

A SYSTEMS APPROACH TO HEALTH, WELL-BEING AND THE
ENVIRONMENT: AIR POLLUTION AND SHANGHAI'S ELDERLY

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Abstract

Using Soft Systems Methodologies (SSM) to transcend cultural boundaries in an open format, this paper examines the changes experienced by Shanghai's elderly in the context of health, well-being and the environment. Shanghai has undergone rapid urban transformation in the past three decades resulting in significant increases in cases of respiratory illness relating to environmental air pollution. Complex and non-linear issues have provoked a re-evaluation of traditional approaches to understanding real world problem situations. Systems thinking provides an epistemological foundation for methodologies that are holistic. A particular branch of systems thinking, SSM, highly values participant knowledge and provides techniques for examining this knowledge. However, the findings in this paper indicate that the participants believe health is not decreasing. Instead, a strong social hierarchy emerged demonstrating that the government heavily influences participant's opinions of the environment and their health. Additionally, overall increases in well-being are deemed as suitable tradeoffs for environmental degradation.

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Table of contents

Abstract.....	i
Acknowledgments.....	ii
Table of Contents.....	iii
List of Tables.....	vi
List of Figures.....	vii
Chapter 1: Introduction.....	1
Chapter 2: Literature Review.....	6
2.1. Systems Thinking.....	6
2.1.1. Systems Philosophy.....	10
2.1.2. Systems Methodology.....	17
2.1.3. Systems Action.....	23
2.1.4. The “Trinity”.....	23
2.2. Approaches to Health.....	25
2.2.1. Failures of traditional approaches to health.....	25
2.2.2. Health emerging through hierarchy.....	30
2.3. Summary.....	32
Chapter 3: Context of China.....	33
3.1. Chinese Environmental Politics.....	34
3.2. Environmental Issues Affecting Health in China.....	39
3.3. Barriers in Research.....	43
3.4. Summary.....	48
Chapter 4: Methodology.....	49
4.1. Soft Systems Methodology.....	49
4.2. Identifying the Problem.....	50
4.3. Define the Problem.....	51
4.3.1. Structures survey.....	53
4.3.2. Interviews.....	53
4.3.3. Rich Pictures.....	55
4.4. Root Definitions.....	56
4.5. Build Conceptual Models.....	59
4.6. Compare Models with Reality.....	59
4.6.1. Content Analysis.....	60
4.6.1.1. Epistemology of Content Analysis.....	61
4.6.1.2. Framework.....	62
4.6.1.3. NVivo.....	65
4.6.2. Critical Systems Heuristics.....	66
4.6.3. Chi-Squared Tests.....	68
4.7. The Final Steps.....	68

4.8. Summary.....	69
Chapter 5: Results.....	71
5.1. Expressing the Problem.....	71
5.1.1. Surveys.....	72
5.1.2. Interviews.....	78
5.1.3. Rich Pictures.....	82
5.1.4. Summary of Problem Definition.....	92
5.2. Root Definitions of Relevant Activity Systems.....	93
5.2.1. CATWOE.....	93
5.3. Building Conceptual Models.....	100
5.3.1. Human Activity Systems.....	101
5.4. Comparing Models to the Real World.....	109
5.4.1 Analyst Based Content Analysis.....	110
5.4.2. Invivo Content Analysis.....	113
5.5. Summary.....	115
Chapter 6: Discussion.....	117
6.1. Generating Themes.....	117
6.1.1. Home & Nationalism.....	117
6.1.2. Media.....	120
6.1.3. Government Action & Hierarchy.....	124
6.1.4. Education.....	131
6.1.5. Health & the Environment.....	134
6.1.6. Themes, Interconnections and Attributing Meaning to Perceived World.....	138
6.2. Hierarchy & Intervention.....	139
6.3. Resilience.....	142
6.4. The Trinity.....	145
6.4.1. Philosophy.....	145
6.4.1.1. Holism and Knowledge Production.....	145
6.4.1.2. Boundaries.....	147
6.4.2. Methodology.....	151
6.5.3. Action.....	152
6.5. Summary.....	153
Chapter 7: Conclusion.....	155
7.1. Reflections.....	155
7.2. The Trinity Reflection.....	157
7.3. Recommendations.....	159
7.4. Looking to the future.....	161
7.5. Summary.....	162
Works Cited.....	165

Appendices.....172
Appendix A: Structured Survey.....172
Appendix B: Interview Questions.....174
Appendix C: Interview Results.....176
Appendix D: Chi-Squared Test Survey Results.....188
Appendix E: Chi-Squared Test Interview Results.....190

List of Figures

2.1	An Automated Duck	7
2.2	Diagram of Boundaries.....	12
2.3	Lorenzian Waterwheel	18
2.4	Lorenz Attractor	19
2.5	Misiurewicz Parameter.....	21
2.6	Holistic Systemic	25
2.7	Ecological Model of Health	27
2.8	Socioeconomic Model of Health.....	27
2.9	The Wellness Model of Health.....	27
2.10	Mandala of wellness.....	28
2.11	Health Determinant Model.....	29
2.12	The Butterfly Model of Health.....	31
3.1	Structure of Chinese Government.....	34
5.1	Rich picture of Shanghai in the 1980's.....	85
5.2	Rich picture of Shanghai in the 1990's.....	88
5.3	Rich picture of Shanghai in the 2000's.....	91
5.4	System of growth of personal wealth.....	101
5.5	System of health decline in 1982 – 1992.....	102
5.6	System of health improvements from 1992 – 2012.....	103
5.7	System to increase well-being.....	104
5.8	System of economic inequality.....	105
5.9	System of corruption.....	106
5.10	System of increased personal car ownership.....	107
5.11	System of re-greening.....	108
5.12	System to disseminate environmental information.....	109
5.13	Themes of the interview data where size correlates with how often the theme is mentioned as generated by Nvivo.....	114
5.14	Word cloud showing the words most frequently used by participants in their interviews as generated by Nvivo.....	115
6.1	The People's Square.....	129
6.2	Boundary diagram.....	147
7.1	Venn diagram of "The Trinity"	158

List of Tables

4.1	Critical Systems Heuristics Questions.....	67
5.1	Age of participants.....	73
5.2	Location of participants' birth.....	73
5.3	Where participants lived 30 years ago.....	74
5.4	Education level of the participants.....	74
5.5	Type of dwelling the participants currently reside in.....	74
5.6	Number of people living in each participant's home.....	74
5.7	Participants' opinion on whether or not health issues related to the environment.....	75
5.8	Participants' opinion on whether or not the environment has changed.....	75
5.9	Where the participants get their information about the environment.....	76
5.10	Amount of time participants spend outside.....	77
5.11	What participants do outdoors.....	77
5.12	How much time the participants spend outdoors compared to 30 years ago.....	77
5.13	If the participants think they are able to participate in urban/community planning.....	78
5.14	Participants' opinion on whether or not well-being has increased in the past 30 years.....	78
5.15	Participants' opinion on whether or not the government is improving China.....	78
5.16	Important changes in Shanghai and the environment.....	111
5.17	Health issues mentioned that could be related to the environment and common arguments against their origins.....	111
5.18	Changes in Shanghai based on time period.....	112
5.19	Government action and results.....	112

1. Introduction

The cityscape of Shanghai has drastically changed over the past 30 years. The popular tourist destination, "The Bund", has rapidly transformed from low level industrial factories to a glimmering skyline of modern high rises including two of Shanghai's most famous buildings: The Shanghai World Financial Center and The Oriental Pearl TV Tower. One of the most striking developments during these 30 years is the number of cars on the streets of Shanghai. In the 1980's there were only 20 000 cars in China, this number comprised almost entirely of taxis (Watts, 2010). In 1993 private car ownership was made legal and the 8th 5 Year Plan set car assembly, distribution and ownership as a major contributor for planned economic growth (Gerth, 2010). As a result, today 12 000 – 14 000 cars are added to the roads every day making cars one of the highest contributing factors to Shanghai's growing air pollution problem (Gerth, 2010).

The conversion of a poor industrial Shanghai to a wealthy modern Shanghai has come with challenges for the citizens. The amount of pollution from cars, air conditioners and construction leaves the Chinese people facing rapid decreases in overall health (Zhu, *et al.*, 2011). The purpose of the research done for this paper is to obtain a first-hand account of the experiences of Shanghai citizens who have lived through this rapid development to see how their health and well-being has been affected. To gain insight on this problem I engaged with a number of Chinese elderly citizens to tell a story of 30 years of experience. However, engaging with Chinese participants comes with a great deal of challenges.

A highly authoritarian government is typically secretive, and China's is no different. They are not welcoming of any intrusive research practices that could result in any amount of

international shame (Vice Broadcasting System, 2008). This political climate began with Mao Zedong who, working off Marxist ideologies, attempted to build a socialist country (Joseph, 2010). Unfortunately, the result was a highly authoritarian regime rife with corruption, economic inequality and suffering for the working class (Eberstadt, 1980). The effects of this political agenda are still seen throughout the country. A strong social hierarchy, which will be explored in this paper, instills pride and the need for privacy in the citizens. The government has long infused fear in the people of speaking out against the government by imprisoning and publicly shaming those who do. Famous artists, such as Ai Weiwei, have experienced this subjugation first hand as they have been put under house arrest for speaking out on issues such as human rights and environmental degradation in China. Thus, it is difficult to hear stories and firsthand accounts of what living in China is like as people may skew the truth.

A second barrier to research when conducting research in Chinese is that Chinese academic journals are rarely translated in English and, thus, any research that has been done on particular topics is inaccessible to those who are unable to translate. Even if the research could be translated, the reputability of the information is not high. Likewise, any information obtained from official government sources should also be considered unreliable as the government is well known for falsifying information. Transcending these issues requires unique approaches to research that are inclusive, culturally sensitive and that look to popular culture for references on Chinese health and the environment.

Such an approach can be found within the philosophy and methodologies of systems thinking. Systems thinking is an approach that is epistemologically, methodologically and

practically powerful. Systems thinking emerged in response to growing limitations of science and reductionist thinking in certain areas of inquiry that cannot be broken down into separate individual parts and still be understood. Systems thinking provides a number of methods for viewing complex situations. For example, social situations often involve a variety of actors and when their opinions are brought together new qualities and properties emerge (Migdely, 2000). Their ideas should not be viewed separately and, thus, systems thinking looks to find ways to view these opinions and ideas simultaneously. It does this by taking a holistic perspective that includes as many actors as possible. Additionally, it mandates seeing one's own view of reality as inherently part of the research rather than attempting to provide potentially false subjective and objective barriers. This ultimately accounts for one's cultural lens instead of ignoring it. There are a number of methodologies within systems thinking, a few of which will be explored in the literature review of Chapter 2. This research employs a particular method from systems thinking called Soft Systems Methodology which is concerned with "organized complexity" (Checkland, 1999, pg. 6). It is used to attribute meaning to a person's perceived world from their experience-based knowledge.

This research will also consider different philosophical ideas of systems thinking and apply it to the research including resilience and hierarchy. Resilience is how much pressure a system can handle before it "tips" or how long it takes for the system to return to its normal state after a disturbance (Holling, 1973; Meadows, 2008). Hierarchy is the differences and interactions between different levels of organization in a system (Checkland, 1999).

The method, fully described in Chapter 4, will include surveys of 62 participants and open-ended interviews with 23 participants. The aim is to ascertain whether or not elderly Shanghai citizens, aged 55 or older, perceive the urban developments in China over the past 30 years as positively or negatively impacting health and well-being. The data gathered will be analyzed using techniques in the SSM approach including creating definitions of relevant systems and human activity systems, both of which will be presented in Chapter 5. Analysis will also be done using content analysis, an exploratory method with the intent of being predictive or inferential of text data (Krippendorff, 2003). Content analysis will be explored at the end of Chapter 5 and into Chapter 6.

Chapter 6 will present a full discussion of the findings through five themes that emerged during the research. These themes are home and nationalism, media, environment and health, government action and education. All five of these themes were of particular importance to the group of participants. It will also include a discussion of the strong nested social hierarchy that was hypothesized to exist prior to the research and confirmed during the interviews. Nested social hierarchy holds the key to understanding power relationships that certain levels within the community hold over another (Tarlov, 1996). For this particular project, the outer macro circle of the hierarchy consists of the government, which controls all other levels of the hierarchy as the government is still largely authoritarian. Proof of this hierarchy and the impacts of such a hierarchy will be discussed. The final chapter of the paper is the conclusion where there is a minor discussion of reasons for hope, final thoughts and recommendations.

Air pollution caused by rapid urbanization and economic development over the last three decades has created wide scale health implications for Chinese citizens. However, as will be demonstrated in this paper, perceived reality of the Chinese elderly citizens directly contradicts this information. I hypothesize that due to strong nested social hierarchies, the opinions of Chinese citizens have been greatly influenced by the government. The government of China still has a strong authoritarian hold on the country while attempting to implement free market capitalism. This research will show that the result is a thriving nation of people who are very focused on economic development. Their loyalty to the government results in denial of issues of health and environmental degradation. Unfortunately, instilled fear from past political instability and continued government control over the media only exacerbates the problem.

2. Literature Review

The purpose of this chapter is to situate systems and health approaches in the larger bodies of literature pertaining to each subject. I will first look at the philosophical roots of systems thinking, including the limitations of science and epistemology of systems that grows out of these limitations. I will also introduce important concepts of systems thinking including boundaries, interrelationships, hierarchy and emergence. I will then look at methods of systemic inquiry, focusing primarily on soft systems methodology. The second part of this chapter will look at different approaches to health, their limitations and ideas for countering these limitations. I will also discuss the potential role of a political hierarchy in affecting health and well-being of those within said hierarchy.

2.1. Systems thinking

The field of systems thinking emerged as a response to the growing realization of the limitations of science in some areas of inquiry, especially those with social components. Traditional science continues to prove its invaluable usefulness in controlled, physical and reductionist scenarios. Science, as described by Checkland, is a linear and reductionist approach to empirical observations of the physical universe through repeatable experiments (1999). The three key words here are reductionism, linearity and repeatability. Reductionist thinking involves the breaking down of problems to simpler ideas and parts in order to examine them individually (Jackson, 2000). Reductionism is not a new concept. Rene Descartes, in *De homine*, argued that animals not belonging to the species *H. sapiens* could be reduced to the mechanics of a self-operating machine, as seen in image 2.1 (Cottom, 1999). Linearity, much like the mathematical definition suggests, implies that the adding up of individual characteristics and

definitions of the broken down parts of a problem will result in a rational and accurate representation of the overall problem (von Bertalanffy, 1968). Repeatability is simply that any of these results can be replicated without the original researcher or research conditions present at the time (Checkland, 1981). The assumptions of these three ideas is that the breaking down of problems will not lose the essence of what is being studied; that the governing principle of the parts can be brought together to achieve a full understanding of the whole; and that the results are independent of the researcher (Checkland, 1981., von Bertalanffy, 1968). These assumptions, however, do not necessarily hold in social situations.

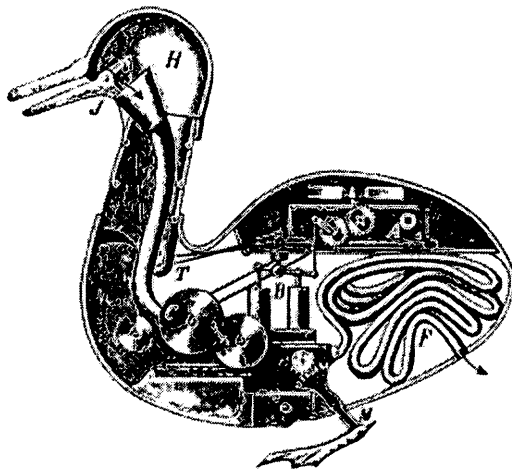


Image 2.1. An Automated Duck. This image was created by the French inventor and artist Jacques de Vaucanson, wrongly demonstrating a digesting duck (Cottom, 1999).

Gerald Midgely calls this type of science mechanistic science, characterized as a method reliant on observations to produce objective knowledge about the world (2000). Russel Ackoff describes the period in which traditional science dominated approaches to problems as the “machine age”, which focused not only on the three characteristics defined above but also on determinism (1973). Determinism is the idea that the effects observed in a problem are

directly determined by causes, commonly called "cause and effect". Additionally, science attempts to play a neutral role in social issues (Resnik, 1998).

Social problems cannot be studied well with deterministic and reductionist methods, as they do not sufficiently cope with complex social situations. Social problem situations often involve a variety of actors with varying worldviews. The contribution of these actors can alter findings and ultimately the outcome of the study (Checkland, 1999). Humans are also unpredictable and thus are not reliable for repeatability (Barabasi, 2011). Also, the characteristics of each individual person, when added together, do not necessarily define a group of humans as new qualities and properties emerge in groups (Midgely, 2000) - a concept I will define and expand on below. Finally, science is ineffective at remaining neutral in social situations (Resnik, 1998). Researchers of complex social situations are unable to remain completely objective due to predetermined biases and backgrounds (Resnik, 2009). Due to these issues one can determine that the act of observation and study should take into account the complexity and value systems of actors, researchers themselves and the outcomes of the study directly in the methodology (Midgely, 2000). This, thus, calls for a new way of thinking to deal with complexity.

Thomas Kuhn's famous work *The Structure of Scientific Revolutions* argues that science is characterized by different paradigms (1962). Whatever the current paradigm is, as practiced by most scientists, is referred to as "normal science". The normal science of a particular time is associated with particular methods, concepts and beliefs that may have limitations. As these limitations become increasingly problematic, scientists will start to change the way they approach problems. This change is referred to as revolutionary science. Eventually, enough

scientists abandon the old paradigm of normal science and the entire system revolutionizes, making the new paradigm the norm. Ackoff suggests that this happened when switching from the machine age to a new systems age of thinking (1973). Systems thinking, first put forward in the 1900's by Alexander Bogdanov (Capra, 1996), was largely ignored until Ludwig von Bertalanffy published his writing on general systems theory. He described general systems theory as a new approach to problems that demands cooperation of multiple disciplines and disallows various foundational characteristics of traditional science (1968). However, systems theory is not necessarily replacing traditional science, and thus, is not creating a paradigm shift. Instead it can be defined as a post-normal science (Funtowicz and Ravetz, 1991). Post-normal science emerges when normal science is still working in some areas, but has limitations in certain fields. Thus, it is revolutionary science but is not suitable for replacing current normal science. Post-normal science is necessary in situations where "facts are uncertain, values are in dispute, stakes high and decisions urgent" (Funtowicz and Ravetz, 1991), which includes complex social problems.

Midgely, in his book *Systemic Intervention* (2000), gives a comprehensive history of the development of systems thinking. The first wave of systems thinking primarily pertained to hands-on approaches that created viable systems and models for individual or group use. It was used in the context of systemic family therapy, socio-technical research, systems dynamics, systems engineering and systems analysis. The second wave was characterized by questions surrounding the philosophical assumptions that the first wave had essentially overlooked. During this period systems were no longer viewed as real world entities but rather as constructed representations to support understanding. There was an emphasis on realities

being constructed through inter-subjectivity, dialogue and mutual appreciation of different viewpoints. The third wave, beginning in the 1980's and continuing to today, focuses primarily on identifying and discussing limitations of approaches that were constructed earlier. This period is also heavily identifiable with the use of a variety of methods for pluralist interventions. This transformation into a metadisciplinary method is especially useful for the discussion of coupled human and natural systems and interdisciplinary approaches to problems (Churchman, 1968).

2.1.1. Systems philosophy

Midgely argues that for research to have valid outcomes one must have a firm understanding of one's own philosophical foundations (2000). Thus, this section will deal with the epistemology and philosophical ideas of systems thinking and my research.

"System", in this context, can be defined in two ways, first based on what a system is and secondly what the idea of a system is. A system can be anything consisting of parts that interact with one another within a determined boundary, which in social systems may be ethically charged. A problem or idea is approached systemically by achieving mutually agreed upon language between various actors in different disciplines to understand a particular issue as comprehensively as possible (von Bertalanffy, 1956). While difficult to achieve, this is done by transcending disciplinary boundaries which produces rich and thorough knowledge about a problem (Midgely, 2000). This idea that a problem being systemically approached "is, as far as possible, comprehensively understood" (Midgely, 2000, pg. 34), is strong in general systems theory and continues in systems thinking today. It is conceivable, and desirable, to have a mutual language among various actors, academic communities and lay people (von Bertalanffy,

1956), as this leads to more holistic knowledge, and thus, more desirable change. Systems theory, unlike normal science, is able to transcend disciplinary boundaries. If knowledge is to be acquired within disciplinary boundaries, the researcher is potentially restricting themselves from outside specialist knowledge to contribute to their own knowledge (Midgely, 2000). Additionally, the original researcher's knowledge may contradict other disciplines, and thus, be challenged by another discipline to create a more holistic idea (Midgely, 2000). This type of knowledge construction can become overwhelming very quickly if boundaries are not involved to help limit the overall scope. Frijof Capra questioned this problem by asking:

“This new approach to science immediately raises an important question. If everything is connected to everything else, how can we ever hope to understand anything? Since all natural phenomena are ultimately interconnected, in order to explain any one of them we need to understand all the others, which is obviously impossible.” (Capra, 1997, pg. 41)

This problem is dealt with in a couple of ways. The first way is demonstrated by Ackoff (1973), who says that systems approaches produce approximate knowledge because the answers are limited by worldviews. This approximate knowledge does not need to be a problem; instead it is a limitation that must be acknowledged while researchers continue to create as complete a picture of reality as possible. This again supports the need for various actors and disciplines to be involved in the creation of a definition and exploration of the problem. Systems are simply generalizations of reality (Churchman, 1968). Furthermore, it is erroneous to confuse these interdisciplinary definitions, which will likely be quite plausible and inherently good, with reality itself (Checkland and Scholes, 1999). Doing so leads to a complete misunderstanding of the systems approach, which is simply looking for as close a definition to the real world as possible, while some things will undoubtedly be left out. The second way of dealing with the problem

Capra presents is by incorporating the concept of boundaries into one's research. Boundaries are the scope of the research or problem definition, they outline the area that is to be defined. Midgely described boundaries by showing a circle as the world, and the boundary as a triangle within it, as seen in figure 2.2 (2000). The triangle defines what is within the scope of a particular project. What is outside of that triangle is equally important because it is what is being excluded, what has been deemed unworthy of consideration, and come from an ethically charged position (Midgely, 2000).

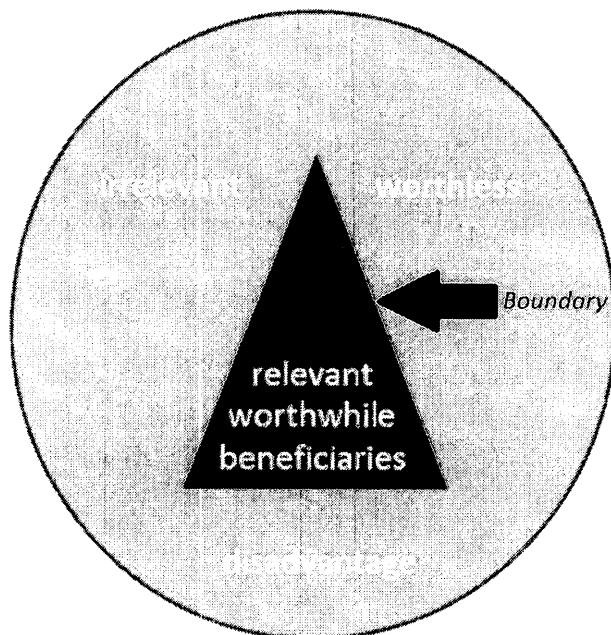


Figure 2.2. Diagram of Boundaries. The triangle represents what is inside of a boundary, and thus, what is considered relevant, worthwhile and who the beneficiaries may be of the system. The circle is everything the boundary designer has decided is outside of the scope of the study, and thus, what is irrelevant, worthless and potentially who is at a disadvantage regardless of the study outcomes (Weedmark-Kish, 2012; adapted from Midgely, 2000).

Prior to Churchman, boundaries were assumed structures within a studied reality (Midgely, 2000). One of the first to demonstrate boundaries as a necessity for limiting scope, Churchman characterized them as having three properties: elements (the parts of the system),

attributes (size, color, etc. of the elements) and relationships (interactions between the elements and attributes) (1968). These characteristics are important as they give vital information about the appropriateness of the boundary that has been drawn (Churchman, 1968). Thus, these three characteristics should be examined and understood about the proposed boundary before continuing on in the process of systems analysis. Churchman was also concerned with the way boundaries can construct the ethical framework from which a project starts. By choosing what lies inside of the system, one is making an ethical decision. Thus, being aware of the boundary that is to be drawn is important. Critical Systems Heuristics (CSH) is one way to approach this and will be explained further in the following chapter.

Systemic thinking, in the way it is practiced, has an opposition to subject/object dualism (Midgely, 2000). Subject (observers) and object (the observed) dualism refers to the separation of these two elements. A dualist believes that the observer can remain entirely independent of the observed by standing outside of it and observing the situation without bias. Not only does the observer refrain from influencing the observed, the success of the study relies on this remaining true. This attempt at objectivism is somewhat naïve as it assumes it is possible for the subject and object to remain separate. This is inherently problematic and potentially unethical in human systems. A systems view of the world assumes that human and non-human actors within a problem inevitably influence other human and non-human actors, intentionally and unintentionally (Midgley, 2000). A problem is automatically influenced by the very act of being observed because objective knowledge is not possible (Midgely, 2000).

Different entities also have levels of complexity, which have been defined by Kenneth Boulding (1956). Certain levels of complexity require different tools of knowledge development

and intervention. There are 7 different levels of complexity including frameworks, clockworks, control mechanisms (described by physical sciences), open or self-maintaining structures, plants, animals (described by biological sciences), humans, social organizations and transcendental systems (described by social sciences) (Kast and Rosenzweig, 1972). Clockwork systems, such as the solar system, are far less complex than social organizations, such as a political system of a country. The political system of Canada cannot be understood with reductionist methods or without incorporating various actors into the definition stage. The solar system, however, was easily understood once humans discovered the necessary tools. Higher levels of complexity encompass properties that I will describe next such as resilience, interrelationships, hierarchy and emergence.

Resilience is defined generally by Donella Meadows as: "The ability to bounce or spring back into shape, position, etc., after being pressed or stretched. Elasticity. The ability to recover strength, spirits, good humor, or any other aspect quickly" (Meadows, 2008, pg. 76). The opposite of resilience is, thus, a fragile or rigid system. Resilience is provided by several loops or relationships in a system operating at different scales and creating redundancies. A system that can restore or rebuild after a disruption is very resilient but not as resilient as one that can also learn from disruptions and adopt ways to prevent problems in the future. Resilience can refer to the time it takes a system to return to its normal state after a disturbance (Holling, 1973). It can also refer to a system that has multiple attractors and states of stable equilibrium. Thus, how resilient the system is depends on the magnitude of disturbance the system can handle before shifting to a new state which could happen without warning (Kay et al, 1999). The human body is an example of a very resilient system. The body has the ability to defend itself

from numerous harmful invaders, can withstand a wide range of temperatures and can live off of a number of different types of sustenance (Meadows, 2008). What makes the body, and humans, even more resilient is self-organization. Humans have the intelligence to design new technologies to make themselves increasingly resilient. Though, designing a very resilient system requires a strong understanding of a system and all of its components.

As opposed to normal science, which focuses on reductionism, systems thinking focuses on the analysis of the whole, its parts and their relationships. Examining interrelationships has been an important part of systems thinking for a long time, explaining the importance of concept maps, network maps, causal loop diagrams and other concrete and visual descriptions of systems. These different visualizations enable those involved to see the interrelationships between various actors and elements within a system and how they respond to one another. The organizational structure and the interactions within that structure are just as important as the actors and elements within the system. However, systemic thinking is not simply concerned with the interrelationships either; it focuses on particular aspects such as the dynamics, inputs and outputs, feedback and context (Bob Williams, personal communication, October 16, 2012). Additionally, the interrelationships need to be seen within a larger framework. There are levels of organization already used in normal science such as ecology and cell biology; these form hierarchies (Allen and Hoekstra, 1990). The boundaries are supraterritorial and supratemporal, creating a differentiation between the context and what is within the boundary. Thus, the issue of scale becomes important, as the definition of scales will be used for observation and potential intervention (Allen et al., 1993). By taking care to

consider interrelationships of elements and the relations between the elements, systems theory creates a radically different approach from reductionism.

Levels of organization, scale and interrelation are all related to the concept of hierarchy. Hierarchy is concerned with the inherent differences between and within different levels of organization within a system, and the interactions that occur between them (Checkland, 1999). Within these levels of hierarchy there are emergent properties - properties that cannot be described by individual and separate levels within the hierarchy (Migdely, 2000). The idea of emergence can be very clearly shown with the example of baking. An egg is not seen as a cake, yet it is required to make a cake or could become a chicken. Set within certain boundaries an egg interacts with the different ingredients, and then emergent property of cake is created. Additionally, the egg can become part of various systems in which the emergent property is quite different. For example, an egg is required to make both cake and a quinoa casserole but the two are quite different due to the other elements of the system. In relation to hierarchy, one must remember that inherent coupling happens between various levels in the hierarchy. This is important because intervention on one particular level will have effects on other levels of the hierarchy; adding more egg would change the overall flavor, and potentially enjoyment, of the cake.

This section has described the philosophical concepts and underpinnings of the new systems age. The key philosophical ideas are denial of subject/object dualism, importance of recognizing the level of complexity at which one is working, creating and understanding boundaries and their ethical ramifications, recognizing interrelationships and the value of

interdisciplinary work, seeing a problem as a functioning system rather than something to be broken down, hierarchy and emergence.

2.1.2. Systems Methodology

Method and methodology are different. Method is a set of techniques that are used in sequence to achieve a predetermined purpose while methodology is a set of theoretical ideas that will justify one's use of specific methodological tools and methods (Midgely, 2000). There is value in being aware of a variety of methodologies, methods and the positions taken by those using them (Midgely, 2000). There are a large assortment of approaches to the philosophy of systems. The following is a small sample of those approaches.

Chaos theory and complexity science use mathematics and non-linear equations to show that much of what happens on Earth is relatively unpredictable (Gleick, 1987). A small disruption introduced to a large system can have an extremely high number of outcomes, rendering long-term predictions essentially impossible (Kellert, 1993). The most common, and often misunderstood, example of this is weather. In December of 1972 Edward Lorenz presented a talk to the Global Atmospheric Research Program where he suggested two things. The first of these was that a single flap of a butterfly's wing could generate a tornado and the second is that if a butterfly's wing can create a tornado, it also has an equal probability of preventing one. Thus, his actual proposal was not that a single flap of a wing could alter the course of history, but instead that there are so many small disturbances that neither increase nor decrease the frequency of events (Lorenz, 1972). The key question is: Does the flap of a wing create a significant difference over a long period of time? What was found is that small errors in large systems tend to double in approximately three days. Thus, prediction of a

weather system beyond three days is largely meaningless, although tracking patterns over a long period of time can often provide a range at which predictability is likely (Lorenz, 1972).

Small changes in a system can eventually lead to large changes, and even a complete flip, of the entire system. For instance, the Lorenzian Waterwheel, as seen in figure 2.3, rotates in one direction until the weight of particular buckets changes just enough that the wheel will begin to spin in the opposite direction (Gleick, 1987). Lorenz demonstrated this behavior with the Lorenz Attractor (or a butterfly curve), as seen in figure 2.4. The system is shown in a three dimensional space where a point in time represents a continuously changing variable. The crossover is representative of a shift in the system's behavior, such as the waterwheel reversing its direction, called a bifurcation point (Gleick, 1987). The trajectory of the lines, represent systems variables, are the attractors within a particular phase. A simple way to think of an attractor is a pendulum that is slowly decreasing in speed. The weight of the ball and force of gravity is creating an attractor for the pendulum, creating a force that drives the behavior of the pendulum (Gleick, 1987).

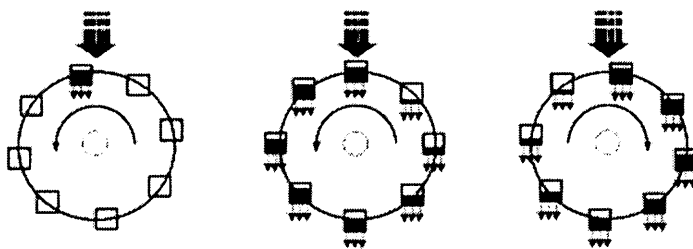


Figure 2.3. Lorenzian Waterwheel (Adapted from Gleick, 1987).

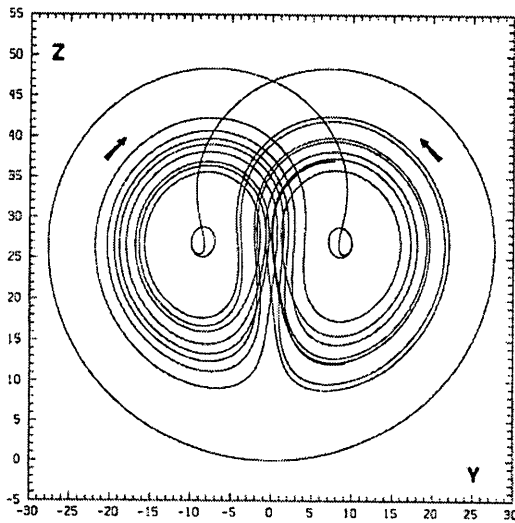


Figure 2.4. Lorenz Attractor. The outline of a Lorenz attractor showing two steady states (Lorenz, 1993).

Other chaos theorists such as Adrien Douady, John Hubbard, Boris Beluzov and Anatoly Zhabotinsky looked for order amongst the chaos. Douady and Hubbard showed that geometric patterns emerge from the repetition of supposedly chaotic non-linear equations, creating beautiful geometric shapes such as Hubbard Trees (Hubbard, 1993). Together, Douady and Hubbard produced proof of an “external ray” which is an infinite curve within fractals showing their projected shape. When these rays and sets are repeated infinitely, a geometrical shape inside the geometry of a Julia or Mandelbrot set emerges, as seen in figure 2.5. Julia and Mandelbrot sets are types of fractals. The term fractal was coined by Benoit Mandelbrot to define certain intricate geometric shapes that are created by mathematical formulas, but that also occur naturally in nature (Mandelbrot, 1982). These patterns can be seen on shorelines, rocks and even in musical compositions. Thus, despite the word “chaos” suggesting non-regularity, there is a high degree of order within the chaos. There is now a philosophical argument among chaos theorists about whether or not the current inability to predict human

action and the future of patterns in nature is an intrinsic problem of the world, or if it is simply due to our current limited understanding of systems.

Gregory Bateson in parts 3 and 4 of *Steps to an Ecology of Mind* introduces cybernetics (1972). He introduced the idea of the world existing as a series of systems comprised of individuals, societies and ecosystems. In each of these different systems he found competition, dependency and adaptive changes that are dependent on feedback loops. These became termed “self-correcting systems” as they would, independent of outside intervention, change variables to attempt to remain stable. Feedback can be described as “causal ‘loops’ where a system makes a change in its behavior and receives information back from its environment about the effects of this behavior, which is then used to determine future actions” (Midgely, 2000, pg. 48). Bateson argued that all these systems are part of a supreme cybernetic system that controls everything, and each is self-regulating within a large self-regulating system, such as the Earth (Bateson, 1972).

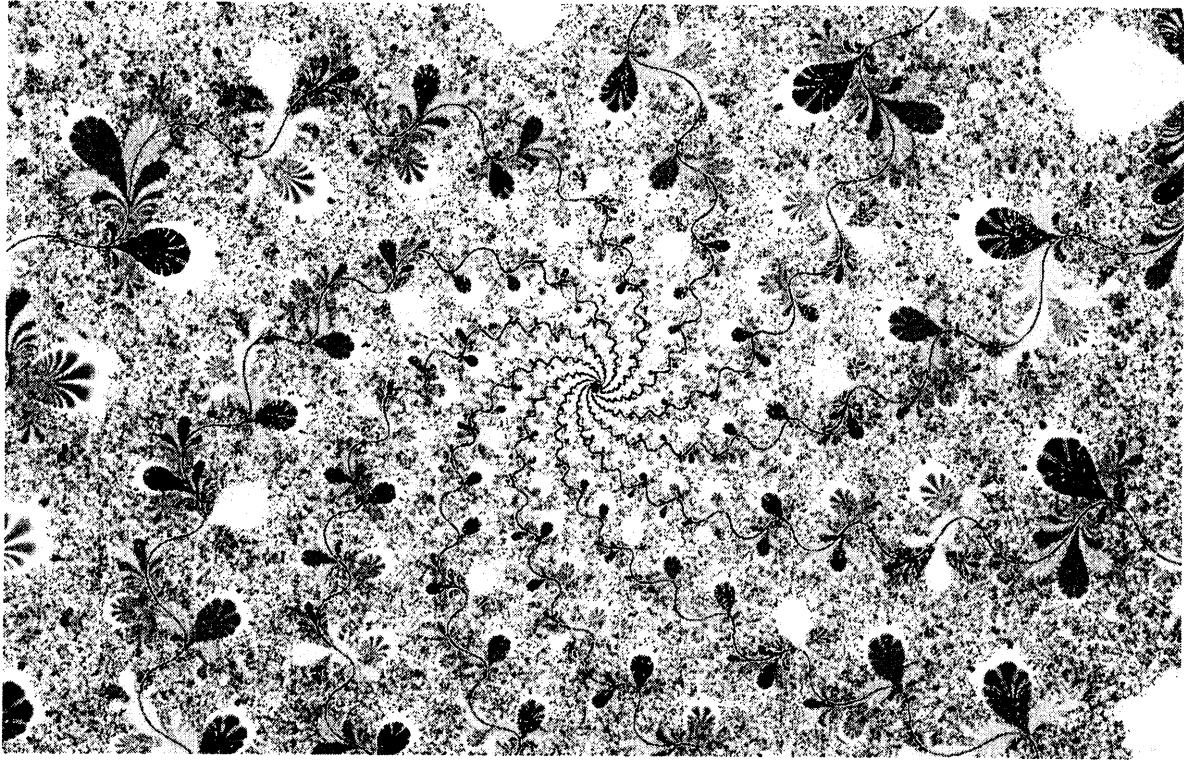


Image 2.5. Misiurewicz Parameter. The colored geometrical shapes are created by non-linear equations, as are Julia set, fractals and Mandelbrot sets. The dark lines in between the sets are external rays. You can see from the image that after the process is repeated it creates another geometrical and patterned shape (Rempe, 2003).

System dynamics, first developed by Jay Forrester, was originally used in electrical engineering and later used for demonstrating the behavior of complex “hard” systems (Forrester, 1961). A system is described as a “hard” system if it is describing a world that is systemic and can be shown using direct connections. Conversely, a “soft” system is when the process of inquiry is systemic for a complex and “messy” situation (Checklack, 1999). Systems dynamics requires computer modeling to show the organization and structure of a hard system. These models can plot feedback loops while simultaneously showing the connections to other variables. The problems are first shown using causal loop diagrams, which are a simple map that show the variables, stocks and flows within a problem and how these relate to one another.

The causal loop diagram is then transferred into a modeling program. Using equations, different outputs are created to simulate a problem. These systems are useful for seeing changes over time in a system and to predict the future.

Soft systems methodology (SSM) is concerned with “organized complexity” (Checkland, 1999, pg. 6). It is useful because humans attribute meaning to their perceived world which are interpretations of the real world formed by experience-based knowledge. These interpretations can be used to improve situations and change the world. This is the foundation of a soft systems approach to understanding and learning. SSM provides the basis for a communal learning cycle through meanings, intentions and purposeful action (Checkland, 1999). It provides this opportunity without hampering the individual approach or opinion of a person while creating knowledge that can be used to improve and change the world (Checkland and Scholes, 1999; Checkland and Poulter, 2010). The seven step process, which is an early expression of the methodology, is an iterative process that encourages an open mindset of various stakeholders involved. The overall approach is sensitive to other cultures, non-traditional knowledge and is as holistic as one may be able to get (Checkland and Scholes, 1999). SSM uses techniques such as rich picture building and conceptual models of human activity to stimulate debates and find leverage points in real life situations. Models are necessary to deal with the complexity as they show the interrelating parts of the system. SSM deals well with this complexity as there is room in the method to consider emergent properties inside of a hierarchy. I will expand on the technique of SSM in chapter 4 as it is the methodology used for this research.

2.1.3. *Systems Action*

In normal science, observation is key. Karl Popper stated that for an event to be worthy of scientific attention it must be observable and testable by observation (1959). In normal science there is an emphasis on experiments and controlled conditions, but for systems theory this cannot always be done. Midgely states that intervention is purposeful action by a person to create change in a system (2000), but this isn't quite complete either. Instead, in systems theory and systems thinking, "action" or "outcome" can come in a variety of forms (Checkland, 1999). While intervention and systemic change is likely the most desired outcome of a systemic approach to a problem, other outcomes could be group reflection, group learning or recommendations to appropriate channels. Without engaging in some form of practice, the methodologist is unable to test whether or not their proposed approach to a problem works or not, and thus, one of these actions should happen at the end of the study. Further information on systems action and the learning process will be discussed in chapter 5.

2.1.4. *The "Trinity"*

Pure philosophy can ignore real world issues; pure methodology can lack an ethical foundation; and pure action can result in illogical solutions or learning. Thus, to have a holistic, strong, ethical and logical approach to complex problems, one must ensure understanding in all three areas (Midgely, 2000). Each element is dependent upon understanding of the other as seen in figure 2.6. A solidified epistemology will lead to a valid methodology. In turn a valid methodology will lead to more effective learning and meaningful intervention. By further exploring the philosophical backings of systems thinking, namely the ideas mentioned in section 2.1.1, a philosophy of subject/object monism, interrelating parts and interdisciplinary

approaches emerges as an ethical philosophy on which to base one's own approach. The methodology can then be criticized using this philosophy to ensure it is ethical and encompasses all important aspects of the epistemology. This leads to a legitimate process of learning or intervention, as the outcomes of the method are securely backed up by solid philosophical decision making on why that method was used. If a person only uses philosophy and methodology, the project lacks purpose. Without any kind of proposal for change, intervention or learning the project was useless. If a person uses only methodology and intervention then their project lacks justification. Philosophical underpinnings explain the why of the project and the method, examining the philosophy of a project gives the researcher an opportunity to evaluate their own role in the process. If a person uses only philosophy and intervention then their project lacks rigor. Without methodology, one is jumping to conclusions without sufficient information and knowledge to do so. The trinity approach is systemic in nature as it fosters a learning experience before even beginning a project and iterative learning takes place between the realms of philosophy and methodology. If, when analyzing one's method, an inconsistency emerges between the philosophy and the methodology, then it is simple to reexamine this particular area, and this results in a more holistic approach.

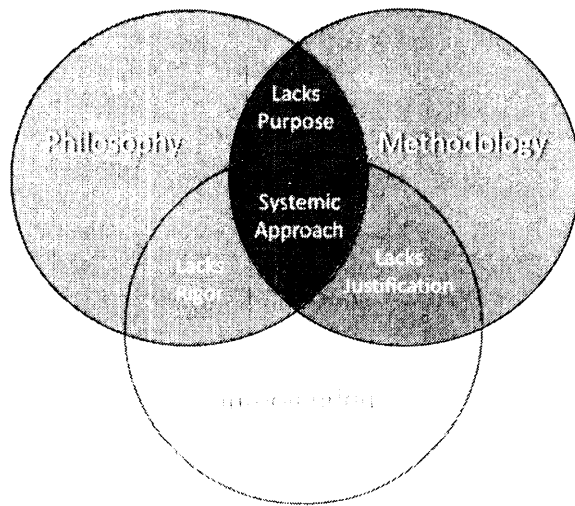


Figure 2.6. Holistic Systemic Approach. (Kaitlin Weedmark-Kish, 2012; adapted from Midgely, 2000).

2.2. Approaches to Health

This section will deal with different approaches to health, some of their failures, alternative options of analyzing health and how environmental factors impact health. For my purposes I am working with the World Health Organization's (WHO) definition of health as "a resource for everyday life, not the object of living; it is a positive concept emphasizing social and personal resources as well as physical capacity," (1999).

2.2.1. Failures of traditional approaches to health

Attempting to understand and analyze health has been approached in various ways and has resulted in conceptual models of health. (For example the Ecological models, social cognition models and the wellness model.) Some models did not effectively take into consideration the biophysical environment's effects on human health.

Ecological models have four core principles, as outlined by Sallis, Owen and Fisher (2008), which are:

1. There are many influences on health behaviors from various levels including intrapersonal, interpersonal, organizational, public and community.
2. Interactions and influences happen across all levels.
3. Ecological models should be behaviour-specific, finding the most relevant influences at each level.
4. The most effective interventions will be at multiple levels.

These models account for behavior of the individual and the intentions of behavior, and also look at different levels of human interactions, but fail to directly link the ecological environment and changes to environment to human health.

Other ecological models, as seen in figure 2.7, focus on a “triad” between the host, the environment and the agent (Waltner-Toews et al., 2001). This comes with a couple of problems such as the assumption that the agents cause only one disease and that all exposed individuals become diseased. The method focuses on people making healthy decisions instead of seeing how the two systems are linked, regardless of decision making abilities. A model based on social cognition and socioeconomic factors, as seen in figure 2.8, similarly focuses on human choice (Sword, 1999; Armitage and Conner, 2000). It supports the dissemination of knowledge to people about choices and consequences, allowing them to make an educated decision. This again ignores the fact that the environment and ecosystems are not something one can simply decide not to partake in. The Wellness model, as seen in figure 2.9, treats health as a continuum rather than a desirable end state (Waltner-Toews et al., 2001), but still has no mention of the physical or socioeconomic environment. While these models have their advantages, they all avoid the issue of socioeconomic and biophysical influences on human health (Waltner-Toews et al., 2001).

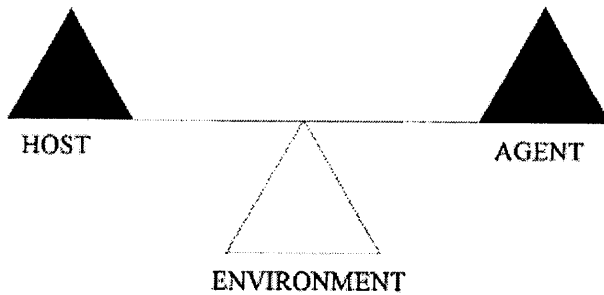


Figure 2.7. Ecological Model of Health. (Waltner-Toews et al., 2001, pg. 206)

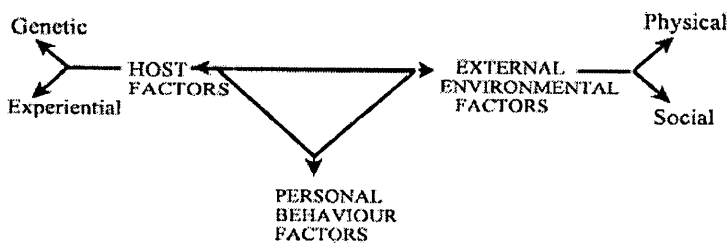


Figure 2.8. Socioeconomic Model of Health. (Waltner-Toews et al., 2001, pg. 206)

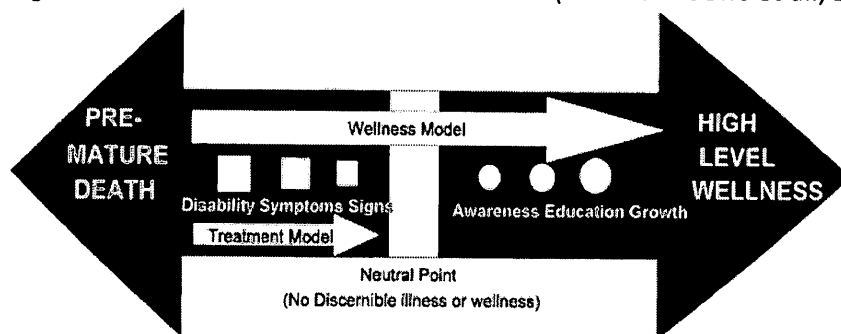


Figure 2.9. The Wellness Model of Health. (Waltner-Toews et al., 2001, pg. 207)

More holistic models focus on four areas influencing human health – the environment, lifestyle, human biology and health care, and how these portrayed health and well-being as an ultimate end state rather than a continuum (Waltner-Toews et al., 2001). After the WHO changed its definition of health (quoted above), a new paradigm emerged around modeling health (WHO, 1999). This paradigm called for a systems approach to health rather than a biomedical approach. A systemic approach to health would sufficiently cope with complexity, while taking into account the various relevant viewpoints in a situation (Waltner-Toews et al.,

2001). Models, such as the Mandala of Health, as seen in figure 2.10, and the Health Determinants Model, as seen in figure 2.11, attempted to do this.

The Mandala Model looks at four factors affecting human health which are human biology, behavior, psychosocial environment and the physical environment (Hancock, 1985). The health of the individual is affected by all, or some, of these realms. This model builds on previous ones, using foundational connections of the individual, environment and disease, while also adding in relationships between hierarchies of family, community and state, mental health and issues of justice. However, it does not deal explicitly with the interactions of the biophysical and socioeconomic environment.

The Health Determinant Model focuses on the relationships between important aspects of health such as disease, health care, social and physical environment and well-being (Evans and Stoddard, 1994). However, the model is too deterministic and linear (Waltner-Toews et al., 2001, pg. 210).

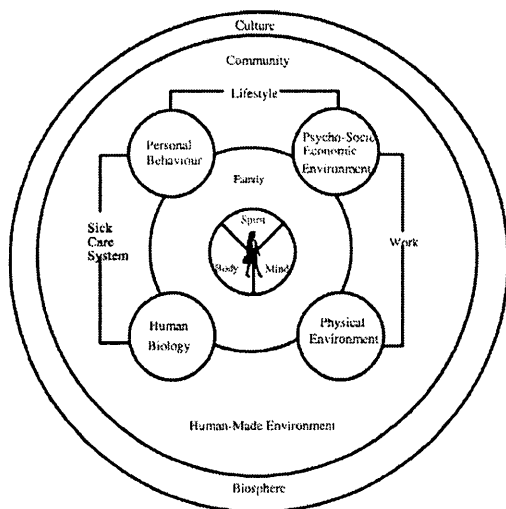


Figure 2.10. Mandala of Wellness. (Waltner-Toews et al., 2001, pg. 210)

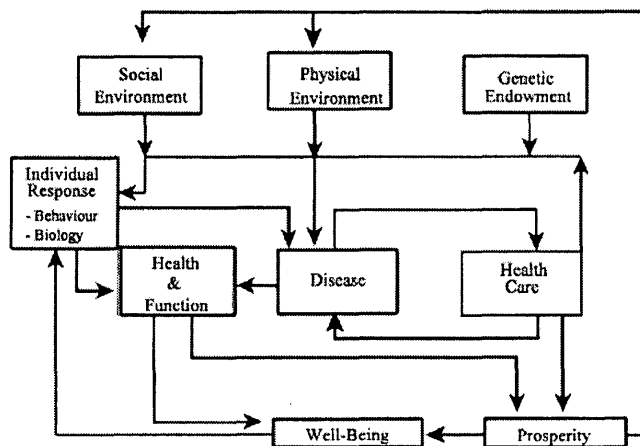


Figure 2.11. Health Determinant Model. (Waltner-Toews et al., 2001, pg. 211)

If humans are viewed as a system, it can be said that they are a subsystem of the environment, because humans live within the environment and require it to survive. Anthony McMichael in *Planetary Overload* examines ecological issues such as land degradation, ozone depletion and loss of diversity, linking them undeniably to negative implications for human health and well-being (1993). McMichael's more recent work draws these connections more specifically to the changes happening in response to climate change (2001).

Thus, a model is required that incorporates the coupling of the human and natural system, such as the Butterfly model, which also allows for the analysis of nested social hierarchies (Parkes et al., 2008). The Butterfly model, shown in figure 2.12, is a generic model meant to have broad application (Waltner-Toews et al., 2001). The model has five components: humans, ecosystems, biological filters, external biophysical and socio-economic environments and the individual, community and ecosystem linkages. The humans in this model are placed inside of the ecosystem, inherently coupling humans and the environment rather than accounting for the environment based only on human decision to interact with it. The lines in the figure, however, are dotted because humans move between different ecosystems and from

the biophysical environment to the socioeconomic environment. The broken lines signify interconnections between the various components. The biological filter includes elements of the environment such as air, water, etc. and their qualities. It accounts for physical, mental and spiritual sustenance, alluding to the idea that those who fulfill these requirements tend to be healthier (Waltner-Toews et al., 2001).

There are three other components in the model: political institutions, social networks and the health care systems. This is designed to emphasize the importance of how well these components work in a particular setting as they, as a system, promote healthy communities. Political institutions are meant to allocate funds to promote health and well-being and to take care of citizens, including providing a secure health care system. A social network will fulfill the spiritual and personal needs of a person, while the health care system takes care of biophysical needs. There are also external biophysical and socioeconomic factors such as decisions and programs implemented by the World Health Organization, trade agreements and other global activities (Waltner-Toews et al., 2001).

In analyzing a problem, the butterfly model will allow for a coupled view of the socioeconomic and biophysical environments of a person while accounting for the hierarchical interactions of institutions, community networks, decisions of the individual and health care systems. It also allows for consideration of the global activities that can greatly affected a given individual's health, well-being and experience.

2.2.2. Health emerging through hierarchy

An individual's health is largely a product of the organization of their society due to nested social hierarchies (Blane et al., 1996). Tarlov (1996) explains that the components of one's social hierarchy are comprised of the inner immediate circle, intermediate circle and

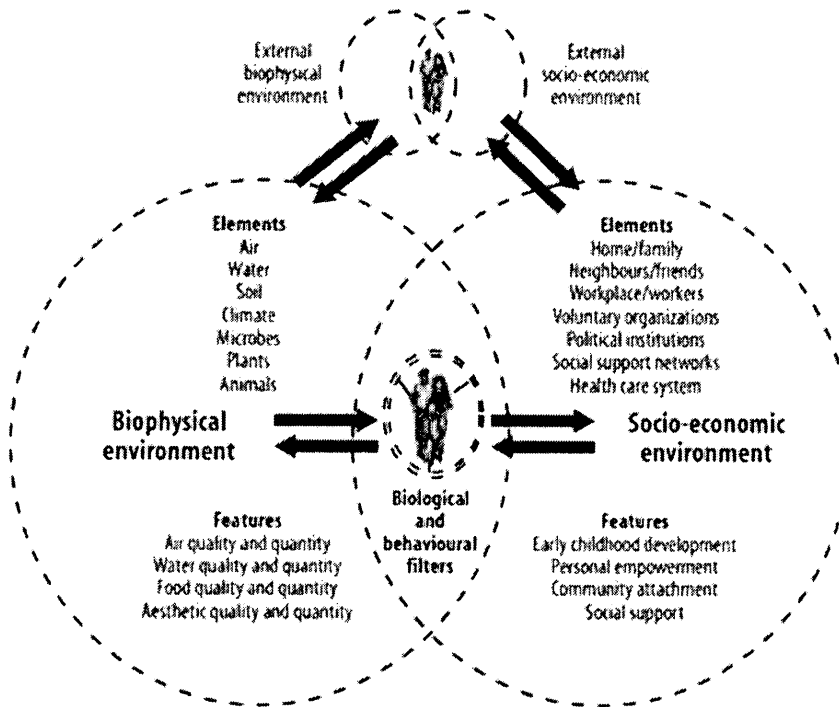


Figure 2.12. The Butterfly Model. (VanLeeuwen, 1998)

outer macro circle. Hierarchy, in this context, is as described in the first section of this chapter. The Inner immediate circle includes the individual's family, close friends and living community. The intermediate circle is a community circle comprised of one's work relationships, school and authority structures. The outer-macro circle is the society at large, such as the government and economic community. I suggest that beyond this there is another circle consisting of the global community, which can greatly influence the outer-macro circle. These levels in the hierarchy are highly interactive and events and decisions made within each are interrelated. However,

because the intermediate and outer-macro circles generally hold more influencing power than an individual, there is a high propensity for the emergence of inequality (Tarlov, 1996).

The health of individuals within a system is related to social inequality, political funding and the organization of society, and thus, these hierarchical structures are important (Byrne, 1998). For example, people's lifestyles will be dictated by how the hierarchies affect them. In China, people who are not extremely wealthy have little say over where they work, live and play due to economic and political constraints. In an authoritarian society such as China, the outer-macro hierarchy strongly influences the way in which the immediate hierarchy lives. Due to lack of options, many Chinese workers are forced to work in coal mines where they develop respiratory issues (Wright, 2004). Diseases and well-being are emergent in this hierarchy.

2.3. Summary

In this chapter the literature has been reviewed for systems thinking and approaches to understanding health. This chapter has demonstrated the difference between reductionistic and holistic approaches to understanding situations. Holistic approaches are necessary when a problem needs to be examined and expressed without reducing it to the sum of its parts. Systems thinking was presented as a way of doing this. This chapter also presented a number of approaches to health including the ecological model of health, the socio-economic model of health, the wellness model of health, Mandala of wellness and the butterfly model of health. The chapter finished with a brief description of hierarchy and nested social hierarchy, a defining concept for this paper. The following chapter will describe the context of the project including Chinese environmentalism, health, politics and barriers to research.

3. Context of China

This chapter will examine the Chinese contexts relevant for this research project. This context includes the current state of the environment and human health in China, China's past and current political climate and how the political climate has effected environmental action. This chapter will also examine the barriers to research that working with the context of China presents.

Rapid industrialization in China has created a new middle and upper class and an overhauled economic landscape. For example, in 1982 there were only state-run hair salons, bringing in approximately 24 million Yuan per year (approximately CAD 4 million). By 2009 there were over 1.6 million hair salons, department stores and boutiques that brought in over 168 billion Yuan (approximately CAD 28 million) (Gerth, 2010). Another example is the new and increasing car culture. In the 1980's there were only 20 000 cars in China, most of which were taxis for tourists as private car ownership was not allowed (Watts, 2010). After car ownership was made legal in 1993 there were still only 37 000 privately owned cars, but in the 8th 5 year plan cars became a major contributor for planned economic growth (Gerth, 2010). By 2000 30% of the 600 000 cars manufactured in China were for private ownership as Chinese car culture saw the car a symbol of freedom and success (Gerth, 2010). Today 12 000 to 14 000 new cars are added to the streets of China every day, creating massive amounts of pollution and traffic congestion (Gerth, 2010).

China has also seen the development of an aristocratic class, something that would have been shunned during Maoist days but is envied by Chinese citizens today. China has become the world's leading consumer of luxury cars, 3rd largest of jewelry, 2nd largest of gold and the

largest of platinum. The Chinese Gini coefficient has risen by over 50% in 2 decades as urban inhabitants now earn four times more than rural inhabitants, making China more unequal than Africa and Latin America (Gerth, 2010).

Without even considering the political complications, the topic of Chinese environment and health is very challenging. As China is a geographically vast country that has an extensive variation of issues across the nation with ineffective local governance (Holdaway, 2010). Politics makes the situation even more difficult as the political system in China is not straight forward. In this paper the term “Chinese government” is used a number of times. It is important to keep in mind that oversimplifying a complex organization such as the Chinese government is easy to do. There are a number of smaller scales outside of the central government (such as provincial and municipal governments, as shown in figure 3.1) and even private actors that influence the central government. For the purposes of this paper the “government” is generalized as the central government.

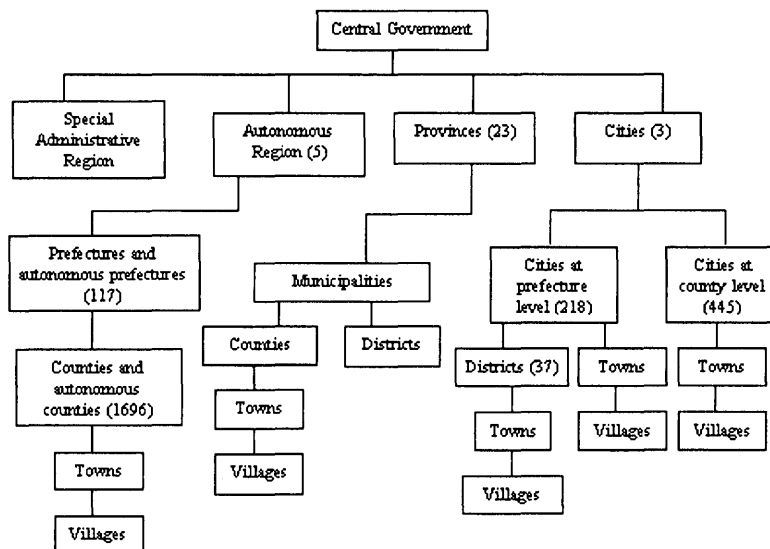


Image 3.1 Structure of Chinese Government (United Nations)

3.1. Chinese Environmental Politics

Dynastic China changed the face of the Chinese landscape in monumental ways with projects such as the Great Wall of China and the Terra Cotta Army. Just outside of Xi'an you can find entire mountains that have been used to create a monument to a single past emperor. China is not a country of modesty; the phrase “丢脸”(pinyin: diu lian) or “losing face” encourages Chinese people display their power, abilities and wealth. For Mao Zedong this meant turning China into a global economic force. Mao introduced heavy industrialization that China had never seen. Hundreds of factories and entire work forces were transplanted into the interior of China (Harris, 2005). The industries began to intensely pollute and extract natural resources at a rate never seen in China before.

Pre-Maoist China was characterized by war and battles for power. With Mao strongly holding China in his grasp, free of civil war, he could focus on his vision. Midway through Mao's rule there was a global underlying assumption that the Communist political structure that had been in place was less competitive than Western economic structures, and thus, less environmentally destructive (Smil, 1993). In Mao's writing it is clear that he saw nature as a force to be conquered and used. Mao fantasized “about a world being shaken by 60 million tonnes of Chinese steel by the year 1962” (Smil, 1993, p 195). After the Cultural Revolution and continuing into today the government pushes for an 8-10% increase in gross domestic product per year regardless of the negative impacts. This materialist attitude toward the environment continues to run through the veins of China's current political party (Harris, 2005).

Mao's reign and the cessation of warfare meant much lower death rates, which between 1949-1957 decreased by almost half (Banister, 1998). The Great Leap Forward saw a

drastic increase in death rates from famine but after food supply was restored in 1961-1962 it dropped substantially again, contributing to China's current population. China attempted to solve the issue of rapid population growth by implementing the One Child Policy in the 1970's. While it had great success in lowering China's population growth rate, the ethics of the law has been questioned (Banister, 1998). Regardless, this booming population began to experience new consumerism after Mao's death.

This new consumerism and economic development led to environmental changes including increased air pollution, acid rain and large volumes of solid waste and toxic wastes (Johnston et al., 1997). International pressure forced China to create environmental objectives as the country was quickly becoming one of the leading countries for industrialization and consumption (Watts, 2010). Through the 1970's the government argued that as a socialist state they did not have environmental problems (Harris, 2005). Regardless, by the end of the 1980's China started its first major campaign to combat pollution and by the 1990's they were even closing some of the older factories that were particularly harmful (Harris, 2005). In 1994 the Chinese State Council adopted *China's Agenda for the 21st Century: White Paper on China's Population, Environment and Development in the 21st Century*. The themes were economic development in the forefront and environmental protection as secondary – themes that remain strong today. In 1998 China's officials summarized China's official environmental objectives as: gaining international status, developing environmental industry, advancing sustainable development, gaining aid and technology transfer, increasing national security and pushing for developing world equity (Harris, 2005). These objectives, which can scarcely even be called

environmental objectives, show the future of China's approach to international environmental policies and their desire to exercise leverage over developed nations.

Overall, the Chinese Government's primary environmental goals are to improve their global image, enhance national economic gain, obtain free technology, strengthen their own security, and to become a developed nation. None of these objectives are concerned with the citizens' wellbeing, the cessation of resource extraction, halting the use of harmful sources of energy or targeting concerns of pollution, deforestation and other vital environmental issues.

The central government started allocating grossly inadequate funds to respond to environmental issues outside of its primary goals (Harris, 2005). Most associated laws were not enforced due to a lack of investment, corruption and refusal of local authorities to enforce the laws. Because of China's legal system, Beijing has very limited control over law and bureaucracy outside of the city itself (Harris, 2005). China runs on "state environmentalism" which refers to national environmental regulations being implemented in different regions at different times through different approaches (Tseng, 1999). This results in an overall inability to implement large scale environmental change and laws. Local governments, subject to little to no enforcement of laws, ignore environmental policies and regulations in order to more easily reach their goals of 8-10% growth dictated by the government (Tseng, 1999).

After the Rio Summit, China launched a massive international propaganda campaign, based on the conference, to show its devotion to environmental progress. However, as a developing nation, international agreements held them to very simple targets and China would never sign anything that would result in intrusive external monitoring (Harris, 2005). This continues to a problem today.

Part of the main issue is that China's foreign policy prevents action on the environment and as a result health and wellbeing continue to suffer. In this context foreign policy is defined by Barkdull and Harris as "the objectives that officials of national governments seek to attain, the values and principles underlying those objectives and the methods by which the objectives are sought" (2002). Approaches to foreign policy can be characterized in three ways: 1) systemic, 2) societal and/or 3) state-centric, such as China's (Ikenberry, *et al.*, 1988). State-centric approaches are shaped by the government, which uses individuals and institutions in the country to implement foreign policies on its behalf. This type of foreign policy is generally very goal oriented and is characteristic of authoritarian governments (Ikenberry, *et al.*, 1988). China's government is customarily characterized as being exceedingly authoritarian with citizens very rarely affecting the foreign policy, which is largely aimed at promoting economic growth (Hanson, 2006).

China intentionally seeks out international environmental commitments that do not have intrusive inspections and that permit them to preserve its "sovereign right to develop its resources as it sees fit" and ones that have low costs with high benefits (Johnston, 1998, p 73).

Harris outlines this issue:

"Chinese policy has been characterized by support for multilateral environmental funding mechanisms, new and additional resources for environmentally sustainable development (aid above and beyond non-environment-related aid) and technology transfer. China has often resisted mandatory implementation of agreements by developing countries and it usually rejects projects for sustainable development that include intrusive inspections" (Harris, 2005, pg. 34).

Rather than looking to improve its environment, China is instead wholly focused on achieving status as a developed nation.

Despite these essentially dishonest approaches to environmental politics, international agencies must continue to take China seriously. Not only is it one of the largest economies in the world but it holds great political power amongst the developing nations and can serve as an example for joining international environmental initiatives (Hanson, 2006). Because of this, China receives the most environmental aid from the World Bank, accounting for 80% of its entire environmental budget. China uses its strong leverage of still being classified as a “developing country” while still having very strong political power over agencies such as the World Bank to continue receiving large amounts of money (Harris, 2005). There is still the mentality in China that as a developing country, it has a “right to development” where rich countries should be principally responsible for tackling global pollution and environmental change (Harris, 2005, pg. 37). This is not to say that Chinese officials do not admit that there are environmental issues and push for real change, however their motivations lie in environmental degradation adversely affecting their economic development and seeing these policies as ways to obtain financial and technological resources from developed countries.

3.2. Environmental Issues Affecting Health in China

China’s approach to issues of environmental degradation are problematic due to the effect environmental degradation has on the health and well-being of individuals. In this section I will look at various environmental problems and their effects on health.

Pollution in China is expected to continue to rise with an annual growth rate of 2.48% in particulate matter and 2.44% in sulphur dioxide between 2010 and 2020 (Wang, 2010). The decrease in public health has already cost China approximate 250 billion yuan (approximately 40 billion Canadian) in 2010. This is expected to rapidly increase at a growth rate of 7.83% per

year, thus, costing 452-615 billion yuan (approximately 98 billion Canadian) in 2020 (Wang, 2010). This is due to an increase in mortality, hospital admissions, emergency room visits, days of restricted activity, asthma rates in children, bronchitis and chest discomfort (Wang, 2010). While China's development has seen a lot of people lifted out of poverty and money invested into green technologies, it is not sufficient to reduce mass health impacts on China's most vulnerable (Wong, 2003).

Obviously, despite China's superficial attitude toward environmental regulation there are various severe health and environment concerns in China. In the 1980's China contributed a mere 3% of world emissions that were destroying the ozone layer. By the end of the 1990's that number soared to 18% and today China contributes 15% of all global greenhouse gases (Harris, 2005). Air pollution is one of the worst environmental issues in China. 16 of the world's 20 most air polluted cities are in China, the worst being Linfen (Vice Broadcasting System, 2008). This large amount of air pollution is due largely to the fact that China relies on coal for 68.7% of all its energy (Gerth, 2010). Every year China is increasing its dependence on coal by increasing coal use by over 10%. This, on average, amounts to 1 new coal plant each week (Gerth, 2010). Each 10 000 Yuan (\$1250 USD) made in GDP requires the burning of 2.6 tons of coal (Gerth, 2010).

The World Bank has stated that within Chinese cities the ambient concentrations of air pollutants greatly exceeds standards set by the World Health Organization (WHO) and the WHO estimates that 75% of Chinese live in areas where air quality is below national standards and 99% by European Union standards (Wong, 2003; Holdaway, 2010). In many Chinese cities, diseases that are directly linked to air pollution, such as emphysema, bronchitis and asthma are the

leading cause of death. Even in over 60% of China's 47 so called "key environmental protection cities", air quality is classified as class III and class IV, the two lowest classes possible (Wong, 2003). In addition to the increase in air pollution from coal, individual car ownership is also on the rise, which adds additional air pollution to cities.

Land is also a problem as there is a major loss of farmland every year due to overgrazing, urban development and natural disasters (Wong, 2003). The diet of the Chinese people has changed drastically to a more Western diet with Kentucky Fried Chicken, McDonalds and Pizza Hut becoming popular options for Chinese people in all major cities. This new diet requires 10 million more cattle than in the United States each year to meet the demand (Gerth, 2010). A mere 50 years after the great famine killed more than 30 million Chinese people, they are now consuming four times the amount of meat that they were eating after the famine was over, increasing the rates of obesity (Gerth, 2010).

There is a loss of topsoil from overgrazing resulting in massive "yellow wind" storms that cause respiratory issues (Gerth, 2010). Deforestation from more farms is resulting in the growth of China's deserts. Deserts are engulfing almost one million acres of land each year (Gerth, 2010). This leads to more sand storms and also will result in at least 150 million ecological refugees as villages are taken over by desert (Gerth, 2010). Deforestation is also causing major flooding such as in the Yangtze river (Wong, 2003). In 1998 the Yangzi River flooded from erosion, killing over 3000 Chinese people, destroying 5 million homes and causing \$20 billion in damage. This flooding also resulted in an increase of water borne diseases that are brought on by pollution.

Water is becoming a national issue in China. Urban rivers are increasingly becoming more polluted. The water quality in only 36% of urban river sources are classes 1, 2 and 3 (excellent, good and fair, all suitable for drinking) while the remaining water is the worst quality class, which is unsuitable for drinking (Wong, 2003). Population growth, the use of chemical fertilizers on crops, and discharge from factories and sewage treatment plants all pollute the water sources. Only one in five cities across China meets internal government standards for drinking water (Holdaway, 2010). 60 million people in China can't meet their water needs and 600-700 million people are forced to drink contaminated water (Gerth, 2010). Incidences of water-borne diseases such as cholera, typhoid and diarrhea are swiftly on the rise, especially in rural areas and almost half of these incidents could be eliminated simply by moving people away from heavily polluted areas to even just moderately polluted waters (Holdaway, 2010). The Chinese use huge amounts of water for industry – for example, it takes 400 000 liters of water to produce a single car (Gerth, 2010). As a result China's aquifers are dropping by 10 ft. per year, forcing Northern farmers to dig over 1000 feet for water (Gerth, 2010). For safety reasons, people are turning to bottled water. The plastic is greatly contributing to pollution and waste.

China produces huge amounts of trash as many citizens have developed a "throw away" lifestyle (Gerth, 2010). The Chinese do not recycle their products. To illustrate this, recycling revenues in Japan annually are around \$1 trillion USD, in the United States \$3.6 trillion but China's annual revenue from recycling is a mere \$5.4 billion USD (Gerth, 2010). In a single year China generates 780 million tons of industrial waste and 14 million tons of domestic waste and the treatment rate for both sets of trash is well below 50%. This trash leads to major health

implications such as acid rain, more water pollution, and hazardous chemicals leaking into residential and public spaces (Wong, 2003). China has also become a dumping ground. 70% of the world's annual 50 million metric tons of e-waste is shipped to China, mainly Guiyu, where it contributes greatly to soil contamination and elevated levels of toxins in the blood of everyone in the village, including children (Gerth, 2010). Soil in e-waste processing villages has levels of heavy metals 3000 times higher than what should usually be recorded in these areas (Holdaway, 2010).

Children, the rural poor and women are all disproportionately affected by environmental issues in China (Holdaway, 2010). Indoor air pollution and the lack of sanitary facilities in rural areas results in 300 000 deaths per year, most of whom are women and 2/3 of all villages lack access to piped water in 2007. Malaria and schistosomiasis are spreading into poverty stricken villages along the Yangzi River (Holdaway, 2010). Villages have no safe method of disposal of their solid waste and urban areas often ship their own solid waste to villages (Holdaway, 2010).

Town and Village Enterprises (TVEs) usually take advantage of rural villages as people are desperate for work and have no choice but to take jobs at the TVEs (Wright, 2004). TVEs lack environmental regulations, safety standards and job security (Holdaway, 2010). They pollute villages with heavy industry and these have become the nation's most polluted cities. The people in these villages and urban poor have less access to affordable healthcare and little choice about moving to gain better healthcare. Healthcare has increased in price by over 30% in 20 years. Life expectancy in China is, overall, 73 years but the life expectancy of the nation's poor is, on average, 10 years less than a more well off citizen (Holdaway, 2010).

3.3. Barriers to Research

There are two major obstacles for examining these issues in China. The first major problem is China's highly authoritarian and secretive government. China, geographically and historically, has required an authoritarian regime to keep orderly control over its people (Joseph, 2010). The current political climate started with Mao Zedong, whose politics are built on Marxist ideologies which stray away from Marxism in terms of application. The key ideas in Mao Zedong Thought are a strong role of the working class in the revolution and in the building of a socialist country (i.e.: great "proletarian" revolutions), the mass line (all cadres have to walk and listen to the people; no one is higher than another), voluntarism for change, class struggle and a permanent revolution (Joseph, 2010). Mao very successfully controlled all aspects of Chinese culture with his political ideology. Unfortunately, this Thought resulted in a multitude of power issues including corruption, economic inequality and suffering for the working class (Eberstadt, 1980). Mao Zedong Thought is still apparent by China's current authoritarian government.

Even though Maoism is no longer the dominant political and societal philosophy, remnants of it are still seen across the country and are evident in the current dominant Deng Xiaoping Thought (Joseph, 2010; Shapiro, 2001). Deng Xiaoping Thought explicitly strives to keep socialist ideology strong in China but also opens up the economy to the world (Joseph, 2010). The Chinese government continues to be effective at maintaining control over media representations of the environment. For example, the documentarians for Vice Broadcasting System's (VBS) *Toxic* (2008) were asked to leave Linfen, China's most polluted city, after only a week of research and interviews. Also, all major media outlets are owned and operated by the central government. There is no central authority for collecting data on pollution and health

issues, and the monitoring standards of data-collection organizations are generally not advanced or kept up to international standards. This is because different cities and states are governed by different levels of government; lower tiered governments generally do not enforce laws made by the central government for environmental protection and monitoring (Holdaway, 2010).

Hu Jintao's current contribution to Chinese thought, Scientific Development Concept, encourages the idea of a harmonious society (Joseph, 2010). While this sounds idealistic and supportive of positive change such as social welfare and increased individual prosperity, it is also used to censor information and media that may disrupt the harmony. There is now a Chinese debate between two prominent economic models, the Chongqing Model and the Guangdong model. This debate is about which model of development is more effective. It is a prime example of how strong the need for continued economic development is embedded in the society.

The Chongqing model, coming out of the municipality of Chongqing, emphasizes the role of the state alongside the economy and capitalist market. In this system money is spent on health care, social services, housing, pensions and education. The Guangdong model follows suit with the development of special economic zones in China with high investment from foreign countries and low-wage manufacturing jobs within China to continue mass exports. I will return to this debate in chapter 7 when discussing reasons for hope in the coming future.

This debate demonstrates that the size of China continues to be an issue; it has become completely possible for two almost opposite ways of developing the economy to emerge in two entirely separate parts of the country. China's huge size, wide range of demographics, a history

of strong ideology and historical oppression remain a problem. The size of China means that enforcing country-wide laws within a culture rife with corruption becomes quite difficult, especially when different zones have developed their own system that works appropriately for that region.

Each geographic region is facing its own problems, for example in the West there is a lot of turmoil and conflict with Muslim Chinese. Regions such as Tibet have a strong international support for its resistance to central government intervention. The South and major cities are money and economy driven while villagers are still attempting to fulfill their basic human needs. Anyone that has been historically oppressed sees the possibility of becoming rich today and strives to have a better life. Corruption and distrust still run rampant throughout the country (Holdaway, 2010). People and governments distrust researchers and fear the possibility of negative information about China becoming public.

Ironically, China claims that feeding their growing population and eradicating poverty must come before environmental protection (Harris, 2005). This demonstrates a historical pattern of ignoring the systemic nature of environmental issues in connection to poverty and food shortages. A famous story demonstrating China's linear thinking is Mao and the Sparrows. There were sparrows eating a lot of grain seeds, so Mao had all the sparrows killed, only to have insects overrun the crops. Thus, in order to approach Chinese environmental issues, a new systemic world view is necessary.

The second major problem to undertake research in China is a lack of scholarly works published in English. While there are scholars in Canada writing about China, the pool of knowledge is drastically hindered by the complications reviewed above. Even government

websites in China cannot be trusted for information as the government is known for falsifying information in order to not lose face (Yang, 2009). Beyond the general information that I provided in the previous section, there is not a lot of well-known information on health and the environment in China (Holdaway, 2010). Additionally, numbers that have been reported in English are likely to be underestimates.

As China avoids intrusive international monitoring methods, there is no way for the World Bank, WHO or any other international regulatory body to ensure that these numbers are accurate. Additionally, data in China is collected by different agencies for different reasons and the data is never pooled together (Holdaway, 2010).

Also, many numbers likely go unreported, particularly with diseases that occur in jobs. This could be for a few reasons. The first reason is that TVEs and private industries are not always registered with authorities, so there is no one requiring numbers on accidents. It is possible that workers are encouraged to withhold accident reports to prevent unwanted government inspection that could lead to the closure of a factory (Holdaway, 2010). Some Chinese workers may also not tell their employers about diseases they contract so as not to lose face or start a legal battle (Holdaway, 2010).

The Chinese legal system itself is also limited in its ability to respond to cases, especially those relating to the health impacts of environmental degradation. Courts at different levels of government will interpret clauses differently; this is especially the case with “the burden of proof”. Some courts will strongly emphasize the victims’ need to show proof that their condition has been caused directly by their work environment, and if they are unable to do so the industry will take no responsibility for the disease (Holdaway, 2010). Workers are generally

unable to show proof as they lack access to legal and medical resources that would assist them in building a case. Thus, a number of diseases from workplaces will be dismissed and the industry owner will be able to report incidences at a much lower rate than reality.

The legal system further complicates matters since in China “law” is often seen as a “loose connection of ideas” (Harris, 2005, pg. 91). Individual, central party and policy interests will always receive more attention than adherence to laws and order. Additionally, the public is not well educated about their rights; in 1996 0.5% of the Chinese people had a basic understanding of environmental law and their role in it (Harris, 2005). The lack of overall public awareness remains a major issue as people are unaware of their rights and potential infractions upon those rights.

3.4. Summary

This chapter has examined the growing environmental issues in China. The increased amount of air pollution from cars and air conditioners along with increased consumerism have all greatly impacted the environment of China. As a result there are a number of growing health issues that can be linked to environmental issues. Respiratory illness related to air pollution is drastically on the rise. However, this chapter also demonstrated that China’s approach to environmental issues have historically been superficial or put economic development above environmental preservation. This chapter also presented barriers to research in China including the authoritarian regime, linguistic barriers and issues of creditability. All of this has set up a context within which the research project took place. The following chapter will examine the methodology used for the project.

4. Methodology

The purpose of this chapter is to describe the methods that were used to collect and analyze data for this work. The overarching method used to approach the problem is Soft Systems Methodology (SSM). Thus, this chapter starts with an overall outline of the steps one takes to employ SSM, followed by sections that describe the different techniques used at each stage. The techniques used are structured surveys, open ended interviews, rich pictures, CATWOE, human activity system modeling, content analysis and critical systems heuristics.

The importance of this section is reflected by Midgely's argument that an approach without a legitimate methodology lacks rigor (2000). A method is deemed legitimate if it creates knowledge and data that, as much as possible, generates an accurate representation of reality and is viewed by all parties involved as appropriate in the particular circumstance (Midgely, 2000). It is for this reason that the methods described in this chapter are particularly useful. Each allows for multiple perspectives, room for declaration of biases and tangible approaches for understanding real world social problems.

4.1. Soft Systems Methodology

Soft systems methodology (SSM) is an action research method within the realm of systems theory. It is used to tackle and understand messy real world situations. The method provides a framework to approach complex problematic situations. Checkland and Scholes (1999) argue that the methodology is useful because it allows for inherent cultural biases of the observer to be accounted for in the research, rather than attempting to rid the research of

biases. These biases, derived from experience-based knowledge, become interpretations of the world. People use these interpretations to inform their intentions, which then become purposeful action to improve an undesirable situation. This action then changes the world and the first three steps in this process become a cycle.

By making use of systems thinking epistemology, this cycle can be formally articulated and activated. Thus SSM is a formalized enquiring and learning process; it helps to move meanings to intentions to purposeful action. Yet SSM does this without imposing the rigidity of other techniques.

The original framework used to practice SSM is a seven step process created by Peter Checkland. While this seven step framework may seem rigid, it is a process that has evolved over time. Users now alter this technique taking steps in a different order or may skip steps entirely. Presenting the process in the original form is the most succinct mode of discussing the framework. The process is as follows, as described by Checkland (1999):

1. Discover a problem
2. Express the problem
3. Create a root definition of relevant purposeful activity systems
4. Build conceptual models of systems based upon the root definition
5. Compare the models with the real world, other models or a formal systems model
6. Come up with systemically desirable and culturally feasible change
7. Take action to improve the situation

The following sections will elaborate on each of these steps while describing the techniques used to accomplish them in this research.

4.2. Identify the Problem

As with any research, SSM starts by identifying a problem and defining it informally. This stage is usually done by the researcher, or group of researchers. In the case of this research I

completed this step alone. The initial problem definition was realized through preliminary research and literature review. It resulted in a formalized research question:

What has been the health and well-being experience of elderly Shanghai residents in the context of environmental issues caused by economic development?

SSM was originally adapted to address “messy” situations. While this question seems relatively “clean” SSM is still useful for taking into consideration the worldviews of participants and taking a culturally sensitive approach. I hypothesized that the answer to this question would be quite negative. Based on the literature it would stand to reason that the participants would experience increasing amounts of health issues and that the well-being of average citizens is not increasing enough to outweigh these health issues. Issues of health were to be measured by the citizens’ opinions on their physical health and the frequency of hospital visits. States of well-being were to be measured by the citizens’ levels of overall happiness and contentment with the government and their lives.

4.3. Define the problem

The second stage is intended to express the problem more formally, which should be done with various stakeholders associated with the problem situation. The more viewpoints that can be incorporated in this stage, the closer to reality the problem definition will be. The problem definition is used to inform the next few stages in the process. In this work, the process was conducted with 62 interview respondents, 23 of whom also provided detailed interviews. The research was conducted by my translator and I, Beiyuan Xu, in the summer of 2012. 39 of the surveys were completed by strangers we met in parks and public spaces. The

other 23 surveys were completed by interviewees obtained via snowball sampling. We began with the immediate social circle of Xu, and the participants then suggested others to talk to. While this type of sampling means staying within a particular social circle of individuals, which could result in some biases, it was necessary due to distrust of outsiders in the society.

The first step was to distribute surveys to people on the street and then to the participants obtained by the snowball sampling. This was followed by informal interviews and confirmation from the 23 interviewees that the problem had been understood to their satisfaction. The following section will describe these processes.

The way in which the participants were obtained has issues of validity and reliability. Most notably that the parks where the surveys were distributed were in more affluent areas of Shanghai. Additionally, all of the interviewees come from a social circle that could be described as upper middle class. An appropriate use of soft systems methodologies would have included different income ranges as they will have varying interests in the problem situation. Cluster sampling from a number of different income brackets and jobs would have made a more representative group. Additionally, the small size of the sample has a large effect on the statistical outcomes. For example, it requires only 5 people to make up 1/5 of the entire participant pool. Saying something is supported by 20% of the participants really only means 5 participants. The validity of the study is also questionable as the participants all had a personal relationship with myself or the translator. It is, thus, difficult to argue that the results of this study can be generalized as true for all elders in Shanghai. Rather, they are generalized for elder's who live comfortably and are in the upper middle income range.

4.3.1. Structured survey

A Chinese translation of the survey (refer to appendix A, where the survey is shown in English) was distributed to 100 potential participants on the street, with small disposable pencils. We received 39 surveys back from participants in public and obtained 23 more from the interview participants. The survey consisted of 11 questions meant to ascertain basic information about the participants, such as their occupation and whether they have any health issues. The survey asked questions about income and home life to see if low income participants have different issues from those with higher incomes. The survey results were entered into the statistical software SPSS for basic statistical analysis. While the sample size is not large enough to make any certain statements about correlations and relationships it is large enough to test parametric statistics based on the normal distribution. Exploring how the different answers relate to one another will be further explored in chapter 5.

4.3.2. Interviews

The list of interview questions (refer to Appendix B) was compiled by and asked by me. The questions were developed based on the literature reviewed and the research goals. All follow up questions were conducted by Xu as my language abilities were not developed enough to follow the full conversation. The interviews were conducted in the participants' homes or office buildings in groups of 1 to 6. The interviews ranged from 40 minutes to 3 hours in length. The questions were open ended and informal, allowing for a process that allowed for much more detail than the survey and to allow for as much of the participants' opinions to come

through as possible. Every participant was asked the same opening statement; to have them describe what has changed about the environment around them in Shanghai over the past 30 years. The majority of the participants took a very lengthy time answering this question, answering a number of the other questions simultaneously.

The rest of the questions were organized in three sets. The primary purpose of the first set of questions was to see if the participants believed that they have health issues, how these health issues came about and whether the government had improved the environment around them and their well-being. Some questions, such as “Do you find it more difficult to breath?” were asked to determine whether participants noticed the changes in increasing amounts of smog. Some questions intentionally sought out contradictions in answers in an attempt to understand the government’s role in influencing the opinion of the respondent.

The second set of questions was based on participants’ survey answers. If the participant had migrated to the city, it was important to know when this occurred to ensure they were still within the boundaries of the project. Additionally, it was important to find people who had lived in the same neighborhood for the past thirty years as they would have better knowledge about whether and how the neighborhood had changed.

The third set contained more sensitive questions and, thus, were only asked to people who seemed open to talking about the government and who had not been defensive in any of their previous answers, creating an unavoidable bias in the results. Since all of the interviews were conducted in Chinese and because he was more familiar with the cultural reactions of people in the city, Xu made the decision about whether to pursue this line of questioning. This

final set of questions asked about the government's role in changing the city and affecting the lives and health of people living in Shanghai.

4.3.3. Rich Pictures

There is value in being aware of a variety of viewpoints contributing to a methodology as people with different perspectives can have different insights (Midgely, 2000). Their insights can be used to challenge ourselves and others who are attempting to build representations of reality on which to base change. The key of SSM is to welcome insights from others without losing one's own position and ideas. This has been done in this study through the use of rich picture development.

In this study, and generally in SSM, pictures are used to show human affairs because they reveal relationships much more effectively than words alone. Rich pictures, which can be built with various actors in the system, can express relationships and value judgments while creating a product that transcends lingual, cultural and professional barriers (Checkland and Scholes, 1999). In this study the rich pictures drew attention to stakeholders, key people, key relationships and connections inside of the problem situation. More importantly, in a culture such as found in China, rich picture development was an easy way to transcend language barriers and cultural aversions to saying too many things.

Rich pictures were developed with the 23 interview participants and then compiled into one all-encompassing rich picture that was shown to the participants, who gave their approval of the final product. The pictures were developed in their own homes in groups of 1 – 4 people. Often the picture development was conducted with more than one person. I provided the

participants with paper and colored pens. The only direction they were given was to draw Shanghai in the present day and 30 years ago. They were asked to focus on important changes and relationships between them and the environment and how the environment has changed. After they had completed the pictures, I showed the participants a very rudimentary rich picture I had created about Shanghai and asked if they wanted to change anything. After I had an example of a participant's rich picture I used this to show other participants instead of my own. Most participants saw things in the other picture that prompted them to demonstrate more specific relationships, not necessarily what had been on the picture they were shown, but it just gave them a better idea of what they could include.

After they finished their pictures I compiled them into three larger images. I brought these compiled pictures to all of the participants to ensure that they still showed their opinions sufficiently. Most of the participants were satisfied with the final product and two of them made addendums to the pictures. This final visit also included a reiteration of what we had learned from the participants to ensure that their opinion had been recorded, translated, understood and summarized appropriately. These final rich pictures are what I have used for the analysis of the research. The results and discussion of these pictures will be presented in the following two chapters.

4.4. Root Definitions

The third stage of SSM was used to break the larger problem definition into smaller systems that are functioning within the larger system. For this stage the mnemonic CATWOE is utilized to define adequate root definitions, which will be explained in full in the following

section. This stage has been completed without the direct participation from the respondents. It was entirely based on the interview questions.

Systems deemed “relevant” are usually subjective - a fact that researchers simply have to accept (Checkland and Scholes, 1999). However, there are two kinds of choices I have made on what is considered a relevant system, informed by Checkland and Scholes (1999). First, there are ‘primary-task systems’ - existing organized systems that affect the overall system. For example, a system may exist in a society that provides clean water to residents. This would easily be identified and named “a system to provide clean water”. The second set of potentially relevant systems, ‘issue-based systems’, are more conceptual, such as “a system to resolve disagreement on water use”.

The root definition of these systems should express the core purpose of the activity system. This is most effectively done by working through the mnemonic CATWOE, where C is customers, A is actors, T is transformation, W is Weltanschauung (worldview), O is ownership and E is environmental constraints (Checkland, 1999). Customers are the victims or beneficiaries of the transformations occurring in the system, and some suggest there are always some beneficiaries and some victims in all transformations that should be considered. Actors are those who are performing the transformations in the systems. The transformations are the conversion of inputs to outputs in the systems. These are descriptions of desired outcomes of the variables in the system. For example, a local population becomes better informed or pages on books become dog eared (Checkland and Scholes, 1999). The Weltanschauung is the worldview that makes the context of the transformations meaningful, it

can also display biases or preconceived notions of reality. The owners of the system are those who could stop or prevent the transformations from happening. The environmental constraints are the elements making up the system that are taken as a given. Once each of these is defined, a root definition of the system is created. For example a “system to have a cleaner home” could be defined by CATOWE as:

C: homeowner
A: homeowner
T: dusty house → house is no longer dusty
W: a clean dust free house is desirable
O: homeowner
E: hand dusting, cats, skin cells, dust accumulation

The root definition then could be: “A homeowner-owned and operated system to dust a house by conventional hand dusting methods, to have a cleaner home that is dirtied by cats, skin cells and dust accumulation.” By defining a variety of these activity systems, the processes of the system have been understood to make change in the problem situation.

If the problem situation here is that people have dirty homes, then an intervention of teaching people how to dust could help. In this research root definitions of the relevant systems were developed after the interviews and surveys with participants. Since this project is largely one of acquiring knowledge and developing theory, the participants were not active in creating the root definitions or choosing relevant systems. However, their responses to the interview questions were the only input to the root definitions.

The creation of the CATWOEs used in this study started first with a concept map to show the various interactions of the citizens, businesses and governments. By going through the interviews and the surveys, I was able to find important themes. I started with these on a

larger concept map and then linked the issues together on a larger scale with different activities done by humans. Based on this larger concept map I looked at the areas that tended to be reoccurring and seemed to connect to the most things over all. I created problem definitions around these. This process resulted in nine definitions describing the important systems within this problem situation. These definitions will be explained and explored in the following two chapters, respectively.

4.5. Build Conceptual Models

The fourth stage is to develop conceptual models using the knowledge gathered in the previous stages. This is done through concept maps where different bubbles represent human activities. While no human activity system is inherently relevant, it will help to define an adequate definition of and points at which to intervene in the problem situation. This step was completed by me alone, based on the CATWOE definitions developed in the previous stage.

Models of human activity were developed to show accounts of purposeful activity according to personally perceived worldviews. They are typically used to stimulate debate about problem situations and find areas of possible and desirable change. However, since this stage was not completed with the participants or stakeholders for this research, the human activity systems were used to test and question root definitions. Additionally, they were created to practice the creation of them. Since they have been compiled by me alone my bias will be present in how I have shown the activity. I have, however, attempted to base the systems on the interviewee information entirely.

4.6. Compare Models with Reality

Stage five usually consists of the stakeholders and researchers comparing the models to reality to see how the important aspects of the models relate to the real world and how they can be leveraged to create change, generate debate or discussion. For this research, this stage was completed independently of the participants. I have compared the models with reality in three ways. Two techniques are content analysis and critical systems heuristics, which I will explain in this section. The rest of the comparison will be completed in chapter 5 where I present it in the form of analysis to see how the information gathered speaks to the reality that the literature described.

4.6.1 Content Analysis

Content analysis is an exploratory method grounded in empiricism with the intent of being predictive and/or inferential (Krippendorff, 2003). Content analysis has been used in this project to qualitatively analyze the interviews conducted. Historically, content analysis has been used in a variety of ways including pragmatic content analysis, sign-vehicle content analysis and semantical content analysis (Krippendorff, 2003). This research will be more pragmatic. Sign-vehicle analysis counts the number of times a word is said while semantical analysis looks at the meaning of the words when they are used. Pragmatical analysis looks at the number of times something is said in a favorable (or unfavorable) way, thus, looking at the number of mentions and the meaning of the words.

Content analysis can consist of four functions: to confirm or disprove what is already believed, to correct the illusions of supposed specialists, to settle disagreements among supposed specialists and to formulate hypotheses about things in the system. This project will

focus on confirming or disproving what is already believed about the system. It will also be used for the following uses that are part of Berelson's (Krippendorff, 2003) list of the 17 uses of content analysis: to look at the effects of potential propaganda techniques, determine the attitude toward the themes within the research, reveal where the focus of attention is with the participants and to describe the attitude and behavior of the responses in the interviews. It is for these reasons that content analysis has been useful for this project. The data collected has layers of cultural and personal meaning for each person and content analysis provides a framework that allows the analyst to interpret these different meanings.

4.6.1.1 Epistemology of Content Analysis

Content analysis has been used for a long time in different ways. In the early 1900's, churches would measure the columns in newspapers that were devoted to certain topics to establish the "truth" about the newspaper. In the 1930's – 1940's it became a more formalized process as social scientists became more prominent and needed a way for their textual data (or other meaningful sources) to become replicable and valid (Krippendorff, 2003). Texts are meaningful to the person saying it and the person reading it and, thus, analysts must look at how individuals use texts and their purpose behind it.

There are six features of text that are relevant to the definition of content analysis (Krippendorff, 2003). First, texts have no objective qualities; they contain no quality that is independent of the reader. Texts do not have singular meanings as they can be read from a number of perspectives. It is, thus, impossible for a researcher to suggest that they have found the absolute meaning of a particular body of text. It is also restrictive and trivial to demand that any researcher or analyst find common ground with other perspectives seen in the text and,

thus, meanings of text need not be understood by all and shared. All meaning taken from the text speaks to something in the world beyond the text in question. Readings and texts contain mental constructs of a culture, past and future experiences and other hidden causes. Thus, while some content analysis can focus on a problem, it is also vital for the analyst to try and read for context-specific ideas contained in the text.

The texts' meaning is highly dependent on this context and the purpose for which the text was created. However, the analyst reading the text may see the context quite differently than another. It is vital for the analyst to recognize and be explicit about the context through which they are answering their research questions. Content analysts inquire into the social reality that they infer from a text (Krippendorff, 2003).

4.6.1.2 Framework

There are various conceptual components required to conduct content analysis as outlined by Klaus Krippendorff (2003). The first must be a body of text that contains some sort of data. Data in this context can refer to anything from poetry to newspaper articles. Data is inferred and created by the analyst by looking at the themes, meaning and information presented in the texts. It is up to the content analyst to understand the different relationships present in the text as best as possible. For example, when analyzing interviews, it is important to keep in mind the context and self-interests of the person answering questions, as this will influence their answers to varying degrees. Thus, the analyst should start by acknowledging the origin of the text and define the context of the world it has come from. The text data in this study are the interviews. The first step in content analysis for this study was obtaining the interviews and translating them.

Content analysis also requires at least one research question that the analyst is attempting to answer; I have already outlined one used in this study that fit these criteria. The question should be believed to be answerable and allow for (in)validation. These questions become the goal of the inference when reading through the texts. Because inference from the text is the sole way to answer the research question, this could result in reading into answers in a way that is unproductive and not appropriate. The question outlined earlier in this chapter completes the requirements for this step.

As mentioned before, a context to situate the research and analysis in is also required. This context is of the analysts' choice. It is a construction and a conceptual representation of the environment through which the text is being analyzed. This context helps to clarify what the analyst does with the text, such as where the texts originated from and their original purpose. In the case of this research, where the analyst was present in the creation of the text, this will be easier to construct. Relatedly, content analysis also requires that the analyst's knowledge is operationalized by an analytical construct. For example, the network of correlations that may explain the ways in which different texts in the set are connected to one another or how these texts will speak to one another to help answer the research questions. The context for this study has been to examine the texts as coming from people who are used to living with an authoritarian government and who have lived long enough to know if lives are generally improving for people in similar situations as themselves.

Finally, content analysis requires inferences of the text. Inductive and deductive logic are not crucial to content analysis. Rather, abductive reasoning is required to assess different particulars in the text. For example, one can date text by the vocabulary used or infer the

religion of the participant by things they reference. This sort of reasoning makes for a difficult task in validating evidence. If a participant refers simply to “god” this could potentially refer to a number of things. The themes and words can be interpreted in a variety of ways. This is the primary way in which the data has been analyzed in chapter 5.

The types of data that content analysis deals with can have major errors that the researcher must be aware of. This project is no exception. The interviewees of this project were well aware that they were being tested and observed, which could, and did as shown in the results; alter the outcome of their word choices and answers. Other potential errors are the participants lacking experience, unreasonable expectations of participants, and influence on participants by the researcher or other participants, stereotypes that the participants are attempting to avoid or adhere to and reactions by the researcher influencing the actions of the participants. However, these errors need to be considered as real data because while the participants may be defensive, as they were in this research, their interview is their opinion of what is happening and their defensiveness is part of that. Thus, these “errors” are simply a part of the results.

Content analysis, due to these open inquiries of information and accounting for errors as data, is very compatible with systems theory. Researchers using content analysis can begin to extrapolate trends from people’s speech, and the analyst can take the information to describe a potential worldview and observe changes within the system based on the opinions and ideas of participants.

Using the program NVivo to identify common themes I have done user based content analysis. The following section deals specifically with the computer program’s functionalities

but it fails in some areas. For example, I have been looking for instances of defensive language. These kinds of idiosyncrasies are not identifiable by the computer program. Using the framework above I have gone through the interview data thoroughly looking for instances where the participants' answers have been influenced by things such as the past, indirect government propaganda and the self-interests of those answering. I have also needed to keep in mind others who were present at the time of answering the questions, as this would highly influence what was said. Going through the interview in this way is necessary to find the relationships between the words that have been recorded and the themes and history of the problem situations.

4.6.1.3 NVivo

In this study, content analysis has been used to understand the various pictorial and verbal data collected. All of the previous approaches for content analysis mentioned have been done without the aid of computer analysis. Following this analyst-based content analysis the data was entered into a computer program, NVivo, to organize the different ideas and themes in the research. NVivo is a program specifically designed to organize textual data.

To start this process with NVivo I first had to input all of the text data into the program and go through each interview individually to identify (tag) different themes that appeared throughout the interviews. After completing this I ran different searches to learn things about the text such as the frequency of theme occurrence, relationships between themes and word occurrence. For example, the words "Shanghai", "water", "population" and "factory" were all used quite frequently, demonstrating that these were things of importance while talking to participants about the environment. When a query search is made the program can also show

how related certain themes are to one another. For example, the themes of “pro-government” and “environmental restoration” frequently occur together. Thus, the user can extrapolate that the participants praised the government for doing environmental restoration.

While NVivo made for interesting query searches on the relationships between different themes and the frequency of phrases and themes mentioned, user conducted inference has been the main source of analysis.

4.6.2 Critical Systems Heuristics

Critical Systems Heuristics (CSH), developed by Werner Ulrich and expanded on and modified by Martin Reynolds and Midgely, is a way to promote self-awareness of system boundaries (Hummelbrunner and Williams, 2010). CSH is a framework used to philosophically explore judgments in the design of systems boundaries (Reynolds and Ulrich, 2010). Table 4.1 outlines 12 questions used to question boundary design. CSH has been important for this research and comparing the models to reality for three reasons. The first is that CSH has allowed me to reflect on the assumptions of the system and to appreciate that there is a whole range of people, ideas and things excluded by the boundary that make the models unrealistic. The boundary questions attempt to nurture a holistic cognizance of the values and motivations built into the system, and power structures. The second is that CSH helps to ensure that boundaries promote mutual understanding and incorporate necessary perspectives. The questions are intended to demonstrate areas often overlooked that need to be examined. The questions also demonstrate that this cannot be done without multiple stakeholder involvement. Finally, CHS promoted reflection and analysis before the research even began, thus encouraging more understanding in the very early stages of this work.

The questions' four sources of influence, or main purpose, are motivation, control, expertise and legitimacy. Motivation questions what the system is achieving and for whom, control is what the system has decision making power over, expertise focuses on what knowledge is needed to understand the system and legitimacy looks at the justification of the boundary (Hummelbrunner and Williams, 2010).

Table 4.1
The 12 questions of Critical Systems Heuristics

Source of Influence	Interests of a system decided by boundary design		
	<u>Social Roles</u>	<u>Concerns</u>	<u>Problems</u>
Motivation <i>(the involved)</i>	1. <i>Beneficiaries</i> Who is/ought to be the beneficiary of the system?	2. <i>Purpose</i> What is/ought to be the purpose of the system?	3. <i>Gageing improvement</i> What is/ought to be the systems measure of success?
Control <i>(the involved)</i>	4. <i>Decision maker</i> Who is/ought to be in control of the conditions of success in the system?	5. <i>Resources</i> What conditions of success ought to be/are under the control of the system?	6. <i>Decision environment</i> What conditions of success are/ought to be outside the control of the decision maker?
Knowledge <i>(the involved)</i>	7. <i>Expert</i> Who is/ought to be providing relevant knowledge and skill in the system?	8. <i>Expertise</i> What is/ought to be the relevant new knowledge and skills in the system?	9. <i>Guarantor</i> What is/ought to be regarded as assurances of successful implementation?
Legitimacy <i>(the affected)</i>	10. <i>Witness</i> Who is/ought to be representing the interests of those negatively affected by but not involved with the system?	11. <i>Emancipation</i> What are/ought to be the opportunities for the interests of those negatively affected to have expression and freedom from the worldview of the system?	12. <i>Worldview</i> What space is/ought to be available for reconciling differing worldviews regarding the system among those involved and affected?

(Adapted from Reynolds and Ulrich, 2010, p 244).

I will use these questions in the following chapter to examine the system as a whole, especially in the context of nested social hierarchy.

4.6.3. Chi-Squared Tests

To further understand whether or not the results of the structured surveys and open ended interviews are significant I will employ the Chi-Squared test to three subgroups that emerged during the research process. The Chi-Squared test allows for the testing of statistically significant relationships between different groups and how they respond to answers. The test generates a probability at which belonging to a particular group will affect one's answer to the given question. The level of testing will be at $p=0.05$, the standard for social sciences.

The chi-squared test is important as it gives statistical quantitative confirmations to qualitative results. Given that the results are nominal and low in number the chi-square test can strengthen the outcomes. The chi-square test is easy to use and does not require a high number of data points. While the low number of samples (63 surveys and 23 interviews) means that the results of the chi-squared test may not be representative of the entire population it is useful for comparing differences in groups.

4.7. The Final Steps

This research uses only steps 1 – 5 of SSM as it focused largely on obtaining new knowledge and creating theory around the issues within the problem situation. Steps 6 and 7 were outside the scope of the research intentions. Additionally, the research conducted did not follow the steps in exact order as later expression of SSM are presented as more flexible and non-linear. The problem was defined twice; once before the interviews were completed and

once after as there was a dramatic shift in how I understood the problem. This demonstrates the flexibility of SSM, which has been vital in conducting field research.

Stage six has to do with generating ideas for change and stage seven is implementing them. It is important to remember that using the language of “problems” and “solutions” in these last stages is too simplistic as they do not sufficiently cope with actions, norms, standards, judgments and changes of everyday experiences (Checkland and Scholes, 1999). Hence, the use of the words “problematic situation” instead of “problems” is more appropriate. Additionally, since in SSM there are generally no linear problems with linear solutions, the entire methodology is meant to be flexible; the method does not need to be followed step by step and is an iterative process. Once the problem is analyzed and/or defined, the researcher and system participants will decide on systemically and culturally desirable and feasible change. The points and methods of intervention need to make sense within the system and match the values and morals of those who live within it.

4.8. Summary

The research has been conducted using the framework of soft systems methodology. The flexible and interactive format of SSM allowed for a relaxed and culturally sensitive approach to the problem situation while employing techniques such as CATWOE, rich pictures, content analysis and CSH. Surveys were distributed on the street and by snowball sampling to get basic information about the people in the project’s focus. 23 of the 62 survey respondents also completed interviews. The survey data has been analyzed using SPSS and the pictorial and verbal data has been analyzed using content analysis. The root definitions of relevant systems

and human activity systems have been questioned by critical systems heuristics. The following chapter will explain the results of the data collection.

5. Results

This chapter will, using soft systems methodology (SSM) as a framework, report on the results of the study. The data obtained via qualitative interviews and quantitative surveys will be presented using steps 2 - 4 of SSM to organize the results. All of the survey and interview data has been translated from Mandarin Chinese to English. In some instances a phrase may not have an exact translation into English and has thus been left in the original language with a brief explanation in English.

The first section will look at the data that expresses the problem, the second stage of SSM, including raw survey data and interview questions with answers. The second section will create root definitions of the relevant systems, the third stage of SSM, which can be identified within the problem situation using CATWOE. The third, and final, section will present human activity systems, the fourth stage of SSM, created from the raw data and root definitions to demonstrate how the parts of the systems relate to one another. Because SSM is an iterative approach where researchers do not always follow the steps of the methodology as originally presented, at the end of the chapter the problem will be identified for a second time as it changed during the collection of data.

5.1. Expressing the Problem

This stage involves defining the problem situation. This research was organized around the hypothesis that increased economic and urban expansion has had negative implications on elders' health in Shanghai. This hypothesis stems from the fact that the literature reports that Shanghai's environment is in a state of decline and the overall health of the nation is being affected, as presented in chapter two. While the initial research pointed to this conclusion, I

wanted input from elders in Shanghai to see if this was their experience. Experiential data is important for this topic due to the authoritarian nature of the Chinese government, which has the capacity and infrastructure to greatly influence the opinion of people living within China. Additionally, it is worthwhile to see if the elders of Shanghai believe that any decline in health has been balanced by gains in overall quality of life and well-being due to development over the past 30 years.

5.1.1. Surveys

The first step of my research was the distribution of the survey to 63 participants. The survey has three purposes. The first is to identify the participants and to learn more about them. The second purpose is to see what the participants know about health, the environment and the government. The third purpose is to see how their behaviors had changed and if they think these were positive changes.

The results, shown in table 5.1, indicate that all participants are at least aged 55 with a mean age of 66.8. As seen in tables 5.2 and 5.3, the majority of the participants were born in cities and have lived in Shanghai for the past 30 years. The levels of education varied. Most of the participants have no formal education, as shown in table 5.4. It is worth noting that the two participants with PhDs were actively sought out for the research and they introduced me to the participant with a master's degree. All three of the postgraduate participants are from the field of languages and literature. Unexpectedly, one quarter of the participants have undergraduate degrees and less than 15% have high school degrees. It was not expected that we would have more university graduates than those with high school degrees. This is likely due to the fact that our snowball sampling resulted in a large number of friends who met during university. In China

a person's cohort frequently becomes a lifelong group of obligatory friends. Over half of the participants, as outlined in table 5.5, live in one room apartments. For comparison purposes this can be thought of as a small bachelor type apartment in Canada. By referring to table 5.6, one can see that 63% of the participants are living with 2 – 3 people or more, and thus, it can be said that most of the participants are living in small homes with multiple people. This is further supported from my personal experience of being in their homes. Many were quite small, less than 500 square feet, and crowded. This type of living condition is not rare in Shanghai. While there is currently an emerging middle class with youth who want spacious living arrangements and a growing sense of individualism, this is quite a recent development. Previously it was common for children to share a bed with their parents in a one bedroom or bachelor type home. The homes the participants live in are usually those to which the government relocated the families after the Cultural Revolution.

Table 5.1
Age of Participants

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
55-60	24	38.1	38.1
61-70	16	25.4	63.5
71-80	15	23.8	87.3
81+	8	12.7	100.0

Table 5.2
Location of the Participants' Birth

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
City	38	60.3	60.3
Farm/rural	13	20.6	81.0
A different city	12	19	100.0

Table 5.3
Where the Participants Lived 30 Years Ago

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
City	54	85.7	85.7
Rural/farm	7	11.1	96.8
Other	2	3.2	100.0

Table 5.4
Education Level of the Participants

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
None	35	55.6	55.6
High school	9	14.3	69.8
Undergraduate	16	25.4	95.2
Graduate	1	1.6	96.8
PhD	2	3.2	100.0

Table 5.5
The Type of Home the Participants Live In

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Apartment 1 room	34	54.0	54.0
Apartment 1 room 1 bedroom	9	14.3	68.3
Apartment more than 1 bedroom	7	11.1	79.4
House	13	20.6	100.0

Table 5.6
The Number of People Living in the Participants' Home

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
1	4	6.3	6.3
2 – 3	40	63.5	69.8
4 – 5	16	24.4	95.2
5+	3	4.8	100.0

The survey's second purpose was to gain initial information on how the participants viewed the environment, health and where they obtain information on these topics to inform their opinions. When asked if the participants have any health issues that they could directly relate to the environment, most said yes, but none that are significant, (table 5.7). While many of the participants said they have respiratory issues this was commonly contributed to the

amount of direct or second-hand cigarette smoke they have inhaled. Despite any reported health issues due to the environment 56% of the participants believe that the environment in Shanghai is improving. As shown in table 5.8, only 32% believe that the environment is worse and 13% believe that it is mostly the same as in the 1990's. When asked what influences their opinion on the environment, the majority of the participants said it is based mainly on their own personal observation and on the media, as shown in table 5.9. Personal observations ranged from the clarity of the air due to smog, aesthetics of the city around them and the number of hot days in Shanghai. What is important to know about those gaining information from the media is that the media is entirely owned by the government and, thus, those basing their opinion off the media are founding their opinion on information the government provides. Only 7.9% of the participants stated that they get their information directly from the government. There is no indication in survey responses that the participants associated information and news from the television and newspaper with the government.

Table 5.7
Participants' Opinions on Whether or Not They Have Health Issues Related to Environment

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Yes	13	20.6	20.6
No	21	33.3	54.0
Yes, but not significant	22	34.9	88.9
Unknown	7	11.1	100.0

Table 5.8
Participant Opinions on Whether or Not the Environment of Shanghai has Gotten Better, Worse or Stayed the Same

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Worse	20	31.7	31.7
Better	35	55.6	87.3
The same	8	12.7	100.0

Table 5.9

Where the Participants Get Their Information About the Environment From

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Family	6	9.5	9.5
Friends	7	11.1	20.6
Self	19	30.2	50.8
Government	5	7.9	58.7
Media	19	30.2	88.9
Other	7	11.1	100.0

The third purpose of the survey was to determine how the lives of the participants have changed and if they thought these were positive changes or not. In table 5.10 it is shown that the amount of time the participants spend outdoors varies. Most of the participants spend very little time outside while one third of the participants spend a lot of time outside. In table 5.11 it is shown that the most common outdoor activity is to go to the park. Public parks are on the rise in China and have become common meeting grounds to dance, play board games and socialize for many of Shanghai's elderly citizens. Table 5.12 shows that 40% of the participants now spend less time outdoors than they used to 30 years ago. During the interview the participants were asked why they answered as they had in this question and most participants said they spend less time outdoors now because it is so much hotter. 30% of the participants spend the same amount of time outdoors while just fewer than 30% spend more time outdoors. Those spending more time outdoors stated that this is due to more free time. The purpose of this question was to see how environmental change has changed the habits and physical activity of the participants.

When asked if the participants feel if they have the opportunity to participate in community development, only one participant said yes, as seen in table 5.13. Most of the participants, 59%, said no, and the rest were unsure.

When asked if their lives have improved compared to conditions 30 years ago, 80% of the participants said yes, as seen in table 5.14. This response was not expected due to my own preconceived bias, supported by the literature review, that a rapidly degrading environment, such as Shanghai's, would result in overall discontent with the development of the city. Thus, the original research question was answered in an unexpected way giving rise to the development of a new research question. The participants felt that their lives were much better and, as seen in table 5.15, 60% believed that the government has improved the quality of life in Shanghai through their policies and decision making.

Table 5.10
How Much Time the Participants Spend Outdoors

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Very little	30	47.6	47.6
Some	11	17.5	65.1
A lot	20	31.7	96.8
No answer	2	3.2	100.0

Table 5.11
What Activities the Participants Do Outdoors

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Shop	1	1.6	1.6
Exercise	9	14.3	15.9
Play recreational sports	7	11.1	27.0
Go to the park	22	34.9	61.9
None	24	38.1	100.0

Table 5.12
How Much Time is Spent Outside in Comparison to 30 Years Ago

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Less	25	39.7	39.7
About the same	19	30.2	69.8
More	17	27.0	96.8
No answer	2	3.2	100.0

Table 5.13

If the Participants Feel as Though They are Able to Contribute to Community Development

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
No	37	58.7	58.7
Yes	1	1.6	60.3
Unsure	25	39.7	100.0

Table 5.14

Participant Opinion on Whether or Well-Being has Increased in the Past 30 Years

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Yes	50	79.4	79.4
No	3	4.8	84.1
About the same	10	15.9	100.0

Table 5.15

Participant Opinion on Whether or Not Government is Improving China

	<u>Frequency</u>	<u>Percent</u>	<u>Cumulative Percent</u>
Yes	39	61.9	61.9
No	16	25.4	87.3
Unknown	8	12.7	100.0

The surveys were a very effective way of quickly obtaining preliminary information. They were also useful in a society where distrust in strangers is common and, thus, recorded interviews were difficult to obtain. The surveys allowed me to obtain a higher sample size for this information than if I was to rely on the interviews and rich pictures alone.

5.1.2 Interviews

The interviews, conducted with 23 participants, ranged from 20 minutes in length to slightly under 4 hours in length and averaged 1 hour and 3 minutes. Some of the answers were quite lengthy while others were succinct and guarded. People who did not know me or my translator were not interested in providing a lot of information. Due to the nature of the interviews and complications of translation, not all questions were asked to all participants. Often the translator would attempt to gauge the participants' interest and comfort level and ask questions based on this. Other times a participant may have answered one question with

the answer to another. In this case we would skip the question that would create redundant data. Some of the answers, while expressed using different words, were similar in sentiment to answers of other participants. In these cases the idea, sentiment or thought is represented in the results only once as the same answer. Additionally, some participants took an entire hour answering the first question and, thus, there was no time to ask remaining questions. Appendix C shows the questions that were administered to the participants, the number of participants that responded, the answers given and percentage of the participants that gave the same, or similar, answer. This information will be used to enhance the descriptions of the rich pictures.

There are some important themes that emerged in the answers to these questions, as shown above. The majority of interview participants, 86%, saw few to no issues with the environment and saw little impact on their own health. Having a stable home and a constant source of food has increased their wellbeing substantially balancing greater loss of their natural surroundings.

The participants, with the exception of two, had an overall opinion that the environment was at its worst in the 1990's but has since greatly improved due to government intervention. The only major concern for the other 21 participants about the environment was the ever increasing amount of cars on the road. The participants complained that this not only contributes to air and noise pollution but makes it difficult to walk around in the city. 86% of the participants did not care about environmental issues and 78% considered themselves to be fully aware of the environmental situation of the country. Any health issues were associated with smoking or other non-environment related issues by all participants except one who believed the air had caused respiratory issues. There was a lack of interest from 86% of the

participants in contributing to community development and change because the government has been doing a sufficient job. Overall, all but three participants believed that life is much better today than it was 30 years ago.

Three distinct subgroups emerged in the interview process. The first consists of 13% of the interview participants all of whom have post graduate degrees. All of these participants thought that the environment is getting much worse and that this change is fueled by government corruption and ineffective regulations. This group also saw a growing income disparity and the elders of Shanghai being left to take care of themselves without sufficient government services. All three of these individuals cared greatly about the environment but considered themselves uneducated about environmental issues. Their primary concerns were the growing problem of air pollution and the future of water availability. This group thought that coughs were common in China but that it is difficult to know the source given that smoking is still a common activity and still permitted indoors in public spaces. While these three participants did not explicitly state an interest in community planning and development they said there was no opportunity to do so. This group also provided insight on environmental injustice and had a low opinion of the government.

The second distinct subgroup consists of 21.7% of the interview participants, all of whom are employees at a large corporate institute. These participants were greatly concerned with issues of money and economic advancement. While the majority of the participants thought life had improved because access to health care and food had increased, this subgroup thought it had improved due to access to luxury goods and economic opportunities. This group said the biggest change about Shanghai was that people were now able to make money and

that the city had modernized. They pointed to Nanjing Road as an example, which is the economic and shopping hub of Shanghai. They each cited that this road now has a number of fortune 500 companies on it, demonstrating Shanghai's growing power. They also pointed to the growing business and tourist district of Shanghai as a glowing example of Shanghai's success in becoming a global city. The growing number of cars was of little concern to this group as they each had private drivers. All but one of the participants in this subgroup considered themselves to be in an excellent state of health because they can afford private health care. They had little concern for community planning and questioned the relevance of doing so. Their knowledge of environmental issues was centered on knowledge of investment into green technologies. When asked about the government this subgroup did not have a positive or negative reaction. They simply stated that all countries have a history and China is no exception. They said that the opening up of the economy and the continued growth of GDP demonstrates the power of China. The subgroup also mentioned the importance and high incidence rate of corruption in the government and industries.

The third is the largest subgroup consisting of 65.2% of the interview participants. These participants have special interest in the notion of "home" and greatly value community. They get the majority of their information about the environment from the television, which they spend a great deal of time watching. This group strongly supports the government and would use defensive language if anything seemed to speak out against the government during the interview process. None of them had health issues that they were willing to admit yet many spoke about spending time at hospitals.

Unfortunately many of the participants thought our intention was to show that China's environment has degraded. I insisted that I was there for an honest discovery of ideas but distrust ran rampant through some of the participants. This undoubtedly affected the results. In two instances the participants said "I know you want me to say that we moved to this area because it was green and now it isn't." Overall the interviews were successful in obtaining information for defining the problem especially in conjunction with the surveys and development of rich pictures.

5.1.3 Rich Pictures

After completing the interviews the participants were invited to draw rich pictures on their own or in groups of 2 – 5 people. There was resistance from the majority of men and a lot of questions about why this activity was relevant. This can be attributed to a consistent issue of trust that I encountered and a cultural reluctance toward strong women. I then compiled the pictures into three overall rich pictures which were subsequently approved by the participants by taking it to them and showing them the final product.

I asked the participants for two rich pictures. All but two participants ended up doing three pictures. The first picture, shown in figure 5.1, is Shanghai in the early to late 1980's. The second picture, shown in figure 5.2, is Shanghai in the 1990's during the transition from an industrial to commercial-based economy, which 34.8% of the interview participants believe shows China's success. I had not intended for the participants to draw this picture, however most thought it was necessary to fully understand the transition Shanghai has under gone. The third picture, shown in figure 5.3, is Shanghai in the 21st century and today.

Figure 5.1 depicts the participants' view of Shanghai in the 1980's. It is titled "1982" to demonstrate that the intended temporal boundary was 30 years and, thus, figure 5.3 is titled "2000's". The 1982 image shows a lot of trees which are associated with happiness and positive impacts on health by 91.3% of the participants. There are traditional shikumen homes that are associated with being unhappy because they are considered to be poor places to live. Living in traditional homes was concerned a negative by 13% of the participants. Farms on the outskirts of Shanghai provide fresh food and jobs for uneducated citizens and are associated with happiness; these were not mentioned in the interviews. The factories along the banks of the river heavily pollute the river, causing pollution, stress on citizen health and unhappiness. The factories also contribute to a minor problem of air pollution which, according to 4.3% of the participants, resulted in negative impacts on health. However, the sky is relatively clear with few smog days. On the People's Square in central Shanghai conflict is represented between the citizens and the government. This refers to a variety of social unrest happening around the Cultural Revolution and the Tiananmen Square Massacre in 1989. This was mentioned by 100% of the participants. There are very few cars on the road as personal car ownership had yet to be allowed.

Overall a mixture of happy and unhappy citizens were represented, as well as a lot of trees and natural surroundings and pollution from Shanghai being a primarily industrial city. Happiness was associated with nature and unhappiness is associated with government conflict, factory pollution and poor living conditions. The participants had very little to say about impacts on physical health during this time period. There was a much stronger focus on well-being and quality of life. During this period quality of life was low due to government

regulations and the fact that China was an underdeveloped country at this point in time. When asked what the participants miss the most about this time period their responses corresponded with the areas that make people happy in the picture. The participants miss having farms close by and having a number of trees and naturally forested areas within the city.

Figure 5.2 represents the participants' view on what Shanghai was like during the 1990's. It is titled "1992" to show that the temporal boundary of the study was kept in mind, not because it is meant to show this is exactly what was happening in 1992. This rich picture is meant to be a transition picture, and therefore it is an edited version of the 1980's image to show how the city began to transform from an industrial economy to a commercial economy.

There are various areas of conflict represented in this picture. Most notably, there is conflict between native Shanghai citizens and those immigrating into Shanghai. The participants, all of whom are native Shanghai citizens, harbored some resentment toward outsiders living in the city, saying they contributed to dense city living and high levels of trash on the streets. Most participants are of the opinion that those immigrating to Shanghai are less educated and less civilized. There is also conflict between the citizens and the government. In this period the government began to remove traditional shikumen homes and replace them with more modern apartment buildings. Despite the negative opinion of shikumen homes in the previous picture, the participants were also unhappy with their removal. This was seen as stripping Shanghai of its native and cultural roots. The participants did not want to live there but wanted the traditional buildings to be preserved. In some areas of Shanghai they were.

1982

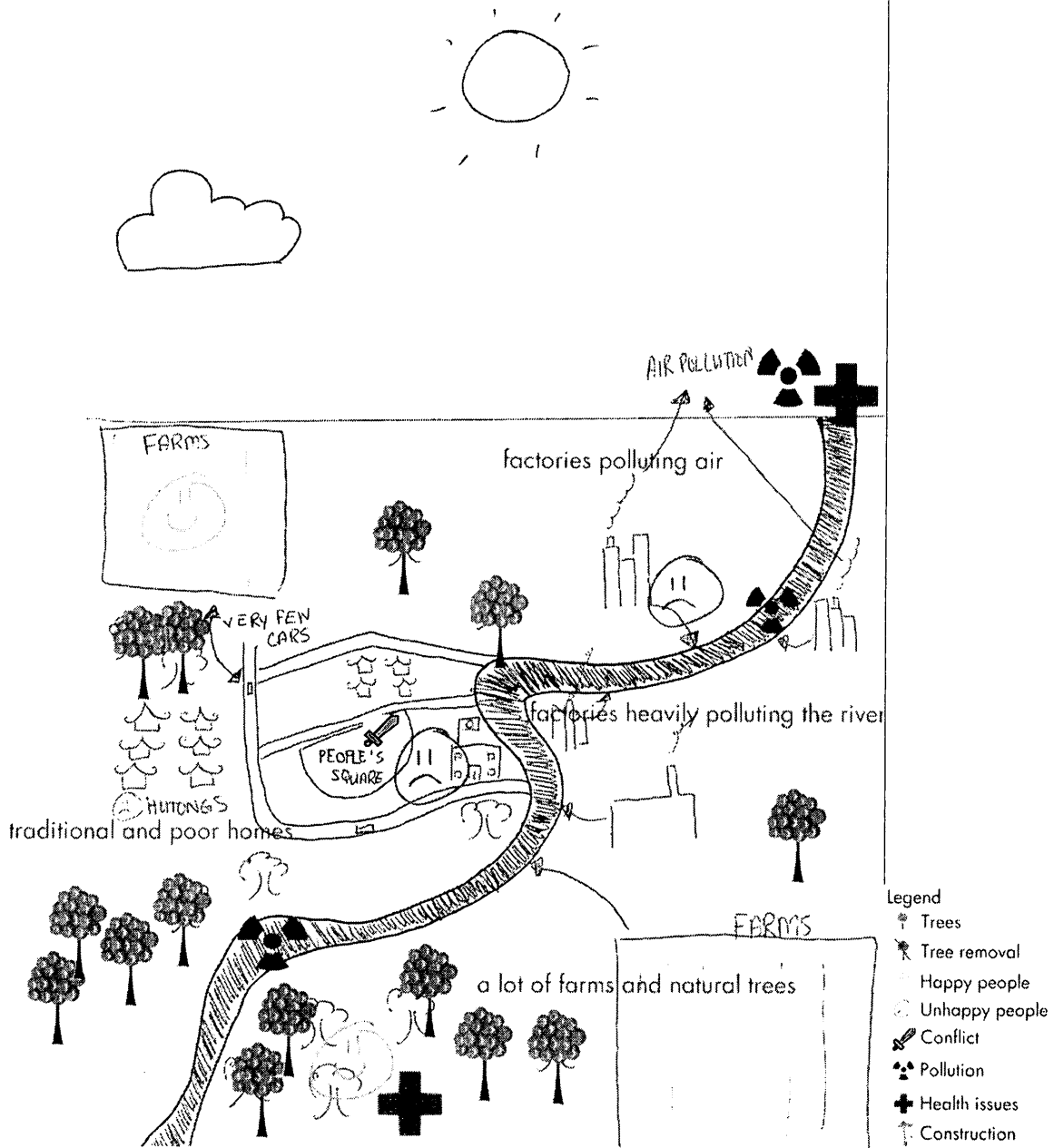


Figure 5.1. Rich Picture of Shanghai in the 1980's.

Also represented is conflict between the government and the people as the political tension of China in general began to adapt to a Post-Maoist society. Conflict between farmers,

urban dwellers and the government also erupted as farms began disappearing to make way for urban expansion. In response, the farmers were relocated by the government into new housing complexes and were left to find work in the city. This, reportedly, made the farmers unhappy but the overall participant opinion was that the urban expansion was worth the relocating of farms, despite the farms being a source of happiness in the previous rich picture.

In the 1990's factories and trees begin to be removed to make way for new construction of shopping malls, modern apartment buildings and expansion of roads. The construction was a major source of unhappiness and contributed to air pollution and dust in the air. The participants also associated this with negative impacts on their health. They further associated the continued pollution from the factories with negative impacts on citizen's health. Of all the images this one had the most comments and figures drawn to represent deteriorations in health. In particular, 38% of the participants mentioned issues with breathing, developing symptoms of asthma, coughs and increased stress. The river was extremely polluted compared to previous decade of, (and ongoing,) dumping of industrial waste and construction waste. There were a few more cars on the road but mostly these are taxis and government vehicles. Private car ownership was still not allowed.

Since the factories were closing, farms were being destroyed and people were being relocated to various parts of the city, and many of the participants remembered a feeling of being lost. This rapid change affected the lives and livelihoods of most people living in Shanghai. Citizens lost their factories jobs and were fighting the immigrants to find new jobs. The participants remembered a rise in the number of entrepreneurial ventures such as food stands on the street and rice artists (people who carve words onto grains rice).

Overall this period is highly associated with unhappiness, conflict, negative impacts on health, removal of nature from the city and high levels of pollution. All participants agreed that this was a negative time period. Quality of living was low due to losses of homes and, jobs, and increased competition with immigrants.

The final rich picture, figure 5.3, is a representation of Shanghai in 2002 and today. In this rich picture there are only two areas where participants expressed unhappiness. The first is the amount of waste accumulating on the streets. To some extent this issue was still attributed to immigrants. There was also negative health implications associated with the amount of trash, although no specifics were mentioned. The second area of concern was with ongoing construction on the outskirts of Shanghai as Shanghai continued to develop and expand. This has the same negative consequences as before such as noise pollution, dust and construction waste. Every other aspect of the picture was associated with happiness.

In the rich pictures, participants expressed that government initiatives have led to a number of improvements. For example the new tourist and financial district has replaced factories. This is seen as a benefit as it gives Shanghai higher status on the global stage. The government has launched initiatives to clean the river and as a result the river is substantially cleaner than represented in the previous two pictures. It also has a much higher density of boats. The government has also created a number of greening initiatives. People's Square now has trees and city parks are on the rise. This contributes to overall happiness, health and well-being. The government has also opened up a number of new shopping areas and allowed private car ownership and, thus, people can drive and shop, increasing happiness.

1982
1992

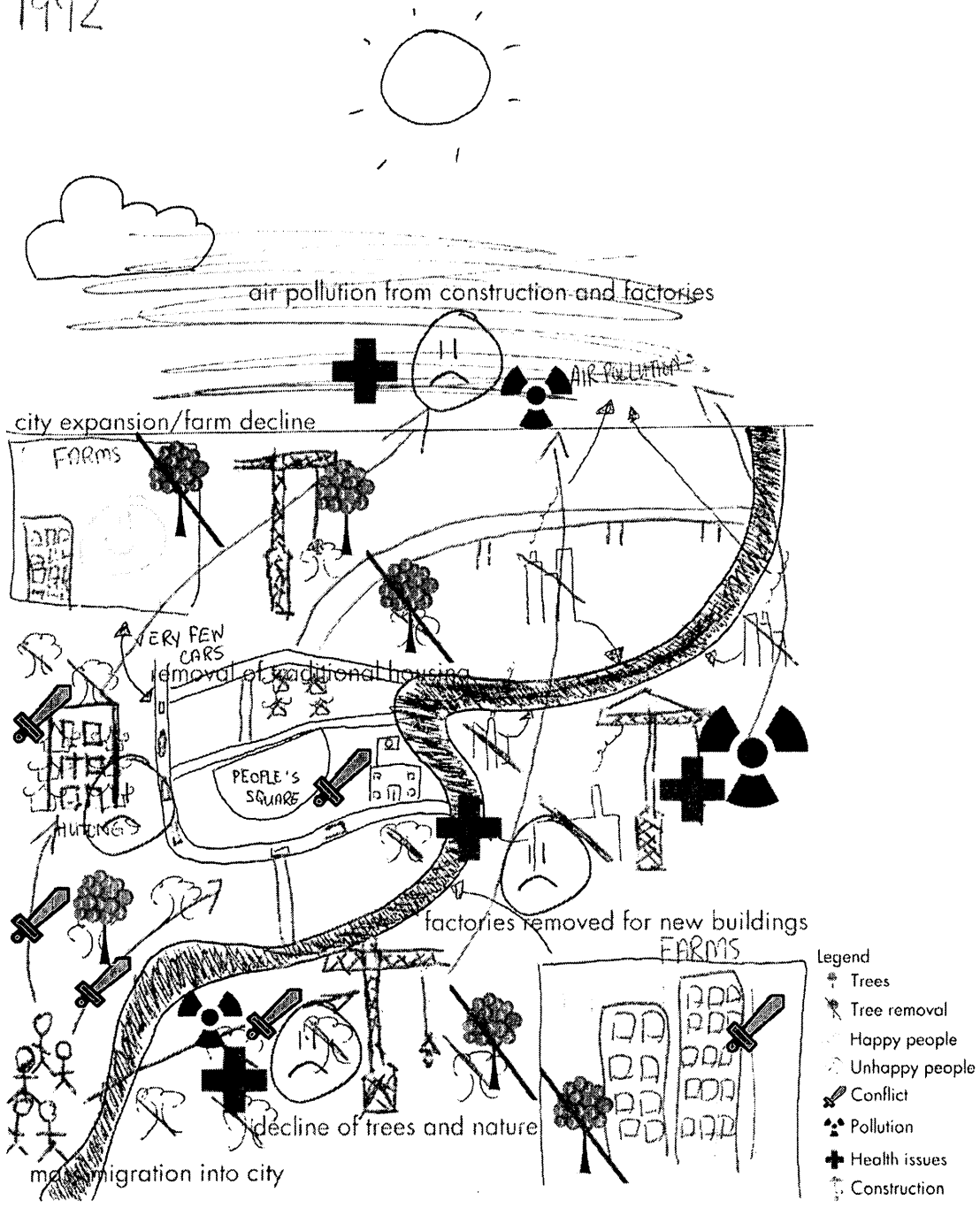


Figure 5.2. Rich picture of Shanghai in the 1990's.

This is mainly due to an increase in personal freedom and the opportunity to live a more consumerist lifestyle, which is idealized by the participants. The government, in response to the

rise of personal car ownership, also has started extensively expanding the road network in Shanghai.

The 2002 picture depicts overall happiness in the citizens. They are happy due to urban greening policies that introduce new natural spaces, shopping centers, new comfortable and modern homes and the opening up of China as a commercial economy. However, there is a lot of pollution. The participants identified pollution coming from air conditioners in the new homes, exhaust from cars, increases in waste, new construction, factories that have not closed, the boats in the water and simply from urban density. However, none of these sources of pollution were associated with any impacts on health of the participants. There is concern that the heat island effect will continue to get worse, but an overall complacency due to personal solutions such as air conditioners.

Each of the pollution problems could have a solution that has previously been presented to the participants. For example air pollution from the increased number of cars is thought to be counteracted by continued greening by the government and creation of new parks. Another example is that the continued rise in temperature is thought to be combated by being inside highly air conditioned shopping centers, cars and homes. There is little to no identification of feedback loops existing in the city such as air conditioners leading to warmer climates and, thus, more need for air conditioners. The participants clearly identified that air conditioners, further construction, cars and factories lead to air pollution. However, the participants fail to see any relationships that are not directly related such as air conditioners leading to high outdoor temperatures.

Overall this picture was highly associated with happiness. The participants were happy that they had access to shopping, new jobs, communities and parks. The political struggles were, in their opinion, over and the government is now taking care of the citizens with their numerous initiatives to improve Shanghai. The government is improving Shanghai not only through environmental initiatives but also by making Shanghai a more global city and creating a more desirable economy.

The 1990's rich picture was a necessary and interesting addition to the expression of the situation. It, coupled with the image depicting the 21st century, showed the contentment with how Shanghai is developing and the tradeoffs the participants are willing to deal with in regards to health in exchange for economic gains. The rich pictures very clearly described the feelings around Shanghai's transitions over the past 30 years. They were very effective in demonstrating overall levels of contentment and areas of importance within the problem situation.

2012

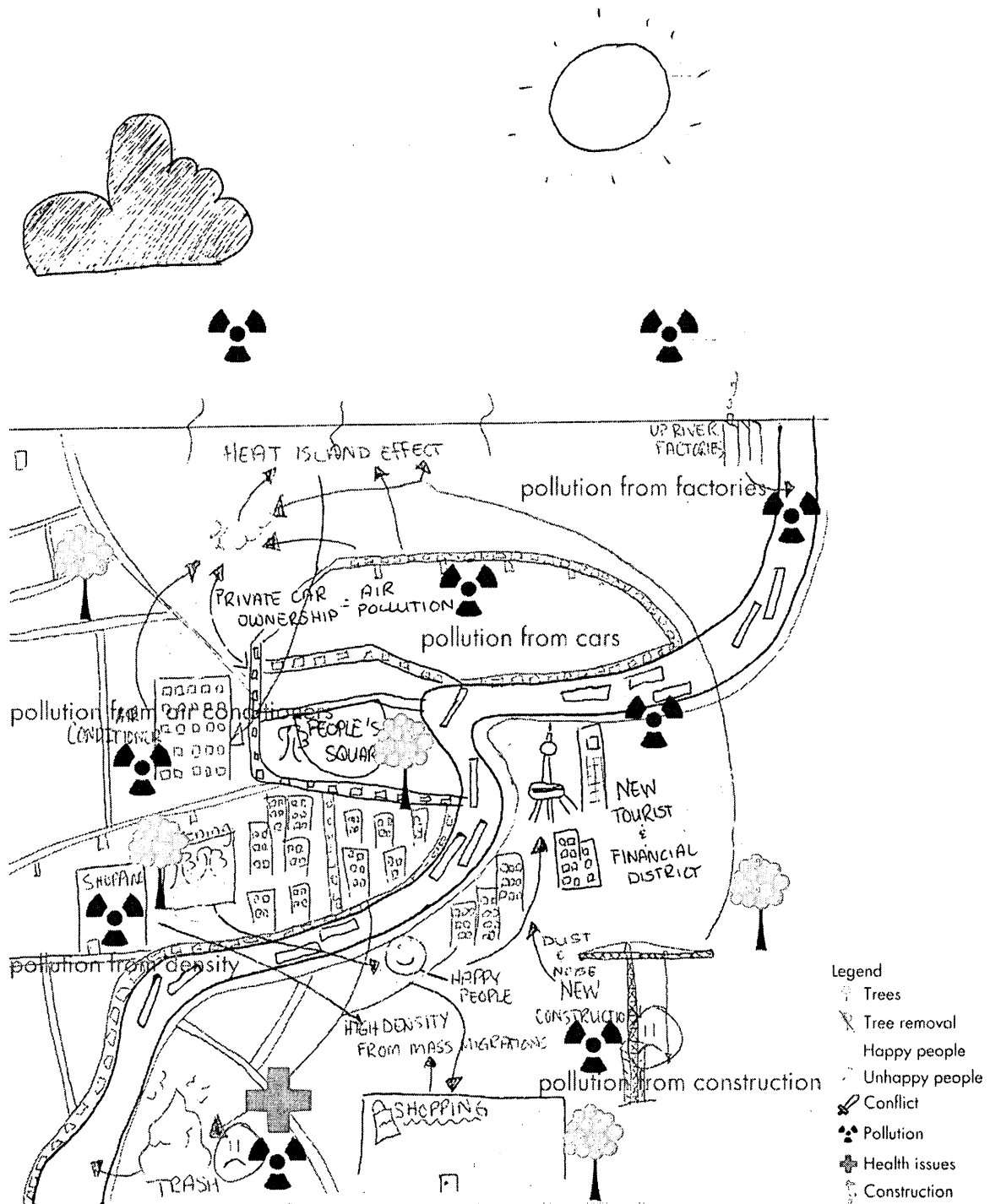


Figure 5.3. Rich picture of Shanghai in the mid to current 2010's.

5.1.4 Summary of Problem Definition

The surveys, interviews and rich pictures demonstrated that my expectations of the problem definition formulated based on the initial literature review were incorrect. It is not the case that the participants thought their health and well-being was deteriorating due to environmental issues; quite the opposite. The participants believed that their health had been impacted only very slightly and that their well-being had greatly improved. This begs the question of why there is a discrepancy between the literature review and the opinions of the participants.

The participants defined the environment-health problem as virtually non-existent. This could, potentially, be due to the background of this particular group of participants. The participants were middle to high income and almost all lived in central Shanghai. Thus, the participants would not be experiencing issues of environmental injustice; they have access to good health care and are within close proximity to a number of major parks and social spaces. The problem for this particular group of participants occurred during the 1990's during the rapid transition in Shanghai from an industrial economy to a commercial economy. The primary environmental issues described were air pollution from cars and air conditioners, increased heat and waste. Other issues such as water pollution, severe air pollution, construction noise and air pollution and lack of greenery in the city were, according to the participants, solved by the government in the past decade. There is no problem to be solved; rather, the participants believe that staying on the current path of development will continue to benefit their overall well-being. One part of the problem that was identified by only three of the participants is the role of hierarchy and environmental injustice in the society; for these three there was an overall

sense that this was getting worse, especially as the gini coefficient of the country continues to increase.

5.2. Root Definitions of Relevant Activity Systems

The fourth step of the original process of SSM is to identify the root definitions of relevant activity systems within the larger system. To do this I have employed the mnemonic CATWOE. By doing this process on my own I am ultimately exposing my bias on the choice and expression of the systems within the problem that I think are important. The systems that are described below will hopefully provide insight into differences between the literature review and the results of the surveys, interviews and rich pictures.

5.2.1. CATWOE

The process of applying CATWOE involves looking at the primary subsystems or themes within the larger problem, helping to define primary systems. The result is definitions of relevant systems within the problem that can be utilized to further understand the system or to develop meaningful methods of intervention. Ideally it is done with various stakeholders to avoid bias by the researcher but for this project this was not possible. I, alone, looked at the interviews and rich pictures and defined nine systems that seem to be important based on how often the themes emerged and how connected they were overall. The following outlines the name of the system, the CATWOE defining the system and the resulting formal definition of the system.

1. System of growth of personal wealth

C: citizens

A: government, businesses, citizens

T: closed market and nationalism -> free market and privatization

W: free market and privatization increases individual and national wealth so it is better

O: government

E: social and economic inequality of hierarchy, natural resource limits, access to goods, industry production

Definition: A government owned system operated by the government, business and citizens, within the constraints of social and economic inequality and the limitations of natural resources, to grow personal wealth through an open market and privatization.

It is through this system that the government creates opportunity for businesses to expand by opening the market and allowing privatization. A move to a more capitalistic and individualistic society has led to an increase in personal wealth. This system was extrapolated from participant responses and could be argued to be supported by 100% of participants.

2. System of health decline in 1982 - 1992

C: citizens of Shanghai

A: government, citizens, businesses

T1: good health -> bad health

T2: farm land -> factories

W: development at all costs

O: government

E: urban space, desire to increase GDP, air pollution level

Definition: A government owned system operated by the government, business and citizens, within major urban construction and expansion and a desire to increase GDP, that increases the risks of environmental based illnesses through developing Shanghai into an industrial city.

In this system the government encourages industrial development in Shanghai and rapid urban expansion in an attempt to increase GDP and increase the well-being of the citizens that had been poorly treated for many decades prior to this. The increase in factories leads to an increase in air quality-related health issues such as asthma and coughing. This system is supported by 87% of participant responses to questions during the interviews.

3. System of health improvements from 1992 - 2002

C: citizens of Shanghai

A: government, citizens, businesses

T1: bad health -> good health

T2: factories -> commercial and tourist buildings

W: a commercial based city is less environmentally harmful than an industrial city

O: government

E: health care capacities, car ownership regulations

Definition: A government owned system operated by the government, business and citizens, within increasing personal health care capacities and urban re-greening projects, that decreases the risks of environmental-based illnesses through developing Shanghai into a commercial and tourist city.

In this system the government encourages commercial and tourist development in Shanghai while increasing personal health care capacities and implementing major urban re-greening projects. This results in a drastic reduction in the potential to develop environmental health issues, particularly asthma and coughing. An increase in commercial and tourist buildings results in an overall increase in happiness and is also strongly associated with the increase in private car ownership. This system is supported by 87% of participant responses during the interview process.

4. System to increase well-being

C: citizens, businesses, government

A: citizens, businesses, government

T1: happiness is low, hunger is up -> happiness is up, hunger is down, and environment suffers

T2: closed market -> free market

W: Money, food and economic gain is important than the environment

O: government

E: job market, health care facilities, citizen's health

Definition: A government owned system operated by the government, businesses and citizens, with the constraints of natural resources, citizens' health, economic opportunities and access to food, that increases happiness and decreases hunger, despite potential environmental issues.

The government allows for the market to open and increases economic opportunities.

There are now more small businesses opening, especially privately owned restaurants. Since people now have better access to economic opportunities they can take advantage of these new restaurants. Thus, the hunger of the citizens' decreases and their overall happiness and well-being increases. For the citizens, being well fed and having access to a more modern and comfortable lifestyle is a suitable tradeoff for any of the resulting health and environment issues, this is supported by 100% of the participant responses.

5. System of economic inequality

C: government, citizens

A: government, businesses

T: wealthy people obtain more money; some poor people obtain more money

W: having more money is desirable

O: government

E: resources, competition, access to education and job opportunities

Definition: A government owned system operated by the government and businesses, within the constraints of resources, competition, access to education and access to job opportunities, that results in wealthy people having more access to jobs and education while poor people have limited opportunities resulting in a growing income gap.

While it is the case that the overall income of individuals is rising in China, it is happening unequally. The wealthy in China tend to become richer due to access to jobs and education. In China a person can gain access to a great job based entirely on connections. Thus, people who lack the ability to go to school to make good connections, or who are already born

outside of a circle that lacks connections to the upper class, have limited ability to experience economic gain available to the most wealthy in China. The wealthy people continue to experience economic gain. This system is supported 100% by the subgroup of educated participants but only by 17% of the participants overall, not including the subgroup.

6. System of corruption

C: government, citizens, businesses

A: corrupt bureaucrats, corrupt business/factory owners, corrupt judges, corrupt citizens

T: money -> favors and more money

W: gaining advantage via abuse of the system is acceptable

O: government

E: judicial system, national culture, global culture

Definition: A government owned system operated by corrupt members of the city-wide community, within the constraints of the judicial system and supportive/unsupportive cultures, which results in exchanging money for favors.

The literature supports the fact that China still has a high level of corruption; however this is only supported by 9% of the participants. In this system a corrupt judicial system and complacent culture continue to allow for money to be exchanged for favors. The judicial system is meant to stop illegal activities from occurring but it often perpetuates the system. The culture has become increasingly accepting of doing "favors" for friends. An example given by a participant is that a factory owner may pay an inspector to not report certain findings.

7. System of increased personal car ownership

C: citizens

A: government, citizens and car manufacturers

T: no private cars allowed -> private car ownership allowed

W: personal car ownership is acceptable and desirable symbolizing freedom

O: government

E: limited space, each citizen is only allowed to register one license plate, production limits, and bans on some brands of car

Definition: A government owned system operated by the government, citizens and car manufacturers, within the limitations of space availability and caps on ownership and production, which results in the ability to privately own cars.

Prior to 1994 private car ownership was not allowed in China. Now the government encourages car ownership with the limitations of one license plate per person, and each car requires a license plate. There is also a production limit on how many cars can be produced each day and a ban on some imported cars, which limits the availability of cars to the citizens. Also, Shanghai was not originally designed for a high volume of cars, thus, there are few parking spots and traffic congestion is an increasing problem.

8. System of re-greening

C: citizens

A: government

T: "concrete jungle" -> greened areas, parks

W: having trees and green space is good and healthy for people, but also prevents protests and riots

O: government

E: geographical space, need for greenery, government priorities

Definition: A government owned and operated system, within the constraints of limited geographic space and government budget, to plant trees and build parks in an attempt to improve health and well-being of citizens and to discourage public protests.

This system shows that participants believe this to be a response to the declining health of citizens the government is attempting to renew the urban environment. They have done this by greening public spaces and adding in new parks in the city. This system is supported by 100%

of the participants. The additional note, that the government has re-greened public space to prevent protests, is supported by 22% of the participants.

9. System to disseminate environmental information

C: government

A: citizens, government

T1: citizens have no opinion on environment -> citizens have opinion on the environment

T2: government has data on environment -> government distributes data on environment

W: government reports on the environment are true and government environmental action is improving Shanghai

O: government

E: open source information, education

Definition: A government owned system operated by the government and citizens, within the constraints of alternative means of information and education, to influence people's opinion on the state of and action taken to improve the environment.

This system entails the government disseminating information that is potentially false through government controlled channels to influence public opinion. This information is what shapes public opinion about the government, environment and health. 37% of the survey participants obtain their information about the environment from the government or government owned media and 83% of the interview participants obtained the majority of their information about the environment from the government or government owned media. 100% of the subgroup of educated participants believed that the information provided by the government was likely not true and functioned more as propaganda.

All of these systems are parts of the larger problem definition. Many of them interact with one another inside of a society that has a strong social hierarchy and a complacent

citizenry. It is important to remember that the complacency of the citizens may stem from their age. There is reason to hypothesize, based on 13% of participant's feedback, that the younger generation's approach and response to issues of the environment, freedom of information and health is quite different.

5.3. Building Conceptual Models

The next step in SSM is to build conceptual models based on the systems created in the previous steps. These models are not intended to show what exists in the real world. Rather, they are meant to represent the viewpoint of the participants and are used to generate debate and generate insight that will lead to ideas for intervention in the full application of SSM (Checkland and Scholes, 1999). Thus, the human activity systems presented in the next section are not meant to show what is actually currently happening in China. They are meant to show the actions that the participants believed are involved in the various subsystems. Ideally this step would be completed by the participants, but again, this was not possible for this project. I have constructed the conceptual models based on how I observed the participants' perception of the problem. There are, of course, limitations to this as my interpretation may not accurately depict the participants' perceived reality. I have, however, supported the process with the information gathered during the interviews to attempt to show hierarchy in the systems.

Conceptual models often take the form of causal or bubble diagrams. The actions of individuals, groups and organizations are represented by a verb inside of a circle. The circles then connect to one another using arrows. These arrows are meant to represent a connection or dependency between the two actions. For example, in figure 4.4, it is shown that people are dependent upon implementation of government policy to allow them to drive cars.

5.3.1. Human Activity Systems

The following human activity systems (HAS) are based on the root definitions of relevant systems created in the previous section. The pictures are organized to demonstrate the interactions happening between the various levels in the system. The top level is the government, also described as the outer macro circle. The middle level consists of business and organizations, described as the intermediate circle. The lowest level consists of the participants, which represents citizens known as the inner circle. The arrows are used to connect actions taken at different levels to demonstrate how the levels of the hierarchy interact with one another.

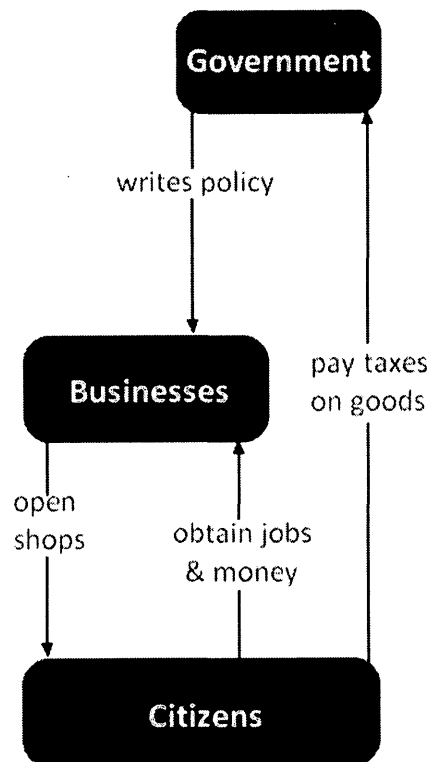


Figure 5.4. System of growth of personal wealth.

Figure 5.4 depicts a system to growth personal wealth in Shanghai. In this system the government allows people to open private companies. People open private businesses and this creates more job opportunities for the citizens at large. Thus, the people obtain money and spend that money. As people spend their money more businesses open because demand rises and this creates a positive feedback loop; the more jobs there are, the more money people have to spend which will lead to the need for more businesses and more jobs. As people buy goods they also pay taxes which generates income for the government. Generating income is desirable for the government so they continue to allow more private companies to open.

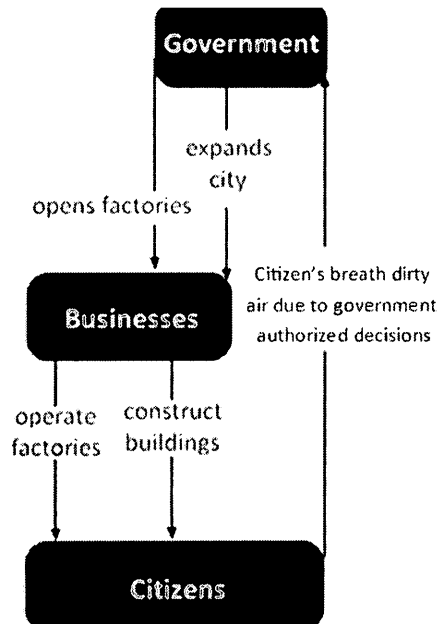


Figure 5.5. System of health decline in 1982 – 1992.

100.0% of the participants agreed that from 1982 – 1992 government encouragement of industrialization in Shanghai lead to major pollution and health issues for the citizens, as defined in system 2. Figure 5.5 demonstrates this system. The government desires a higher gross domestic product so they open factories in Shanghai and they begin to expand the city. Construction in China is often used to increase the GDP (Stahl, 2013); only 13.0% of the

participants mentioned this and referred to it as falsely inflating the GDP. People then run the factories, which creates air pollution while simultaneously people construct new buildings, which creates noise and air pollution. As a result people breathe dirty air.

Figure 5.6 continues where figure 5.5 leaves off demonstrating the participant's perception of how citizen health changed from 1992 – 2002 as described in system 3. It begins with the citizens experiencing elevated levels of illnesses associated with air pollution. As a response to the sick community the government closes factories, increases public health care and begins to encourage commercial growth in the city. As a result people become healthier.

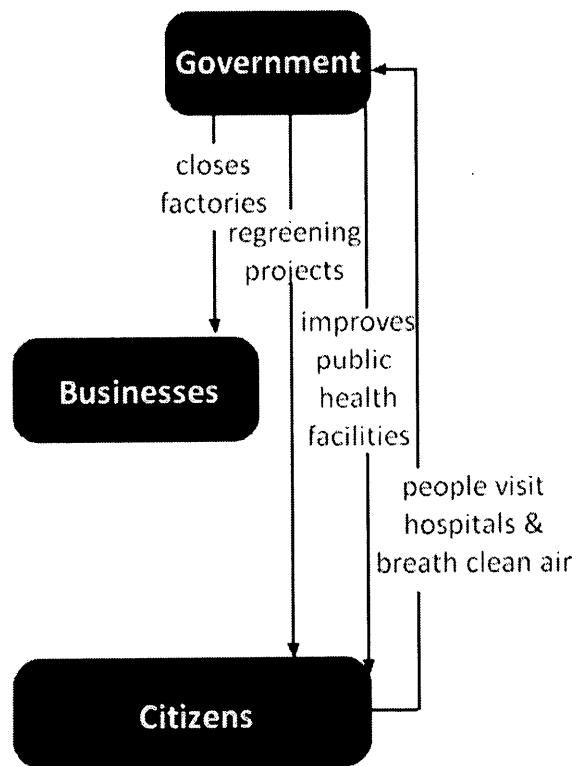


Figure 5.6. System of health improvements in 1992 – 2002.

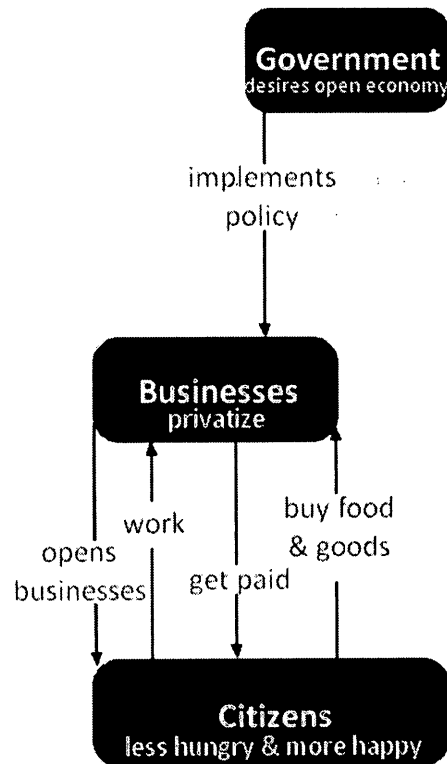


Figure 5.7. System to increase well-being.

Access to food was strongly related, by 100% of the participants, to happiness and well-being. Figure 5.7, based on system 4, demonstrates that the participants believed the government allows private restaurants and businesses to open that this leads to less hunger and more happiness. People obtain jobs from the new businesses, thus obtaining money. Having more money, and more restaurants, means that it is now easier for people to obtain food.

Figures 5.8 and 5.9, based on systems 5 and 6, show figures only supported by approximately 20% or less of the participants, however they are 100% representative of systems described by the subgroup of educated participants. Figure 5.8 shows a system of

inequality. The government changes the economic system to a more open economy. The people who obtain good jobs are those who are well connected, and in China this originally meant people connected to the government. The wealthier in the population also had access to good education and, thus, got better jobs. This created an upper class in Shanghai comprised of the well-connected and the well-educated. In turn, these people continued to move up in the ranks of the economic ladder becoming increasingly wealthy. Those without access to education or those disconnected from influential circles have far less opportunity to monetarily prosper.

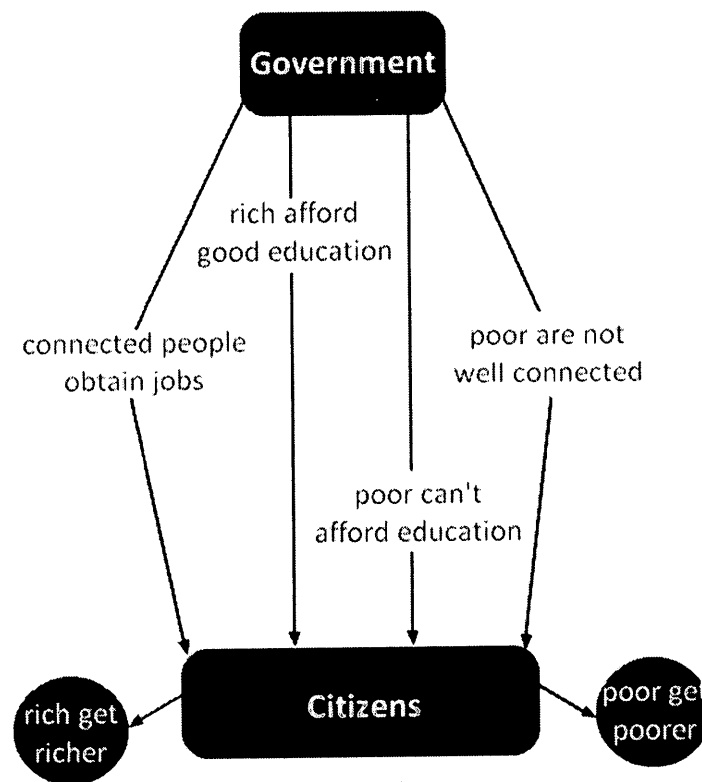


Figure 5.8. System of economic inequality.

Figure 5.9 depicts the ongoing problem of corruption. Citizens file complaints due to unsafe or unhealthy issues in their work place. Citizens may also file to complain about bylaws or that the company had treated them unfairly as a client. A case is opened and in response the business bribes the government or judicial system. The government or judicial system then rules in favor of the business and the case is dropped. This leads to a positive feedback loop of more issues arising. The more issues a business gets away with the more likely they are to attempt these things again.

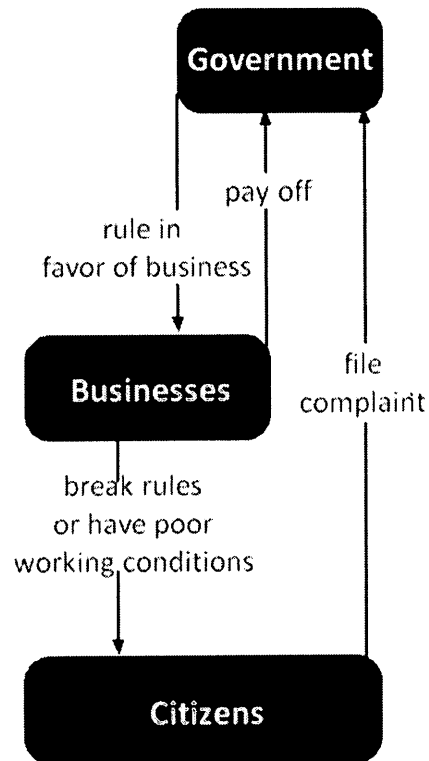


Figure 5.9. System of corruption.

Figure 5.10 demonstrates the actions caused by system definition 7 that entails increased pollution from cars and increased private car ownership. This system begins with the

government writing policy to allow private car ownership and creating a quota of how many cars are allowed to be sold. The businesses then make cars and they receive money as the citizens buy the cars. The citizens get their licenses and pay taxes on their cars, which leads to a profit for the government and, thus, the government increases the number of cars allowed. Simultaneously the citizens drive their cars and buy gas to fuel their cars so businesses continue to make money, which means there is more interest in the society to continue to allow an ever increasing number of cars to be in use.

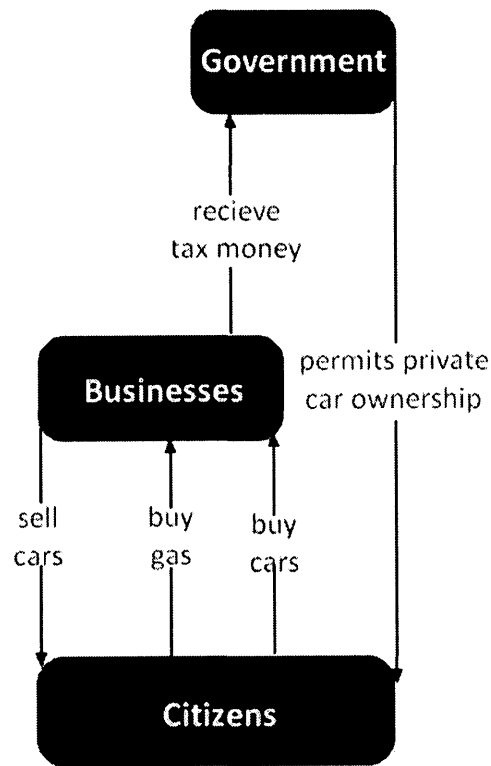


Figure 5.10. System of increased personal car ownership.

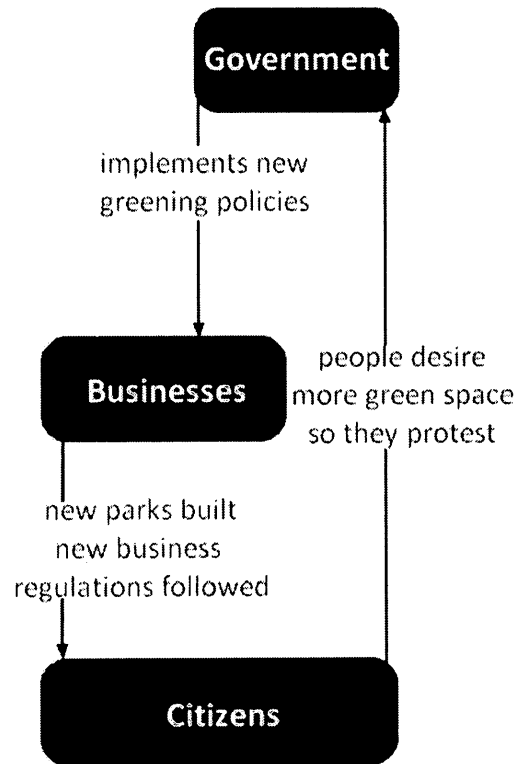


Figure 5.11. System of re-greening.

Figure 5.11, based on system 8, demonstrates the participants' view on why the government decided to add greenery to Shanghai. Only 36% of the participants said that the greening happened to curb protests but 96% of them said that greening was a response to increased environmental illnesses within the citizens. The government then created policy that required businesses to plant greenery on their lots, they planted trees in public spaces and built new parks. Because of these improvements the overall happiness of the citizens increased.

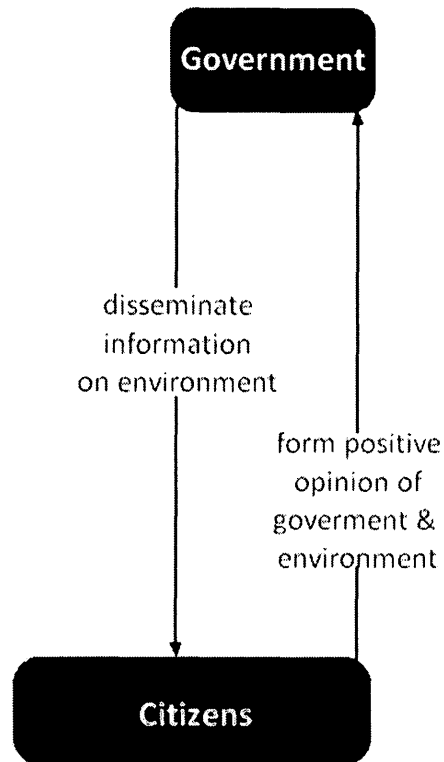


Figure 5.12. System to disseminate environmental information.

The final system, system 9, is represented in figure 5.12. In this system the government creates reports on the environment and releases them to the public. The citizens watch television and read the newspaper, where these reports are published, and they form their opinion based on this. 56% of the participants get their information about the environment through this system.

5.4. Comparing Models to the Real World

The next step in SSM, and final step for this chapter, is to compare the models to the real world. To do this I will be relying on content analysis which allows for more rigorous inferences from textual based data. The majority of the content analysis will be done through

user based methods. Using the framework outlined by Krippendorff (2003), I will engage with the interviews, surveys and rich pictures.

5.4.1. Analyst Based Content Analysis

Klaus Krippendorff identifies a number of conceptual components required to conduct content analysis (2003). The first is a body of text and context which the analyst should explicitly acknowledge the origin. In this study the origin of the interview text is from 23 elderly individuals in Shanghai. There is an overarching bias in the context; I approach the data explicitly looking for environmental themes while having the opinion that China is still largely an authoritarian state based on the information provided by Western media and the review of the English language academic literature. The context is, thus, the opinion of people on the subject of the environment within an authoritarian government.

Table 5.16 shows the various changes that the participants said the city has gone through, as identified by NVivo and content analysis, with the percentage who said so in brackets beside each change. The issues listed on this table were those that the participants found to be the most important as indicated by the frequency of their occurrence in the text.

Table 5.17 shows the various health issues that the participants said they are experiencing. The table also includes a list of the various excuses that the participants gave as the reasons they were sick. This may be due to the participants' attempting to shift the blame off of the environment or because they actually believed what they were saying. The potential for blame shifting seems to be quite high.

Table 5.16.

Important Changes in Shanghai and the Environment

<u>Homes</u>	<u>Air</u>	<u>Water</u>	<u>City</u>
More high rises (82.6%)	Large scale greening projects (100.0%)	Old water pipes are the reason people need to boil their water (86.9%)	Many more roads (100.0%)
Relocation (43.5%)	Trees are mandated to be planted on certain plots (86.9%)	Over fishing has depleted the fish stock (34.8%)	Mass migrations has changed the face of who lives in Shanghai (60.9%)
Fewer traditional homes (13.0%)	Air conditioners (69.6%) Car pollution (69.6%)	Can't swim in the water (34.8%) Factories still dump into the river (13.0%)	Factories are gone (34.8%) Farmland is now houses and/or city (34.8%) More garbage (8.7%)

Table 5.17.

Health Issues Mentioned That Could Relate to the Environment and Common Arguments Against Their Origins

<u>Common Health Issues</u> <i>(Only those associated with environmental problems)</i>	<u>Common Reasons Cited</u> <i>(Not necessarily for health issues listed beside it.)</i>
None (89.0%)	Now eating daily so everyone is much healthier on average (80.9%)
Coughing (17.4%)	Smoking is the cause of coughs, not air problems (72.7%)
Difficulty breathing (13.0%)	Life expectancy is much higher so health issues emerge from old age (47.6%)
Stress (8.7%)	Breathing issues always existed from sand storms (28.6%)
Cancer (4.3%)	We simply know about more diseases and ways of detecting them; no increase in actual sickness (19.0%)
Dizziness (4.0%)	

Table 5.18 is an attempt to synthesize the changes occurring in Shanghai based on the year. It shows how the housing, industry, political climate, conflicts, environment, health, happiness and access to nature changes in each decade. Table 5.19 lists the different

interventions done by the government over these time periods and the results from these changes.

Table 5.18.
Changes in Shanghai Based on Time Periods

<u>Time</u>	<u>Housing</u>	<u>Industry</u>	<u>Politics</u>	<u>Conflicts</u>	<u>Environment</u>	<u>Health</u>	<u>Happiness</u>	<u>Nature</u>
1980's	Traditional, old and rundown	Industrialism and nationalism	Tiananmen square	Post mao and rebuilding after Cultural Revolution	A lot of air & water pollution from factories	A lot of health issues	Low happiness from poverty and hunger	A lot of access to nature
1990's	Small but nice buildings	Heavy transition period	Deng Xiaoping Thought	People very unhappy with city development	A lot of pollution from construction, factories; worst	A lot of health issues developing	Very low from changes and pollution	No access to nature
2000's	Buildings becoming out of date	Change to commerce based economy	China enters WTO	Mass immigrations from rural areas	Greening projects and no factories	Health issues vanishing	Getting better due to cars and consumption	Building more nature
2010's	Homes are considered small and old	Open economy and privatization	No problems	No problems	A lot better, some air issues	Few health issues	Very high	Enough access to nature

Table 5.19.
Government Action and Results According to Participants

<u>Government Action</u>	<u>Results</u>
Urban Planning	parks; new roads; a certain percent of trees are required; richer areas are farther from environment issues; new tourist centers
River Clean Ups	Increase in fishing; less smelly water; water is able to be swam in
Greening	Fewer demonstrations in public areas; more nature; concrete areas become meeting spaces
Economic change	Individualism; open market; increase individual wealth; more opportunity to make money
Environmental campaigns	Acceptance of climate change; positive opinion on government and environment; news reports on the environment

In the following chapter I will expand on the themes using inferences from the text based on the context of the interview data. These tables and questions will be useful in helping to organize the information for a more meaningful discussion.

5.4.2. NVivo Content Analysis

This final section explains the software based content analysis. The software NVivo was employed to look at the frequency of occurrence of different themes, the frequency that important words were used and the themes that relate to one another most. Figure 5.13 shows the various themes that appear in the text data. Multiple themes are nested within parent themes. For example, the theme of “the environment” holds the theme of “negative” which means someone said something negative about the environment. Within “negative” there are the themes of cars, air pollution, factories and air conditioners. Also within the “environment” there are the themes of “change”, “positive > greening”, “worse”, “better”, “same” and “romanticizing the present”.

The second largest theme is “hierarchy”. This includes instances when the participants said that government action has had positive or negative impacts on them, or simply affected them. The third major theme is “health”. There are many smaller themes inside of “health” such as “contradictions about health”, “health being impacted negatively or positively”, “defensive language about health”, the “Cultural Revolution” and “migrations”.

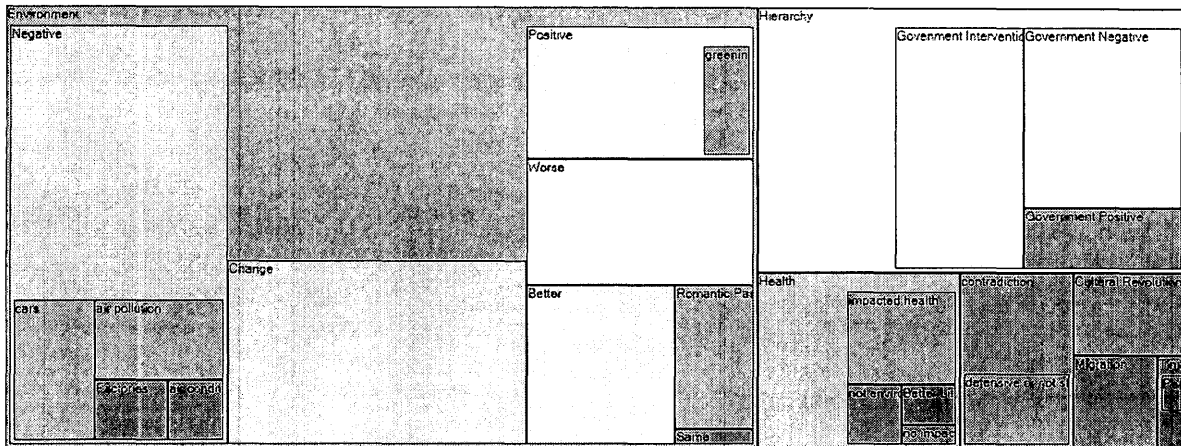


Figure 5.13. Themes of the interview data where size correlates with how often the theme is mentioned.

Similar to the previous figure, figure 5.14 is a word cloud generated by NVivo to show the frequency of words used. It is obvious that the words “Shanghai”, “people” and “government” were mentioned the most. What is interesting to see words such as “factories”, “moved”, “river”, “better” and “cars” stick out as some of the most used words. These correspond closely to themes most frequently identified by NVivo and myself during user based content analysis.

Using NVivo I looked further into these themes and words and found the themes that most highly correlate with each other, that is the themes appear together frequently. For this research NVivo generated the following themes as being highly correlated: “health > decline”, “hierarchy > government intervention” and “environment > change > negative”. This immediately generates the idea that government invoked changes lead to negative environmental impacts and decline in health of the participants, but this is oddly the exact opposite claim of the participants. This will be explored further in the following chapter.



Figure 5.14. A word cloud showing the words most frequently used by the participants in their interviews.

5.5. Summary

In this chapter I have reported on the results of the surveys, interviews and rich pictures and presented analysis of the material using system definitions and human activity systems. I have also shown the results of the user based and software based content analysis. The results drastically changed the focus of the project midway through the process. The focus of the research has changed from seeing whether the elders of Shanghai are being negatively impacted due to environmental change to investigating the contradiction between the initial literature review and the participants' experiences. I defined the subsystems of this problem using CATWOE and further explored these systems by developing HASs to show the actions happening, and by whom, within the systems. These HASs also demonstrated the areas where there is overlap between citizens, businesses and the government to explore the roles of hierarchy and who different actions affect. I finished the chapter by exploring different themes

and ideas that are generated by using content analysis. In the next chapter I will look at all of this data and information more critically.

Discussion

This chapter presents a discussion of research results. The discussion will start by identifying five key themes that emerged throughout the study via the different methods of inquiry. These themes will then be critically examined through key concepts such as hierarchy, complexity, interrelationships and resilience. Following this, there will be a discussion of “the trinity” which will question the philosophical and methodological soundness of the study and the effects of action taken and potential for action in the future.

6.1. Generating Themes

Five major themes emerged from participants’ contributions: home and nationalism; media; environment and health; government action; and education. These five themes encompass all of the participants’ major concerns or interests. Additionally, three primary participant subgroups, the educated, the business oriented and the retired, all had specific interests in certain themes. This section will look more closely at these five major themes, the subgroups’ interests in these themes and the significance of the theme in the larger picture. The results of the chi-squared test will be included where there were statistically relevant results. A full table of the chi-squared tests with various comparisons can be found in Appendix D and Appendix E.

6.1.1. Home & Nationalism

The largest subgroup of participants consists of 15, or 65.2% of the overall group. This subgroup is comprised entirely of retired individuals who spend the majority of their time at home or within their local communities. The primary theme that emerged in this subgroup was

the importance of home and a strong sense of nationalism. 100% of the subgroup was consistently defensive of the government in areas of social, economic and educational development throughout the interviews. Additionally, a statistically significant portion of the subgroup have an aversion to outsiders, even those who simply live outside of Shanghai, but who may still be Chinese ($\chi^2(1, N=23)=6.2, p=0.01$)¹. The chi-square tests indicated that, compared to the rest of the participants, a statistically significant number of the retired subgroup believe that the government is doing a good job of developing Shanghai as it is now a commercial city ($\chi^2(1, N=23)=4.1, p=0.04$) and a world class city ($\chi^2(1, N=23)=5.7, p=0.02$). They backed this up by saying that people have more access to health care and opportunities to increase wealth ($\chi^2(1, N=23)=4.1, p=0.04$).

26.1% also said that, compared to other countries, China's environmental initiatives and improvements are among the best ($\chi^2(1, N=23)=6.2, p=0.01$). This group is of the opinion that environmental issues are improving due entirely to government action ($\chi^2(1, N=23)=15, p=0.0001$). A statistically significant number specifically mentioned that the state of the rivers and waterways in Shanghai have greatly improved due to government intervention ($\chi^2(1, N=23)=4.27, p=0.04$).

The government's total control over the media potentially enhances these feelings of national pride especially for this subgroup as they spend a lot of time watching television. 63.6% of their opinions have been crafted by watching and reading government produced media. However, the pride may not be entirely unwarranted. According to the participants the

¹ The Chi Square Test results are presented with the degree of freedom and number of participants in parentheses followed by the Chi Square value and the level at which the test is significant.

government has provided more access to natural surroundings, areas to meet in the public, homes to live in and has created an economy that now provides jobs and growing wealth. All of these actions have enhanced the overall happiness of 100% of the participants. Additionally, a significant number of the retired subgroup believe that the government always puts the needs of the people first ($\chi^2(1, N=23)=4.8, p=0.03$).

What is less clear is, if as 82.5% of all participants believe, the government did this solely for the people or if it was done due to international pressure and desire for recognition, as suggested by the subgroup of educated participants. They suggest that since the government has potential to gain economically by encouraging a capitalist economy their attempts at environmental renewal are shallow and almost entirely intended to placate the international audience. Despite this, they use their strong hold on the media to enhance national pride.

The idea of “home” is important to the retired subgroup of participants. 60% of the subgroup said life had greatly improved due to new permanent settlements, homes and communities. The vast majority of the participants currently live in the homes to which they were resettled after the Cultural Revolution. These apartment buildings have developed communities in which residents rely on one another for support and companionship. 73% of the participants were relocated to these buildings together in groups that they continue to socialize with.

The literature suggests that as the government prioritizes its own development needs, including the creation of upscale modern homes and condos, a number of traditional shikumen homes are lost (Joseph, 2010). However, according to 100% of the retired subgroup the

continuation of community is an acceptable tradeoff for the loss of cultural heritage buildings ($\chi^2(1, N=23)=5.63, p=0.02$). A growing issue with these new homes is that the high numbers of immigrants moving to Shanghai are not able to afford them (Joseph, 2010). The immigrant population, as characterized by the participants, is poor, uneducated and uncivilized. The literature, as outlined in chapter 2, discusses the growing income gap between the urban and rural populations (Joseph, 2010). However, to attribute all urban poverty to rural populations, as over half of the retired subgroup alluded to, seems dubious. It is likely that due to the high amount of dislike toward immigrants the opinion of the participants has been skewed. It is more likely that urban citizens have a bias against rural citizens.

The educated subgroup of the participants suggests that this bias against non-Shanghainese citizens could be encouraged by the government to dissuade people from moving to the city. There have been initiatives in the past, such as city passes, to prevent large numbers of rural populations from moving to the city (Cheng and Selden, 1994). Now, as leaders attempt to abolish such systems (Ruwitch and Li, 2013) it is more difficult to continue these practices. It is possible that the government exacerbates the conflict between the rural and urban; this was supported by 4.3% of the participants. Additionally, the government has created a number of incentives to keep people living in rural areas, such economic support to farmers and allowance of more children in rural areas (Fleisher and Wang, 2001; Oi, 1999; Short and Fengying, 1998).

6.1.2. Media

The media, even foreign journalism, is strictly controlled by the hierarchy in China (Li, 2000; Qinglian, 2004). It is, undeniably, one of the strongest holds observable in the research that the government maintains over the people. The government owns all television channels,

the major news sources in print and online, and they strictly monitor the internet, blocking out a number of sites (Li, 2000). The educated subgroup believes that the government strengthens nationalism by showing how improved China has become and, thus, wants to maintain control of the media to keep this as the primary opinion. It stands to reason that breaking the government's control on media would lead to an information revolution that would lead to political change, not unlike that seen with the Arab Spring (Stepanova, 2011). The success of Arab Spring has been commonly linked to sites such as Twitter and Facebook and the use of mobile networks (Stepanova, 2011). However, in China Twitter and Facebook are both banned. The Chinese government owns, operates and monitors the country's own versions of the websites called Renrenwong and Weibo. Furthermore, 70% of all mobile networks are also controlled and monitored by the government (Zhang and Prybutok, 2005). Uprisings and political gatherings become difficult with these restrictions.

Media plays a strong role in nested social hierarchies as control over media can establish strong power over the citizenry. This relationship can be detected in this project, especially in the retired subgroup. 100% of the retired subgroup get at least some of their news and information about the environment and other events from the government-owned media outlets such as the television and newspapers ($\chi^2(1, N=23)=5.3, p=0.02$). Thus, the media will highly influence their opinions and since the government owns the media it can be deduced that the government strongly influences their opinions. A significant number of the retired subgroup say they their environmental knowledge is based entirely on information provided on the television ($\chi^2(1, N=23)=4.3, p=0.04$).

Two systems created during the system definition phase of the research are concerned with government regulations directly changing the opinion that citizens have of the government via the media. For example, the system definitions describe people's discontent about urban expansion so the government creates urban green spaces. The government then reports that this has been done, potentially over-exaggerating the importance of the action, improving the citizen's opinion of the government and solving the problem. More importantly, in another system a relationship is described where the government disseminates information about the environment to the citizens and the citizens form their opinion based on this information. The government releases reports that show the improvement of the environment, that say the green space has been developed to create a better Shanghai and that cars are allowed to give people more freedom, while this may not be the entire truth.

These systems show the power that the government has in altering the opinion of the citizens through the media. The educated subgroup said that, in this way, the government uses the media as a propaganda tool. It is problematic that the government encourages pro-government and pro-Chinese sentiments through their dissemination of, potentially misleading, information. This greatly strengthens the hold that the outer-macro level of the hierarchy, the government, has on the immediate-inner level, the citizens. If people are content with government action, they are more likely to allow the government to continue their current course of action, which could be detrimental to their health. According to the opinions given by the retired subgroup, as mentioned in the previous section, the media is shaping their opinion of environmental change and the state of citizen health. The literature states that the citizenry is experiencing health issues related to the environment (Zhu et al., 2011) but the experiences

of the citizens is different and this contradiction could have to do with this hierarchical structure of information and, thus, this is problematic. If people are complacent about the environment it will begin, or continue, to negatively impact their health.

The systems described in the previous chapter and the media are all owned by the government which, again, helps to elucidate the strength of the social hierarchy. The government is in control of most major systems that the citizens are involved with and the systems that the participants were concerned with. The participants in this study very willingly admitted that they have little to no say over the outcomes of changes in the city and were willing to forgo this participation. This is because the government, according to 60.3% of the participants, is doing a sufficient job in taking care of the citizens. The participants supported this by giving a number of examples where the government has responded to citizen problems and environmental issues. For example, they cited instances where the government removed factories, built parks, created indoor exercise facilities and relocated citizens to central areas after the Cultural Revolution. Most of the participants, except 100% of the educated subgroup, ignored issues such as corruption, increased air pollution, increased number of visits to hospitals, etc. It could be argued that the social hierarchy of the system is so strong that citizens are not even comfortable questioning the hierarchy that controls them.

Despite these challenges Guobin Yang (2012) discusses successes seen in China due to local internets that break past these barriers. When available, people use local internets to plan meetings and organize demonstrations against unfair working conditions and low wages. Yang attributes the growing success of political organization in China to the internet. Without

internet access, people would not have been able to organize together. If the internet and the media were free, as it is in developed nations, there would potentially be a surge of demands for improved human rights and for improved environmental conditions. What is unclear, through the research done with this project, is if the younger generation has found ways to access more information and if that has changed their opinions on such matters. Free media could be a key component in dismantling the strong hierarchy present in China as it would break public complacency. This may be seen as it becomes more difficult to control free information in the future (Li, 2000).

6.1.3. Government Action & Hierarchy

The theme of government action and hierarchy, is concerned with the actions the government has taken and the impacts these actions have on lower levels of the hierarchy. Most government action is seen by the participants as positive while a number of potential negative effects go unnoticed by most.

One subgroup comprised of 5, or 21.7% of all participants, is made up of business men and women whose interests are primarily concerned with economic growth. They see the effects of government action as very positive as it has created a number of new economic opportunities. This group praised government action as it has led to the availability of luxury goods. They say life is better because “we have luxury cars, watches and other goods and people actually have the money to consume these things”. 100% of this subgroup highly praised the Chinese government’s ability to create strong international connections and business partnerships quickly ($\chi^2(1, N=23)=4.3, p=0.04$). They support this notion by pointing to things such as Special Economic Zones which include the cities of Shenzhen, Zhuhai, Shantou, Kashgar

and Xiamen (Fang, 1994). They also pointed to Shanghai's growing commercial districts that "allow people to shop and participate in the economy" ($\chi^2(1, N=23)=7.81, p=0.005$). When compared to other subgroups a statistically significant portion of the business oriented subgroup is of the opinion that the environment is a suitable tradeoff for this growth by saying "trees are less important" than economic growth and material goods ($\chi^2(1, N=23)=7.81, p=0.005$) and they care very little about the environment ($\chi^2(1, N=23)=6.67, p=0.01$).

The rich pictures drew attention to the emotions of the participants over various periods of time especially in relation to government action. The picture from the 1980's is more or less neutral in feeling. The picture does not show any major threats in the city, but there is also little demonstration that a fruitful future is ahead. In 1978 the Chinese government launched market reforms resulting in massive overall growth including growth in GDP, life expectancy, improved education and poverty reduction (WHO, 2005). The rich pictures for 1990's shows extreme displeasure with these changes as most of the change was brought on by a fast development of industrial growth (WHO, 2005). The participants pointed to construction and pollution as major sources of displeasure. In the 1990's and 2000's the government began to change the economic focus to job creation, increases in personal wealth and the opportunity to buy material goods (WHO, 2005). This, combined with efforts to restore the urban environment, created an overall culture of happiness and increased well-being for the participants. These emotional impacts of the historical dynamics with the government were not readily apparent in the interviews. Nor did the interviews show how the different variables interact with one another and change over time. The rich pictures, along with knowledge of the political history of China, demonstrate how the government, at the top of the social hierarchy,

has shaped the emotional response of the citizens by changing the face of Shanghai over the years. Additionally, the previous theme of government controlled media helps illuminate why happiness and contentment would become so prevalent. The government has been able to spread information that praises the government's initiatives while keeping a closed lid on negative sentiments about government action and citizen well-being. Not only has the environment been viewed as a suitable tradeoff for economic prosperity, but the government has successfully delinked the deterioration of health and the environment. Only 4.3% of the participants explicitly stated any such link.

These changes, led by the government, also resulted in a system of economic inequality. Access to jobs, education, wealth and goods in China is unequal (WHO, 2005). The educated subgroup describes a system where well-paying and comfortable jobs are created for those who have connections and good education. This is already unequal as it is expensive to obtain a good education and those in a lower economic bracket of the society are unlikely to have connections with people who are in charge of hiring for these highly desired jobs. Thus, a circle of wealthy, influential and connected people emerge who take over the higher paying jobs, which it is difficult for those outside the circle to get in. This creates a distinct class of elite in China with an overabundance of disposable income. A lot of these desirable jobs are government positions and, thus, the government perpetuates this. The educated subgroup argues that this results in corruption and enhanced inequality as the wants and needs of the government and elite class are put above all else. Thus, the government may not have the needs of the people in mind when taking action. A statically significant relation exists between

being educated and believing that the government does not prioritize citizens, rather they do what is good for themselves and the elite class of citizens only ($\chi^2(1, N=23)=7.23, p=0.007$).

This system further strengthens the social hierarchy. Actions that will negatively affect the rich or the government may be less likely to come to fruition. Conversely, action that positively impacts the wealthy or the government may be more likely to happen and could be framed to show that it is actually a benefit for the entire country. For example the rich enjoy luxury cars in China; they are the number one consumer in the entire world (Gerth, 2010). Cars are creating a lot of pollution that are negatively impacting citizen's because living in high traffic areas will result in a number of respiratory illnesses (Gerth, 2010). However, because the rich enjoy their cars it is unlikely that strict bans will be put onto car ownership. Additionally, the government makes money from cars, as seen in the system of car ownership. They get money from taxes, licenses, parking and insurance (Gerth, 2010). However, the lack of a ban on car ownership is framed as a way of helping to maintain the personal freedom of all citizens, and government controlled media is used to propagate this notion. Thus, the change implemented through the hierarchy is potentially harmful to citizens. But citizens may not be aware, because of how the government frames the issues.

There are five major actions identified by the participants that the government has implemented in the recent years, all of which are outlined in table 5.19. These actions are urban planning, river clean up, greening, economic change and environmental campaigns. 100% of the participants said that a number of the rivers became incredibly polluted after the 1990's when a number of factories opened that illegally dumped waste into the water. Now, the

participants say, the government is attempting to clean the water. Despite attempting to clean the rivers, the participants believe there remain a number of problems. The main river is still filled with shipping boats, as shown in the rich pictures. One participant also remarked that the smaller rivers and bodies of water have become almost impossible to be around on hot days as they emit an incredibly foul odor. The participants, again, claim that the cleaning of rivers is so the citizens can fish and swim in the water but none of them said they do, or plan to in the future. The world has also seen troubling news about China's river such as the 16, 000 diseased pigs that were found dead in the Huangpu River, a primary source for citizen's drinking water (Davison, 2013).

100% of the participants mentioned a number of re-greening projects that are visible throughout the city. The People's Square in central Shanghai has a significantly higher number of trees than the last time I visited three years prior. The building of parks and the addition of trees to concrete zones has transformed many public spaces in Shanghai into community meeting spaces as seen in image 6.1. Regardless of the government's intentions, these greening projects have undoubtedly served the population quite well as they are utilized as community spaces by over 90% of the participants. However, the educated subgroup points out that even these projects, as previously mentioned, are not free of ulterior motivation. The subgroup said that a number of these parks and concrete areas were broken up with trees to prevent the citizens from having large demonstrations ($\chi^2(1, N=23)=7.23, p=0.007$).

Government action regarding economic change has been mentioned a number of times. However, the rise of individualism associated with this economic change is worth noting. The

subgroup of those interested in economic development see the rise of a new economy as opportunity presenting itself for them. This strengthens the hierarchy as any problem is overshadowed in the minds of some citizens by the fact that their wealth is increasing. It is possible that this new found economic glory gives the citizens a biased view of the changes happening in Shanghai. The benefit, however, is unequal as described by 100% of the educated subgroup. Many are not able to reap the benefits of economic growth. For this reason it would be interesting to speak with a lower income group about how they view the environmental changes happening in Shanghai. This would be a group of people who are not experiencing extreme rises in well-being and wealth, which 96.6% of the participants were eager to trade for environment integrity in regards to air, water and green space. It may be the case that the hierarchy has a totally different effect on the urban poor. The hierarchy does not give them the opportunity to trade off the environment and their health for wealth and decreased poverty. Instead, the hierarchy could prevent them from obtaining high level jobs through access to people and education.



Image 6.1. The People's Square; an example of regreening

The chi-squared tests indicates that the business subgroup believe that the government knows what is good for Shanghai, which includes green investments that are good for both the economy and the environment ($\chi^2(1, N=23)=7.81, p=0.005$). They also believe that, compared to other countries, China is doing quite well in improving the environment ($\chi^2(1, N=23)=13.38, p=0.0003$). The subgroup believes that these interventions are good due to the increases in access to luxury goods ($\chi^2(1, N=23)=13.38, p=0.0003$) and people are now able to strive for more income and to progress more in life ($\chi^2(1, N=23)=6.67, p=0.01$). Like the retired subgroup, those coming from a business subgroup are much more likely to believe that the government is putting the priorities of citizens first, however this group adds an additional complaint that businesses come second ($\chi^2(1, N=23)=7.81, p=0.005$). It is clear that the business subgroup is supportive of government interventions due to increases in economic opportunities and making Shanghai into a world class city ($\chi^2(1, N=23)=7.81, p=0.005$).

There are a number of environmental campaigns initiated by the government. For example, it is the official stance that climate change is a real problem. However, the onus of change is put on developing nations, as stated by 100% of the participants excluding the educated subgroup. Additionally, the government has made a number of contributions to renewable energies and attempted to limit cars on the road (Ying and Ho, 2013). It is difficult to see the motivation behind these campaigns. As discussed earlier, the central Chinese government seems only to be taking superficial steps toward environmental change to placate the global audience yet a number of examples show failed attempts or demonstrate how the government continues to conceal environmental issues. For example reports on the current state of soil pollution have been touted as “state secrets” (Jing, 2013). Development of carbon

trading has been said to be only for economic incentives, which remain the main focus of the government (Liu, 2013). There have also been urges for companies and the government to be more transparent about environmental information (Yinan and Xiaofan, 2013) while the Chinese government tries to keep other countries from reporting on their poor environment (Olesen, 2012).

It is possible that the government is genuinely attempting to improve the environment, but based on the literature review it is unlikely that this is a primary motivation. If this is the case it is problematic because the country will continue to be one of the top polluters (Gerth, 2010). Also, the Chinese people are being told that the Chinese government is making progression on environmental campaigns and, thus, there is no internal pressure for change. 100% of the participants said that the air quality of Shanghai has improved, but it is difficult to give the government credit for this because the factories that were once in Shanghai have simply been moved to other Chinese provinces (VBS, 2008). Despite all this, the government could be making headway on environmental issues as the most recent five year plan specifically targets environmental issues, this will be discussed more in the following chapter.

6.1.4. Education

The third subgroup is comprised of 13% of the participants and are those with higher education. While agreeing amongst themselves, this subgroup consistently has widely varying opinions compared to all other subgroups². Their opinions are more highly correlated to the information gathered during the literature review. While other participants denied

² While a personal relationship existed with at least 2 of the educated participants it is worth noting that at least 5 of the retired participants have an even closer relationship with myself and my translator. This relationship did not change their likelihood of answering similarly to the other people in their own subgroup.

environmental issues, 100% of this subgroup claimed things such as “companies dump toxic waste into the water because rules and laws are not strict enough” ($\chi^2(1, N=23)=13.33, p=0.0002$) and “there is massive deforestation on the outskirts [of Shanghai]” ($\chi^2(1, N=23)=6.66, p=0.01$). Unlike the retired subgroup, the educated subgroup was more likely to claim that the rivers are much dirtier than they used to be and are too dirty to drink or swim in ($\chi^2(1, N=23)=13.54, p=0.0002$). Additionally, this subgroup was of the opinion that the changes the government is implementing are “superficial and not improving the social fabric of China” ($\chi^2(1, N=23)=13.33, p=0.0003$) and that environmental issues can be closely linked with corruption ($\chi^2(1, N=23)=13.54, p=0.0002$). They were the only ones to acknowledge a connection between environmental degradation and health issues. They also admit that things in Shanghai might be improving but that China, overall, is worsening over time ($\chi^2(1, N=23)=6.66, p=0.01$). Finally, this group was also concerned about the propaganda used by the government to ensure that people support the government completely. When asked why they had these widely differing opinions they claimed that their educational connections from outside of the country were the main contributor.

All of the educated subgroup firmly believed that “better education and media is needed” for citizens to understand social and environmental issues. While research is needed to fully understand the impact of the government owning the media this group is of the opinion that the information given to citizens by the government is inaccurate yet entirely shapes the common citizen’s opinion of the environment.

100% of the educated subgroup believe that over the past 30 years, the education system has been used by the government as a way of controlling citizens ($\chi^2(1, N=23)=13.54$, $p=0.0002$). During the Cultural Revolution, the youth were sent to the countryside for “re-education” to prevent them from becoming too active in society and rising up against the government (Harris, 2005). Professors and teachers who did not explicitly teach the way Mao wanted were ostracized, called elitists and fired (Harris, 2005). The educational system was torn apart to prevent people from discussing ideas that could be detrimental to the government’s regime.

The participants with higher education had a higher distrust of the government, as shown by the differing opinions of the subgroups, and care about the future of the environment. Participants with lower education care less about the environment and trust the government more. 22% of all participants believe it is difficult for underprivileged people to obtain higher education as it costs money to get into, further strengthening the previously described circle of a well-educated and elite class of citizens. Thus, despite education instilling distrust in the government and placing higher importance on environmental protection, a number of people obtaining university degrees are those who will continue to benefit from maintaining the status quo.

Overall 17.4% of the participants claimed to know very little about the environment due to being poorly educated on the issues. The survey indicates that education has a very high statistical correlation with believing there are environmental issues ($\chi^2(1, N=23)=20.70$, $p=0.000005$), to believing that life overall has not improved in Shanghai ($\chi^2(1, N=23)=3.75$, $p=0.05$) and to believing that the government is not improving China ($\chi^2(1, N=23)=20.0$,

p=0.000008). 13% of the participants were unaware of why urban planning would be useful and also attributed this to a lack of education on how society functions. Educating the public on these matters could change opinions on issues of the environment.

6.1.5. Health & the Environment

Issues of health and the environment are not well known to the participants. 43.5% of the participants said there was a lot of information on the television about food, water and air issues but said none of these issues were major issues for Chinese citizens. 34.8% of the participants said that these are not major issues because the government is investing in green energy and taking the initiative to protect the environment. While only 2.2% of the participants explicitly connected any environmental issue with health issues, 14.3% made loose connection and the rest made no connection. Between 80 – 100% of all participants see that there are more cars, increased smog, fewer trees, that the air is more difficult to breathe and that the environment is deteriorating. However, they also believe that any respiratory issues are from second or first-hand smoking, that life expectancy is up, food is more readily available, the government is being proactive on environmental issues and, thus, environmental issues are not their concern.

The systems definitions for changes in health demonstrate that the participants believed the government is willing to implement considerable change to help promote health and well-being. Rather than connecting the transition from an industrial economy to a tertiary economy with natural economic progression, 63% of the participants conclusively attributed this change to a governmental desire to support the population. They further supported this by stating that the government created urban green space and more public hospitals for the participants. Thus,

the participants believe that these changes were done wholly to improve the well-being of the citizenry. However nearly one quarter of the participants said green space has been made for tourists or to prevent public demonstrations. They also stated that hospitals do not meet the needs of the population and are subpar attempts at public health that are still too expensive for most citizens. While the intention for change cannot be known without further research into the government's intentions I believe that this further validates the power of the hierarchy. The government can make large scale change to the environment and health that may not be in the best interest of the citizens, but the citizens are unaware of the problems.

Issues of health are virtually nonexistent among participant opinion. Only 21.7% said any health issues exist. The majority of the participants actively avoided the topic and deny any potential links to their health and the environment. I suggest that this is due to their strong national pride that is constantly reinforced by the hierarchy. If this is correct the hierarchy could potentially be harming the participants by encouraging the citizens to ignore or deny health issues. What is not clear is if the participants do take the health concerns seriously but they were simply not forthcoming with that information.

The major source of air pollution in Shanghai has changed over the past 30 years (Harris, 2005). The source of air pollution used to be the industrial factories. Today the major source of air pollution is from the number of cars (Harris, 2005). Cars are a great economic push for the government as it means profit from selling gas, licenses and repairing the cars. The growing number of cars has resulted in traffic that is borderline unmanageable, a lack of space to park the cars, and pollution. The government has attempted to respond to these problems by

building more infrastructure, designating sidewalk space as parking lots and planting trees to help counteract the pollution (Ying and Ho, 2013). However, these efforts are not sufficient to respond to the amount of air pollution, as outlined in chapter 2. There has been a recent development of a car culture in Shanghai (Gerth, 2010). There are a number of private drivers that can be hired for a low cost and China is the top consumer of luxury vehicles in the world (Gerth, 2010). The new culture of cars has increased the illusion of personal freedom and increased overall happiness in the participants. The government has little incentive to remove cars as, according to 83% of the participants, few people are connecting cars directly with issues of pollution and difficulty breathing.

Despite the growing problems around health and social barriers to health the social determinants of health have increased in China. This suggests that attributing all of the blame for citizen complacency on the hierarchy may not be entirely accurate or fair. The people do have increased access to healthcare (Liu et al., 2002). They also have increased access to employment in general in Shanghai (Joseph, 2010). The government has also made it a priority to ensure the lives of the elderly are comfortable by providing homes and social programs (FlorCruz, 2013). The social fabric of the society also ensures that elderly people are not left alone and the family is often extremely involved in the lives of their elderly family members (FlorCruz, 2013). Family ties to the elderly are even outlined in governmental law. Children are required to visit their parents “often” and companies are required to give people time off work to do so (FlorCruz, 2013).

Access to health care in urban areas is quite expensive and wait times are lengthy (Liu, 2002). However, China’s focus on healthcare since the 1950’s has resulted in drastic

improvements to the system (Liu, 2002). 56.6% of the participants said “even the poor now have access to health care”. Still hospitals are often quite busy. The government is having a difficult time keeping up with the number of people who require medical attention (Liu, 2002). Many of the health care challenges China faces are similar to those faced in developed nations, and thus, it is simply a matter of government innovation to intervene and improve the system.

Chi-squared tests indicate some additional statistically significant results from all three subgroups on the issue of health and the environment. The educated participants were more likely to say that hot air from pollution has increased stress in Shanghai ($\chi^2(1, N=23)=7.23$, $p=0.007$), that Shanghai has improved due to becoming a commercial city ($\chi^2(1, N=23)=4.22$, $p=0.04$) and that water table depletion is a problem as Shanghai is beginning to sink ($\chi^2(1, N=23)=6.66$, $p=0.01$). They were also more likely to point out issues of inequality in the healthcare system ($\chi^2(1, N=23)=4.82$, $p=0.03$) and that money is being invested into areas that are less important than the healthcare system ($\chi^2(1, N=23)=13.33$, $p=0.0003$).

Statistically significant relationships with the business subgroup include saying that any health issues are associated with smoking, not environmental deterioration ($\chi^2(1, N=23)=3.76$, $p=0.05$). They also believe that those who do not exercise are simply making excuses and are lazy, not because the environment is not suitable for physical activity ($\chi^2(1, N=23)=14.4$, $p=0.0001$).

Statistically significant relationships with the retired subgroup include attributing coughs from the past, not to current environmental issues ($\chi^2(1, N=23)=4.27$, $p=0.04$) and saying that the environment and air quality is too poor to get outside to exercise ($\chi^2(1, N=23)=5.63$,

p=0.02). Overall they believe that life is better because life expectancy is up ($\chi^2(1, N=23)=5.47$, p=0.02).

6.1.6 Themes, Interconnections and Attributing Meaning to Perceived World

The use of SSM in this project helped to reveal issues of complexity and unexpected interrelationships between the five themes just described. It also helped to demonstrate a number of relationships that the participants either did not notice or potentially denied. For example, the participants indicated that they are spending more, or just as much, time outdoors but they did not connect this to increased health or agree that it was because there was more green space in which to be active. However, they did say that they use parks very often³. Additionally, all but the educated subgroup were unable to identify simple interrelationships and feedback loops such as air conditioners contributing to increased heat. There is a lack of understanding of the complex and interactive relationships occurring within the problem situation. However, drawing the rich pictures made these connections and complexities emerge without intention. Unfortunately, the inability to connect the issues of human action, such as air conditioners, cars and using nature for recreation, with environmental degradation suggests there was little concern or understanding about future environmental struggles.

My application of SSM has also been successful in showing the way the participants attribute meaning to the perceived world in relation to these themes. It helped illuminate some contradictions and the potential source of these contradictions. For example 100% of the participants believed that the environment has both improved and worsened. Their answers

³ Surveys were distributed in parks. Thus, a bias could be present in this answer as the people answering obviously use parks.

changed based on context. It is likely that this is due to national pride and the government propagating certain sentiments. Thus, the perceived world changes due to the hierarchy which alters the way the citizens view all five of the themes. It has created the idea that home and national support is important and that China, as a country, has greatly improved and is a global leader in environmental sustainability. The hierarchy has also successfully disassociated health and the environment. It has strengthened support for government action, even when that action is potentially harmful for the citizens. The government, at the top of the hierarchy, has done these things through their control of the media. The final theme, education, is the one most likely to dismantle this hierarchy. However it too is negatively influenced by issues of access and power.

6.2. Hierarchy & Intervention

The topic of the “hierarchy” has been mentioned a number of times. As discussed in chapter two, hierarchy is important because it dictates who is in control of decision making and who is able to influence other levels of the hierarchy. The rich pictures and interviews generated how understanding about decisions by the government result in positive and negative emotional experiences on the citizenry. As previously mentioned government action such as encouraging continued car ownership, increasing access to money and material goods and having an increased availability of food has made the population happy. They also demonstrated that, despite the large number of pollution problems identified by the participants, the most recent picture is of a positive and healthy place to live. This contradiction can be attributed to the hierarchy.

NVivo identified a number of themes that appeared regularly throughout the interviews that correlate with the hierarchy. The themes generated by NVivo as the most commonly occurring are: education, maintaining order, money, immigrants, access to health care and the media. These themes are some of the most important aspects for creating change and measuring well-being in this project. To further understand the importance of these themes I will examine them in the context of the hierarchy.

While education holds the power to produce informed citizens who are able to critically question the motivations of the government, it also suffers from corruption. According to 75% of the subgroup of educated participants, academic journals, tenured teaching positions and grade allocation are all highly rife with corruption. Publications in peer reviewed journals can be bought or are chosen based on connections. A number of articles never go through a rigorous peer review process. Similarly, teaching positions are given to people who have connections within departments. 100% of the educated subgroup believe that the education system as a whole is designed by the government to produce workers, not thinkers. There is a strong emphasis on grades rather than on critical thinking, and an emphasis on finding a high paying job at the end of the degree. So, while education has the potential to produce those that will question the status quo and the stronghold that the government has over the society, this outcome is in the minority. This system positively impacts the government's current position of authority within the hierarchy creating a more resilient system against change.

The government exercises its hierarchical power to attempt to maintain order in developing urban areas. 8.6% of the participants alluded to the idea that the government has a motive to maintain control over the people to plan for the growing population, which is why

slums, like those found in Delhi, do not exist in China. However, 21.7% of the participants point to the fact that the income gap between the urban and rural populations is continuing to grow. Thus, by keeping people in rural areas, the government is essentially keeping them poor. Additionally, many of these citizens have access to few job options. For example, as mentioned in chapter 2, there are entire cities built around particular jobs, such as coal mining, and it is difficult to leave to go elsewhere. The hierarchy and organization of society has made it near to impossible to attempt a better life.

Another primary topic generated through content analysis by NVivo is money and economic gain. The desire for economic gain is so strong that approximately 75% participants alluded to the fact that they are willing to tradeoff any number of things for more opportunities to make money and for more places to spend their money. This included, but is not limited to, the environment, health, access to outdoor space and parks. One member from the educated subgroup believes that the government, in the urban centers, has made economic incentives so enticing that it is difficult for the citizens to see through it. They believe that the very fabric of education in the country is aimed at creating people who are complacent with the way the society currently functions. Thus, the drive for increased money is stronger than the desire to have clean air and access to health care. The hierarchy enforces this through access to education, controlling the media and limiting the growth of knowledge.

The hierarchy of this system is very clearly established. The inner ring of the hierarchy includes the participants and their local communities and families. This inner circle means a great deal to the participants, particularly to the retired subgroup. This level of the hierarchy lacks control over the system and has its opinions greatly influenced by the outer macro circle

of the hierarchy. The intermediate level consists of the businesses and is extremely important to the subgroup of those who are interested in economic development. The interests of this level of the hierarchy are highly valued by the outer macro circle as the government wants this level of the hierarchy to be successful. Thus, this level of the hierarchy has some power in the system as their interests are more highly valued than the inner level. The interactions between the inner level and intermediate level are for shopping, jobs and economic growth. The inner level sees the growth of the intermediate circle as a symbol of success in the country.

Additionally, the growth of this intermediate level has increased their well-being and is, thus, a suitable tradeoff for the inner circle. The outer macro level consists of the government. The government owns the entire system and influences both the intermediate and inner level. The government maintains this strong hierarchy by controlling the media and, thus, controlling the opinion of the inner level. The intermediate level is already greatly benefiting from the outer macro level and, thus, is supportive of government action. While the inner level claims to be support of government action, the educated subgroup suggests that this is due to the fact that the government control over the media has made this inner level unaware of the harms they face on a daily basis. This social hierarchy has created problems of health, inequality and freedom of information and choice.

6.3. Resilience

As previously mentioned, a resilient system is one that is able to return to its original state after being disturbed, making change difficult. The hierarchy of the system in this study is highly resilient. In some instances a resilient system is desirable, however it is my opinion that

in this case it is not. The citizens believe that the government is improving China and they therefore lack any desire to contribute to planning or decision making. Furthermore, even if the citizenry desired to contribute to change there is no opportunity for such provided by the government. This creates a reinforcing feedback loop as the government controls what information the citizens obtain via the government's stronghold on the media. This propagated information instills within the citizens certain ideas. In this case it is that the government is making a positive impact on China, overall.

14.7% of the participants point to the high level of corruption in China. In the opinion of the educated subgroup this corruption means that the actions taken by the government are not in the best interest of the country. Rather, the interests of the actions made are to those with the most money and highest levels of influence. Consequently, it is potentially the case, as supported by the interviews, that this is a resilient system benefiting the richest and most corrupt people running the country who have no qualms about disseminating false information.

This resilient system is further strengthened by the government's desire to be recognized as an international power (Harris, 2005). According to the participants, the government and the citizens of China want to be seen positively by the global audience. For the government their interests lie in enhancing economic gain for the nation, obtaining free technologies and strengthening their own security (Harris, 2005). As heavy economic producers and role models for developed nations for environmental initiatives this is problematic as their goals to develop may not correspond with environmentally sustainable mandates (Harris, 2005). China currently lacks environmental regulations. Their global success continues and they

continue to receive environmental aid, this strengthens the resilience of the system. This situation gives China little incentive for change.

State environmentalism, as discussed in chapter 2, furthers the resilience of the system (Tseng, 1999). China upholds cities such as Shanghai and Beijing as examples of growing and greening cities (Tseng, 1999). However, there are many other cities that stay out of the news. For example China possesses 16 out of 20 of the world's most polluted cities (VBS, 2008). The strong authoritarian government means that information about the state of China is not well known and this strengthens the government's ability to continue developing on their own terms.

An example of a wasteful outcome of the government's drive to have economic success is Chinese ghost cities. One participant described these cities as "completely useless". A statistically significant number of the educated subgroup mentioned issues that could be falsely inflating GDP ($\chi^2(1, N=23)=6.67, p=0.01$). These ghost cities have been built to assist in falsely inflating the national GDP (Stahl, 2013). In recent years the government has demanded a growth rate of 8% per year from each region of the country. Not all areas are able to meet this goal and, consequently, implement projects to employ people and create infrastructure. Unfortunately, the outcome are cities that are uninhabited and unused (Stahl, 2013).

This resilience is problematic. Globally, China must be taken seriously as they provide a number of jobs, goods and economic trade with developed nations. It is difficult for international partners to put too much pressure on the China as this could have negative outcomes. Locally, it is problematic as the system is taking away freedom of information and,

thus, freedom for the citizens to make informed decisions about their lives and well-being. The strength of the hierarchy and China's authoritarian government makes this system incredibly difficult to change. But for there to be sufficient environmental responses, it needs to.

6.4. The Trinity

As discussed in chapter 2, a holistic approach to understanding an issue is to have a solid understanding of the philosophy, method and action associated with the study. The purpose of this section of the chapter will be to first question the philosophical soundness of the study, including the boundaries created and whether or not the philosophy of systems was appropriate for this study. Following this, there will be a discussion of whether or not the method of SSM was appropriate for this study. Finally, the section will question the effectiveness of action taken, potential action to be taken in the future and the knowledge generated by this research.

6.4.1. Philosophy

As explained in detail in chapter 3, a philosophical underpinning of soft systems methodologies includes, but is not limited to, a holistic approach that allows for, and deeply considers, participant based knowledge. Additionally, the philosophy should include a critical examination of the boundaries of the study (Midgely, 2000). This section will examine these areas of philosophy in relation to this study.

6.4.1.1. Holism and Knowledge Production

Something is said to be holistic if the understanding of it is concerned with the whole, or as a complete system, rather than as individual parts (Checkland and Scholes, 1999). SSM

encourages a holistic approach by allowing for multiple stakeholder participation and not valuing any one particular stakeholder's knowledge over another. A variety of stakeholders are given the opportunity to provide different viewpoints and understandings about the problem situation. Each set of stakeholders will have their own priorities and opinions on what is important. By bringing in a number of stakeholders, a wide variety of opinions is given and a more complete picture begins to emerge. With only one stakeholder, there are a number of potentially key insights and opinions on the problem situation that are neglected. Thus, it is desirable for a number of stakeholders from various points in the problem situation to participate in the study.

This study only provided the views of one stakeholder – Shanghai's middle income elderly. There were, however, different voices inside of this sample group. These subgroups enhanced the voice of those who are primarily concerned with economic growth, those with higher levels of education and those who are retired and spend the majority of their time at home. These subgroups helped to demonstrate why people would be concerned about the economy over the environment, how higher education can contribute to an opinion and the effects of the media on those who frequently watch, read and listen to it.

More stakeholders would have created a more holistic approach. The views of this group were important for looking at a time scale over the past 30 years as they were able to remember and identify with the entire time period. However, including government officials, youth and the urban poor would have helped to clear up a number of issues and details.

6.4.1.2. Boundaries

Boundaries, as previously outlined in chapter two, are the scope of one's research or problem definition which influences where the systems boundaries are drawn. Figure 6.2 demonstrates that what is within the scope of a project or problem's boundary is what is considered relevant and important. Conversely, what is outside of this boundary is implied to be less relevant, worthless and at a disadvantage to the study (Midgely, 2000). Thus, the boundary of a project should not be considered lightly. Critical systems heuristics provides 12 questions for reviewing the boundaries placed on a study to decide whether or not the boundary should be altered (Midgely, 2000).

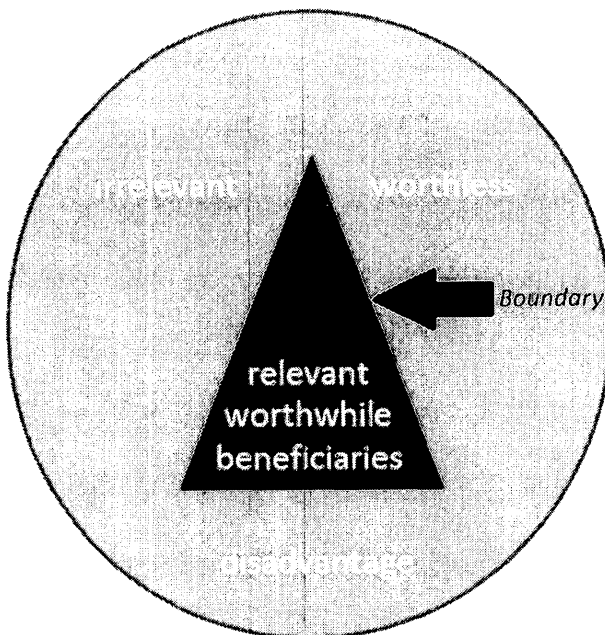


Figure 6.2. Boundary diagram.

Answering the questions outlined in table 2.1 helps to evaluate the boundary that has been drawn. This is difficult to do as the questions can be answered from a number of perspectives. The discussion of each question below will come entirely from my own

perspective while attempting to incorporate what the participants would have desired. Some questions are not addressed as they deal with implementation of solutions, which was beyond the scope of this project. The following is a reflection on these questions.

The first three questions allow the project coordinator to question the motivation of the study and who is involved. For example, who are the beneficiaries and what is the purpose of the system? The beneficiaries of the system in this project ought to be the participants as it is an attempt to see if they are happy and healthy. Or, the beneficiaries ought to be China in general. The purpose of the system is to see how the economic changes encouraged by the government have impacted the lives of the citizens. Again, this supports the idea that the pool of participants should have been larger and more diverse. This should have included people from different areas of Shanghai, different income groups and potentially different age groups. The implication of these questions is that by choosing the participants I chose those who I alone thought were important for the study, as informed by the interviews and surveys, and this has undoubtedly altered the outcome.

The second set of questions look at how the study is being controlled and who is controlling it. For example, who is in control of the conditions of success and what conditions should be outside of the control of those in charge? For this project the citizens ought to be in control of the conditions of success in the system meaning I have placed their wants and needs over the government and businesses. SSM allowed for the participants to be in control of how they wanted their information depicted in at least two forms. They were given the tools to demonstrate what they wanted changed and to discuss their opinions. I allowed for the

translator to do the majority of the speaking so that they could use their own language and make clear how they wanted to deliver information. In all possible ways I handed over the power and control to the citizens, as I recognized that I was an outsider asking a favor of them.

The third set of questions examines knowledge in the system and the kind of knowledge that will be produced. For example, what knowledge is deemed appropriate and who ought to contribute knowledge? The problem situation involves an entire city and, thus, there should have been knowledge coming from a number of different voices in the city. A number of participants that could have contributed alternative knowledge were not represented. For example, a government representative could have been useful to speak to the intentions and motivations of government action. Business owners also would have given a unique perspective on what it has been like to be an entrepreneur in Shanghai during all these changes.

Setting the age boundary is useful because it focuses on a certain subgroup of the population who have had a unique and relevant experience over the past 30 years. However a wider pool of people over the age of 55 would have provided more additionally relevant knowledge. Relevant knowledge and skills ought to be, and are, any form of contribution the participants want, and need, to use to create a more full understanding of the situation. The implications for my decision making on these questions meant that I was unable to interact with the participants fully. Because the interviews were done through a translator I was unable to question things further; however this was a worthy sacrifice as it gave the participants more freedom and power for discussing the problem situation. Similar to the previous set of questions, the implication for having a non-representative set of people means the outcome is

significantly biased towards middle-class retired residence; as this is explicitly stated to be the boundary this is not an issue.

The fourth, and final, set of questions question the legitimacy of the project and the boundaries that have been drawn such as whether or not those who are negatively impacted are represented and how differing worldviews are reconciled. Those negatively represented should be able to speak for themselves and represent their points of view. In this case this could include the government, businesses and foreign countries. However, all of these actors have some form of power over the participants and, thus, it is fair to allow participants to express their concerns. What is not fair is the number of citizens negatively impacted by the problem situation that were not included in the project, including the poor, migrants, etc. The boundary of the project should have been widened to ensure voices of under privileged families and those suffering from environmental injustice were also included. SSM provides an opportunity to bring the worldviews of those being negatively impacted together with those being positively, or neutrally, effected. For example, the rich pictures were a collaborative effort to allow everyone to express their opinions on the problem situation.

These reflections indicate that the boundary drawn for this study usefully could have been wider. While the study generated interesting information it did so in a non-representative capacity. The underprivileged voice was desperately needed and likely would have drastically changed the outcome of the study. However, I do believe that this reflection shows the success of using SSM in this project as it allowed for a collaborative approach to understanding.

The overall question for this section is “Is the epistemology of systems thinking appropriate for this study?” The philosophy of systems thinking allowed for a culturally sensitive approach that gave the power of information and data production over to the participants. It also helped to create a holistic understanding of the problem including identifying the weaknesses in the outcomes, such as the boundaries and voices that were excluded. The philosophy of systems allowed me to justify the approach that I took while speaking with my participants. Furthermore, allowing people to express their views entirely also led to the emergence of a whole aspect of the study I was not expecting (the 1990’s opinion). However, the boundaries should have been questioned before the research started to ensure that the necessary voices were included. This was not a failure of the systemic epistemology; it was simply a matter of not sufficiently questioning the boundary design prior to the research and having limited time to conduct the study.

6.4.2. Methodology

The overall question for this section is whether or not the method of SSM and techniques used with it were appropriate for this work. While the techniques of open ended interviews and the creation of rich pictures were illuminating, the overall process of SSM was not fully utilized. This particular problem required a modification of SSM that did not utilize the action portion of the process. However, the process of creating systems definitions and human activities systems illuminated a number of interesting ideas. For example, the subsystems clearly demonstrate that the government has total ownership over the system. This provides great proof that there is a strong social hierarchy in the population. If the citizens had control over something in this problem, then they would have had more ownership over these systems.

The rich pictures, another technique of SSM, helped to demonstrate the way that government action coupled with media ownership changed the emotions and experience of the participants over time. They also demonstrated what the participants are willing to trade-off in order to have a more comfortable life. These rich pictures assist the reader in understanding why the citizens may be complacent. While the environment may be degrading they now have access to food, clean water and other basic human needs.

Creating the system definitions and human activity systems was an interesting process that resulted in systems definitions and results that are representative of the designed group but not of the population at large. I would, however, use SSM again in the future for a similar project. I would ensure that the participants were brought together for larger workshops, during which we would construct the rich pictures together and create root definitions together as well. I think this would help give knowledge back to the participants, a vital outcome that was missed in this particular project.

6.4.3. Action

Intervention is third important aspect of a project. While direct intervention did not happen during this project, the discussion of resilience demonstrated why intervention would be difficult. This previous chapter has also demonstrated how government intervention has drastically changed Shanghai and the citizens.

The overall question for this section is whether or not the systems approach of knowledge creation and finding places for intervention has been appropriate for this work. The method produced a lot of interesting information about the hierarchy and how the citizens'

opinions had been shaped. The method gave the participants the opportunity to respond to the knowledge in the literature reviews and to create their own views of what reality is in Shanghai at this time. It was effective in allowing experience to become an acceptable form of knowledge. It was also effective in identifying areas that would be good for intervention. For example, intervening in the health care system would be useless as it does not deal with the situation directly but rather deals with the symptoms. However, intervening with the government control of the media could be the key leverage point of a very resilient system.

Overall, a system that has sufficient epistemology, methodology and action will not lack justification, purpose or rigor. The epistemology of SSM demonstrated why speaking to the elderly population would be important and took their opinions into account as relevant knowledge. The SSM methodology allowed for their voice on this particular issue to be heard and deemed it relevant. Because of this, the project did not lack justification. The project followed the methodology of SSM using techniques that have proven to be successful in other projects. I also ensured that the process of doing statistical analysis and working with NVivo were done correctly. Because of these methodologies the project was done in a rigorous manner. Finally, while the project did not result in actual action being taken it did result in interesting information that could be used in the future.

6.5. Summary

This chapter included a discussion of the five major themes that emerged during the project. These themes are home and nationalism, media, environment and health, government action and education. The themes of home and nationalism and media were of particular

importance to the retired subgroup of participants as they spend most of their time at home and watch a lot of television. Watching television has also potentially increased their sense of nationalism as the media is controlled by the government. Government action were important to the subgroup of those who are business oriented as most government action has resulted in positive outcomes for economic growth. Growth of personal wealth is extremely important to this subgroup. The theme of education was important to the educated subgroup. The theme of environment and health was not of particular importance to anyone. This chapter also looked at “the trinity” examining whether or not a sufficient approach to holistic understanding had been taken. This will be further explored in the following chapter. The following chapter will also have final reflections and recommendations.

7. Conclusion

In this final chapter I will first discuss my final reflections on the difficulties of doing research and discrepancies between the literature review and the study findings. I will also reflect on the process in general. Secondly I will make concluding statements on “the trinity”. Following this I will present five recommendations based on the results of the study. To finish, I will look to the future and present reasons to be hopeful about the government’s action toward the environment.

7.1 Reflections

The process of conducting research for this project was difficult. Attempting to gain trust as an outsider proved to be incredibly difficult even with a Chinese person working closely with me. After reviewing all of the data I am increasingly unconvinced that the information provided by the participants was true and accurate. The defensive tone and nature of many of the interviews leads me to believe that a lot of the participants tried to protect the face of China, and themselves. The cultural barriers of trust and language were difficult to overcome.

The discrepancies between the interviews and the initial literature review are staggering. The literature states that China has 16 out of 20 of the world’s most polluted cities (VBS, 2008) however the participants say that pollution is not a problem in China. The literature points out a number of issues with inequality, corruption and access to clean water and food (Holdaway, 2010; Joseph, 2010; Zhu, et al., 2011), however the participants claim that China is on the verge of becoming a developing country with easy access to food, water and personal economic growth for all. A number of the participants seem to be ignorant of issues happening outside of

Shanghai. The literature suggests that this could be due to government controlled media (Li, 2000), however the participants say it is because overall, everyone is better off. The participants said that the government is taking great effort to improve the environment yet the literature suggests that many of these improvements have been from a place of economic motivation and superficial in nature (Harris, 2005). The government, historically and today, creates very linear policies that deal with situations individually instead of taking an approach that sees how things are interconnected (Shapiro, 2001).

The inequality created by an authoritarian government was only recognized by the educated subgroup of participants. This inequality has created a hierarchy of health that negatively impacts people at the bottom. However, the people may have been influenced by government information to believe that health issues are of no concern, especially as they relate to the environment. The literature suggests that these participants should be feeling effects from, at the very least, air pollution (Gerth, 2010) yet none of them identified any issues. They all did, however, express the fact that the air has gotten worse and that most days the air is "grey". This contradictory information can be attributed to the hierarchy making it difficult to find the truth, for both researchers and citizens.

The power of this nested social hierarchy is much stronger than I anticipated. The government owns all systems and the participants were satisfied with it remaining as so. Future work could examine the youth's opinions on this matter as there may be more discontent in the youth who have access to information outside of the government control. I hypothesize that the nested social hierarchy may be less strong with the youth; however the government may

already have been successful in creating a complacent population at all ages. The participants also believe that the government has greatly improved Shanghai since the 1990's, this again is not supported by the literature, especially for China overall (Gerth, 2010). However, the participants' problems largely occurred in the 1990's and now their identified problems are solved. Thus, according to the participants, there is no issue in China within the context of this project. This is power of the nested social hierarchy; the participants are unaware of problems that, according to the literature, do exist.

Finally, doing research in China was a personally taxing goal. It is difficult to see so many issues inside of a system that one has very little power in. The possibilities for intervention are few. It was also difficult to be a woman researcher in a predominantly patriarchal society; this was difficult personally and professionally. I found it difficult to speak with older male participants, however having a male translator alleviated this problem. I also found it difficult to see, and participate in, entrenched traditional gender roles.

7.2. The Trinity Reflection

In chapter 2 I discussed "the trinity" and alluded to it a number of times after that. Image 7.1 shows a Venn diagram outlining the importance of taking an approach that has a firm understanding of philosophy, methodology and intervention. Ignoring any one aspect of these three could result in problems (Midgely, 2000). A process that ignores intervention, which could also be thought of as a concretely stated outcome, lacks purposes. A process that ignores the philosophy behind the process lacks justification. A process approached without a firm methodology lacks rigor. Using all three categories results in a systemic approach to understanding a problem.

This project was based in an epistemology and methodology of systems thinking. The epistemology emphasized the need for a holistic approach that took into consideration all the different kinds of knowledge being produced. The project used soft systems methodology as the methodology, which resulted in a rigorous approach to understanding a lot of complex and fuzzy information. Finally, the project identified a couple potential areas for intervention but also created knowledge about Shanghai's elderly that had not been compiled before.

According to "the trinity", I would argue that, I took as holistic, epistemologically grounded and rigorous approach as possible. I deliberately attempted to ensure that each one of these areas represented in the Venn diagram was sufficiently met. I have answered the research question "*What has been the health and well-being experience of elderly Shanghai residents in the context of environmental issues caused by economic development?*" with a strong philosophy, method and outcome.

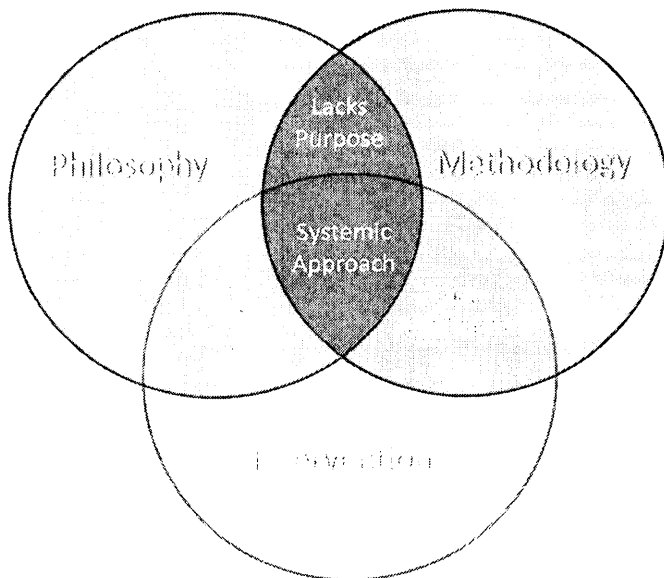


Image 7.1. Venn diagram of "The Trinity". (Weedmark-Kish, 2013)

7.3. Recommendations

Based on the information gathered mostly from the interviews, but also from the surveys, I have five recommendations. These recommendations are purely for my own academic interest as there is no intention to propose change in China or to the participants.

The first recommendation comes from the fact that 63.6% of the participants said that there is no need for action in China. This is largely due to the fact that the participants believe China is already taking action. I would recommend that participants and citizens of Shanghai have access to information on the importance of the power of the individual. While the government has implemented re-greening projects and closed factories the individual use of air conditioners, cars and consumption will continue to negatively impact the Shanghai environment.

The second recommendation is based on the literature and from the outcome of the research. Free and open media could be a critical threshold for the Chinese people (Yang, 2009; Stepanova, 2011). It is clear from the systems definitions and interviews that the government controlled media is drastically influencing the opinions that the participants hold about the environment and urban development. If the government were to allow non-government controlled media it could result in an intellectual revolution. I believe that freedom of information, especially when it pertains to one's own health and environmental surroundings, is vital. Thus, I would like to see free media in China's future.

The third recommendation follows closely with the previous recommendation. The educated subgroup of the participants consistently had widely varying views from the majority

of the participants. They self-described that this was due to having higher education and having access to other academics internationally. I would recommend that higher education be encouraged along with scholarships so those less privileged have better access to education. It is important that education also be free and open for intellectual discussion against the status quo. Corruption in education, and in all of the country, should be avoided at all costs to produce educated people with critical thinking skills.

The issue of corruption, in general, is a troubling one. According to the educated subgroup of the participants corruption in the city is helping to breed inequality (with the help of the social hierarchy). Thus, it is my fourth recommendation that corruption stops. Corruption has become part of the political culture of China. Doing “favors” for one another is a long held custom. However, without the cessation of corruption companies and businesses will prevail over the individual and the division between the rich and poor will likely only increase. The participants indicate that it is due to corruption and “favors” that those in lower income brackets are unable to break into higher paying jobs. The longer this system perpetuates the more difficult it will become to break as the division between the rich and poor gets larger.

My final recommendation comes from the literature review and the outcome of the study. The literature review suggests that China’s approach to environmental issues has been superficial and more economically driven than environmentally driven. I suggest that China needs to create a clear, honest and defined path toward environmental sustainability. I will show in the next section that this could already be happening.

7.4. Looking to the Future

The future of environmental protection in China is looking up. China is at a turning point. The most recent 5 year plan heavily considers environmental protection (China Briefing, 2011). The plan could shift China's past focus on developing buildings and infrastructure to more environmentally focused projects as it states that RMB3.4 trillion will be invested into green projects. The plan calls for a reduction in air pollution in the form of chemical oxygen demand, ammonia, sulfur dioxide and nitrogen oxide. It also calls for a reduction in area of polluted surface water and air quality in general.

Green projects planned by the government in The Five Year Plan include a number of proposed ideas. The plan calls for pollution reduction in sewage and water especially as it pertains to sulphur and nitrogen. The plan calls for general improvements in water, soil and air quality across the country. It also focuses on increased environmental protection in rural areas, an area that has often been forgotten in the past. The plan also seeks to see the development of nature reserves to preserve biodiversity. It also mentions nuclear technology development and monitoring including the development of nuclear power plants and radiation monitoring where there are current plants. The plan will also include building new environmental infrastructure such as water treatment plants and increased environmental monitoring, which includes training new monitors. There are all important steps for protecting China's environment. This Five Year Plan will be completed in 2015 at which time it will be interesting to see how much was implemented. Already China is emerging as a potential leader in

environmental initiatives such as their recent carbon cap to take place in 2016 (Thompson, 2013).

7.5. Summary

In this paper I have discussed the issue of environmental issues, health and well-being in relation to Shanghai's elderly. I began with a literature review of systems theory and approaches to health. In the literature review of systems theory I discussed the philosophy of systems thinking and methodologies associated with it. In the literature review of approaches to health I discussed some approaches to health that fail to deal with issues holistically and presented options that do so, namely the Butterfly Model of Health.

In the third chapter I introduced the context of the project. In China the environment is being degraded as the country relentlessly develops. China has become the number one consumer for a number of luxury goods and is adding over 10 000 new cars to the roads every day. This has resulted in a number of growing health issues in the citizens, especially those linked to respiratory illnesses. The government's response to these growing environmental issues has largely been superficial and with the main goal of getting closer to having developed-nation status. The political climate of China is still quite authoritarian leaving change entirely in the hands of the government.

In the fourth chapter I described the methods used to conduct the research. The overall approach to the research was to use the framework of soft systems methodologies. I first handed out structured interviews and did open ended interviews. I then produced rich pictures with the participants to have a visual description of the problem situation. I then created root

definitions of relevant systems in the problem situation followed by the development of human activity systems to demonstrate how the systems function and to show the social hierarchy.

In the fifth chapter I presented the results including all of the results from the techniques mentioned in the previous paragraph. This chapter presented a number of graphs and images to show the resulting information. It also had a written and pictorial description of the systems created. Of particular importance here, is that the government owned and operated all of the systems.

In the sixth chapter I discussed the results that were presented. I did so by showing five themes that emerged as being particularly important. These themes are home and nationalism, media, government action, health and environment and education. I discussed the importance of each of these themes and related them back to philosophies presented in systems thinking. I also discussed the outcomes in the context of resilience and hierarchy. I also critically engaged with the material through critical systems heuristics and with “the trinity”.

In this final chapter I have shared some final reflections on contradictions in the results as compared to the literature review. I have also discussed “the trinity” and presented five areas for future improvement. These areas include enforcing the importance of individual action, free media, access to education, getting rid of corruption in the society and having China define clear and defined paths toward environmental sustainability. I then demonstrated that China has begun to take this final step by implementing the newest Five Year Plan, which focuses on environmental sustainability.

The continuing problem of air pollution in China is resulting in an increased number of hospital visits and respiratory illnesses linked to air pollution. The growing economy is resulting in massive amounts of pollution and environmental regulations that are focused on goals unhelpful for protecting the environment in the future. Overall, there was a lack of interest in the environment from the participants, strong support of the government and a rejection of growing illness in the country due to pollution problems. It was agreed among the participants that the problem of air pollution and environment issues peaked in the 1990's but has since been solved. Today, the number of opportunities for jobs and personal economic growth, as well as access to food, water and basic education are more important than environmental concerns. The participants also largely agreed that the government is doing a good job in responding to citizen needs and environment challenges through re-greening projects and a focus on modernizing Shanghai.

It is clear that the nested social hierarchies of the country are greatly impacting the opinions of the citizens. The government owned media, from which the majority of citizens obtain their information about the environment, puts the government in a positive light. The government also makes decisions that negatively impact the health of the citizens, the lower level of the hierarchy, without giving any power to them. It is also clear that a number of areas are available for intervention but the government controls all systems. Thus, it is entirely up to the government to break the stronghold it has over the entire country in order for change to be made.

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Appendix A: Structured Survey

Participant Information

Name: _____

Date of Birth: _____ (including year)

Location of Birth: _____

Where did you live 30 years ago?

City

Farm/Rural

Other _____

Occupation: _____

If retired, occupation before retirement: _____

Highest level of education: _____

Type of home:

Apartment (1 room)

Apartment (1 room, 1 bedroom)

Apartment (more than 1 bedroom)

House

Other _____

How many people live in your home:

1

2 - 3

4 - 5

5+

Do you have any health issues arising from environmental problems?

yes

no

yes, but insignificant

unknown

Do you think the environment in Shanghai has gotten worse, better or stayed the same?

worse

better

stayed the same

unknown

Who contributes to your opinion on the environment?

family

friends

self

- government
- media
- other

How much time do you spend outdoors?

- very little
- some
- a lot

What activities do you do outdoors?

- shop
- exercise
- play recreational sports
- go to the park
- none

Do you spend more or less time outdoors now compared to 30 years ago?

- less
- about the same
- more

Are you able to contribute to community and urban planning?

- no
- yes
- unsure

Has your overall well-being increased in the past 30 years?

- yes
- no
- about the same

Has the government improved Shanghai in the past 30 years?

- yes
- no
- unknown

All interviews opened with:

"Tell me about how your life in Shanghai has changed over the past 30 years."

1. What about the environment has changed?
2. Has your physical health been affected by environmental changes?
3. Do you think your life today is better than it was 30 years ago? Why or why not?
4. Why did this change happen? Whose interests were being prioritized by the government?
5. Have your visits to the hospital increased for respiratory issues?
6. What was your relationship to the physical environment like before? How has it changed?
7. Do you think the air quality is worse in Shanghai? If yes, how so and what has caused it?
8. Have you noticed a decrease in trees, plants and other signs of nature in the city?
9. Have the changes in the city made your life better? How?
10. Are you getting regular exercise?
11. Do you find it getting hotter in the city?
12. Do you find it more difficult to breathe now?
13. Do you contribute to decision making processes in your city? Are you given the opportunity to do so?
14. Who makes the decisions for planning and development and change in your neighbourhood?
15. What elements of the environment do you come in contact with?
16. Has environmental issues altered your day to day life? Do you go out more or less often?
17. Do you walk to get around? Is it dangerous to walk? What are the alternatives? Has this changed since 30 years ago?
18. Do you travel areas outside of Shanghai for any reason besides tourism and visiting relatives?
19. Do you attend community meetings? How well do you know the other people in your nearby community?
20. What surrounding area do you consider to be your neighbourhood and has this changed since 30 years ago?
21. Do you want to have more or less input on the changes in your neighbourhood and environment? What changes would you make?
22. What has caused changed in your neighbourhood? What and who drives development?
23. What does the development result in, directly?
24. Are you aware of environmental issues? Do you think you are well informed?
25. How much do you care about environmental issues? Why?

Questions based on their information sheet:

1. When did you move to your current home? Do you own it?

2. Why did you choose this neighbourhood? Have you lived in other neighbourhoods?
3. Is this neighbourhood more or less polluted than other neighbourhoods?
4. What do the other people in your house do? Are they all family?
5. Are your children or yourself politically active?
6. Were you relocated to this region by anyone other than yourself?
7. How has this neighbourhood and Shanghai in general changed, physically?
8. When did these health issues develop and why do you think caused them?
9. If you could relocate to any region in Shanghai, where would you go and why?
10. Why did you migrate from the country? Has your life become better?

The following questions were asked after reminding the participant that if anything makes them feel uncomfortable, they don't need to answer.

1. Do you feel like a priority in your country's development?
2. What are your thoughts on environmental issues and economic development in Shanghai?
3. Is there anything you would change about the environment you now live in?
4. Do government decisions about development in the city affect you?

Question (# of participants who answered)	Answers	Frequency	Percentage
How has your life and Shanghai changed over the past 30 years? (23, 100%)	There are many new roads and an increasing amount of cars	23	100.0%
	The air has gotten a lot worse since 30 years ago	22	95.7%
	15 years ago Shanghai was a "concrete forest" but now it has a lot more trees	21	91.3%
	There are no regulations requiring companies and industries to add up to 50% greenery on their lot	20	86.9%
	There are a lot more high rise buildings	19	82.6%
	There is a large amount of immigrants; real Shanghainese are now outnumbered by outsiders; Shanghainese are more civilized and have better manners	14	60.9%
	People are much richer; even poor people have access to health care and opportunities to increase their income	13	56.5%
	Permanent settlements and homes	10	43.5%
	The city boundaries have expanded; where there was once farmland there is now city	8	34.8%

	There is more access to everything; people used to spend hours making dumplings now they can be bought on the corner for a cheap price	8	34.8%
	Shanghai has changed from an industrial city to a commercial city (as seen from the fortune 500 companies on Nanjing Road) and that has greatly improved the air and water quality	8	34.8%
	It is much hotter in the summer giving an overall feeling of stress from the air and crowds of people	6	26.1%
	There is more opportunity to make money and places are much more modern; business opportunities are continuing to grow	5	21.7%
	Homes that were considered nice 30 years ago are now deteriorated and considered small	3	13.0%
What about the environment has changed? <i>(23, 100%)</i>	In the 1990's there as a lot of construction that made the air dirty but now the construction is done so the air is much cleaner	23	100.0%
	The sky is no longer blue, it is grey.	22	95.7%
	The greening projects have improved the air a lot.	19	82.6%
	The number of cars and air conditioners has increased the noise pollution and makes the air grey.	16	69.6%

	You used to be able to swim in the river but you no longer can – not because it is dirty but because there are so many boats in it. The river and water around Shanghai has improved since the 1990's due to government intervention	8	34.8%
	China's environmental problems stem from corruption and ineffective regulations	4	17.4%
	The river is much dirtier than it used to be, so you can no longer drink out of it.	4	17.4%
	There is a lot more garbage on the ground; this is largely due to the immigrants	2	8.7%
	Companies dump toxic waste into the water because rules and laws are not strict enough; there is a corrupt system that results in an exchange in money for passing environmental regulation tests	2	8.7%
	There used to be a lot of trees all over and around Shanghai but now there is massive deforestation on the outskirts	1	4.3%
	Due to so many new high rise buildings Shanghai is sinking by 2 cm per year; this is also because of the water table being depleted	1	4.3%
	Shanghai's air pollution is bad but it is not the worst in China; factories have closed here and moved to other cities so Shanghai might be a bit better but China overall is worse	1	4.3%
Has your physical health been affected by environmental changes? <i>(21, 91.3%)</i>	I don't feel like the environment has caused any impacts on my health.	18	85.7%

	Health issues are due to cigarettes, not the environment; China is the number one consumer of cigarettes in the world	18	85.7%
	I only have regular aging issues such as knee and joint pain, back problems, hip issues and arthritis	13	61.9%
	People might have health issues but the overall life expectancy is up	10	47.6%
	A cough exists from quite a while ago, thus, it is not from the environment.	8	38.1%
	Coughs are very common in China – everyone has it so it is not worth mentioning	6	28.6%
	Those who can afford the best and private health care do not need to worry about these kinds of issues	4	19.0%
	Any increase in cases of diseases is likely due to advances in health care so now people are finding diseases that they have always had but didn't know existed before	4	19.0%
	I am very sick but I don't think it is from the environment	2	9.5%
	Why would this matter?	2	9.5%

	I don't know; doctors don't tell you where the problem comes from, just that there is one	2	9.5%
Do you get regular exercise? (16, 69.5%)	There are a lot of opportunities to exercise so people who don't it is because of habit; I do not exercise because of habit	11	68.8%
	Older people go out each morning to the park to dance or do tai chi, before there were not enough parks close by to do this but now there are	11	68.8%
	The government provides opportunities to do exercise	9	56.3%
	It is too hot in the summer but in the spring and fall it is nice to go outside and get exercise	8	50.0%
	There are gyms now where you can do workout indoors so anyone who does not workout is just lazy	4	25.0%
	I go to the gym frequently	4	25.0%
	Due to the air you can't get outside often to do workouts; the air is too bad to do activity	3	12.5%
	Sometimes I go to the park to dance and sing but this is mostly to be social	1	6.3%

Are there opportunities for you to contribute to urban and community planning? <i>(15, 65.2%)</i>	None at all, it is all done by the government	10	66.7%
	I don't understand what this means	4	26.7%
	The government puts the plans in the urban planning museum so you can see what they have done and what they plan to do	4	26.7%
	Private builders may buy land and build on it, but the government creates zones for residential, commercial and industrial buildings	2	13.3%
	Citizens can go to protest now, some communities have stopped the government from putting in factories in their neighborhood by protesting	2	13.3%
	There is no education on how or why anyone would want to do this, but it is desirable	2	13.3%
	Why would people spend time doing community planning in a city that is already so full?	2	13.3%
	There is no need for me to give input on this matter, the government is doing a good job	1	6.7%
How much environmental knowledge do you have?	The future generations will be more informed due to the internet	13	56.5%

<i>(23, 100%)</i>	Quite a lot; the newspapers have a lot of information, especially about how America needs to start responding to global warming	11	47.8%
	There is a lot of information on television and in the newspaper about food, water and air issues	10	43.5%
	We know that China is investing a lot of money to make green cities and invest in renewable energy; the Chinese government knows that making green investments is good for the Earth and the economy	8	34.8%
	The government releases reports that talk about the drinkability of water and the quality of air; it is published online and is reported on the news	8	34.8%
	I only know what is shown on television	8	34.8%
	In comparison to other countries China is doing quite well in improving the environment	6	26.1%
	Very little; I only know what I see and there is a lot to understand so without education it is hard to know what is good and what is bad	4	17.4%
	Global warming is a serious problem	4	17.4%
Is life better today than it was 30 years ago? <i>(21, 91.3%)</i>	Yes, I am no longer poor and I always know where my next meal will come from and where I will be living next week	17	80.9%

	People are no longer hunger, we used to barely have enough food to survive and now there is a surplus	17	80.9%
	People are no longer being forced to work at jobs they don't want or to work in the countryside	15	71.4%
	The average life expectancy is much higher now	10	47.6%
	Absolutely because now we have luxury cars, watches and other goods and people actually have the money to consume these things	6	28.6%
	There is no longer fear of the government and this makes life better	5	23.8%
	People are now able to strive for a good steady income, a family and to progress further in life	4	19.0%
	Things on the internet are blocked so people think things are better when they may not be, people may not be given the truth about things	3	14.3%
	People are wealthier and China's GDP is higher, but a lot of people are still poor and the GDP is falsely inflated by doing unnecessary construction	1	4.8%
Whose interests are being prioritized by the government where there is development?	It is called the people's government because the government always puts the needs of the people first.	9	75.0%

(12, 52.1%)	The government only thinks of the citizens when they plan things, businesses come second	8	66.0%
	It is always the government's interests that are prioritized, we are told they do everything for the people but the government wants more money and to be as strong so they do what will make this happen	6	50.0%
	Every country has a history and China used to not put people's needs first but now they do, this should not be held against them	4	33.3%
	They people only think their needs are put first and only think they are happy because the government tells them they are happy	3	25.0%
	The government will invest millions into Olympic athletes and landmarks for tourists but they don't put more money into hospitals and education	2	16.7%
Do you find it more difficult to breathe now? (11, 47.9%)	It is hard to breath around still water like rivers and ponds because they smell very bad, especially on hot days	9	81.8%
	Definitely, but this is because of my history with smoking	8	72.7%
	Sometimes on hot days when there is a haze over the city it is hard to breath	6	54.5%
	Yes, but it is better than what it used to be. There used to be dust from construction but now it is all clear	2	18.2%

Is the government doing a good job? <i>(14, 60.9%)</i>	The environment got worse for a while but then a lot better so the government did a very good job	14	100.0%
	Yes, we are now a commercial city	10	71.4%
	The government has a very good idea of what a good city is and they are making Shanghai a world class city	8	57.1%
	There are more white people visiting now and there were no whites before so I think the government is getting foreign visitors to come and this is good	6	42.9%
	No, not at all – it is all superficial, the government is not improving the social fabric of China	2	14.3%
Is it easy to get around Shanghai? <i>(8, 34.8%)</i>	The streets are very crowded so driving is not safe	6	75.0%
	Personal drivers have become quite common so that people don't need to deal with the stress of Shanghai roads	6	75.0%
	Only people who are not careful may get hit by cars	4	50.0%
	The subway system in Shanghai is very good even though it is often quite busy, it is extensive an inexpensive	3	37.5%

How much do you care about environmental issues? <i>(22, 96.7%)</i>	You have to decide what is important – getting a good job and a good wife/family is important. The environment is already better so it is worth our time to worry about these things first	14	63.6%
	We should plan to make the environment better but the government is obviously already doing that	9	40.9%
	School and the economy are the most important, not the environment	8	36.4%
	I want the future to be good for my grandchildren so we should try to improve it	4	18.2%
	I care very little about the environment	4	18.2%
Have you noticed a decrease in trees, plants and other kinds of nature in the city? <i>(13, 56.5%)</i>	Yes, but the government is greening places	13	100.0%
	Going to city parks is very popular, it brings in a lot of money so now there will be more trees because the government sees that people like it	8	61.5%
	Trees prevent people from gathering and doing demonstrations or protests so there are more in places like the People's Square now	6	46.2%
Additional Information Provided <i>(N/A)</i>	There are higher and lower classes in Shanghai; the rich tend to be exposed to better education and thus are more civilized; the communist party tried to promote the ideology that said people who had callouses and cow dung on their hands and feet are clean whereas the educated and wealthy are filthy because their souls are dirty; you can act dirty and uneducated because you have the cleaner	5	21.7%

	soul; now this seems ridiculous		
	The communists used the poor to try and gain power; they said the working class was the flesh and skin of the country and the educated are the hair on the skin. If there isn't the skin, all the hair wouldn't be there.	4	17.4%
	Higher class areas of Shanghai have less pollution; cancer rate is higher for people who are living closer to factories and in less desirable areas, these are usually poor people; the rich educated would avoid bad areas but the lower class would have no idea; rich are able to afford doctors, the welfare system for people to go to hospitals is getting better now but historically has been bad	4	17.4%
	"Today in China it is still the world of the rich person. If you have money to buy out the judge, you're in the clear. Unless the person you're trying to use is as poor as you, then maybe justice will be served."	4	17.4%
	I feel like a pawn to the government because the government uses me, and other Chinese, to tell the world how great China is. I am rich, but I am not the majority. I am educated, but I am not the majority.	2	8.7%

Appendix D: Chi Square Test Survey Results; Educated vs. All

Question		Educated	Other	Total	e(Educated)	e(Other)	χ^2 Statistic	χ^2 Prob
Location of Birth	city	20	18	38	16.89	21.11	1.03	0.31
	farm/rural	4	9	13	5.78	7.22	0.98	0.32
	Another city	4	8	12	5.33	6.67	0.60	0.44

**Lived 30 Years
Ago * Highest
Level of
Education**

Crosstabulation	city	25	29	54	24.00	30.00	0.08	0.78
	rural/farm	3	4	7	3.11	3.89	0.01	0.93
	other	0	2	2	0.89	1.11	1.60	0.21
Type of Home	Apartment 1 room	5	29	34	15.11	18.89	12.18	0.00
	Apartment 1 room 1 bedroom	3	6	9	4.00	5.00	0.45	0.50
	Apartment more than 1 bedroom house	7 13	0 0	7 13	3.11 5.78	3.89 7.22	8.75 16.25	0.00 0.00
Number of People in Home	1	0	4	4	1.78	2.22	3.20	0.07
	2-3	15	25	40	17.78	22.22	0.78	0.38
	4-5	10	6	16	7.11	8.89	2.11	0.15
	5+	3	0	3	1.33	1.67	3.75	0.05
Any Enviro Health Issues	yes	5	8	13	5.78	7.22	0.19	0.66
	no	3	18	21	9.33	11.67	7.74	0.01
	yes, but not significant unknown	14 6	8 1	22 7	9.78 3.11	12.22 3.89	3.28 4.83	0.07 0.03
Is the Environment Better	worse	19	1	20	8.89	11.11	20.70	0.00
	better	5	30	35	15.56	19.44	12.89	0.00
	the same	4	4	8	3.56	4.44	0.10	0.75
What Contributes to Opinion on Environment	family	3	3	6	2.67	3.33	0.08	0.78
	friends	3	4	7	3.11	3.89	0.01	0.93
	self	12	7	19	8.44	10.56	2.69	0.10
	government	1	4	5	2.22	2.78	1.21	0.27
	media	4	15	19	8.44	10.56	4.21	0.04
	other	5	2	7	3.11	3.89	2.06	0.15
How Much Time is Spent Outside	very little	13	17	30	13.33	16.67	0.02	0.90
	some	7	4	11	4.89	6.11	1.64	0.20

	a lot	7	13	20	8.89	11.11	0.72	0.40
	unknown	1	1	2	0.89	1.11	0.03	0.87
What Is Done Outside	shop	0	1	1	0.44	0.56	0.80	0.37
	exercise	8	1	9	4.00	5.00	7.20	0.01
	play recreational sports	3	4	7	3.11	3.89	0.01	0.93
	go to park	5	17	22	9.78	12.22	4.20	0.04
	i don't do outdoor activities	12	12	24	10.67	13.33	0.30	0.58
Spend More or Less Time Outside Now	less	12	13	25	11.11	13.89	0.13	0.72
	about the same	8	11	19	8.44	10.56	0.04	0.84
	more	7	10	17	7.56	9.44	0.07	0.79
	unknown	1	1	2	0.89	1.11	0.03	0.87
Opportunity to Participate in Community Development	no	19	18	37	16.44	20.56	0.71	0.40
	yes	1	0	1	0.44	0.56	1.25	0.26
	unsure	8	17	25	11.11	13.89	1.57	0.21
Is Life Better Now Compared to 30 Years Ago	yes	20	30	50	22.22	27.78	0.40	0.53
	no	3	0	3	1.33	1.67	3.75	0.05
	about the same	5	5	10	4.44	5.56	0.13	0.72
Is the Government Improving China	yes	9	30	39	17.33	21.67	7.21	0.01
	no	16	0	16	7.11	8.89	20.00	0.00
	unknown	3	5	8	3.56	4.44	0.16	0.69

Appendix E: Chi Square Test Interview Results; Retired Subgroup vs. All

Question	Retired	Other	Total	e(Retired)	e(Other)	χ^2 Statistic	χ^2 Prob
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How has your life and Shanghai changed over the past 30 years?

(23, 100%)

There are many new roads and an increasing amount of cars

15 8 23 15 8 0 1

The air has gotten a lot worse since 30 years ago

15 7 22 14.347826 7.65217 0.085227 0.7703

15 years ago Shanghai was a "concrete forest" but now it has a lot more trees

15 6 21 13.695652 7.30435 0.357143 0.5501

There are no regulations requiring companies and industries to add up to 50% greenery on their lot

12 8 20 13.043478 6.95652 0.24 0.6242

There are a lot more high rise buildings

11 8 19 12.391304 6.6087 0.449123 0.5028

There is a large amount of immigrants; real Shanghainese are now outnumbered by outsiders; Shanghainese are more civilized and have better manners

8 6 14 9.1304348 4.86957 0.402381 0.5259

People are much richer; even poor people have access to health care and opportunities to increase their income

5 8 13 8.4782609 4.52174 4.102564 0.0428

Permanent settlements and homes

9 1 10 6.5217391 3.47826 2.7075 0.0999

The city boundaries have expanded; where there was once

2 6 8 5.2173913 2.78261 5.704167 0.0169

farmland there is
now city

There is more
access to
everything; people
used to spend
hours making
dumplings now
they can be bought
on the corner for a
cheap price

5 3 8 5.2173913 2.78261 0.026042 0.8718

Shanghai has
changed from an
industrial city to a
commercial city (as
seen from the
fortune 500
companies on
Nanjing Road) and
that has greatly
improved the air
and water quality

0 8 8 5.2173913 2.78261 15 0.0001

It is much hotter in
the summer giving
an overall feeling
of stress from the
air and crowds of
people

2 4 6 3.9130435 2.08696 2.688889 0.1011

There is more
opportunity to
make money and
places are much
more modern;
business
opportunities are
continuing to grow

1 4 5 3.2608696 1.73913 4.506667 0.0338

Homes that were
considered nice 30
years ago are now
deteriorated and
considered small

0 3 3 1.9565217 1.04348 5.625 0.0177

**What about
the
environment
has changed?**

In the 1990's there
as a lot of
construction that
made the air dirty
but now the

15 8 23 15 8 0 1

	construction is done so the air is much cleaner							
(23, 100%)	The sky is no longer blue, it is grey.	14	8	22	14.347826	7.65217	0.024242	0.8763
	The greening projects have improved the air a lot.	11	8	19	12.391304	6.6087	0.449123	0.5028
	The number of cars and air conditioners has increased the noise pollution and makes the air grey.	8	8	16	10.434783	5.56522	1.633333	0.2012
	You used to be able to swim in the river but you no longer can – not because it is dirty but because there are so many boats in it. The river and water around Shanghai has improved since the 1990's due to government intervention	8	0	8	5.2173913	2.78261	4.266667	0.0389
	China's environmental problems stem from corruption and ineffective regulations	1	3	4	2.6086957	1.3913	2.852083	0.0913
	The river is much dirtier than it used to be, so you can no longer drink out of it.	1	3	4	2.6086957	1.3913	2.852083	0.0913
	There is a lot more garbage on the ground; this is largely due to the immigrants	2	0	2	1.3043478	0.69565	1.066667	0.3017

	Companies dump toxic waste into the water because rules and laws are not strict enough; there is a corrupt system that results in an exchange in money for passing environmental regulation tests	0	2	2	1.3043478	0.69565	3.75	0.0528
	There used to be a lot of trees all over and around Shanghai but now there is massive deforestation on the outskirts	0	1	1	0.6521739	0.34783	1.875	0.1709
	Due to so many new high rise buildings Shanghai is sinking by 2 cm per year; this is also because of the water table being depleted	0	1	1	0.6521739	0.34783	1.875	0.1709
	Shanghai's air pollution is bad but it is not the worst in China; factories have closed here and moved to other cities so Shanghai might be a bit better but China overall is worse	0	1	1	0.6521739	0.34783	1.875	0.1709
Has your physical health been affected by environmental changes?	I don't feel like the environment has caused any impacts on my health. Health issues are due to cigarettes, not the environment;	15	3	18	11.73913	6.26087	2.604167	0.1066
(21, 91.3%)	China is the	14	4	18	11.73913	6.26087	1.251852	0.2632

number one
consumer of
cigarettes in the
world

I only have regular
aging issues such
as knee and joint
pain, back
problems, hip

8 5 13 8.4782609 4.52174 0.077564 0.7806

issues and arthritis
People might have
health issues but
the overall life
expectancy is up

8 2 10 6.5217391 3.47826 0.963333 0.3263

A cough exists
from quite a while
ago, thus, it is not
from the
environment.

8 0 8 5.2173913 2.78261 4.266667 0.0389

Coughs are very
common in China –
everyone has it so
it is not worth
mentioning

5 1 6 3.9130435 2.08696 0.868056 0.3515

Those who can
afford the best and
private health care
do not need to
worry about these
kinds of issues

0 4 4 2.6086957 1.3913 7.5 0.0062

Any increase in
cases of diseases is
likely due to
advances in health
care so now people
are finding
diseases that they
have always had
but didn't know
existed before

4 0 4 2.6086957 1.3913 2.133333 0.1441

I am very sick but I
don't think it is
from the
environment

1 1 2 1.3043478 0.69565 0.204167 0.6514

Why would this
matter?

2 0 2 1.3043478 0.69565 1.066667 0.3017

	I don't know; doctors don't tell you where the problem comes from, just that there is one	2	0	2	1.3043478	0.69565	1.066667	0.3017
	There are a lot of opportunities to exercise so people who don't it is because of habit; I do not exercise because of habit	7	4	11	7.173913	3.82609	0.012121	0.9123
Do you get regular exercise?	Older people go out each morning to the park to dance or do tai chi, before there were not enough parks close by to do this but now there are	9	2	11	7.173913	3.82609	1.336364	0.2477
(16, 69.5%)	The government provides opportunities to do exercise	8	1	9	5.8695652	3.13043	2.223148	0.136
	It is too hot in the summer but in the spring and fall it is nice to go outside and get exercise	4	4	8	5.2173913	2.78261	0.816667	0.3662
	There are gyms now where you can do workout indoors so anyone who does not workout is just lazy	0	4	4	2.6086957	1.3913	7.5	0.0062
	I go to the gym frequently	0	4	4	2.6086957	1.3913	7.5	0.0062
	Due to the air you can't get outside often to do workouts; the air is too bad to do activity	0	3	3	1.9565217	1.04348	5.625	0.0177
	Sometimes I go to the park to dance and sing but this is mostly to be social	1	0	1	0.6521739	0.34783	0.533333	0.4652

Are there opportunities for you to contribute to urban and community planning?

(15, 65.2%)

None at all, it is all done by the government

6 4 10 6.5217391 3.47826 0.12 0.729

I don't understand what this means

4 0 4 2.6086957 1.3913 2.133333 0.1441

The government puts the plans in the urban planning museum so you can see what they have done and what they plan to do

3 1 4 2.6086957 1.3913 0.16875 0.6812

Private builders may buy land and build on it, but the government creates zones for residential, commercial and industrial buildings

0 2 2 1.3043478 0.69565 3.75 0.0528

Citizens can go to protest now, some communities have stopped the government from putting in factories in their neighborhood by protesting

0 2 2 1.3043478 0.69565 3.75 0.0528

There is no education on how or why anyone would want to do this, but it is desirable

0 2 2 1.3043478 0.69565 3.75 0.0528

Why would people spend time doing community planning in a city that is already so full?

2 0 2 1.3043478 0.69565 1.066667 0.3017

	There is no need for me to give input on this matter, the government is doing a good job	1	0	1	0.6521739	0.34783	0.533333	0.4652
How much environmental knowledge do you have?	The future generations will be more informed due to the internet	5	8	13	8.4782609	4.52174	4.102564	0.0428
	Quite a lot; the newspapers have a lot of information, especially about how America needs to start responding to global warming	8	3	11	7.173913	3.82609	0.273485	0.601
(23, 100%)	There is a lot of information on television and in the newspaper about food, water and air issues	10	0	10	6.5217391	3.47826	5.333333	0.0209
	We know that China is investing a lot of money to make green cities and invest in renewable energy; the Chinese government knows that making green investments is good for the Earth and the economy	1	7	8	5.2173913	2.78261	9.801042	0.0017
	The government releases reports that talk about the drinkability of water and the quality of air; it is published online and is reported on the news	6	2	8	5.2173913	2.78261	0.3375	0.5613
	I only know what is shown on	8	0	8	5.2173913	2.78261	4.266667	0.0389

television

	In comparison to other countries China is doing quite well in improving the environment	1	5	6	3.9130435	2.08696	6.234722	0.0125
	Very little; I only know what I see and there is a lot to understand so without education it is hard to know what is good and what is bad	1	3	4	2.6086957	1.3913	2.852083	0.0913
	Global warming is a serious problem	1	3	4	2.6086957	1.3913	2.852083	0.0913
	Yes, I am no longer poor and I always know where my next meal will come from and where I will be living next week	14	3	17	11.086957	5.91304	2.20049	0.138
Is life better today than it was 30 years ago?	People are no longer hunger, we used to barely have enough food to survive and now there is a surplus	12	5	17	11.086957	5.91304	0.216176	0.642
(21, 91.3%)	People are no longer being forced to work at jobs they don't want or to work in the countryside	11	4	15	9.7826087	5.21739	0.435556	0.5093
	The average life expectancy is much higher now	3	7	10	6.5217391	3.47826	5.4675	0.0194
	Absolutely because now we have luxury cars, watches and other goods and people actually have the money to consume these things	1	5	6	3.9130435	2.08696	6.234722	0.0125

	There is no longer fear of the government and this makes life better	2	3	5	3.2608696	1.73913	1.401667	0.2364
	People are now able to strive for a good steady income, a family and to progress further in life	0	4	4	2.6086957	1.3913	7.5	0.0062
	Things on the internet are blocked so people think things are better when they may not be, people may not be given the truth about things	0	3	3	1.9565217	1.04348	5.625	0.0177
	People are wealthier and China's GDP is higher, but a lot of people are still poor and the GDP is falsely inflated by doing unnecessary construction	0	1	1	0.6521739	0.34783	1.875	0.1709
Whose interests are being prioritized by the government where there is development?	It is called the people's government because the government always puts the needs of the people first.	9	0	9	5.8695652	3.13043	4.8	0.0285
(12, 52.1%)	The government only thinks of the citizens when they plan things, businesses come second	3	5	8	5.2173913	2.78261	2.709375	0.0998

	It is always the government's interests that are prioritized, we are told they do everything for the people but the government wants more money and to be as strong so they do what will make this happen	3	3	6	3.9130435	2.08696	0.6125	0.4338
	Every country has a history and China used to not put people's needs first but now they do, this should not be held against them	4	0	4	2.6086957	1.3913	2.133333	0.1441
	They people only think their needs are put first and only think they are happy because the government tells them they are happy	0	3	3	1.9565217	1.04348	5.625	0.0177
	The government will invest millions into Olympic athletes and landmarks for tourists but they don't put more money into hospitals and education	0	2	2	1.3043478	0.69565	3.75	0.0528
Do you find it more difficult to breathe now?	It is hard to breath around still water like rivers and ponds because they smell very bad, especially on hot days	6	3	9	5.8695652	3.13043	0.008333	0.9273
(11, 47.9%)	Definitely, but this is because of my history with	4	4	8	5.2173913	2.78261	0.816667	0.3662

	smoking								
	Sometimes on hot days when there is a haze over the city it is hard to breath	3	3	6	3.9130435	2.08696	0.6125	0.4338	
	Yes, but it is better than what it used to be. There used to be dust from construction but now it is all clear	2	0	2	1.3043478	0.69565	1.066667	0.3017	
Is the government doing a good job?	The environment got worse for a while but then a lot better so the government did a very good job	12	2	14	9.1304348	4.86957	2.592857	0.1073	
(14, 60.9%)	Yes, we are now a commercial city	5	8	13	8.4782609	4.52174	4.102564	0.0428	
	The government has a very good idea of what a good city is and they are making Shanghai a world class city	2	6	8	5.2173913	2.78261	5.704167	0.0169	
	There are more white people visiting now and there were no whites before so I think the government is getting foreign visitors to come and this is good	1	5	6	3.9130435	2.08696	6.234722	0.0125	
	No, not at all – it is all superficial, the government is not improving the social fabric of China	0	2	2	1.3043478	0.69565	3.75	0.0528	
Is it easy to get around Shanghai?	The streets are very crowded so driving is not safe	3	3	6	3.9130435	2.08696	0.6125	0.4338	

	Personal drivers have become quite common so that people don't need to deal with the stress of Shanghai roads	1	5	6	3.9130435	2.08696	6.234722	0.0125
	Only people who are not careful may get hit by cars	4	0	4	2.6086957	1.3913	2.133333	0.1441
	The subway system in Shanghai is very good even though it is often quite busy, it is extensive an inexpensive	0	3	3	1.9565217	1.04348	5.625	0.0177
	You have to decide what is important – getting a good job and a good wife/family is important. The environment is already better so it is worth our time to worry about these things first	9	5	14	9.1304348	4.86957	0.005357	0.9417
How much do you care about environmental issues?	We should plan to make the environment better but the government is obviously already doing that	5	4	9	5.8695652	3.13043	0.37037	0.5428
(22, 96.7%)	School and the economy are the most important, not the environment	1	7	8	5.2173913	2.78261	9.801042	0.0017
	I want the future to be good for my grandchildren so we should try to improve it	4	0	4	2.6086957	1.3913	2.133333	0.1441
	I care very little about the environment	1	3	4	2.6086957	1.3913	2.852083	0.0913

Have you noticed a decrease in trees, plants and other kinds of nature in the city?

	Yes, but the government is greening places	10	3	13	8.4782609	4.52174	0.785256	0.3755
	Going to city parks is very popular, it brings in a lot of money so now there will be more trees because the government sees that people like it	4	4	8	5.2173913	2.78261	0.816667	0.3662
(13, 56.5%)	Trees prevent people from gathering and doing demonstrations or protests so there are more in places like the People's Square now	3	3	6	3.9130435	2.08696	0.6125	0.4338
	total	455	328	783	102.13043	680.87	1402.074	307