In IPCC (Ed.), (Final Report ed., pp. 101): United Nations.
- University of Melbourne, (2016). *Faculty of Arts School of Culture and Communication*. Retrieved 20 February 2016, from
<http://culturecommunication.unimelb.edu.au/about/staff/assoc-professor-chris-healy>
- Vermont Folklife Center. (2016). *What is Cultural Sustainability? :: Cultural Sustainability Institute :: Vermont Folklife Center*. Retrieved 12 February 2016, from

<http://www.vermontfolklifecenter.org/education/cultural-sustainability/cultural-sustainability.php>

Vidal, J. (2014). *Rate of deforestation in Indonesia overtakes Brazil, says study.* *the Guardian*. Retrieved 20 April 2016, from <http://www.theguardian.com/environment/2014/jun/29/rate-of-deforestation-in-indonesia-overtakes-brazil-says-study>

Villalobos, R. (2011). *Bamboo Texture*. Retrieved from <https://www.flickr.com/photos/planetoftheweb/6000350521>

The Wall Street Journal,. (2015). Indonesia's Rice Consumption. Retrieved from <http://blogs.wsj.com/briefly/2015/05/27/indonesias-rice-consumption-the-numbers/>

Walker, A. Retrieved from <http://gizmodo.com/a-acid-spilling-mine-turned-this-colorado-river-bright-1722726719>

Water catchments. (2016). *Melbourne Water*. Retrieved 20 April 2016, from <http://www.melbournewater.com.au/whatwedo/supply-water/water-catchments/pages/water-catchments.aspx>

Wikipedia,. (2004). *Map of the Murray–Darling basin*. Retrieved from https://en.wikipedia.org/wiki/Murray%E2%80%93Darling_basin

Wilk, J., Andersson, L., & Warburton, M. (2012). Adaptation to climate change and other stressors among commercial and small-scale South African farmers. *Regional Environmental Change*, 13(2), 273-286. doi:10.1007/s10113-012-0323-4

Wingqvist, G., & Dahlberg, E. (2008). *Indonesia Environmental and Climate Change Policy Brief* (1st ed., pp. 3-5, 8-11). University of Gothenburg Department of Economics. Retrieved from <http://www.sida.se/globalassets/global/countries-and-regions/asia-incl.-middleeast/indonesia/environmental-policy-brief-indonesia.pdf>

Wmo.int,. (2016). *2015 is hottest year on record* | *Media Centre*. Retrieved 12 February 2016, from <https://www.wmo.int/media/content/2015-hottest-year-record#overlay-context=fr/content/l'omm-confirme-2015-est-lannée-la-plus-chaude-jamais-enregistrée>

Working in Indonesia. (2016). *InterNations*. Retrieved 20 April 2016, from <https://www.internations.org/indon>

WorstPolluted.org : Projects Reports. (2016). *Worstpolluted.org*. Retrieved 26 April 2016, from http://www.worstpolluted.org/projects_reports/display/109

Wright, I. A., Wright, S., Graham, K., & Burgin, S. (2011). Environmental protection and management: A water pollution case study within the Greater Blue Mountains World Heritage Area, Australia. *Land Use Policy*, 28(1), 353-360.

Wynen, E. (2009). Organic farming in Australia. *The world of organic agriculture-statistics and emerging trends*, 266-271. *Year Book Australia, 2012*. (2012). *Australian Bureau of Statistics*. Retrieved 21 April 2016, from <http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/1301.0~2012~Main%20Features~Water~279>

Appendix A: General Survey



Environmental Awareness Survey



Hello! We are American students working with the CERES Community Environment Park to improve environmental education within their cultural centre. The goal of this survey is to gain a better understanding of Australia's knowledge on environmental topics specifically in Indonesia, Africa, and India to guide our designs. Thank you very much for your time and participation.

1. In your opinion, what is the largest environmental issue in Australia?(in 10 words or less)
2. In your opinion, what is the cause of this issue? (in 10 words or less)
3. What is one thing you have done/could do to help combat the above issue?
4. Please rank your knowledge level on Australian environmental issues.

No Knowledge	Fair Knowledge	Extensive Knowledge
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5. In your opinion, what is the largest environmental issue in Indonesia?(in 10 words or less)
6. Please rank your knowledge level on Indonesian environmental issues.

No Knowledge	Fair Knowledge	Extensive Knowledge
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7. In your opinion, what is the largest environmental issue in Africa?(in 10 words or less)
8. Please rank your knowledge level on African environmental issues.

No Knowledge	Fair Knowledge	Extensive Knowledge
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9. In your opinion, what is the largest environmental issue in India?(in 10 words or less)
10. Please rank your knowledge level on Indian environmental issues.

No Knowledge	Fair Knowledge	Extensive Knowledge
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11. What environmental issue would you like to learn more about? (in 10 words or less)
12. What is your gender?

Male	Female	Prefer not to answer
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13. What age range applies to you?

10-25	26-40	41-60	60
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14. What is your ethnicity? (if prefer not to answer write "no")

Appendix B: Indonesian Specific Survey



Environmental Awareness Survey

Hello! We are American students working with the CERES Community Environment Park to improve environmental education within their cultural centre. The goal of this survey is to gain a better understanding of Australia's knowledge on environmental topics specifically in Indonesia, Africa, and India to guide our designs. Thank you very much for your time and participation.

1. In your opinion, what is the largest environmental issue in Australia? (in 10 words or less)
2. In your opinion, what is the cause of this issue? (in 10 words or less)
3. What is one thing you have done/could do to help combat the above issue?
4. Please rank your knowledge level on Australian environmental issues.

No Knowledge	Fair Knowledge	Extensive Knowledge
--------------	----------------	---------------------
5. In your opinion, what is the largest environmental issue in Indonesia?(in 10 words or less)
6. Please rank your knowledge level on Indonesian environmental issues.

No Knowledge	Fair Knowledge	Extensive Knowledge
--------------	----------------	---------------------
7. What environmental issue would you like to learn more about? (in 10 words or less)
8. What is your gender?

Male	Female	Prefer not to answer
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9. What age range applies to you?

10-25	26-40	41-60	60+
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10. What is your ethnicity? (if prefer not to answer write "no")

Appendix C: African Specific Survey



Environmental Awareness Survey

Hello! We are American students working with the CERES Community Environment Park to improve environmental education within their cultural centre. The goal of this survey is to gain a better understanding of Australia's knowledge on environmental topics specifically in Indonesia, Africa, and India to guide our designs. Thank you very much for your time and participation.

1. In your opinion, what is the largest environmental issue in Australia? (in 10 words or less)
2. In your opinion, what is the cause of this issue? (in 10 words or less)
3. What is one thing you have done/could do to help combat the above issue?
4. Please rank your knowledge level on Australian environmental issues.

No Knowledge	Fair Knowledge	Extensive Knowledge
--------------	----------------	---------------------
5. In your opinion, what is the largest environmental issue in Africa?(in 10 words or less)
6. Please rank your knowledge level on African environmental issues.

No Knowledge	Fair Knowledge	Extensive Knowledge
--------------	----------------	---------------------
7. What environmental issue would you like to learn more about? (in 10 words or less)
8. What is your gender?

Male	Female	Prefer not to answer
------	--------	----------------------
9. What age range applies to you?

10-25	26-40	41-60	60+
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10. What is your ethnicity? (if prefer not to answer write "no")

Appendix D: Interview from Melbourne Museum

The following questions and answers are an excerpt from the interview with Kate Phillips, the Senior Curator Science Exhibitions, at the Melbourne Museum on March 21, 2016. Her answers are paraphrased from notes taken during the interview.

How do you typically begin your design process for exhibitions?

Kate Phillips: Sometimes we start with the space or an idea or have a specific audience in mind that we wish to target. It is important to ask yourself who your audience is, why they are there, and what they want to get out of the exhibit. Once a target audience is selected, get lots of information on them and prototype for that target audience. However, it is important to remember that they won't be the only ones interacting with it. If your audience is kids, they learn well through touching and the other senses. Make sure you have a clear overall goal or idea that you are trying to achieve, but make it specific. Think in terms of cognitive, affective, and skills based learning. This would be how the brain works, what the emotional response is, and what skills you would now know having completed a visit.

In what ways do you design the exhibits to promote change? Can you provide any examples?

KP: Start with understanding where your audience is starting. Do they know a lot? Do they know a little? It is boring if someone tells you something that you already know or already do. Take into account people's emotions. Perhaps they're feeling down if the scope is too heavy and too big for them to do anything about it. Solve this by highlighting successes. Always remember the emotional aspect. Information must be presented in an inspirational and positive way or else the exhibition won't be successful. Using case studies can be a very useful technique. The media is very negative and it'd be better to avoid that type of awareness. We deal with this issue when presenting gloomy factual information. All of these animals are becoming extinct but we focus on each animal's amazing characteristics and then include the sad fact that they are endangered or extinct. It's a good idea to focus on the bigger picture but also offer ideas on how they can make a change at home on the small scale.

Can you provide examples on how to engage an audience and interest them in your exhibits?

KP: Use props! They can be very simple like a picture frame framing a specific area of space that you want the audience to focus on. You could hang a mirror and ask, “who is going to make a difference?” (YOU!) Ask questions about the props to get them engaged. One example we have in the museum is that children turn a wheel to make an exhibit move, which is better than it turning by itself all the time.

When you are considering a new exhibit, how do you prototype and pilot test it?

KP: There are many stages of development behind the scenes before pilot testing is done. Once you feel that your design is good enough to be tested by people you just invite some in and give them time to interact with the displays. It is important to watch them and see what goes on. Some things might go wrong or might not be apparent to the user that you thought were clear. Ask them about it afterwards and get their feedback. Did they learn something? What did they like? What didn't they like?

Can you offer any advice on the actual construction of prototypes?

KP: Think about safety. If children will be interacting with the exhibition, then you want to avoid sharp edges and pinch points. Remember to use an appropriate tone of voice in any writing. You don't want to be boring or patronising. Displays must be easy for people to find and they should all have the same theme. It makes it easier to follow along. If there is a trail, mark it clearly so it is easy to follow. What else could draw their attention away from your exhibits?

Appendix E: Interview from Melbourne Zoo

The following questions and answers are an excerpt from the interview with Rebecca Levey, the Interpretations Manager, at the Melbourne Zoo on March 24, 2016. Her answers are paraphrased from notes taken during the interview.

Could you explain your design process when creating campaigns at the zoo?

First off we do a matrix, and we see what we are trying to do including the following goals. How do we make it fun? It must be fun to engage the audience. How do we do the visual? It can either speak to people subconsciously or be memorable. Sound wise, things have to be either jarring or subtle. Everything has to work towards your one specific goal.

How did you make decisions regarding your gorilla campaign signs?

You have to know what the goal is. For the gorillas it's bringing home a satchel, which is quite specific, and it's specific for a reason. The goal at the zoo is just to take a satchel home, and then from there it will be to recycle your phone. The first batch of signage is personal stuff about the animal so that they, the visitors, can relate to it, to the animals... that make the animal likeable. Getting the audience involved through signage about what they like is important. Then it's what we want them to know about the animal's problem. In the case of gorillas, the actual threat is habitat loss. Then once the audience understands the threat they should be pretty willing to act, and the satchel is right there, easily accessible.

It's also important to remember the actions you want the audience to make require a set of tools. For example, the satchel is the tool for the gorilla campaign and has all the information in it. The instructions are one method of getting people to act. If there is a talk and you get people to promise they'll take a satchel, especially in front of other people, they are more likely to do it. If everyone else is taking one, and can show it, people are more likely to do the same. We also consider the flow of emotion. For example, lemurs are the first thing on the trail because they're fun and make lots of noise, and they prime people for the much more serious gorilla section.

In terms of longer-term change in behaviour, there are slightly different things to consider. The goal for the wiping campaign was to get people to pledge to buy recycled toilet paper every time. The starting point was the same, what about the animal do we want people to

love and like and relate to about the animal? Well birds are harder, but the campaign is about toilets, so it's actually fairly provocative, not necessarily in a negative way. If the feedback is largely good, with a couple bad ones, that's good because it means the display is jarring enough to make an impact, but the results are mostly good.

People could text their first name to a number and their name would show up on the board that says "I pledge to buy recycled toilet paper" which is public and therefore sticks a bit. However, the pledging and texting isn't going so well because it's more private, they consider getting spammed. Another option is getting their promise written down on a little green leaf and that's been more successful.

What would you say makes a successful campaign?

Definitely face-to-face works better than signage, and if you follow the design steps above it should be pretty good. Also, if you make the action at the end really easily accessible then people are just more likely to do it. If the action is linked to a really good cause and there is a relationship built with the audience, then people are much more likely to help you and donate or act. Finding the thing that people connect with is the necessary part. If they don't connect, it won't work.

How do you go about getting feedback/ prototyping or testing your displays?

There are a number of different ways. One is we have a number of research volunteers to get direct feedback. We state the objectives, and then later after it's made we measure against the objectives. Just sitting and watching people interact with our designs is really important.

Do you ever pilot test small scale before putting it in the zoo?

Not really, but we will do that with messages or slogans. A slogan that some of us said could have been taken a certain way was just tested on the public, so we asked and the people said it was fine. It's hard for actual physical things, because sometimes you can spend a lot of money and have it not work out.

In terms of signage, is there any sort of word count or limitations you set ahead of time?

We do not set a limit. We base our signage on the three types of people who will pass through: streakers, strollers, and studiers. You are trying to make the general idea exist in the

title and make each person go one level down. If you get the main idea in the title and subheading, then you're doing pretty well. I'm actually trying to get away from words, using more images, which are much more powerful and are more easily consumed by the audience. Sometimes you can't use just images because the ideas you're trying to get across are too complex, but they are really important. Less is best with text though. It's a real mistake to put a big slab of text on there.

Is there anything right off the bat you avoid in the design process?

Definitely don't try and tell people everything. We want to tell people all about it, and often people make the mistake of assuming that if you tell someone everything they'll be as passionate about the subject as you are, which is almost never the case. Also, don't do anything with technology unless it's really good because it'll be the bane of your existence.

Do you have any interactive exhibits? Do you find that they're helpful or captivate people more?

Yes, there are several, there are some that you can scan products with and we also have a maze. They seem to be helpful, and one of the interesting things is that people want a genuine experience, and they're willing to do something as long as it's really simple. It makes the zoo more relevant and gives people more time to slow down and reflect. The maze is really good. It gives the parents time to stop and read while the kids are engaged in the display. If you can make the space so that the parents can sit, and see their kids, and read, those moments are gold because the parents know their kids are safe and can focus more on the other things like the message of the campaign.

Is there a way to do that with just signage and displays?

I've seen it done in other places where, even on a budget, the signs have two different components, one is geared towards adults and the other is geared towards kids. The kids' portion is more interactive and has a different feel than the part for adults and it usually can work really well.

Do you have any advice for us?

You have to start with being really clear with what your main goal is, and you keep going back and testing anything you make against that. If that is the constant fall back, then you won't lose sight of the goal and it will probably end up working out. Having a case study can be the life of a project. That's actually really good, because it makes the display authentic and real, which people can relate to. You should look into traditional story telling. Look into the ways a story could be told so that you can get your message across. There is the classic hero story, which has a set format, and it gets people every time. If you can use that then it's really good. It's generally pity, fear, then catharsis, which is really just... people relate to that. It's easier to draw people in with other people, because there is an immediate connection.

Appendix F: RMIT and Melbourne University Indonesian Student Meeting

The following questions and answers are an excerpt from the meeting with RMIT and Melbourne University Indonesian students on April 5, 2016. The answers are paraphrased from notes taken during the interview.

What can you tell us about deforestation?

Deforestation is not exclusively caused by Indonesia, because the demand is growing in the US for cheap labour and cheap places to produce those products. The rationale is to make the community more empowered and prosperous, but the environmental concerns are still there. Another issue is that the people can see American standards of living that are 200 years ahead of Indonesia, and they want to catch up, so they say we should have the same opportunities as the US did when we went through the environmental issues.

What can you tell us about unsustainable fishing?

There are issues with how local people catch the fish, and illegal fishing occurs, especially through using chemical products. The fishermen don't necessarily know, and if they know then the problem is money, because if the technique is prosperous then it's very difficult to say no. People use chemicals (fertilisers) that run off and pollute the water in the village and it's really bad. People are also making bombs to catch fish. They blow up the fish with fertiliser bombs and they don't know that that is bad for the environment. They don't have access to the new technologies that are good, but they do have access to technology. People throw most of the waste from Jakarta right into the river and it builds up in the bay of Jakarta. This degrades the fish environment, so the fishermen have to go farther away, so they need more gas. They are poor so they need loans to get gas, and these loans come from loan sharks.

What can you tell us about environmental issues that pertain to water?

The main problem from major cities in Java is waste management. There is not much awareness or knowledge on how to treat the waste. There are problems even trying to teach people to recycle because some people put recycling in a plastic bag, which will break the

recycling machine. People don't really care about the waste; they think the government will take care of it. The system to take care of the waste is there, but the government can't run it, because they don't have enough money or enough motivation to do that. Social issues arise because it's easy for lower class people to get placed next to the landfills. There are issues like flooding, waste management and mitigation, transportation, and all of these issues are getting exacerbated from overpopulation. A lot of water issues are in the city. The city does not have a plan... well there is a plan, but not much implementation. The water is really bad, and the local government wants to change that so it can be a tourist attraction. They want to do this through reclamation. They just want to build new islands and buildings and such. The damage is much worse in that area. There are river issues because the river is in like three different states. The downstream states get all the waste from the upstream states. The river may be pristine up above but then those houses and stuff generate (money for the local governments) but pollution, which goes downstream creating yet another problem. You need water, so they pull it from the ground. This makes the ground sink, and then the sea level is rising, so now the plan is to build a wall to keep the sea out. Also Indonesia is experiencing the incursion of seawater into groundwater.

What can you tell us about environmental issues that pertain to overpopulation?

Planning for this has just started recently because urbanisation has started, and started very fast (with the baby boom). Campos, synonymous with slums, are common types of societies. Rural areas get filled up because it's cheaper to live there, and then they turn into Campos. Some things are good about that, for example the social networking is really good, but environmental awareness and care is bad. In Javanese culture, having a lot of kids is considered prosperous to have a lot of kids. So families in Campo have a lot, people in the city have fewer kids, but there is social pressure when they talk to campo families, "why do you have so few kids?" This, the transition from rural culture to urban culture, is an interesting phenomenon because people had lots of kids to help in the field, but now in the city it's hard to have a lot more kids, so the culture is shifting.

What can you tell us about Indonesia's industrialisation?

In 1945-65, there was really huge political turmoil. Then, there was a new era from 1965-98, the new order development program happened. All the developers tried to push these ideas

and say, “what does it mean to be a well-developed country?” The goal was to meet all of these western standards, meaning prosperity, sufficient food for the people in your country, need to be really in control of the population. Birth control was really successful, there were 2 kids in your family or there were social sanctions. But what happened was that everything, in 1998, that was connected with the Dutch was cut off or banned. People started to talk about human rights issues, environmental issues. This old system got repealed because all that environmental stuff was happening there. The first 5 years after 1998, people were really struggling to look at what types of goals they want, and which goals to prioritise? What does it mean to be having a democracy? What type of country did they want to be? The government was weak, but everyone had a voice, there was a lot of discussion. There was backlash though against big government, since all decisions were made in Jakarta, but this backlash spread out the power, and dissemination of power happened. As the developing countries grow, it’s hard to stop the business from growing because they’re making money. Two of the biggest islands are dealing with this issue. If you don’t have these economics, then poverty is a problem, whereas the environmental issues are happening with economic increases.

What can you tell us about Indonesia's division of power?

Now the power is split. Jakarta no longer makes decisions about big master plans, but decisions about whether or not to make plantations is now in the hands of the governor. There are 300 ethnic groups and each one wants to rule their own land. In the law there is a rule that says a province must have at least 5 municipalities. All these people want to take this land and create their regions. Basically there are a lot of splits because everyone wants to make their own region, so they just split them up.

How can Indonesia from Australia learn from each other?

There is a lot that Australia can learn from Indonesia as well particularly with meat consumption. Indonesians could learn some things from Australia like about owning fewer cars and taking public transport.

How does Indonesia combat their environmental problems?

Some of the campos, or slums, are split off completely from the rest of the world, ignore it, saying this is our life, and it's ok. The media has the majority, which is bad, and then change.org in the West side is really good because it's using social media to get people more aware. They reach numbers for big petitions this way that can start to affect policy. In Jakarta, there is a plan for public transport, and the hope is that people will stop using their cars through the use of this public transport. This also has issues, because the cars are built in Java and money comes from Japan and then there is a whole economic impact. There is a debate between cars vs. trains, and now there is mostly consensus on trains, and the funding still comes from Japan. Japan has the money and Indonesian government does not so they take a loan. Every Sunday in most of the cities there is no-car-day where the streets get closed. In some region there is a program that the government is involved with called the waste bank, where a society collects waste like a landfill. They collect it and get paid for that, they get more money based on the weight. The waste itself will be changed with rice. The mayor introduced this campaign. Basically he said if you elect me I'll get a program going where you can exchange your waste for free rice. Also he promised free healthcare and free education. The waste to rice exchange program is small but it's a good example and the hope is that it will spread. The government works with the national army (TNI) to clean the river. The thing that must happen is to implement the law. The law is there, but it is not being practiced or enforced. For example, if you litter it's a \$100 fine. This isn't realistic for most people to pay or for the government to enforce. Awareness and education are the two most important things. So the young people, combined with the local wisdom, are the hope for this situation because they support each other and implement the local wisdom to make good changes. Apart from all of those bad things, there are a few places that retain their local wisdom and are very environmentally aware.

Appendix G: Victoria University Indonesian Student Meeting

The following questions and answers are an excerpt from the meeting with Victoria University Indonesian students on April 6, 2016. The answers are paraphrased from notes taken during the interview.

What can you tell us about environmental issues that pertain to land?

In West Java, in particular, there is a huge push towards industrialisation. The country is transforming from agriculture to industrialisation and land is being sold to build factories. The government presents a big problem within these issues. Companies come to Indonesia and tell the government they need huge plots of land to build plantations or mines, and the government approves their land requests without determining which specific lands will be granted. They lands that are used for plantations can be located near the sea or by rainforests and can even overlap with other plantations. Government officials often take these lands from individuals without consulting them or with only consulting the village leaders. Because many village members do not have deeds even if they live on the land and have lived on the land for generations, the government justifies its actions. There is also a growing mining problem. More power plants are being created to allow for more mining, and the government is not regulating small illegal mines. These illegal mines often only interact with the heads of the villages and do not follow government protocol or regulations. Large mines are more heavily regulated by the government, but have a tendency to bribe and buy their way out of situations. Problems associated with these issues include pollution due to the plantations' proximity to catchments and water sources, destruction of springs and water sources, and deforestation of a nation of which 70% of its land was forest before the palm oil and mining industries developed. Some of the things Indonesians have done in response to these problems are to practice local wisdom and develop legislation. Some of this legislation dictates that mining companies must plant a tree for every tree that is cut down and that 20% of the nation must be forest.

What are some of the environmental issues that have affected the cities and their surrounding areas?

In East Java in particular, the population has skyrocketed and the land is being used for development. Rice fields are being turned into housing. One problem that facilitates this issue is that fact that society does not want to live in apartment housing because they feel that it does not provide a proper home. Society prefers to live in individual housing. This requires more land and also creates more environmental issues. Flooding problems have developed because this increase in housing eliminates natural ground drainage.

What can you tell us about environmental issues which pertain to pollution?

In Indonesia, there has been a push towards industrialisation because this industry offers increased wages. Fishermen, for example, receive huge increases in wage to switch professions and work in the mines. This industrialisation creates pollution in the water sources. Many factories and mines dump chemical waste directly into river without treating it. The lack of adequate sewage systems in major cities, like Jakarta, and poorer households also means that this sewage waste goes directly into the river systems. Although there are regulations on water quality, they are not enforced and many bodies of water are not up to code. In certain instances, the government has taken judicial action against industry and has won, but there is permanent environmental damage on the river systems.

What can you tell us about environmental issues that pertain to waste?

In West Java and Jakarta, 40% of waste that is produced is not removed from the city. The country is not ready to combat the problem because the urban infrastructure is not present, and there is a lack of awareness. Citizens have no problem dumping their waste in public places.

What can you tell us about environmental issues which pertain to industry?

Most companies are not concerned about the environment. Over the last 5 years, the concept of social responsibility has developed within these companies, but this is a new development. The government and industry has been focusing on how to minimise disparities between regions by creating infrastructure in developing regions.

What are some of the political issues that affect the environmental problems within Indonesia?

In Indonesia, the Head of Regency grants land requests to companies. The term in office is 4 years for this position. Around re-election time, the Head of Regency gives more land grants to receive more money from the companies to campaign and to gain popularity with the people for the election.

What are some of actions Indonesia is taking to counteract their environmental issues?

The government has made it illegal to export mining products for processing. This has decreased the amount of illegal mining because the products must be processed in Indonesia. Additionally, the government is investing in infrastructure and governance by developing landfills and increasing awareness. New programs are being introduced into school systems to increase awareness within the student body, and local wisdom is being reintroduced into the villages. Geothermal energy is being developed and utilised in certain parts of the country and solar panels have been installed on 1,000 islands to replace diesel power with solar power and hydropower. There has been a big push to reduce carbon emissions and use geothermal waste as heat sources. The government is also trying to attract more private sectors to the country to create more solar panels and electricity plants by providing incentives if large solar plants are created. Many initiatives have also been developed to combat deforestations. There are annual replanting programs started by the government, and litigation, which states that companies must replant trees after they forage them. Rice and bamboo plants are also planted on the riverbanks to maintain water springs and prevent erosion. In certain tribes, there are sacred areas, which people cannot utilise and couples are required to plant trees when they wed.

In your opinions, what is the most significant environmental issue in Indonesia?

Answers to this question include: palm oil, deforestation, waste management, clean water, pollution, and poor urban infrastructure.

Appendix H: Monash University Indonesian Student Meeting

The following questions and answers are an excerpt from the meeting with Monash University Indonesian students on April 11, 2016. The answers are paraphrased from notes taken during the interview.

What are environmental problems in Indonesia relating to the land?

There are so many issues and so many ethnic powers/cultures within Indonesia. Indonesians have a tradition of living in harmony with nature. Each culture has their own reference or style of how to live in harmony with nature. It is better to focus on solutions to the many diverse environmental issues in Indonesia and focus on local wisdom. This is better than just making a list of the problems.

Indonesia has the 4th largest population in the world. In Indonesia there are around 240 million people, and geographically these people are mostly concentrated on the Java island. There are 36 million people just on the island of Java whereas in Australia there are 26 million for the whole continent. So comparatively East Java is very small and has much higher population density. The large population causes problems for people and limits available space to live. In Malang, they are relying on agriculture for a living, but now everything is moving towards housing. Also in Indonesia there is a tradition where people like to have a lot of children. There is a saying that if you have more children you will have more fortune. This may not be true, but most people have at least two children or probably more, and they have already moved from agricultural land to the city. Not more than 10 years ago, the house that one student lived in in Malang was rice field. Most of these rice fields have been transformed into housing now. If you have a lot of money you can have a big house, but if you don't, then you live in a cluster of like 15 houses and all have the same name like a little neighbourhood. Demand is very high because the population is so high. So the biggest issue is population versus space to live.

Another of our big issues is forest fire, which affects Indonesia as well as Malaysia. The wind blows the smoke that is made to Singapore, and Singapore is covered in smoke for a month or maybe more. Most of this smoke coming from the fire is from deforestation. Different from

Australia where forest fire is from natural occurrences, in Indonesia it is often a human factor. People set fire to the forest to make room for plantations. The real cause of the problem is that the number of forests in Indonesia is shrinking, and all of these issues are tied in with economic issues.

What are solutions to environmental problems in Indonesia?

In Surabaya (Makassar as well) due to a decree from the local government, all people have to pay for plastic bags, except when shopping in a local market. If people want to use plastic bags they pay 200 rupees. One time at a shop at night a lady, who was not of high rank bought some stuff, and the cashier asked if she wanted to spend the money on the bag. The woman was offended, because she wanted people to see she could pay for it. So that lady felt her appearance took precedent over the environment.

Another example is the garbage bank. It's a place where people bring local garbage and recycling and there they will get paid 200-500 rupees for their separated garbage. It was hard to get people to separate their trash and recycling until there was a financial incentive. Now they get paid and there is a lot of recycling. Also, the garbage doesn't have to be picked up by the garbage man because the people bring it to the garbage bank. It's a good thing, and has been very successful.

Within schools, green ideas and environmental lessons are already infused in the curriculum. Kids from primary school up through high school are already being taught good environmental practices like recycling and how to make compost, and how to garden. They are even learning how to distinguish between garbage and recycling, how to make compost, and how to garden. The kids are learning about nature. For example, if kids learn about flowers, they aren't going to just destroy flowers that they see. One example is giving the presenters or lecturers flowers, and those are flowers that you have to water every day. There are also environment ambassadors on some campus, in the school levels and also even on the national level. There are some people that come to schools who are trained in environmental issues and solutions. There is even a government program that makes a competition (in East Java) that pits schools against each other for who can be the most environmentally friendly. Competition is one really good way to promote environmental learning and things because

people are proud of where they live and they like competition. There used to be a lot of billboards in Jakarta and Surabaya, but now educated people are beginning to get rid of them and clean up the city.

One student comes from Lampo. His colleague was teaching English there and he has a unique way of punishing students. Many students frequently break the rules like submitting a paper late, and they are required to donate a tree to the lecturer, to him. In the end the students are asked to plant the trees everywhere. This is really important because lecturers are promoting environmental practices through punishments so we can help save the world.

In West Java the women and men live in mountainous areas, and do terraced rice farming. This technique, which is a large part of Indonesian heritage is known as Supak. It is cascade style farming in the character of a waterfall and people are trying to live in harmony with nature. The rain that falls on the top is used and then goes down to the next level and so forth and all of it gets water. It is a social arrangement. It's the villagers who decide who gets water in what order. Farmers also plant different kinds of plants on these fields. It is also the solution for flooding because the farms absorb water and they don't allow a big amount of water to flow all at once. This practice has a lot of benefits, and is not used in Australia. Farmers also try to use compost to put in their fields. Then when it rains the water is clean and picks up some of the compost and goes to the fishpond where the fish get that natural nutrients, so then they have fish to eat too.

An example of something the nation is doing to solve this is a project from the government to follow the Citarum River, to the source of water. The project involved walking from the source to the city to examine how people along the river live with and use the water. The project is very important for city planning. The project discovered that in some areas, mountains where there was a big lake surround the river, but now there is a city there. Naturally this land should be a body of water but now there is a city. Around 100 years ago there were many swamps around the river, but now it is housing. This project tried to move some people away from the river, and build a reservoir. The governor gave people living close to the river two choices He said you can move, or you can stay and die in the floods. This is how the leader got people to move. The poor people moved to apartments and now it's better. This project also looked at why people throw their garbage in the river. They looked at the landscape, and tried to understand how nature works and how to best exist in

nature. The river should be recovered first, and it's improving, but in the end there are some areas where it is very hard to avoid floods.

In Bali you cannot build buildings taller than a certain height, and this wisdom will help when you think about a tall building. Everyone in that building needs water and food so it's just compressing the needs of people into one area. So it's not good but the terracing and social agreements will be really amazingly helpful in the future. Personal wisdom, local wisdom, and cultural wisdom will be invaluable.

There are some groups like that in Java who isolate them and live without electricity, like the Amish. In East Java and Tonga there are those who live in these famous tall structures. In many cultures there are people in these groups who preserve an older way of life, which is usually quite harmonious with nature. In the south end of Sumatra there is Lambo. Supak is related to Bali. No building there is taller than a coconut tree. Supak is the traditional way to distribute water between farmers. There is also a village called Campo Naga, which was engineered by the Sudanese people, and they stay away from modern things like electricity. When dealing with nature the Sudanese people know when they should start farming, and they know when it's okay to go outside and sell their products. Somehow in the urban cities, a lot of people forgot about this local wisdom.

Taboo is also a way to preserve nature. In Central Java there was a lake uphill from one student's home. There are catfish in this lake that people don't dare to take from the river because there is taboo. People believe that if you take the catfish away from the lake, there will be diseases and calamity, so people don't touch them. This taboo can also be found in other places and people are forbidden to touch, or move things from the way it is. But in the case of this town there are things that are preserved because of taboo.

The government has set up a policy where people must have a trash bag in their car to limit littering. Now every time when the police stop a car in Bandoon city they will check your car to see if you have garbage pail in it. If there isn't one you can be fined because it was so common for people to just throw their garbage out onto the street when driving.

Another example is that there is a cigarette factory, and it is trying to help by supporting a water program. The worry is conservation of water for the people and the company wants to help. The mayor is really visionary in terms of the environment. They have a mission that

they want to make the city like Singapore. This is all starting from the need to conserve the water. It is like a nurse for the city. They also have a program, where they will be planting grain all over the place so that people will have water and grain. So companies are getting involved too which is nice.

Are the rice farms getting turned into housing for a particular reason? What's the cause?

It's mostly because of the demand. The number of people has been increasing significantly so the need for housing increases every year and what was farmland around 10 years ago is now becoming more urban, just because of the demand.

One of the patterns is that there are new streets that are built, and flanking that road is land. Even before the road is built, the flanks of the road have already been sold. This happened to a village about 600 km away from Surabaya. People move from some agricultural villages, leave and move to the city and no longer feel the need to keep the land. People then sell their land and so as more and more people leave and sell their farmland and then it gets developed. So another cause of this urbanisation is migration. This also happens if there are siblings who leave and the remaining siblings sell the extra land. On the Citarum river bank, people build houses, and that makes the river smaller and smaller and narrower and that eventually blocks the flow of the water.

Does the change in water patterns regularity affect farmers?

Yes, the government is starting to understand that the city is pushing into the canal and the flow gets faster and faster. Since everyone is trying to build and urbanise local wisdom has been lost, but now the city planning is trying to fix this. City planning is also causing other problems. To recover the river it will be very expensive, costly, because the government has to move the people who are already living there.

Do you have and other questions or comments on this project?

Engaging people is very important in exhibits through activities and lectures. Using online resources like social media can also help engage people. This could also help get people to come to the exhibit.

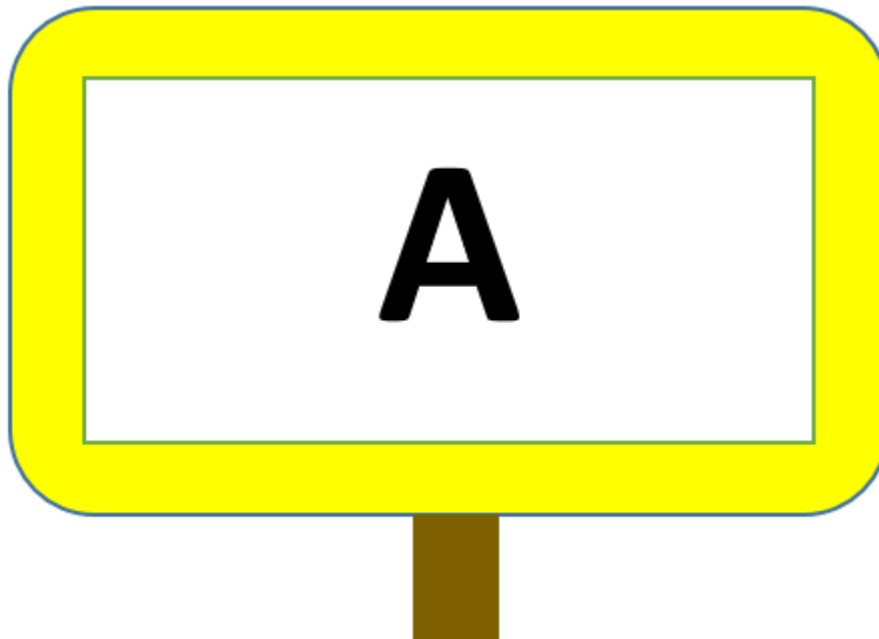
Appendix I: Exhibit Signs

The following images are the content presented on the signs for the Indonesian prototype. Some signs represent an entire board, while others are mock ups of interactive components in the prototype.

Below is the entrance sign that should be posted either outside or directly inside the village doors.



The banana plantation sign is comprised of only picture providing factual information.



A.

Banana Plantation

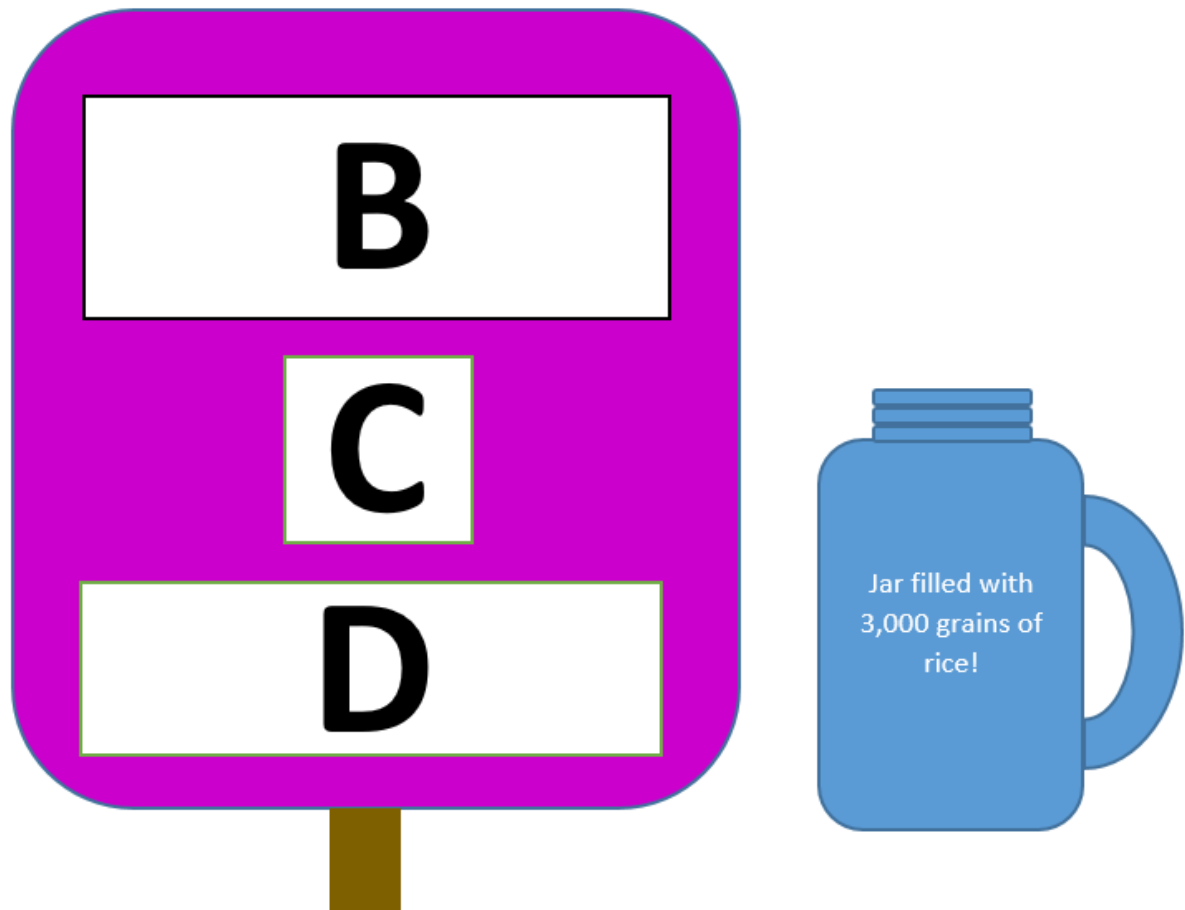
Do you like bananas? You probably do, because bananas are the most popular fruit in the world! It is believed that bananas were first grown in Indonesia, Malaysia and the Philippines. In 2012, Indonesia produced 5.4 million tonnes of bananas.

Banana plants are tricky to grow. They need a steady temperature of about 27°C and individual care to grow and produce fruit. Without lots of water and other banana plants around them, banana plants will not grow well. As global warming increases temperatures in Indonesia, it will become more difficult to grow bananas.

Did you know?

- Almost 100 million metric tonnes of bananas are consumed each year.
- Wrapping cling wrap around a banana stem helps them last at least 3 days longer.
- Bananas are naturally slightly radioactive because of all the potassium in them! Don't worry, they won't harm you!

The rice planation sign is comprised of pictures B, C, and D. Picture B provides factual information. Picture C is the image of a terraced rice farm. Picture D is an interactive display that should be made as a flap to reveal the answer of 3,000 grains. The jar of rice should be next to the sign.



B.

Rice Plantation

Do you like rice? Not as much as Indonesians! On average an Indonesian eats 114 kg of rice every year! Indonesia is the third largest rice producer in the world. Rice is the main crop and is grown by over 75% of all farmers.

In Indonesia, rice is primarily grown by flooding a field, called a paddy, with water. After the rice beds are flooded, rice seedlings are transplanted into the beds. After 100-130 days, the paddies are drained to harvest the rice. When farmers pick the rice they must do it by hand, using simple tools like knives. Take a look at the rice crops behind you!

Did you know?

- Rice grows best in a tropical climate with temperatures ranging from 20-27 degrees celsius, but climate change may drastically affect rice growth. In Indonesia, rice yields will drop 10% for every 1 degree Celsius the average temperature rises.
- Many rice farms are located in mountainous areas where farmers use a terraced technique (like in this picture) to efficiently use the land.

C.



Terrace rice farming

D.

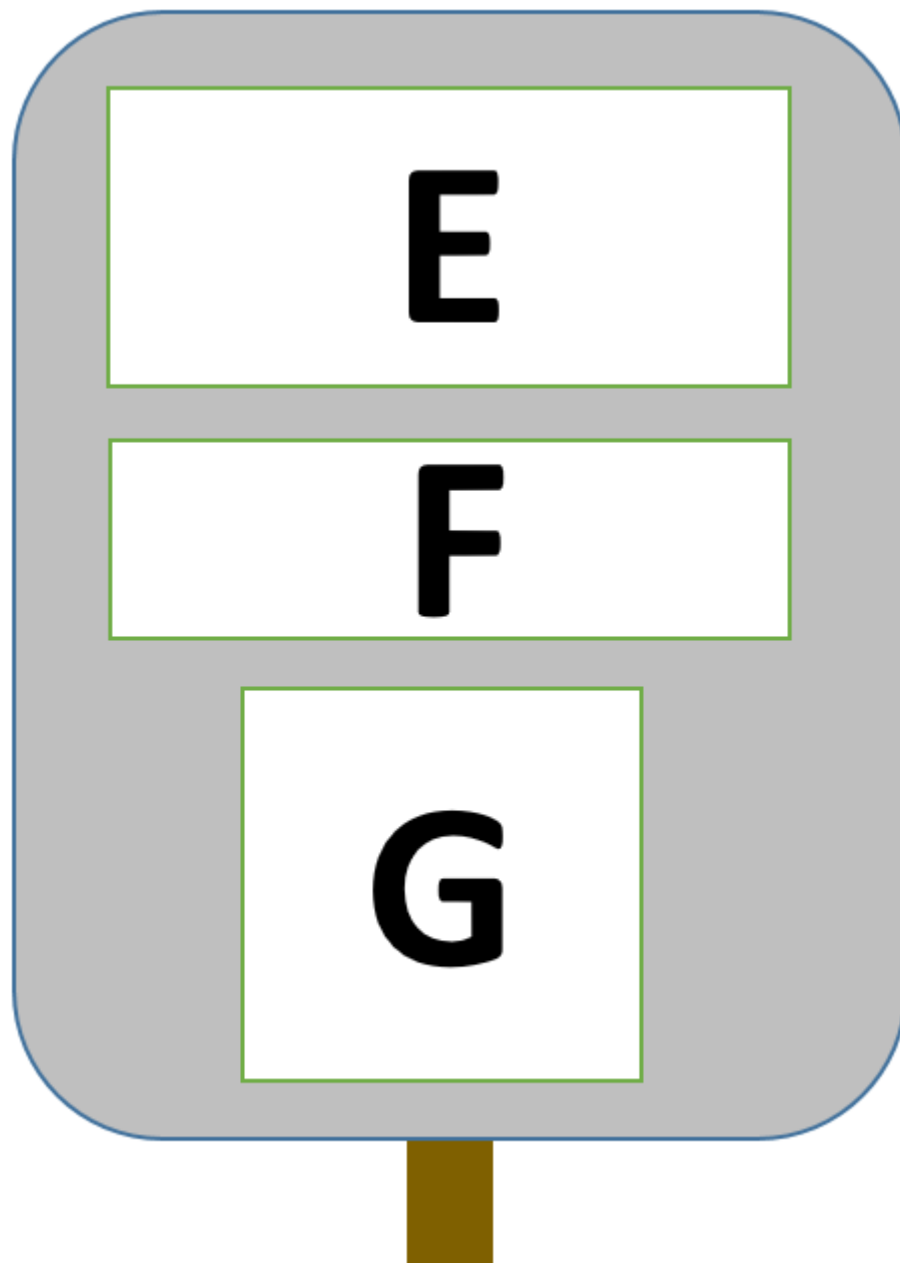
How many grains of
rice can grow from
one seed?

Take a look at the jar and
make a guess! Then, flip the
tab to find out.

3,000 Grains!



The mineral mining sign is comprised of pictures E, F, and G. Picture E presents factual information on mineral mining. Picture F is a flap that shares what Indonesia is doing about mineral mining. Picture G is another flap that reveals an image of a river with dead fish. The picture label should be on the back of the “Flip up” flap.



E.

Mineral Mining

Do you ever wonder what makes your mobile phones do amazing things? Without precious minerals, like gold and coltan, your phone wouldn't even be able to turn on!

Indonesia, Australia's closest neighbour, is home to the largest gold mine in the world as well as numerous illegal mines. Indonesia's metal mining industry is taking in more than \$13 billion AUD each year from the precious minerals that can be found in your mobile.

Why is this a problem?

- This type of mining requires more water than any other type of mining, and water tables in the surrounding areas are often drained. This means that farmers do not have access to water to sustain their crops!
- Lands surrounding mines experience increases in flooding because the mines remove the topsoil that absorbs rainwater.
- Chemical pollution from mining causes some rivers around mines to have a pH of 3.0 (that's the same as vinegar!). This means that the fish in the river cannot survive!

F.

What is Indonesia doing about this?

- Since 2012, the Indonesian government has required all mining companies to complete environmental plans and assessments before they can even start digging. Companies must also apply for Environmental Permits.
- Since 2014, the government has required all mining products to be processed domestically. This has decreased the amount of illegal mines in the country, which are some of the biggest offenders of polluting the environment.

G.

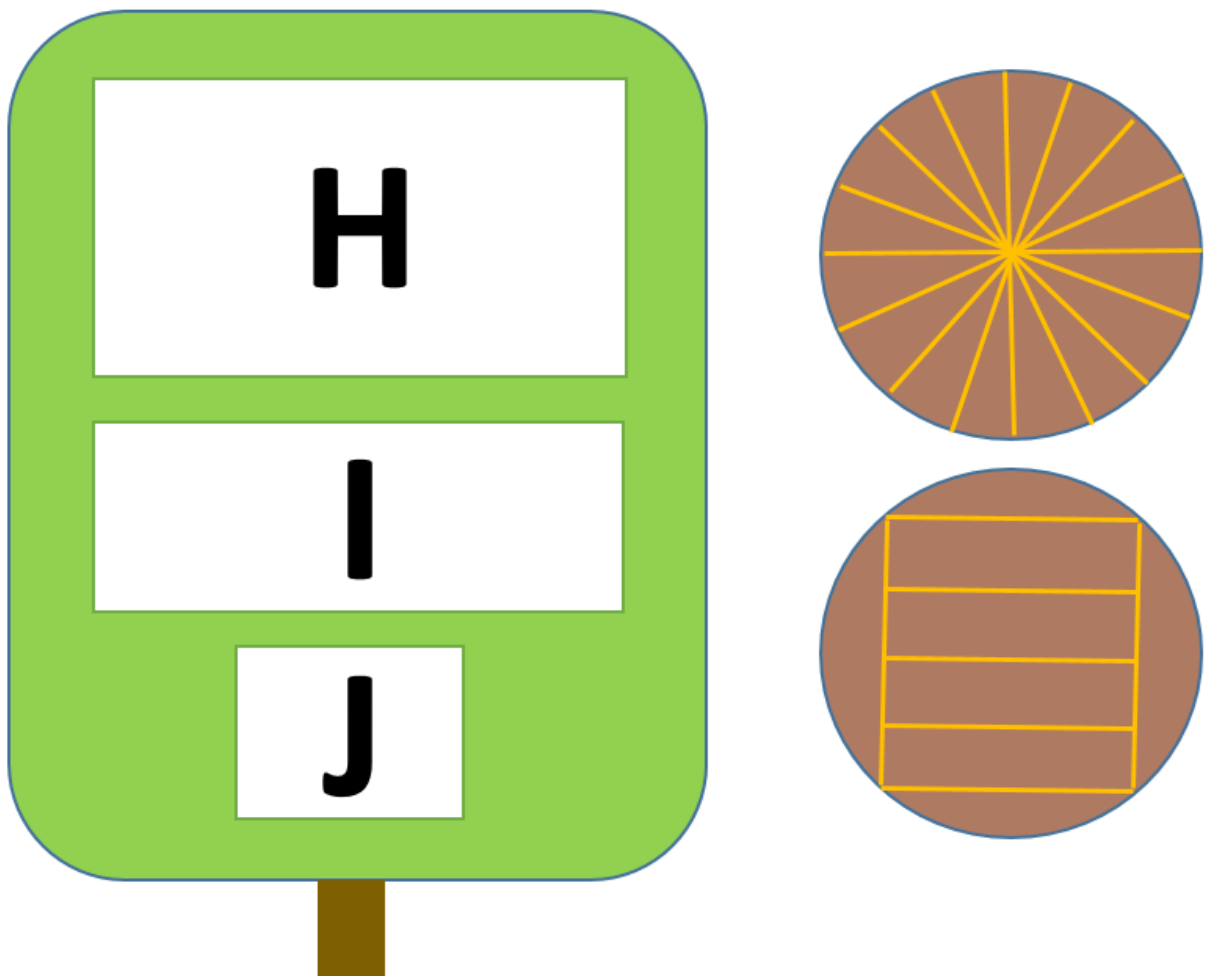
Flip up to see
what mining
pollution does to
fish



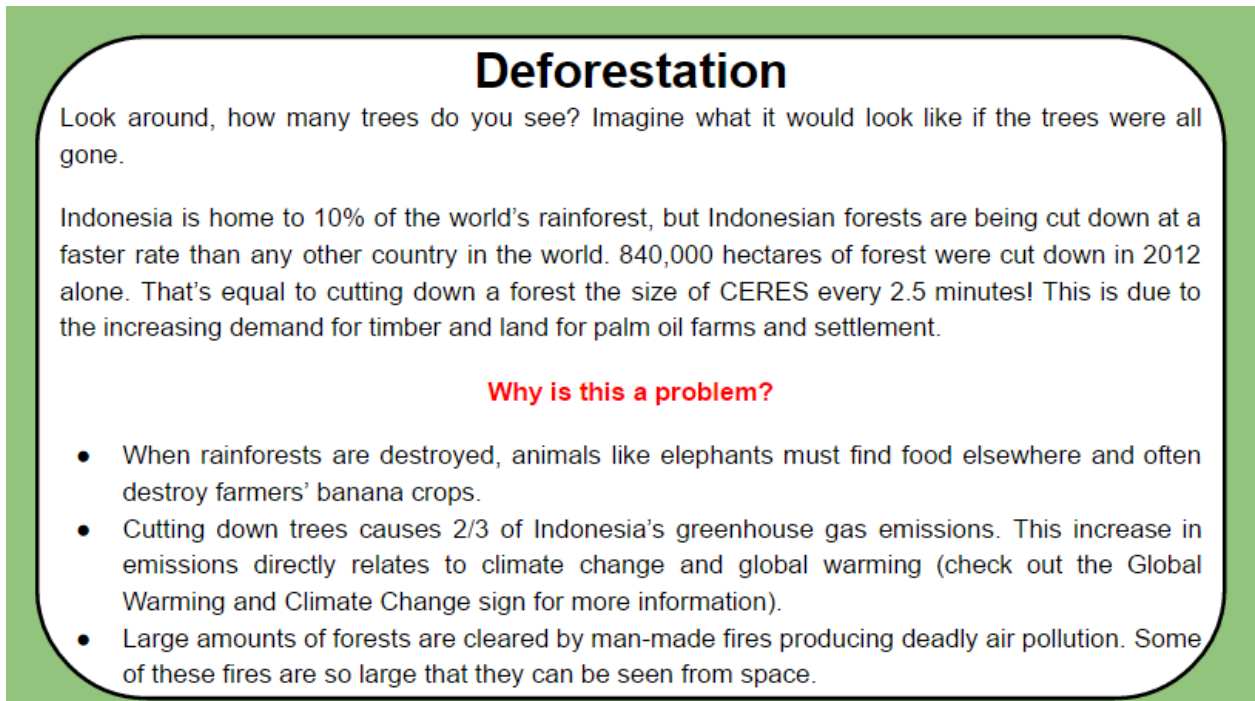
Citarum River, Indonesia

This river contains lead from local
mines at more than 1,000 times the
recommended level.

The deforestation sign is comprised of pictures H, I and J. Picture H presents factual information on deforestation. Picture I is a flap that shares what Indonesia is doing about deforestation. Picture J is instructions for an interactive display involving wood puzzles cut from wood as seen below.



H.



Deforestation

Look around, how many trees do you see? Imagine what it would look like if the trees were all gone.

Indonesia is home to 10% of the world's rainforest, but Indonesian forests are being cut down at a faster rate than any other country in the world. 840,000 hectares of forest were cut down in 2012 alone. That's equal to cutting down a forest the size of CERES every 2.5 minutes! This is due to the increasing demand for timber and land for palm oil farms and settlement.

Why is this a problem?

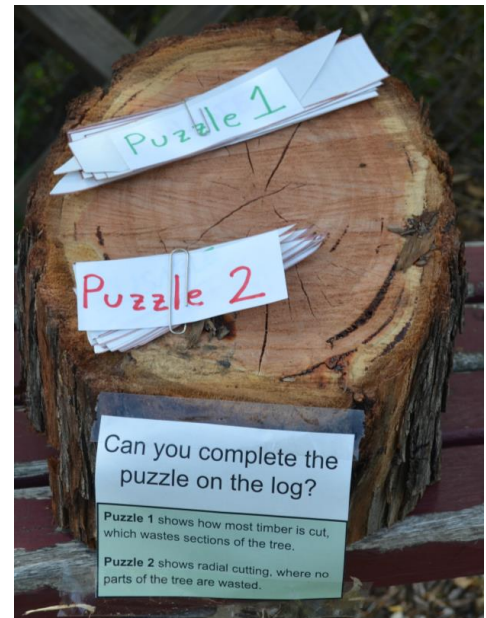
- When rainforests are destroyed, animals like elephants must find food elsewhere and often destroy farmers' banana crops.
- Cutting down trees causes 2/3 of Indonesia's greenhouse gas emissions. This increase in emissions directly relates to climate change and global warming (check out the Global Warming and Climate Change sign for more information).
- Large amounts of forests are cleared by man-made fires producing deadly air pollution. Some of these fires are so large that they can be seen from space.

I.

What is Indonesia doing about this?

- In the island of Java, couples are fighting deforestation by planting and caring for trees as they begin their marriages.
- The Indonesian government requires companies to replant any trees they have cut down.

J.

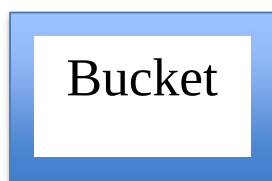
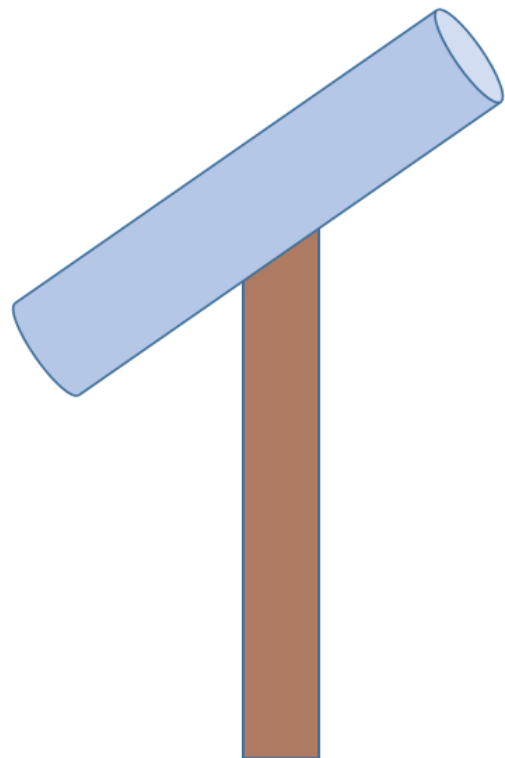
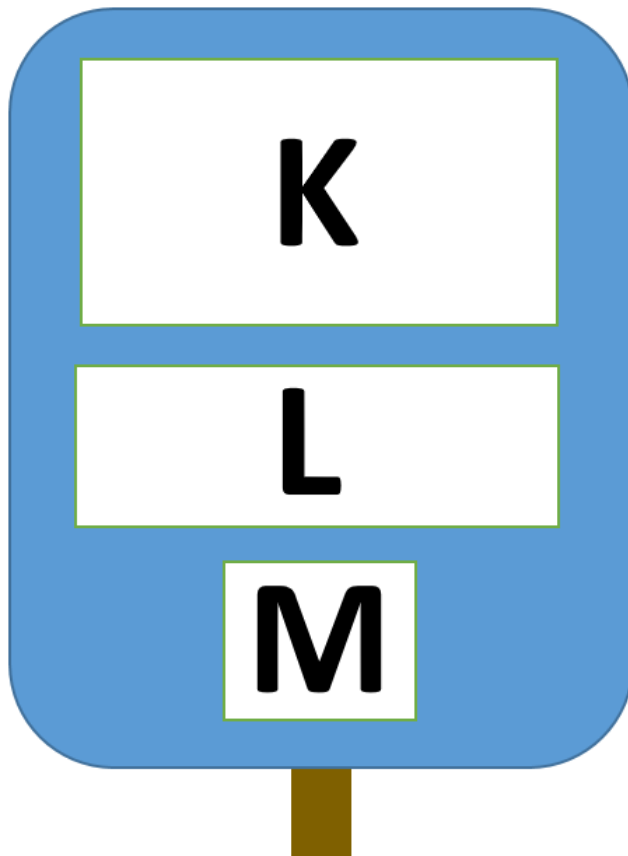


Can you complete the
puzzle on the log?

Puzzle 1 shows how most timber is cut, which wastes sections of the tree.

Puzzle 2 shows radial cutting, where no parts of the tree are wasted.

The water pollution sign is comprised of pictures K, L and M. Picture K presents factual information on water pollution. Picture L is a flap sharing what Indonesia is doing about water pollution. Picture M is instruction to look through a telescope next to the sign at a river.



K.

Water Pollution

Do you know where your drinking water comes from? About 70% of the drinking water in Melbourne comes from the Yarra River.

The Citarum River in Indonesia supplies 80% of the water in Jakarta. Unfortunately, the Citarum River is the most polluted river in the world. It's polluted by sewage, industrial waste, fertilisers, pesticides, and rubbish.

Why is this a problem?

- 43 million Indonesian people do not have any access to piped water, so they must use water from the Citarum. In some places, there is enough solid waste in the river that you can't see the water!
- 3,500,000 tonnes of rice are dependent on water from the extremely polluted Citarum River.
- Since clean water is hard to get, farmers are forced to use fertilisers. When it rains, the fertilisers pollute drinking water.
- 3,200,000 tonnes of rubbish from Indonesia flows out to sea and contributes to the Great Pacific Garbage Patch every year.

L.

What is Indonesia doing about this?

- The Indonesian government has setup garbage banks where they will pay people to turn in their garbage and recycling. This way the rubbish doesn't end up in the river.
- The government has set up a \$3.5 billion plan to recover the Citarum River over the next 15 years.

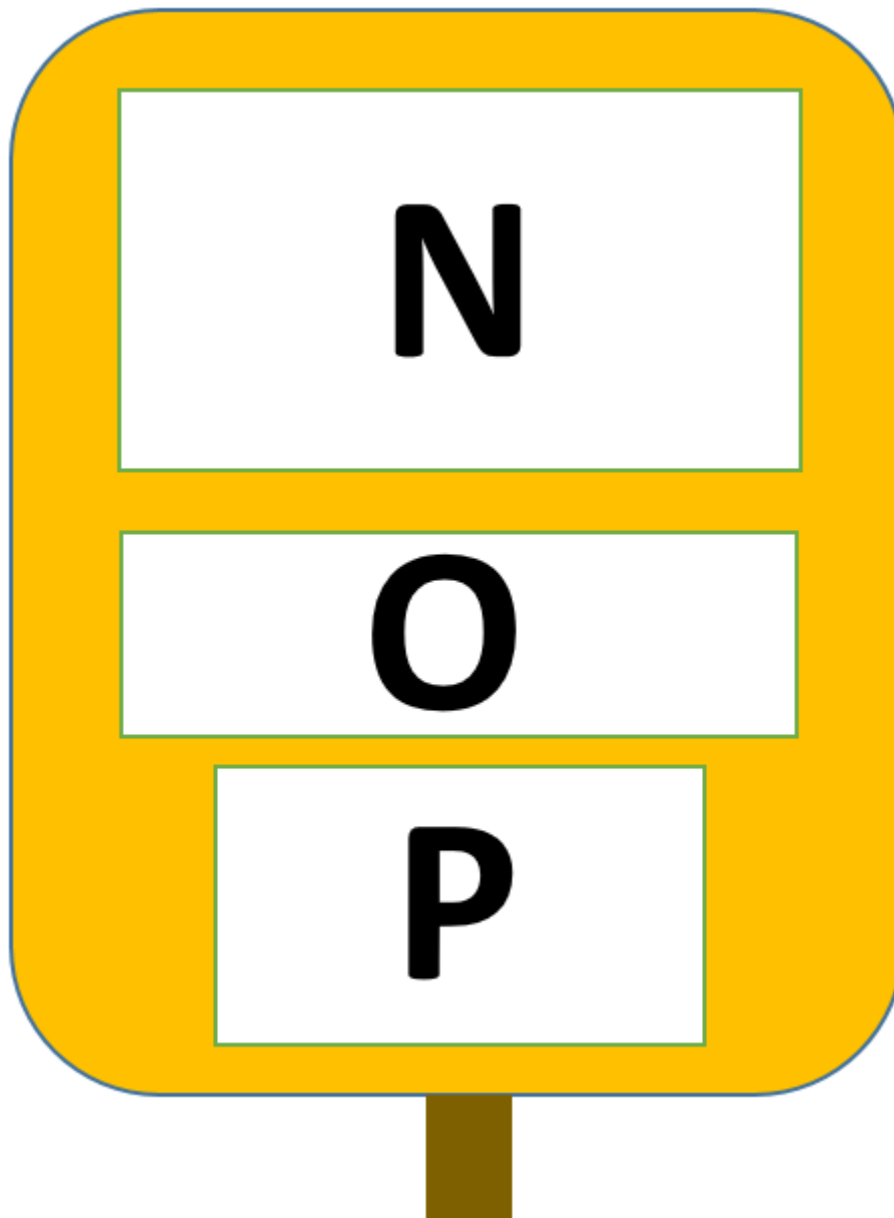
M.



Look through the telescope
to see the Merri Creek!
Now look down at the
polluted bin of water. This is
what the Citarum River looks
like in Jakarta.



The global warming/climate change slide is comprised of pictures N, O and P. Picture N is factual information about global warming. Picture O is a flap that shares what Indonesia is doing about global warming/climate change. Picture P is a graph and slide bars. The slide bars should emerge from either side of the graph when pulled.



N.

Global Warming and Climate Change

Have you noticed the weather acting weird lately? This is due to global warming and climate change.

Greenhouse gas emissions are one major reason why this is happening. Fossil fuels, deforestation, and animals all release greenhouse gases into the atmosphere. Did you know that food related emissions could be cut by 63% if everyone became a vegetarian?

Why is this a problem?

Indonesia is the 5th largest producer of greenhouse gases in the world.

- Destroying forests increases the amount of greenhouse gasses, because trees naturally absorb CO_2 in the air.
- Parts of Indonesia will reach irreversible climate change by the year 2020 if no changes are made.

Global warming is present everywhere, even in Australia! Australia is the 12th largest producer of greenhouse gases in the world.

- With climate change there will be more droughts and more chances of bushfire.
- As temperatures increase, ocean levels will rise and the Great Barrier Reef will continue to die.

O.

What are people doing about this?

Indonesia

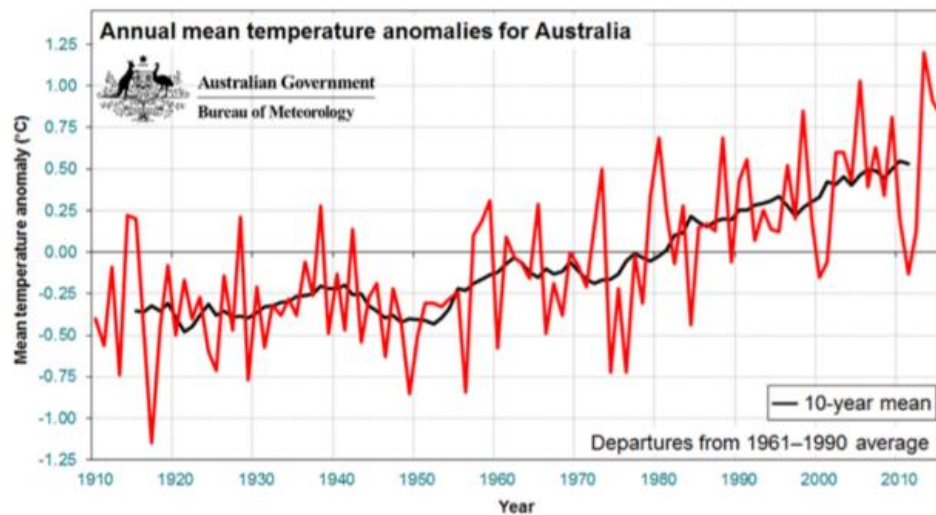
- Over the last decade, Indonesia's geothermal energy power capacity has doubled to 1.3 gigawatts, and there are plans to increase this capacity to 27 gigawatts. That's the same as 270,000,000 light bulbs!

Australia

- Only 6% of Australia's energy comes from renewable energy in 2015. The government plans to increase this to 23.5% by 2020.

P.

Wow! Look at Australia's increase in temperature.



Pull to Learn How Climate Change Can Affect Bananas



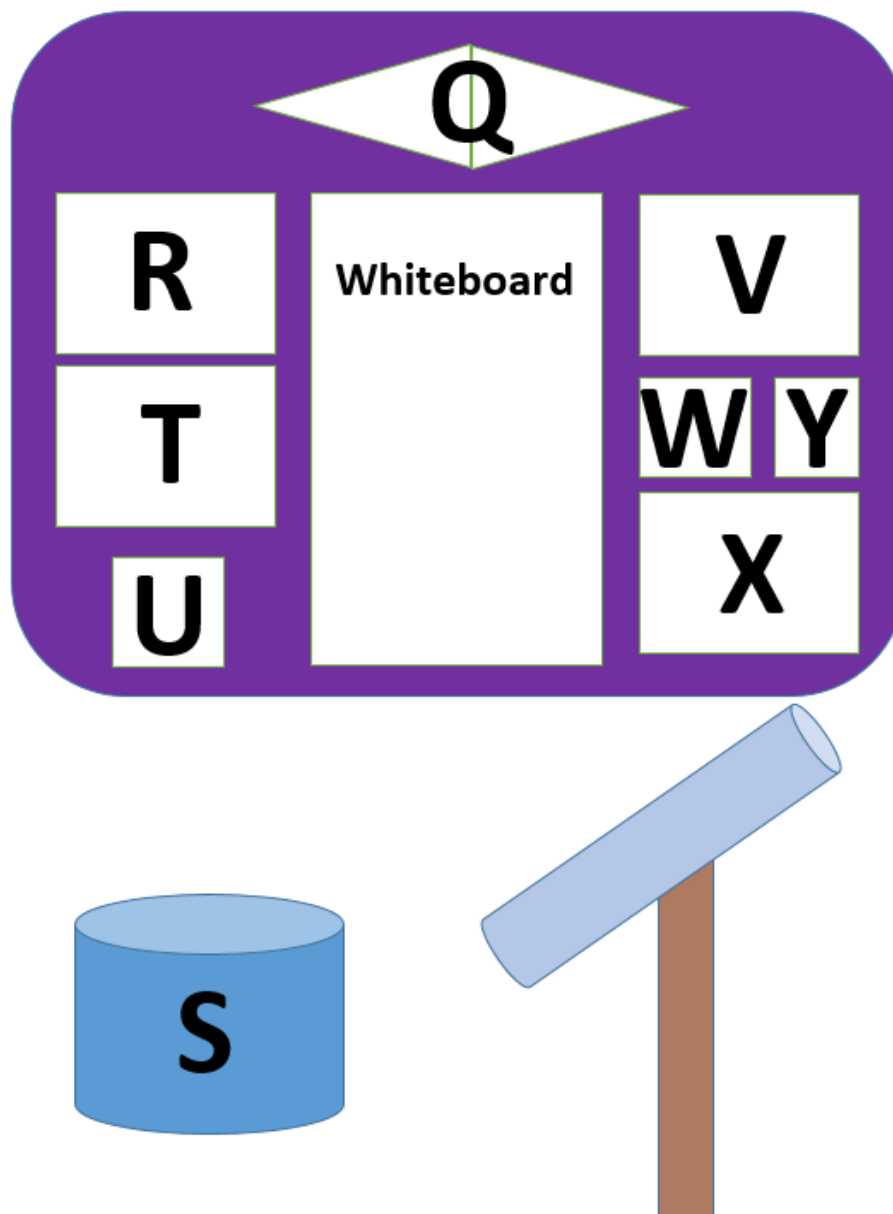
Climate change is causing more violent storms that can destroy entire banana plantations, like this one in North Queensland.

Climate change is killing the Great Barrier Reef and turning it white.



Pull to Learn How Climate Change Can Affect the Reef

The solutions board is comprised of pictures Q, R, S, T, U, V, W, X, and Y. Picture Q is the board title. Picture R is mineral mining solutions. Picture S should be attached to a bin where phones may be placed for recycling. Picture T is deforestation solutions. Picture U is an interactive display containing a piece of merbau and bamboo flooring for physical comparison. Picture V is the water pollution solutions. Picture W is an image of cleaning methods in the Yarra river. Picture X is the global warming/climate change solutions. Picture Y is directing visitors to look through a telescope near the sign pointed at a solar panel.



Q.



R.

Mineral Mining Solutions

RECYCLE YOUR UNUSED MOBILE PHONES!

Australia alone has over 20 million phones in circulation. By recycling these phones, the minerals can be reused, and less precious minerals will need to be mined.

S.

Recycle your unused phones here!

Remember This Phone?



Have any laying around? You can bring them back here to recycle them to help reduce mineral mining in Indonesia!

T.

Deforestation Solutions

- Use bamboo products over items made from wood. Check out the CERES grocery for bamboo products!
- Use wood that is sustainably harvested and cut so trees do not go to waste. Check out au.fsc.org/en-au/ to buy sustainably harvested wood products!

U.

Can you feel the difference?

Merbau Flooring



Merbau trees are considered an endangered species. They also take 75-80 years to reach commercial size before they are cut down and used for floors and construction.

Bamboo Flooring



Bamboo only takes 3-5 years to reach commercial size. Bamboo shoots are much more sustainable for flooring, but can also be used for many other purposes.

V.

Water Pollution Solutions

- Use a reusable water bottle!
- Make sure to recycle bottles and cans from your home! If they end up in the Yarra, they will end up in the ocean!
- Go to this website to help clean up the Yarra River, and check out how the trash is collected in the Yarra!

yarraandbay.vic.gov.au > Actions > How You Can Help

W.

Yarra River Trash Collector



X.

Global Warming and Climate Change

Global warming and climate change affect every country on the globe. The only way to help this issue is for each person to do something about it. If everyone does something small, it will add up to something big, so tell your friends!

- Take public transport or walk
- Plant a tree
- Use renewable energy
- Eat less meat

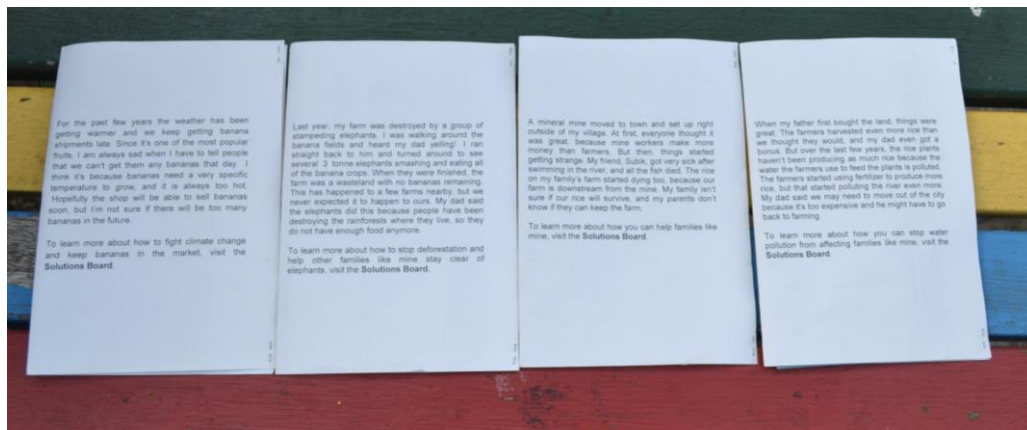
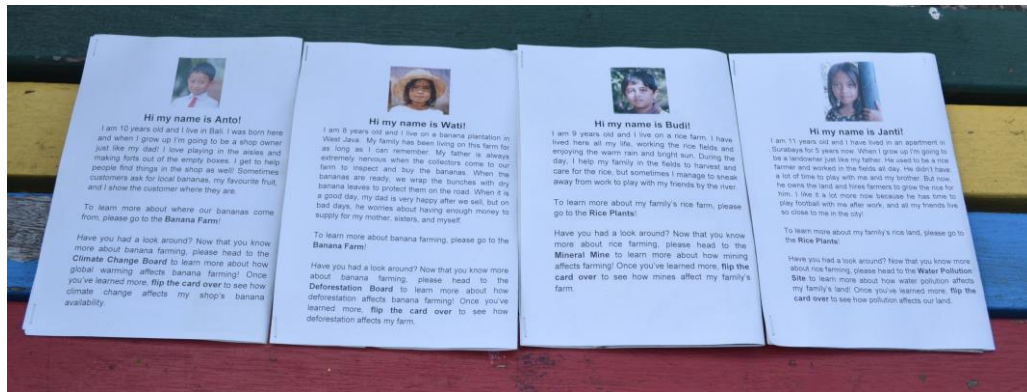
Y.



Look through the telescope!
What form of renewable
energy do you see?

Appendix J: Images from Prototype

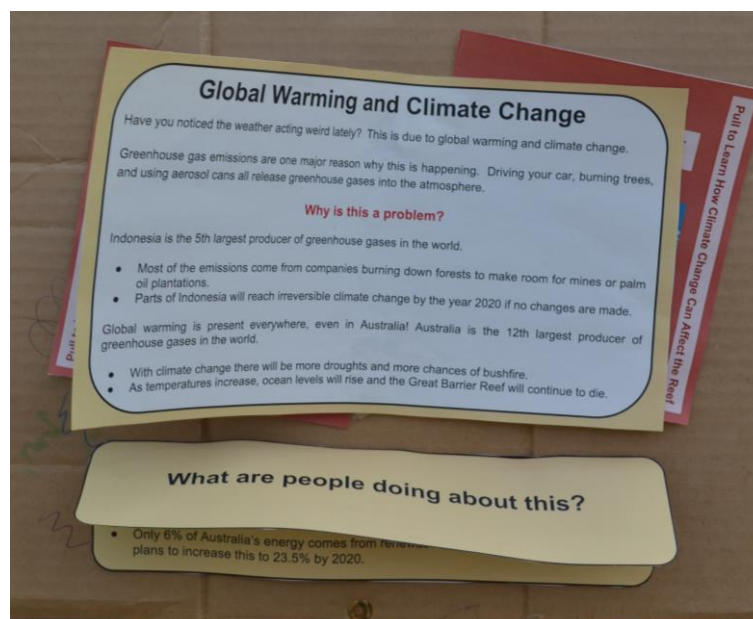
Below are the front and back of each story card prototype.



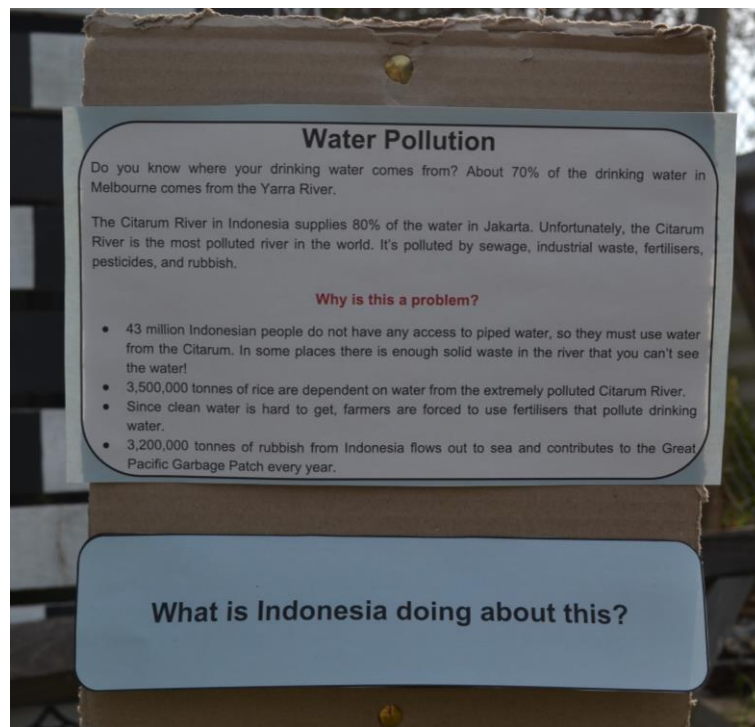
This is the rice plantation prototype sign and rice jar.



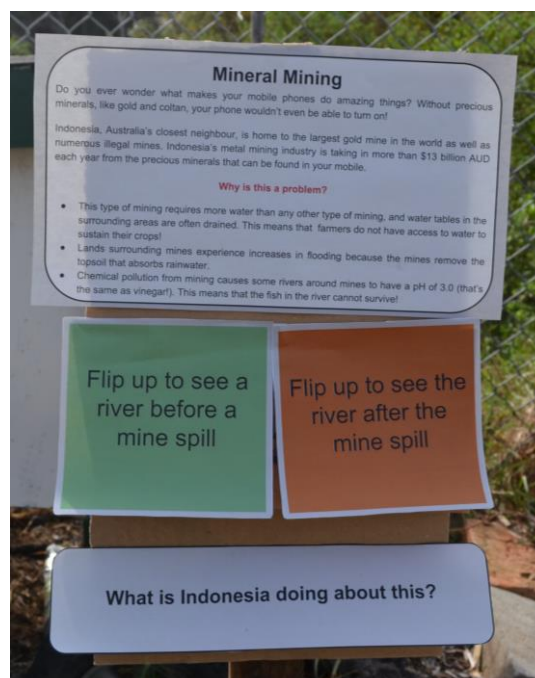
This is the global warming/climate change sign prototype with flap card and pull out tabs.



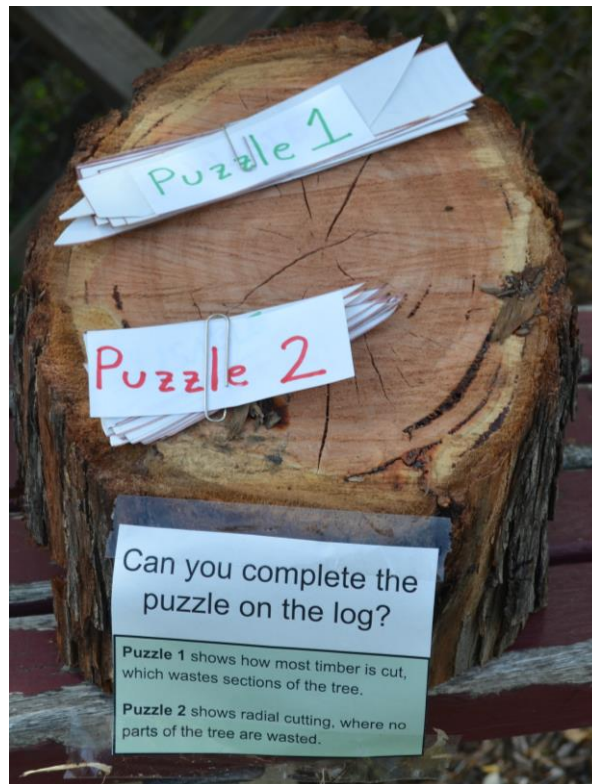
This is the water pollution sign prototype with flap card.



This is the mineral mining sign with 3 flap cards.



This is the deforestation interactive puzzle prototype.



Appendix K: Pilot Test Survey



Indonesian Village Test Survey

1. Whose story did you follow?

2. What did you like about the exhibit?

3. What did you not like about the exhibit?

4. What was your favourite interactive activity?

5. What was your least favourite activity?

6. Do you have any recommendations for the exhibit?

Appendix L: Results from Pilot Testing

The following document is the raw data collected from the design pilot tests.

Question 1) Whose story did you follow?

All 4

Janti

Anto

Anto

Janti

Janti

Budi

All 4

Didn't follow a trail

Janti

Didn't follow a trail

Budi

Didn't follow a trail

Anto

Wati

Anto

Budi

Anto

Question 2) What did you like about the exhibit?

Steps put together with solution at the end. Good for adult classes. Easy to understand. Good cultural connections.

It's a different perspective to learning. I liked different options and the choose-your-own-adventure aspect. There were lots of opportunities for kids.

I like the whole idea. It's pretty amazing

I like the imagery on the front of the cards. I like that it's easy to read and I like the banana facts.

Interactions. I liked looking for hidden bits of information. I also liked the telescopes. It got me involved.

The house.

I like the flaps and the fact that it's easy to read. I also like the rice jar and the fact that the stories connect the rice directly to a person's livelihood. It's nice to have a link between the facts and the people. It's also nice to end with the actions that people can take to combat the issues. I like that bit.

I love the rice jar and the flipping facts and also the connection to the creek and other activities. The overall continuity hangs together well and should be kept relatively the same.

The solutions board is very good for the most part. Just the "Janti" solutions are a bit poor.

I like the flip up signs and the information about why things are important to worry about.

I like the real stories and real rice, the telescopes, and all the interactive portions.

The rice fields were really cool and the telescope was fun. I like that it wasn't too wordy.

The banana plants were really cool.

The radioactive banana facts.

The facts

N/A

The mining sign and the picture of the river on it.

Solutions board options and the pledge. The overall idea is really good and just needs some refinement.

Question 3) What did you not like about the exhibit?

Could have different levels of explaining. One for children one for adults.

I liked everything

I didn't dislike any of it.

It was a bit confusing following the card.

The long text in the cards was a little hard to look at. I also didn't like that the flow between the different sections was weak.

N/A

The bulleted facts are a bit close together which makes them difficult to read.

The connection between the fertilisers and the water pollution is disjointed and out of place because it's jumping from solid waste to particulate waste. There aren't enough web links to things for people to search while in the exhibit (like the garbage patch). On the mining poster it's unclear what type of mining you're talking about and there aren't enough pictures in most of them. The mining solutions are weak and I am not convinced anything is really being done. Get better ones. Some of the solutions on the board don't match with their respective environmental issues so try getting better ones for those. The global warming poster could be redone to be stronger and have information that applies globally instead of just in Indonesia.

I didn't dislike any of it.

The cardboard, but I understand that will change.

Not enough images.

N/A

Not that interested.

There wasn't a clear enough call to action.

The puzzle stump.

No flipping signs on the banana farm sign.

Its early stages.

The connections between the three sources of information are not strong enough. The poster doesn't lead well into the card, which doesn't connect strongly with the problems poster.

Question 4) What was your favourite interactive activity?

The banana panel was my favourite.

I like the pond and the telescope.

The telescope for water pollution.

I liked the flip up facts.

The rice jar was intriguing.

N/A

I like the flip to reveal facts.

The flip up facts.

The jar of rice.

I like the flip up facts, the stump puzzle, and the mobile phone recycling bin.

Telescope.

White board pledging.

N/A

N/A

Flipping signs.

The log puzzle was the best thing.

The flip reveal facts were great.

Question 5) What was your least favourite activity?

N/A

I don't really have a least favourite.

I didn't have one.

Nothing.

A lot was going on at the solutions board, so maybe that could be rearranged or spread out somehow.

N/A

I liked all of them.

I liked all of them.

N/A

N/A

N/A

Not that interested.

N/A

N/A

N/A

N/A

The pledge board because it could be graffitied.

Question 6) Do you have any recommendations for the exhibit?

No.

Put somewhere to sit while reading the cards and signs maybe.

It's pretty good, but making it sturdier and real will be very important.

You could make the cards like a treasure map that you have to unfold so there is a discovery aspect there as well.

The display height could either be higher or lower depending on what you want to draw attention to. If the displays are further away you could have bigger text and the signs could be more robust.

Put more visuals into the exhibits.

You could put a space between the bulleted facts, and use the phrase "urban mining" for the phone recycling portion of the solutions board.

You could spell certain words on the exhibits in Indonesian so that there is more cultural crossover and connection. There are a few American words you can take out like primarily.

You could put why Indonesians are considered different than Australians or say they're "perceived" differently. You should say the "Yarra Catchment" not just the Yarra. Use the word mains not piped. Put more Indonesian culture in there. Be consistent and relate the water parts of the project back to CERES's water project from last year. Also talk about how the flooding from mining occurs because of the loss of plant life. You should also mention palm oil and orang-utans.

Make the signs higher up.

Fill the space more and make it flashier.

You could link the mobile phone to the visitor centre, which has a more official recycling bin for them and other things like batteries.

Make the signs real!

None given.

You could make the call to action clearer.

N/A

N/A

You could show the distribution of water with a model (terraced farming). Keep the bananas in the back and get people out of the loop that is just right there in the middle. Have steps that lead up to the bananas with info and facts on them. You could add more about palm oil. You could have a specific place that the rice farming child is from. Include Subak on the rice plantation poster. Incorporate the rice tools into the exhibit.

You could make the paragraphs to have more guided questions so that the audience has to do less thinking and gets more information easily. There could be more dotted bullet points instead of paragraphs. The connection between Anto and global warming happens too late so I struggled to understand it so move it forward. It's unclear if I'm supposed to have a look around or go to the next board when the card tells me to. The colour coding could be more pronounced. People will engage if it's easier so just make it easier to understand. Put in options for where people can go to get even more solutions for the problems (things that they can do) like activist groups. Leave the bananas where they are so that people go find them and give the space some depth and dimension. Use more pictures.

Team Observations:

There are a bunch of students (adults) learning English and they all came in and tested it at the same time. It was really good to see how adults interact. They were curious, read most things, took pictures of all the signs, and

It was a mom and a daughter. The mother read the exhibits to her child, which seemed to work pretty well. The child was very enamoured with the telescope.

Young adult couple. Interested mainly by the facts and wanted to help us design.