

ENVIRONMENTAL CONCERN IN GLOBAL PERSPECTIVE:
Exploring relations between core-periphery, vulnerability, environmental
problems, post-materialism and environmental concern

Degree of Master of Science (Two Years) in
Human Ecology: Culture, Power and Sustainability (30 ECTS)

CPS: International Master's Programme in Human Ecology
Human Ecology Division
Department of Human Geography
Faculty of Social Sciences
Lund University

Author: Jeroen Mutsaers
Supervisor: Maria Andrea Nardi
Term: Spring 2015

Department:	Human Geography and the Human Ecology Division
Address:	Sölvegatan 10, 223 62 Lund, Sweden
Telephone:	046-222 17 59

Supervisor:	Maria Andrea Nardi
-------------	--------------------

Title and Subtitle:	Environmental concern in global perspective: Exploring relations between core-periphery, vulnerability, environmental problems, post-materialism and environmental concern
Author:	Jeroen Mutsaers
Examination:	Master's thesis (two year)

Term:	Spring Term 2015
-------	------------------

Abstract:

Objective: Within the literature there has not been a coherent answer to the question what influences environmental concern. Previous research have found partial explanations but have not looked at the underlying relations In this study I will look at the connection between (1) core-periphery, (2) vulnerability, (3) environmental problems and (4) post-materialism on (5) environmental concern. Including the underlying relationship between them. *Method:* Data is used from the World Values Survey, WorldRiskReport and Environmental Performance Index to calculate country averages. A factor analysis is used to validate the reliability of environmental concern. The correlations are tested between the five variables. Followed by a structural equation modeling with two models, one with and one without core-periphery. *Results:* The correlations are moderate-to-high for four variables, except for air quality. The structural equation modeling demonstrates a good model fit. However, the model without core-periphery provided a more substantive explanation. In both models there is no significant relation between post-materialism and environmental concern. We see in both models that water quality is negatively associated with environmental concern and positively associated with post-materialism. In model two, vulnerability and water quality are negatively related, vulnerability and post-materialism as well. An increase in vulnerability leads to a positive effect on environmental concern. *Conclusion:* Inglehart's post-materialism thesis can not be confirmed. While environmental problems are a determinative for environmental concern and vulnerability, populations in less vulnerable countries are less post-materialistic but are not more concerned for the environment. We can conclude that a higher vulnerability leads to a higher environmental concern.

ACKNOWLEDGEMENT

I would like to thank Maria Andrea Nardi and Michel Dückers for their valuable comments and feedback. I also would like to thank my parents, Jan and Ria, and my brother Tomas for their help, support and unconditional love.

TABLE OF CONTENT

1. INTRODUCTION	4
1.1. THEORETICAL BACKGROUND	4
1.2. PURPOSE OF THE STUDY	6
1.3. RESEARCH QUESTIONS	7
1.4. OVERVIEW	8
2. THEORY & HYPOTHESES	8
2.1. ENVIRONMENTAL CONCERN	8
2.2. POST-MATERIALISM THEORY	9
2.2.1. Objective Problem-Subjective Values Hypothesis	10
2.2.2. Critique	11
2.3. WORLD SYSTEM THEORY	12
2.3.1. Core and Peripheral States	12
2.3.2. Semi-periphery	13
2.3.3. Core versus Periphery and Semi-periphery	13
2.4. VULNERABILITY	14
2.5. UNDERLYING RELATIONSHIPS	15
2.5.1. Core-Periphery and Environmental Problems	15
2.5.2. Core-Periphery, Vulnerability and Post-Materialism	16
3. METHODOLOGY	17
3.1. INTRODUCTION	17
3.1.1. World Values Survey	18
3.1.2. WorldRiskReport	18
3.1.3. Environmental Performance Index	19
3.1.3. Unit of Analysis	19
3.2. OPERATIONALISATION	20
3.2.1. Environmental Concern	20
3.2.2. Environmental Problems	22
3.2.2. Post-Materialism	23
3.2.3. Core – Periphery	24
3.2.4. Vulnerability	25
3.3. ANALYSES	26
4. RESULTS	26
4.1. CORRELATIONS	26
4.2. STRUCTURAL EQUATION MODELING	28
5. DISCUSSION	31
5.1. INTERPERTATION OF RESULTS	31
5.1.1. Objective Problems-Subjective Value Thesis	31
5.1.2. World-Systems Theory	32
5.1.3. Vulnerability	33
5.2. LIMITATIONS	34
5.2.1. Dataset Limitations	34
5.2.3. Methodological Limitations	35
6. DISCUSSION	35
I. REFERENCE	38

1. INTRODUCTION

Environmental issues related to climate change are a prominent factor in global initiatives and continue to grow, as environmental changes and problems (e.g., air and water pollution) are recognised as some of the most important problems facing the world (World Bank 2010; UNDP, 2010). Research (Marquart-Pyatt 2012; Xiao & Dunlap 2007) argue that locally and global environmental problems (i.e., water and air pollution) and prioritising environmental issues compared with economic ones (e.g., willingness to pay for environmental problems) are parts of the multi-faceted complex of environmental concern. Several explanations are given for the differences in environmental concern, through an individual's socio-economic context (e.g., age, gender, education) and through contextual factors (e.g., environmental conditions, national wealth). For example Kimmelmeier, Krol & Kim (2002), Marquart-Pyatt (2008) and Xiao & Dunlap (2007) have looked into the individual characteristics in relation with environmental concern. While other research (see e.g., Franzen & Meyer 2010; Gelissen 2007; Haller & Hadler 2008; Marquart-Pyatt 2012) are combining the individual and contextual characteristics. They show that national wealth, political factors and environmental conditions pose mixed relations with environmental concern. Previous research may have underestimated environmental concern in the Global South because the focus has been more on the Western (affluent) nations (e.g., Kimmelmeier, Krol & Kim 2002; Marquart-Pyatt 2012), or only measured environmental concern through the use of the construct of willingness to pay (e.g., Franzen 2003; Gelissen 2007). Since previous research has not look at the underlying explanation of environmental concern, I will look at various explanations in conjunction with each other to investigate the country differences in environmental concern.

1.1. THEORETICAL BACKGROUND

In this research the contextual differences will be explained through Inglehart's post-materialism theory (1971; 1977; 1990; 1995; 1997) and Wallerstein's world system theory (1974; 1979; 1984; 2004). Inglehart (1995) suggests the objective problem-subjective values hypothesis, which offers a two-folded explanation for differences in pro-environmental attitudes. The hypothesis suggests that "[...] people are concerned about the environment because they face serious objective problems. This is, indeed, part of the answer - the public of countries with relatively severe pollution do tend to be relatively willing to make financial sacrifices in order to protect the environment" (Inglehart 1995, 57). Secondly, the environmental concerns are also shaped by subjective cultural factors. People with post-

materialistic values (i.e., emphasis self-expression and the quality of life) are more willingly to give higher priority to the environment than those with materialistic values (i.e., emphasis on economic and physical security).

Where Inglehart stresses the importance of having environmental problems and post-materialistic values in order explain the environmental concern, Wallerstein (1974; 1979; 1984; 2004) suggest in his world-system theory that highly industrialised affluent countries (i.e., core countries) strive on the resources (e.g., cheap labour and natural resources) of the periphery and semi-periphery. This uneven development has an effect on the way citizens are concerned about the environment since the environment is vital of their economic mode of production and therefore their livelihood. As affluent states (i.e., the core) will uses (natural) resources from the periphery and semi-periphery. In this research I will look into the differences between the core countries, the periphery and semi-periphery countries in relation with environmental concern.

In order to review the contextual characteristics in this research, a particular emphasis is placed on the contextual characteristic of vulnerability. Vulnerability is described according to the MOVE framework (Birkmann et al 2013a). Here vulnerability is constructed by susceptibility, coping abilities and adaptive abilities. It views vulnerability at a social, economic, physical, cultural, environmental and institutional dimension (Birkmann et al 2013a). It is a combination of the definition of vulnerability in the disaster risk reduction and the climate change community. The United Nations International Strategy for Disaster Reduction (UNISDR) (2009, 30) defines vulnerability as “[t]he characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard”. Comparable is the definition that the Intergovernmental Panel on Climate Change (IPCC) (2012, 564) gives in the Special Report Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (SREX) the following definition of vulnerability: “The propensity or predisposition to be adversely affected.” In this research vulnerability will defined as a construct based on both the disaster risk reduction and climate change discipline. Vulnerability is a methodological defined construct of 23 indicators based on susceptibility, coping abilities and adaptive abilities. The WorldRiskReport (2013) creates a universally applicable method to research worldwide differences by combining social, physical, economic and environmental factors together. It created a well-structured basis on

abstract concepts (e.g., susceptibility, coping capacities and adaptive capacities) and made it feasible to measure it in absolute terms. In total it uses 23 different indicators in order to construct vulnerability. The indicators are public infrastructure, nutrition, poverty and dependencies, economic capacity and, income distribution, government and authorities, medical services, material coverage, education and research, gender equity, environmental status and investment.

The methodology of the research consist of several parts. Firstly I examine whether the World Values Survey (2007) data allows computation of reliable construct of environmental concern by a factor analysis¹. After having calculated country averages for the variables, the data is matched with country vulnerability scores from the WorldRiskReport (2013) and data on water and air quality from the Environmental Performance Index (2010a). I have calculated correlations between the variables in IBM SPSS version 22. Also, I will conduct a Structural equation modeling² (SEM) analysis in IBM SPSS AMOS version 22. Different solutions were explored in two rounds, in the first round all relations were present in the test model, in the second round non-significant relations were removed. Plausible suggestions were considered to enhance fit, based on the modification indices in the structural equation modeling.

1.2. PURPOSE OF THE STUDY

This research responds to these challenges by implementing a worldwide study of environmental problems, post-materialism, core-periphery and vulnerability on environmental concern in various countries throughout the world including the underlying relations. The importance of studying environmental concern in countries can be derived from the fact that in order to accurately influence the concern the population a reliable measurement construct is needed. Therefore, in order to influence the environmental concerns of countries it is essential to understand the level of environmental concern, and to study how environmental problems, post-materialism core-periphery and vulnerability plays a role in the progress of affecting environmental concern. I will present an exploratory research on what are the differences between countries on environmental concern and what

¹A factor analysis is were “[...] one of a number of similar but distinct multivariate statistical models that model observed variables as linear functions of a set of latent [...] variables that are not directly observed, known as factors” (Mulaik 2004, 369).

² Structural equation modelling can be defined “[...] as a class of methodologies that seeks to represent hypotheses about the means, variances, and covariances of observed data in terms of a smaller number of “structural” parameters defined by a hypothesized underlying conceptual or theoretical model (Kaplan 2004,1089).

influences (e.g., vulnerability, being a core or periphery country, having environmental problems or being post-materialism) these differences. By combining the datasets of WorldRiskReport (2013), Environmental Performance Index (2010) and the World Values Survey (2007) it will give this research a unique opportunity to further investigate how environmental concern differs between countries. The relevance of this research within the human ecology paradigm is the statistical exploration of environmental concern based on the theoretical basis of world-system theory (Wallerstein 1974; 2005) and the post-materialism theory (Inglehart 1977; 1990; 1995) will provide new insights on the difference between countries. This research looks at the power dimension created within the world-system (i.e., the difference of a core country and a periphery and semi-periphery country). Inglehart's post-materialism theory looks at the cultural dimension of the research. While the main focus is situated on the sustainability of a country (i.e., the level of environmental concern within a country). The cross-national approach to environmental concern can be a great asset. Or in the words of Rudiak-Gould (2013, 1707); “[w]hile many researchers have sought to diagnose reasons for climate change apathy, disbelief, and skepticism, rarely is the question considered in a cross-cultural light.”

1.3. RESEARCH QUESTIONS

To conclude, this study investigate the main research question: What determines the environmental concern of a country? With the following sub-research questions: (1) To what extent have environmental problems an affect on environmental concern? The following hypothesis will be tested in order to answer the sub-research question: A higher level of environmental problems will lead to a higher level of environmental concern. (2) To what extent has post-materialistic values an affect on environmental concern? To test this sub-research question I will look at the following hypothesis: a higher level of post-materialism within a country leads to a higher level of environmental concern. (3) To what extent differ the core countries from peripheral and semi-peripheral countries on environmental concern? The following hypothesis will be tested to see what the answer is to the sub-research question: peripheral and semi-peripheral countries will have a higher level of environmental concern then core countries. (4) To what extent has vulnerability an affect on the environmental concern? In order to test the sub-research question the following hypothesis will be tested: a higher level of vulnerability leads to a higher level of environmental concern.

1.4. OVERVIEW

In this paper the theoretical background for the study will be presented starting from defining what is environmental concern. Then an overview of previous research and literature about the issue including theory and case studies on environmental problems, post-materialism by using Inglehart's objective problems-subjective values thesis, Wallerstein's world-system theory and vulnerability will be presented including the related hypotheses. Chapter three describes the datasets (i.e., World Values Survey, WorldRiskReport and Environmental Performance Index) that are used to calculate the country averages. The operationalisation of all the used variables (e.g., environmental problems, post-materialism, core-periphery, vulnerability and environmental) are presented. Subsequently, the analysis techniques of study (i.e., the correlations and structural equation modeling) are presented. In chapter four gives an analysis of the survey data and the results of the correlations and the structural equation modeling. Chapter five the discussion on the interpretation of the results and the limitations of the study are presented and finally in chapter six the conclusions are presented.

2. THEORY & HYPOTHESES

2.1. ENVIRONMENTAL CONCERN

Since the 1970's research has been investigating environmental concern (Buttel 1987; Dunlap & Jones 2002; Dunlap & Van Liere 1984; Dunlap, Van Liere, Mertig & Jones 2005; Frasson & Gärling 1999; Greenbaum 1995; Van Liere & Dunlap 1980; Weigel 1977; Xiao & Dunlap 2007; Xiao & McCright 2007). After all those years the literature is still inconsistent and fragmented on the definition of environmental concern. The inconsistent and fragmented definition of environmental concern is mainly due to the fact of the various disciplinary backgrounds of the researchers. In this research environmental concern is viewed as a multifaceted construct about environmental attitudes and beliefs. Based on the research of Xiao & Dunlap (2007, 475) who view environmental concern as “[...] a dual-universe conceptual structure consisting of two general components—the ‘environmental’ and ‘concern’ domains—both of which are multifaceted.”

Before going further into the definition of environmental concern, a general concept of attitudes and beliefs is needed. This is needed because in this research environmental concern is about what the attitudes and beliefs are of the average population of a country and not what

the actual behaviour is towards the environment is. Attitudes are a construct of multiple beliefs that a person can have, or as Rokeach (1968b, 550) defines it: an “[...] enduring organization of several beliefs focused on a specific object (physical or social, concrete or abstract) or situation, predisposing one to respond in some preferential manner.” Using Rokeach (1968a; 1968b) general notion on attitudes and beliefs, environmental concern can be constructed from several beliefs or concepts.

Frasson & Gärling (1999) suggest that environmental concern may be a two part concept. Where environmental concern refers to a specific attitude with determining intentions, and a more general attitude. Xiao & Dunlap (2007) found that environmental concern is a multifaceted construct. They suggest for an approach for constructing environmental concern as a belief system whereby they “[...] agree that the coherence of a belief system (or degree of constraint among its components) is a matter of degree as well as dynamic and likely ever-changing” (Xiao & Dunlap 2007, 490). In other words, environmental concern (i.e., belief system) is about different components who relate to each other and have an underlying construct. Dunlap and Jones (2002) found a similar result that the interconnectedness among environmental problems are becoming more apparent to people. Therefore I will construct environmental concern consisting of three underlying constructs namely; willingness to pay, local environmental problems and global environmental problems. This multifaceted theoretical definition of environmental concern is important for the further methodological operationalisation of the concept. In the methodology section the multifaceted concept will be presented by using various items. By using various items in the methodology section the multifaceted concept will be presented.

2.2. POST-MATERIALISM THEORY

A widely studied explanation of cross-national variation in environmental concern is Inglehart's thesis of post-materialism (1971; 1977; 1990; 1995; 1997). Inglehart's post-materialism theory is inspired by Maslow's (1970) theory of the hierarchy of needs Maslow (1970) stated that the peoples needs are hierarchically structured. At the bottom of the hierarchy are needs which represent materialistic concerns (i.e., physiological and safety needs). These needs are comparable to materialistic priorities (i.e., physical safety and economically safe environment) of Inglehart (1977). Once these materialistic needs are fulfilled people are motivated to fulfil higher needs like post-materialistic needs (i.e., protecting freedom of speech and giving more democratic say).

2.2.1. Objective Problem-Subjective Values Hypothesis

Inglehart (1995) suggested the objective problem-subjective values hypothesis (Brechin 1999), which offers a two-folded explanation for differences in pro-environmental attitudes (i.e., environmental concern). The hypothesis suggests that “[...] people are concerned about the environment because they face serious objective problems. This is, indeed, part of the answer-the public of countries with relatively severe pollution do tend to be relatively willing to make financial sacrifices in order to protect the environment” (Inglehart 1995, 57). In other words, countries that are more affected by environmental problems (e.g., air pollution and water pollution) are more willing to put resources into protecting the environment. Secondly, the environmental concerns are also shaped by subjective cultural factors. People with post-materialistic values (i.e., emphasis self-expression and the quality of life) are more willingly to give higher priority to the environment, than those with materialistic values (i.e., emphasis on economic and physical security) (Inglehart 1990; 1995). Various researchers have been using Inglehart's objective problem-subjective values thesis to look at environmental concern (see e.g., Gelissen 2007; Kemmelmeier, Krol, & Kim 2002). The post-materialism thesis on environmental concern is based on the tension between the self-interest of exploiting the environment versus the self-interest of conserving natural resources. The consequences of this tension between self-interest and environmental concern differs in terms of wealth. Less affluent countries will be less willing to pay the higher costs for environmental protection, simply because they have fewer financial resources to allocate. The citizens in less affluent societies will have different concerns, in the case of the lesser affluent societies, their primary concern will be providing for themselves and their families. They will not be able to relocate their resources they use for consumption (i.e., their basic physiological needs and safety) to a superior good (i.e., environmental protection) (Inglehart 1995). Following this line of thought wealthier societies are able to allocate more resources for environmental protection than the less wealthier societies (Gelissen 2007). Kemmelmeier, Krol, & Kim (2002, 277) found evidence for Inglehart's theory. Where “[...] a strong relationship was found between economic conditions and average support for the environment.” Gelissen (2007) found that a higher level of affluence in a country positively relate to more public willingness to take on higher costs for environmental quality. The increase of wealth, furthermore, lead to stronger demand for environmental quality. Countries with a higher economic wealth are more willing to make (financial) sacrifices in order to protect the environment (Franzen 2003). Franzen (2003) and Gelissen (2007) only look at the willingness to make a financial sacrifice as an

indicator for environmental concern, since willingness to pay is part of the multi-faceted construct we can expect this research will result in the same findings.

2.2.2. Critique

Brechin (1999) pointed out that the problem with the objective problem-subjective value thesis is that it is difficult to falsify. Countries with a high level of environmental concern are among the more affluent countries, this effect is attributed to their post-materialistic values. Whereas high level of environmental concern is found under country with a low affluent countries it is attributed to high level of pollution (i.e., environmental problems) (Dunlap & York 2008). As well, that the construct of environmental concern has a global aspect to it, the objective problems are not limited to the local level but are multidimensional which involves resource exploitation and land degradation (Dunlap & Marshall 2007). Furthermore, Inglehart (1995) argues that environmental problems are materialistic in poor countries, while implying that environmental problems in more affluent countries are more post-materialistic (e.g., being an issue like nature preservation) (Dunlap & York 2008). Environmental concern has both materialistic and non-materialistic dimensions in less affluent and more affluent countries. As Guha & Martinez-Alier (1997) point out that residents of less affluent countries are demonstrating environmental concern due to health effect or protecting of natural resources (i.e., materialist dimensions) and also due to cultural, traditional and religious reasons (i.e., non-materialistic dimensions). This effect can be seen in the more affluent countries as well. For example in the United States where the rise of the environmental justice movement is triggered by water- and air pollution and by the preservation of nature (Martinez-Alier 2002).

To conclude, the objective problems-subjective value hypothesis is a debated issue within the literature. As both affluent and less affluent countries contain materialistic and post-materialistic dimensions it will be even more important to see what the influence is on the environmental concern of the countries. It will therefore be of interest to test if environmental problems (i.e., air and water pollution) influence the attitudes and beliefs people have in regard to the environment (i.e., environmental concern). This will lead to the following hypothesis: A higher level of environmental problems leads to a higher level of environmental concern. Furthermore, in this research I will look at the subjective value part of Inglehart (1990; 1995; 1997) thesis. Inglehart (1990; 1997) demonstrated that a society's economic

wealth is directly related to the inhabitants' endorsement of post-materialist values. He argues that environmental concern is part of a larger set of post-materialistic values. Therefore, in this research I will verify Inglehart's theory by focusing on post-materialism. This leads to the following hypotheses: a higher level of post-materialism within a country leads to a greater environmental concern.

2.3. WORLD SYSTEM THEORY

The world-system theory of Wallerstein (1974; 1979; 1984; 2004) suggest that all countries are part of a larger social system. The concept of the world-system is that there are multiple interacting states functioning as a single purposive economic and political system. In other words a world-system is defined by the economic mode of production, and the political and social structures that assist the progress of economic production and growth. Within the global division of labour there are three typologies of state roles (core, semi-periphery and periphery) operational in order to maintain the world-system. Analysing the different economies it is possible to see a cluster of differences based on the nature of the state or the production process (i.e., the location of raw materials or agricultural production, the location of processing, final production, or export). The production processes that are more capital intensive are core processes, while the production process that require more labour intensive and less skilled processes are peripheral processes.

2.3.1. Core and Peripheral States

The geographical location of the production processes (i.e., the core processes and the peripheral processes) are conceptually linked as core and periphery countries. Core processes are related to wealthier states in the world-system. Within the core countries technology advanced goods are manufactured and traded with high profits. The peripheral processes are based on agricultural production, raw materials or partially produced goods to support the core processes. The peripheral countries have, comparatively, low wages due to the low return on trade of agricultural goods and raw material for manufactured goods. In other words, the peripheral countries trade the agricultural goods and raw material at a low cost to the core states. In return the core states deliver high profit manufactured goods to the peripheral countries. This leaves certain countries in a course of unequal exchange and persistent poverty and therefore are considered peripheral. The exploitation of the periphery leads to the process of capital accumulation of the core countries (Chase-Dunn & Hall 1992;

Straussfogel 1997; Wallerstein 1984). The difference between the core and periphery it is noticeable how the affluence of a country is related to the classification within the world-system. The economic mode of production among other factors (e.g., political and social structures) determine the level of affluence there is within a country.

2.3.2. Semi-Periphery

There are some states that have a mixture of both core and periphery processes. The semi-peripheral state can be located between the core and periphery in an economical, geographical or mediational role. This leaves the semi-peripheral states in a very difficult role. The semi-peripheral states are in competition with periphery states, the core and themselves (Wallerstein 2004). When we speak of production of the semi-periphery, there is no semi-peripheral product, to the contrary with peripheral products (e.g., natural resources) or core products (e.g., high profit manufactured goods). Or as Wallerstein (2004, 97) formulates “[...] if one calculates what proportion of a country's production is core-like and what peripheral, one finds that some countries have a fairly even distribution, that is, they trade core-like products to peripheral zones and peripheral products to core zones.”

2.3.3. Core versus Periphery and Semi-Periphery

Inglehart's theory (1990; 1995; 1997) suggest that less affluent countries (i.e., peripheral countries) will be less willing to pay the higher costs for environmental protection, simply because the lesser affluent countries have fewer financial resources to allocate. The citizens in less affluent societies will have different concerns, in the case of the lesser affluent societies, their primary concern will be providing for themselves and their families. They will not be able to relocate their resources they use for consumption (i.e., their basic physiological needs and safety) to a superior good (i.e., environmental protection) and where affluent countries (i.e., core countries) have resources to allocate towards environmental protection, and are therefore more concerned for the environment (Inglehart 1995; Gelissen, 2007). Contradictory to Inglehart's theory (1990; 1995; 1997) Wallerstein (2004) points out that core countries (i.e., affluent countries) are externalising costs for production in the periphery states, where the immediate negative consequence of production is not for the core state. In the production progress there will be a residual damage to the environment (disposal of material or chemical waste, or long-term transformation of the ecology). Another form of externalising costs, during the production process, is ignoring the exhaustion of materials as

primary materials (i.e., organic or non-organic) are exhaustible. Since peripheral and semi-peripheral countries rely more on raw materials (non-organic primary material) and agricultural production (organic primary material) they both suffer from negative consequences (e.g., exhaustion of materials) (Wallerstein 2004). That is to say the periphery and semi-periphery states are more depended on natural resources since their economic mode of production rely on the natural resources. Since the economic mode of production rely on the natural resources it is vital for the periphery and semi-periphery states that the environment is not polluted. Because the economic mode of production depend on the environment the environmental concern will be higher in periphery and semi-periphery countries. This leads to the following hypothesis: peripheral and semi-peripheral countries will have a higher environmental concern then core countries.

2.4. VULNERABILITY

Vulnerability has been defined within the disaster risk reduction community and in the climate change research community. UNISDR (2009, 30) defines vulnerability as “[t]he characteristics and circumstances of a community, system or asset that make it susceptible to the damaging effects of a hazard”. The definition that the IPCC (2012, 564) gives in the SREX report on vulnerability, “[t]he propensity or predisposition to be adversely affected.” is comparable to the definition of the UNISDR (2009). Sensitivity is repeatedly used to operationalise vulnerability (Tol & Yohe 2007), while in the disaster risk reduction community, susceptibility is more common. In this research a combination of definitions from both research streams is used. In this research the definition of vulnerability by the IPCC SREX (2012) is used, while susceptibility is used to further operationalise vulnerability (i.e., susceptibility is part of vulnerability). Birkmann et al (2013b, 7) describes susceptibility as the “[...] conditions of exposed people or societies that make them more likely to experience harm and to be adversely affected by a natural hazard or climate change.” Susceptibility refers to the “[...] structural characteristics and framework conditions of a society. (Dückers, Frerks & Birkmann 2015, 88) Communities or systems who are vulnerable have the capabilities to cope or adapt to disasters or hazards, it is important to see coping and adaptive capacities as a part of vulnerability. Coping capacities are defined as “[...] limitations in terms of access to and mobilization of the resources of a community or a social-ecological system in responding to an identified hazard” (Birkmann et al 2013a, 200). Coping capacities are more focussed on the individual and societal abilities to minimise negative impacts. Where adaptive capacities are defined as “[...] techniques, assets and strategies applied or available for use in changing the institutional (cultural

and legislative rules that determine rights and responsibilities) and structural (balance and distribution of assets and information) frameworks that constrain human action to intervene in vulnerability [...]” (Birkmann et al 2013a, 201). Adaptive capacities focus more on the long term processes. Vulnerability is therefore a multidimensional construct. It consists of a social dimension (e.g., propensity for human well-being), an economic dimension (e.g., loss of economic value), a physical dimension (e.g., damage to physical assets), a cultural dimension (e.g., damage to intangible values), an environmental dimension (e.g., ecological and biophysical systems) and institutional vulnerability (e.g., governance systems) (Birkmann et al 2013a).

Vulnerability, being a multidimensional construct, is a broad societal framework. In other words, vulnerability is a contextual construct of a combination of societal conditions and factors. These factors and conditions are in constant state of flux making vulnerability a flexible phenomenon to measure (O'Brien et al 2004) (see the methodology section for a further explanation of indicators). Vulnerability is therefore an ideal construct to measure in what ways countries vary from one and other on a societal level. Susceptibility, coping and adaptive capacities show how a country is constructed in the social-ecological sphere. Vulnerability is a way to “[...]elaborate the nature of social-ecological systems while using theories with explanatory power for particular dimensions of human–environment interactions” (Adger 2006, 269). The human-environmental interactions of vulnerability can be seen as “[e]xternal constraints and influences may also influence the preference construction process” (Stern & Dietz 1994, 69) of environmental concern. In other words the human-environment construct (i.e., vulnerability) has an affect on how concerned people are of the environment. The multidimensional characteristics of a country will be able to determine the environmental concern of the citizens. This will lead to following hypothesis: A higher level of vulnerability leads to a higher level of environmental concern.

2.5. UNDERLYING RELATIONSHIPS

2.5.1. Core-Periphery and Environmental Problems

The world-system perspective sees economic growth as the key driving force behind environmental problems. The core countries rely for there economic mode of production on the extraction of natural resources from the periphery and semi-periphery countries. The environmental problems caused by the exploitation of the natural resource will be more noticeable in the periphery and semi-periphery countries (Wallerstein 1974; 2004). The total

impact of the environmental problems will be generated within and beyond the national borders. The environmental problems will increase with the economic growth a country goes through, but the impact of the environmental problems will not (entirely) take place within the borders of the countries that generate the environmental problems (York, Rosa & Dietz 2009). The idea that the impact of environmental problems are geographically determined outside the countries that are causing them is called the Netherlands fallacy (Ehrlich and Holdren 1971). Since the Netherlands imports most of its resources outside the country, the impact of the environmental problems extend beyond its borders. The core countries will therefore experience less impact of the environmental problems. As we demonstrated with Inglehart's theory, the experience of environmental problems will lead to a higher level of environmental concern. Figure 1 demonstrates this relation between core-periphery and environmental problems and environmental concern. Peripheral and semi-peripheral countries will experience a higher level of environmental problems. This will consequently lead to a higher level of environmental concern.

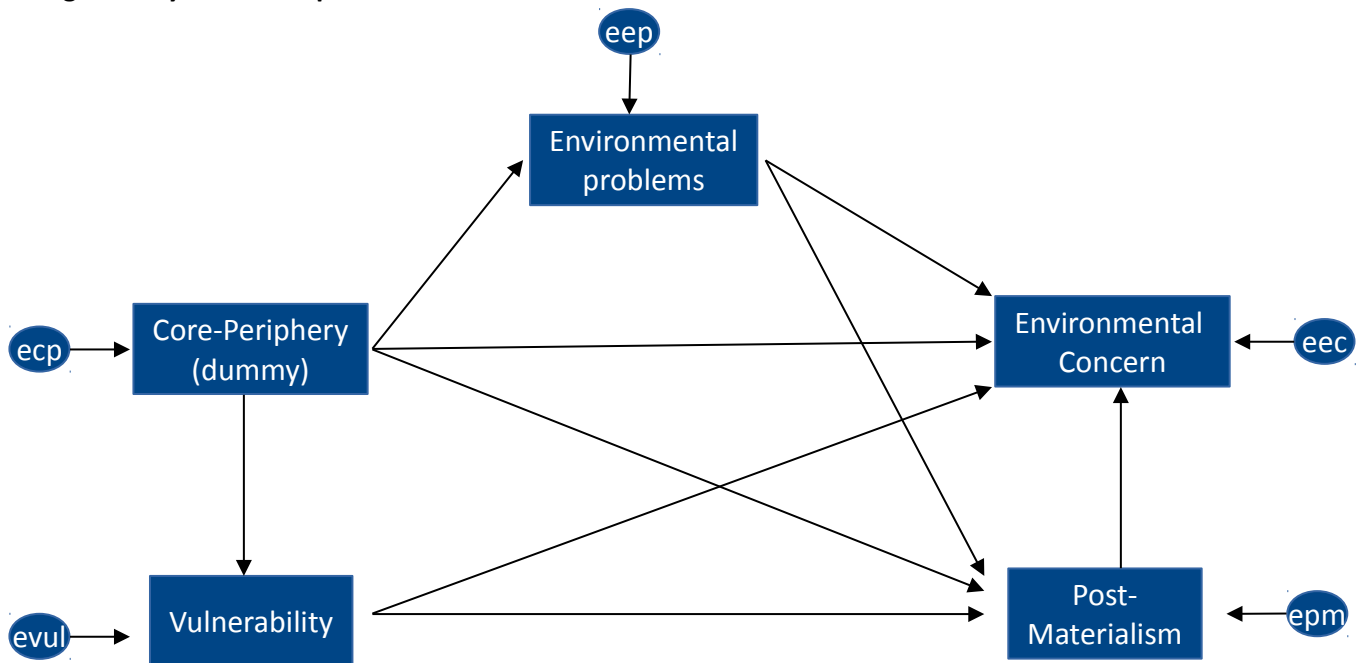
2.5.2. Core-Periphery, Vulnerability and Post-Materialism

Core countries will furthermore differ in environmental concern in comparing with periphery and semi-periphery countries through the externalisation of the environmental problems. We can expect that core countries will demonstrate a lower level of vulnerability. Wallerstein (1974; 1979; 1984; 2004) defines the world-system as an economic mode of production together with political and social structures. The demographic, ecological and infrastructural effects of extractive economies of the peripheral and semi-peripheral countries differ significantly from those of productive economies of the core countries. (Bunker 1984). "The cumulative ecological, demographic, and infrastructural effects of the sequence of modes of production and extraction in any region establish limits and potentials for the productive capacities and the living standards [...]" (Bunker 1984, 1018). That is to say the vulnerability of a countries depends on the mode of production. The living standards of the core countries will be higher since the core countries will not experience the impact on the ecological, demographic, and infrastructural effects. Subsequently, the influence of vulnerability on the attitudes and beliefs of countries can be derived from the fact that less vulnerable countries will be the countries that are more affluent. To conclude, we can expect a relationship between the core countries and the level of post-materialism through vulnerability. Since vulnerability is an indicator for affluence, socio-economic services (e.g., number of physicians, number of

hospital beds or school enrolment).

All in all, to investigate the possible effects of environmental problems, post-materialism, core-periphery and vulnerability on environmental concern, I will investigate the underlying relationships of environmental problems, post-materialism, core-periphery and vulnerability. Since the focus of the study is on environmental concern I will test the following hypotheses: (1) A higher level of environmental problems leads to a higher level of environmental concern. (2) A higher level of post-materialism within a country leads to a higher level of environmental concern. (3) Peripheral and semi-peripheral countries will have a higher level of environmental concern, then core countries. (4) A higher level of vulnerability leads to a higher level of environmental concern. The hypotheses are presented in figure 1.

Figure 1: Systematic representation of SEM model.



3. METHODOLOGY

3.1. INTRODUCTION

In order to test the hypotheses formulated in chapter two, data will be used from the World Values Survey fifth wave of 2005-2009, the WorldRiskReport (2013) and the Environmental Performance Index (2010a). The World Values Survey shows the basic values and attitudes of people from 58 countries around the world with a total of 85,000 respondents by using standardised cross-cultural measures. The World Values Survey covers varied topics ranging from politics, economics, religion to gender roles, family values, environmental concern and so

on. Both datasets are matched, where the World Value Survey dataset is used as base dataset. Since the research looks into the effects of variables on a country level (e.g., vulnerability) the data of the World Values Study will provide the basis of the statistical analysis. All the respondents from each country will be used to create a mean score of a representative sample of the population for that specific country. This way the variables used for the analysis will provide a solid basis for the further constructing and use in the analysis.

3.1.1. World Values Survey

The World Values Survey³ uses a stratified random sampling under the entire population of 18 years and older. In most countries there has not been an upper age limit imposed. Through the stratified random sampling the respondents, that are face-to-faced interviewed, are representative for the whole population of a country. In the first stage a random selection of sampling is made on the bases on the given society statistical regions, districts, census units, election sections, electoral registers, voting stations and central population registers. In some countries individuals are sampled from the national registers. The minimum sample size of a country is 1,000 respondents. The proposed sampling procedures are approved before the start of the fieldwork. In comparison to other large comparative dataset (e.g., The International Social Survey Program (ISSP)), the World Values Survey has a larger representation of countries. Especially the representation of peripheral countries. This is where the World Values Survey excels in comparison to other large datasets.

3.1.2. WorldRiskReport

The WorldRiskReport⁴ (2013) is a dataset which determines the vulnerability level of 173 countries worldwide based on 23 indicators and research data. All the data is obtained directly from official sources (e.g., World Bank, UNICEF, WHO). All the indicators range from 0 to 1 or from 0 to 100. If the indicators range larger then 100, than a normal standardisation⁵ is applied to transform the range from 0 to 1. Certain indicators have missing data. In order to cover the missing data a statistical analysis⁶ is used, where countries with similar characteristics are compared.

³ Detailed information about the origins of the Values Surveys and how they are organized can be found at the World Values Survey Web site: www.worldvaluessurvey.org.

⁴ Detailed information about the methodology of the WorldRiskReport (2013) can be found at the World Risk Report website: <http://worldriskreport.entwicklung-hilft.de/Methodology.424.0.html>

⁵ $v' = (v - \min) \cdot \frac{\max_{norm} - \min_{nom}}{\max_{norm} - \min_{nom}}$

⁶ Templ routine for Robust Imputation of Missing Values in Compositional Data (Templ et al. 2006)

3.1.3. Environmental Performance Index

The Environmental Performance Index⁷ (2010b, 6) ranks 163 countries on 25 performance indicators on ten policy categories. The indicators are used to “[...] gauge at a national government scale of how close countries are to established environmental policy goals. This proximity-to-target methodology facilitates cross-country comparisons as well as analysis of how the global community performs collectively on each particular policy issue.” The targets are drawn from various sources (e.g., treaties, standards set by international organisations, national regulators). The data used, where the indicators are based on, vary from official statistics (from governments and international organisations), modelled data, spatial data and observations from monitoring stations.

3.1.4. Unit of Analysis

The unit of analysis for this research are countries. For the analysis a nationally representative sample was used of the following 46 countries: Argentina, Australia, Brazil, Burkina Faso, Bulgaria, Canada, Chile, China, Cyprus, Egypt, Ethiopia, Finland, Georgia, Germany, Ghana, Hungary, India, Indonesia, Iran, Italy, Japan, Jordan, Malaysia, Mali, Mexico, Moldova, Morocco, Norway, Peru, Philippines, Republic of Korea, Romania, Rwanda, Serbia, Slovenia, South Africa, Sweden, Switzerland, Thailand, Trinidad and Tobago, Turkey, Ukraine, United States, Uruguay, Vietnam and Zambia. Unfortunately 12 countries could not be used to perform the analysis. Andorra and Taiwan were excluded since the WorldRiskReport (2013) did not have any data regarding vulnerability. Colombia, France, Great Britain, Guatemala, Hong Kong, Iraq, Netherlands, New Zealand, Russia and Spain lacked questions that provide measurements for the dependent variable environmental concern. Spain did not answer the questions: 'How serious do you consider poor water quality, poor air quality and poor sewage and sanitation to be in your own community?' Respondents from Guatemala, Hong Kong and New Zealand did not answer the questions: 'How serious do you consider the water quality; the air quality and the sewage and sanitation to be in your own community'? And 'How serious do you consider global warming or the greenhouse effect; loss of plant or animal species or biodiversity; pollution of rivers, lakes and oceans to be for the world as a whole?'. Colombia, Great Britain, France, Iraq, Netherlands and Russia answered none of the questions regarding environmental concern.

⁷ Detailed information about the methodology of the Environmental Performance Index (2010) can be found at the EPI website: <http://epi.yale.edu>

3.2. OPERATIONALISATION

3.2.1. *Environmental Concern*

Xiao and Dunlap (2007) and various research (see e.g., Marquart-Pyatt 2012) have used a confirmatory factor analysis to operationalise environmental concern. A confirmatory factor analysis is a technique to model the relationship between the indicators and the latent constructs. In other words, latent constructs are used because environmental concern is not directly observable (i.e., it is an abstract and multidimensional construct). During the confirmatory factor analysis the construct environmental concern was not statistically possible. This resulted into calculating environmental concern using all eight items into one construct. Firstly, the confirmatory factor analysis will be presented and demonstrated why it was not possible to construct environmental concern with the three latent constructs. Afterwards the final operationalisation of environmental concern will be shown by using an explanatory factor analysis. To operationalise the variable environmental concern a confirmatory factor analysis was tested by using IBM SPSS Amos version 22 and afterwards an exploratory factor analysis was performed using IBM SPSS version 22.

Environmental concern can be constructed by three constructs: willingness to pay, local environmental problems, and global environmental problems. The three constructs are based on research (see e.g., Xiao & Dunlap 2007; Marquart-Pyatt 2012). The first construct *willingness to pay* are two items containing questions about the willingness to sacrifice personally in some manner (e.g. taxes) for the environment. The respondents were asked the following statements: 'I would give part of my income if I were certain that the money would be used to prevent environmental pollution' and 'I would agree to an increase in taxes if the extra money were used to prevent environmental pollution'. Items are scaled, so higher scores indicate pro-environmental responses (i.e., a greater disagreement with each statement). The second construct is *local environmental problems*, where the focus lays on the seriousness of different environmental problems that the respondents experience within the community. Respondents were asked: 'How serious do you consider poor water quality to be in your own community?' 'How serious do you consider poor air quality to be in your own community?' And 'how serious do you consider poor sewage and sanitation to be in your own community?' The respondents could answer: not serious at all; not very serious; somewhat serious or very serious. Higher values on environmental threat awareness indicate pro-environmental

response. The third construct is '*global environmental problems*', which focuses on the seriousness of different environmental problems that the respondents experience on a global scale. Respondents were asked: 'How serious do you consider Global warming or the greenhouse effect?', 'How serious do you consider loss of plant or animal species or biodiversity?' and 'How serious do you consider pollution of rivers, lakes and oceans to be for the world as a whole?'. The respondents could answer: not serious at all (1); not very serious (2); somewhat serious (3) or very serious (4). Higher values on environmental threat awareness indicate pro-environmental response. According to Xiao and Dunlap (2007) the construct '*environmental efficacy*' is another construct of environmental concern. Environmental efficacy address the importance of collective effort for resolving environmental issues and how environmental issues intersect with economic progress. In the World Values Survey the respondents were asked how much they agreed with the following statements: 'The Government should reduce environmental pollution, but it should not cost me any money. The item is scaled so higher scores indicate pro-environmental responses (i.e., greater disagreement with each statement). The second statement is about the importance between environment and economic growth. Which of them comes closer to your own point of view? (1) Protecting the environment should be given priority, even if it causes slower economic growth and some loss of jobs. (2) Economic growth and creating jobs should be the top priority, even if the environment suffers to some extent'. This construct was excluded from the confirmatory factor analysis, due to the low statistical relevance (Cronbach's alpha⁸ is -0.16). A possible reason for the low statistical relevance is due to the double barreled nature of the first statement and inconsistency of scale (i.e., it's a nominal scale instead of an ordinal scale) with the second statement. The confirmatory factor analysis had a surprising result. The Cronbach's alpha of all three constructs had a high statistical outcome. The construct *willingness to pay* had a Cronbach's alpha of 0.79, *local environmental problems* a Cronbach's alpha of 0.90 and *global environmental problems* had a Cronbach's alpha of 0.81. When reliability of the three constructs were tested, in order to form environmental concern, it had a Cronbach's alpha of 0.38. Further investigation showed that the correlation of the first two constructs (*willingness to pay* and *local environmental problems*) were significantly positively correlated. But environmental problems global was not significantly correlated and was even negative. In other words the construct *global environmental problems* demonstrate no statistical relevance with the two constructs. The results showed that the confirmatory factor

⁸ "Cronbach's alpha is one type of internal reliability estimate used to assess the consistency of responses on a composite measure that contains more than one component" (Chen & Krauss 2004, 226)

analysis was not statistically possible. The three underlying constructs (*willingness to pay*, *local environmental problems* and *global environmental problems*) have been found within the analysis but the three constructs together do not statistically uncover the latent construct of environmental concern.

I will calculate the regression factor loadings of the factor analysis with eight items to operationalise environmental concern. The factor analysis with the eight items result is a reliable construct with a Cronbach's alpha of 0.75. Indicating that the construct of environmental concern with eight items is a statistically reliable construct. The used items for the factor analysis are shown in table 1. Items 1 and 2 use the answer possibilities of (1) 'strongly disagree' to (4) 'strongly agree'. While items 3 until 8 use the answer possibilities of (1) 'not serious at all' to (4) 'very serious'. For all eight items a high score indicate a higher environmental concern. The regression factor scores have a mean of '0' and the variance are the squared multiple correlation between the estimated factor scores and the true factor values. The regression scores give the highest validity in a factor analysis (DiStefano, Zhu & Mindrila 2009).

Table 1: Overview items for Environmental concern

1	I would give part of my money to be used to prevent environmental pollution	(1) 'strongly disagree', (2) 'disagree',
2	I would agree to an increase in taxes if the extra money were used to prevent environmental pollution	(3) 'agree', (4) 'strongly agree'
3	How serious do you consider poor water quality to be in your own community?	
4		
5	How serious do you consider poor sewage and sanitation to be in your own community?	(1) 'not serious at all', (2) 'not very serious',
6	How serious do you consider Global warming or the greenhouse effect to be for the world as a whole?	(3) 'somewhat serious', (4) 'very serious'
7	How serious do you consider loss of plant or animal species or biodiversity to be for the world as a whole?	
8	How serious do you consider pollution of rivers, lakes and oceans to be for the world as a whole?	

3.2.2. Environmental Problems

In order to measure environmental problems I will look at the air quality and water quality in countries by using the Environmental Performance Index (EPI) 2010a. The EPI (2010a) provide indicators, that are a gauge to see, how countries relate to each other on

environmental policy goals. This allows us to compare and analyse how countries are doing in respect to air and water quality. Air quality consist of four items with each a specific target: 1) sulphur dioxide emissions per populated land area (0.01 Gg SO₂/sq km), 2) nitrogen oxides emissions per populated land area (0.01 Gg NO_x /sq km), 3) non-methane volatile organic compound emissions per populated land area (0.01 Gg NMVOC /sq km) and 4) ecosystem ozone (0 ppb exceedance above 3000 AOT40). For the four items a logarithmic transformation⁹ is employed. If data for any of the air pollutants was missing, than the data was averaged around the known data. The variable air quality will range from '0' to '100', where '100' meaning that the air quality is at the level of it target and thus representing a proper air quality.

The EPI (2010) was also used to operationalise the variable water quality. Water quality consist of the Water Quality Index. The Water Quality Index originally is developed by the United Nations Environment Programme Global Environment Monitoring System (UN GEMS)/Water Programme. The EPI used the data of UN GEMS and European Environment Agency's Waterbase several targets to compose the Water Quality Index: dissolved oxygen: 9.5mg/l (Temp<20°C), 6mg /l (Temp>=20°C); pH: 6.5 - 9mg/l; Conductivity: 500µS; Total Nitrogen: 1mg/l; Total phosphorus: 0.05mg/l; Ammonia: 0.05mg/l to test the World Health Organization standards for safe drink water (Rickwood & Carr 2009). Missing data for the countries Burkina Faso, Ethiopia, Georgia, Moldova, Rwanda, Trinidad and Tobago, Ukraine, Zambia was created by using data from pre-1990 for which a regression model was used to impute post-1990 scores. The variable water quality generate a score of '0' (poor water quality) and '100' (excellent water quality) (Rickwoord & Carr 2009, 78).

3.2.3. *Post-Materialism*

Post-materialism is measured by 12-items, by using the following set of questions: 'What do you consider the most important for this country for the next ten years. And which would be the next most important?' Each set of questions is divided into three groups. The first group consist of the following options: (1) A high level of economic growth; (2) Making sure this country has strong defence forces; (3) Seeing that people have more say about how things are done at their jobs and in their communities¹⁰; (4) Trying to make our cities and countryside

⁹ $100 - [(winsorized\ value - target\ value) \times 100 / (maximum\ winsorized\ value - target\ value)]$

¹⁰ Each battery contain two materialist and two post-materialist items. All the marked items are post-materialist items (Inglehart & Abramson 1999).

more beautiful¹⁰. The second group consist of the following options: (1) Maintaining order in the nation; (2) Giving people more say in important government decisions¹⁰; (3) Fighting rising prices; (4) Protecting freedom of speech¹⁰. The third and final group consist of the following options: (1) A stable economy; (2) Progress toward a less impersonal and more humane society¹⁰; (3) Progress toward a society in which ideas count more then money¹⁰; (4) The fight against crime. This results into a scale from '0' to '5', where '0' is a materialistic score and '5' a post-materialistic score.

3.2.4. Core–Periphery

In this research core–periphery and semi-periphery countries are classified based on global trade Chase-Dunn, Kawano & Brewer (2000) and on the distribution of wealth (i.e., GDP valued by PPP, total exports of goods and services, and population) IMF (2014), UNDP (2014) and the UN DESA (2013). Chase-Dunn, Kawano & Brewer (2000, 78) use structural globalisation (i.e., “changes in the density of inter-national and global interactions relative to local or national networks” in order to categorise countries in the world-system. The data from the IMF (International Monetary Fund) (2014), UNDP (United Nations Development Programme) (2014) and the UN DESA (United Nations Department of Economic and Social Affairs) (2013) is used to categorise the countries on the level of development (i.e., developed, developing and least developed). The operationalisation of structural globalisation is the trajectory of international trade as a proportion of global production. This shows the way how core, periphery and semi-periphery states interact in the world-system. All the 46 countries that are used for the analysis are presented per category. Core countries are: Australia, Canada, Finland, Germany, Italy, Norway, Sweden, Switzerland, Republic of Korea¹¹ and United States. Semi-periphery countries are Argentina, Brazil, China, India, Indonesia, Mexico, South Africa, Bulgaria¹¹, Chile¹¹, Cyprus¹¹, Egypt¹¹, Georgia¹¹, Ghana¹¹, Iran¹¹, Jordan¹¹, Hungary¹¹, Malaysia¹¹, Moldova¹¹, Morocco¹¹, Peru¹¹, Poland¹¹, Romania¹¹, Serbia¹¹, Slovenia¹¹, Thailand¹¹, Turkey¹¹, Ukraine¹¹, Uruguay¹¹ and Vietnam¹¹. Periphery countries are Burkina Faso, Ethiopia, Mali, Rwanda, Trinidad and Tobago and Zambia. Once the countries are classified into core, periphery or semi-periphery a dummy variable¹² is constructed. Since

¹¹ Are countries that are classified different by Chase-Dunn, Kawano & Brewer (2000) and the IMF (2014), UNDP(2014) and UNDESA (2013). The data of the IMF (2014), UNDP(2014) and UNDESA (2013) is used as reference point, due to the fact that it is the most up-to-date data available.

¹² A dummy variable is a categorical explanatory variable as independent variable. In this analysis I use a single dummy variable. The dummy variable with a binary coding “indicates the presence of an attribute or membership in a particular category. For classifications with more than two categories, we can fully represent the categorical information and produce coefficients that provide interpretable information”. (Hardy 2004, 289)

periphery and semi-periphery countries both experience the environmental degradation from the core countries, (Wallerstein 2004) I will combine the periphery and semi-periphery countries as one category. Therefore the dummy variable consist of core countries with '1' value and periphery and semi-periphery countries with a '0' value. The periphery and semi-periphery countries are the reference group.

3.2.5. Vulnerability

The WorldRiskReport (2013) looks at *susceptibility* as the likelihood of being harmed if a natural hazard occurs. *Susceptibility* is constructed in seven indicators (1) Population with access to sanitation, (2) Population using an improved water source, (3) Malnutrition, (4) The total dependency ratio, (5) Extreme poverty, which is the percentage of population living on less than 1,25 USD/day, (6) GDP per capita Purchasing Power Parties (PPP) and (7) The GINI Index. *Coping capacity* refers to the ability of societies to minimise the negative impacts of natural hazards through direct actions and resources. *Coping capacity* consist of the following five indicators: (1) Corruption, (2) Governance, (3) Number of physicians per 10,000 inhabitants, (4) Number of hospital beds per 10,000 inhabitants and (5) Insurance coverage. Whereas *adaptive capacity* is a more long-term process that involves structural changes and strategies to better deal with the negative impacts of natural hazards (e.g. improved literacy and gender equity). *Adaptive capacity* is divided into four groups within each group there are different indicators. (1) Education: (A) Adult literacy rate (B) Combined gross school enrolment ratio, (2) Gender equity (C) Gender parity in primary, secondary and tertiary education (D) Proportion of seats held by women in national parliament (3) Environment: (E) Water resources, (F) Biodiversity & habitat (biome protection, marine protection, critical habitat protection), (G) Forestry (growing stock change, forest cover change), (H) Agriculture (agricultural water intensity, agricultural subsidies, pesticide regulation). (4) Financing: (I) Public expenditure on health, (J) Life expectancy at birth, (K) Private expenditure on health. Each indicator from the different concepts (i.e., *susceptibility*, *coping capacity* and *adaptive capacity*) are normalised and weighted equally in order to aggregate the indicators.

A factor analysis was performed to establish the validity of the aggregated formula. A perfect aggregation would result in a Kaiser-Meyer-Olkin¹³ (KMO) Measure Accuracy of 1. The result

¹³ "An indicator of the strength of relationships among variables in a correlation matrix. It is determined by calculating the correlations between each pair of variables after controlling for the effects of all other variables. The KMO statistic can range from 0 to 1.0; 0.70 is often considered a minimum for conducting a factor analysis [...]"(Vogt 2005a, 167)

of the factor analysis resulted in a KMO of 0.73. In other words the aggregated formula is reasonable. The factor loading for susceptibility is -0.85, for coping 0.87 and for adaptation 0.93. The score of the Kaiser-Meyer-Olkin indicate that each variable has a strong correlation with the overall index and between each variable.

3.3. ANALYSIS

In the analysis I will calculate the correlations between the variables: air quality, water quality, post-materialism, core-periphery, vulnerability and environmental concern in IBM SPSS version 22. The correlations between all the variables are tested where afterward the insignificant correlations are excluded. Subsequently, a structural equation modeling analysis is conducted in IBM SPSS AMOS version 22. A structural equation modeling is an extension on the general linear model. This means that it is possible to test a set of regression equations simultaneously instead of just a single regression equation. Structural equation modeling permits the examination of more complex relationships. Within the structural equation modeling analysis different solutions were explored in two rounds. In the first round all relations were present in the test model, in the second round non-significant relations were removed. Plausible suggestions were considered to enhance fit, based on modification indices. In total two models with each a sub-model will be presented where each model having model version of an enhanced model fit.

4. RESULTS

4.1. CORRELATIONS

Before we will look at the structural equation modeling analysis, the correlations between all the variables are presented in table 2. Correlations “[...] describe a relationship between two variables as a descriptive statistic” (Chen & Popovich 2002, 2). We can see that water quality, post-materialism, core-periphery and vulnerability have a significant correlation with environmental concern. The correlation of post-materialism on environmental concern is negative (-0.50). It indicates that a higher level of post-materialism (i.e., being more post-materialistic) will lead to a lower level of environmental concern. This is contrary to the formulated hypothesis. In the structural equation modelling we will further investigate this relation. Furthermore we can see that water quality and core-periphery are according to the formulated hypotheses. Water quality shows a significant negative correlation on environmental concern (-0.52) which indicates that the higher the water quality the lower the environmental concern. Core-periphery demonstrate a significant negative correlation (-0.56)

which indicate that core countries have a lower level of environmental concern. Air quality does not have any significant correlation with the other variables. For this reason air quality will be excluded from further analysis of the structural equation modeling.

Table 2: Distributional information and correlations

Distributional information						correlations					
	N	Min - Max	Mean	S. D.	IQR	EC	AQ	WQ	PM	CP	VUL
EC	46	-0.99 - 0.80	-0.03	0.07	0.73	-					
AQ	46	24.26 - 69.43	45.4	10.47	13.38	0.25	-				
WQ	46	24.45 - 97.54	71.57	15.57	22.01	-0.52**	-0.07	-			
PM	46	1.38 - 2.84	2,00	0.06	0.6	-0.50**	-0.08	0.51**	-		
CP	46	0.00 - 1.00	0.24	0.43	0.25	-0.56**	-0.27	0.39**	0.64**	-	
VUL	46	27.30 - 68.90	43.78	1.71	14.54	0.50**	0.18	-0.39**	-0.53**	-0.67**	-

Table 3: intercepts. regression weights. correlations and model fit scores of SEM

	Model 1-A	Model 1-B	Model 2-A	Model 2-B
Intercepts	Estimate	Estimate	Estimate	Estimate
Core-Periphery (CP)	0.24 ***	0.24 ***	-	-
Water quality (WQ)	68.22 ***	68.22 ***	71.57 ***	71.57 ***
Vulnerability (VUL)	48.06 ***	48.06 ***	43.78 ***	43.78 ***
Environmental concern (EC)	0.63	0.83 **	0.61	0.14
Post-materialism (PM)	1.55 ***	1.34 ***	1.93 ***	1.93 ***
Regression weights	Estimate (Beta)	Estimate (Beta)	Estimate (Beta)	Estimate (Beta)
CP → WQ	14.05 (0.39) **	14.05 (0.39) **	-	-
CP → VUL	-17.88 (-0.67) ***	-17.88 (-0.67) ***	-	-
CP → EC	-0.31 (-0.29)	-0.46 (-0.43) ***	-	-
CP → PM	0.40 (0.46) **	0.46 (0.52) ***	-	-
WQ → EC	-0.01 (-0.30) *	-0.01 (-0.35) **	-0.01 (-0.32) *	-0.01 (-0.37) **
WQ → PM	0.01 (0.30) **	0.01 (0.31) **	0.01 (0.39) **	0.01 (-0.36) **
VUL → EC	0.01 (0.15)	-	0.01 (0.30) *	0.02 (-0.36) **
VUL → PM	-0.00 (-0.11)	-	-0.01 (-0.41) ***	-0.01 (-0.39) **
PM → EC	-0.11 (-0.09)	-	-0.25 (-0.20)	-
Correlations	COV (COR)	COV (COR)	COV (COR)	COV (COR)
WQ ↔ VUL	-	-	-	-68.80 (-0.39) *
Model-fit				
Chi-square (df)	1.66 (1)	3.70 (4)	7.42 (1)	1.84 (1)
P (badness of fit)	0.20	0.45	0.01	0.18
NFI	0.98	0.96	0.86	0.97
NNFI/TLI	0.92	1.00	0.18	0.89
CFI	0.99	1.00	0.86	0.98

* p < 0.05 ** p < 0.01 *** p < 0.001

4.2. STRUCTURAL EQUATION MODELING

In table 2 the results of the structural equation modeling analysis are presented. Model 1-A shows all the various relations between core-periphery, water quality, post-materialism, vulnerability and environmental concern. In figure 1 is a systematic presentation of model 1-A presented. In the regression weights we can see the effects of the estimates and beta's. The estimates are the unstandardised regression coefficients¹⁴. And the beta are the standardised regression coefficients (b)¹⁵. There are sharp discrepancies between the unstandardised and standardised regression coefficients with the effects of core-periphery on water quality and vulnerability. This could be explained because core-periphery is not derived from survey measurement items (i.e., variables in the same model have a different measurement scales). The regression coefficients (i.e., estimates) of core-periphery on water quality, vulnerability and post-materialism are significant, except on environmental concern. This indicates that core countries have a higher water quality (b=14.05) compared to the peripheral and semi-peripheral countries. Core countries are less vulnerable (b=17.88) compared to the peripheral and semi-peripheral countries. Finally the core countries have a higher level of post-materialism (b=0.40) compared to the peripheral and semi-peripheral countries. Water quality demonstrate a significant negative effect (b=-0.01) on environmental concern, indicating that a higher water quality leads to a lower environmental concern. While a higher water quality leads to a significant higher level of post-materialism (b=0.01). The rest of the effect (vulnerability on environmental concern and post-materialism, and post-materialism on environmental concern) show no significant relations. In Model 1-B the not significant connections will be excluded.

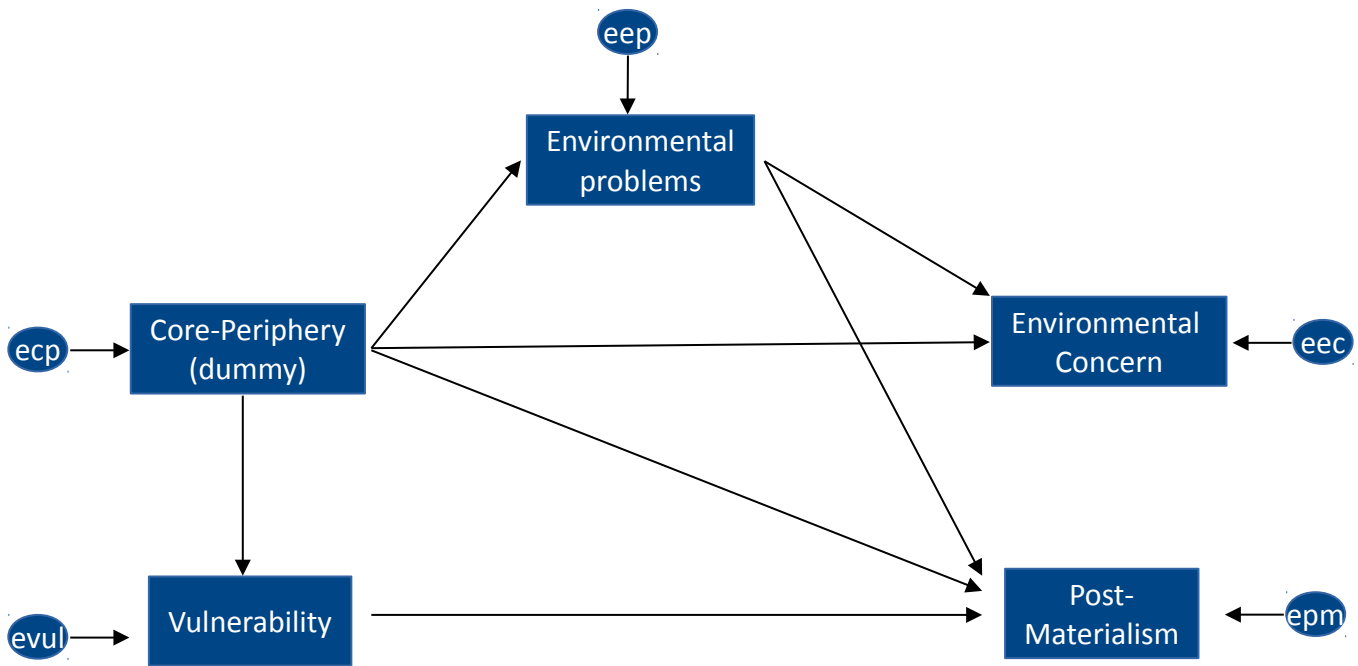
The systematic representation of model 1-B is presented in figure 2. It is important to notice that the relation of core-periphery on environmental concern is still included in the analysis of Model 1-B. Since the modification indices of the SEM analysis of model 1-B required that the connection is needed to create a good model fit. The model fit has increased in comparison to model 1-A (i.e., the P, NNFI/TLI and CFI all increased). The regression weights demonstrate the same effects as Model 1-A. Core countries have a higher water quality (b=14.05), are less

¹⁴ Unstandardised regression coefficients “[...] describes the relationship between a dependent and an independent variable in terms of the original units of measurement of those variables. A one-unit change in the independent variable is expected to produce b units of change in the dependent variable.” (Menard 2004, 1070)

¹⁵ Standardised regression coefficients “[...] expresses the same relationship in standard deviation units: A one-standard-deviation increase [...]. Using standardized coefficients converts all of the coefficients to a common unit of measurement (standard deviations), and the standardized coefficient is the same regardless of the units in which the variable was originally measured.” (Menard 2004, 1070)

vulnerable ($b=-17.88$), are more post-materialistic ($b=0.46$) and are less environmental concerned ($b=-0.46$). In the end Model 1 is technically a model with a good fit. However, after having removed the non-significant relations it provides limited explanation for the level of environmental concern within a country. The core-periphery is strongly related (the core countries are significantly less vulnerable and have higher water quality). The dummy variable is less sensitive than the vulnerability score because it only distinguishes between 0 and 1. Vulnerability is measured on a scale from 1 to 100. For this reason model 2 is tested without core-periphery. The model is largely the same. However, core-periphery is left out.

Figure 2: Systematic representation of SEM model 1-B.



In model 2-A all the effects of water quality, vulnerability, post-materialism and environmental concern are significant except for the relation of post-materialism on environmental concern. See figure 3 for the systematic representation of model 2-A. This indicates that the level of post-materialism does not have an effect on environmental concern. The effects of water quality on environmental concern indicate that a higher water quality leads to a lower environmental concern. A higher water quality leads to a higher level of post-materialism ($b=0.01$). Countries with a higher vulnerability score will have a higher level of environment concern ($b=0.01$) while a higher vulnerability leads to a lower level of post-materialism ($b=-0.01$). In order to create a better model the relations that are not significant will be excluded from model 2-A. The systematic representation of model 2-B is presented in figure 4. The modification indices of the SEM analysis of model 2-B required that there is a correlation

between water quality and vulnerability needed to create a good model fit. The model fit has increased in comparison to model 2-A (i.e., the P, NFI, NNFI/TLI and CFI all increased) indicating that model 2-B is statistically better model. This is furthermore shown in the significant score on all the relations in the model, since the p-level's of all effects increased.

Figure 4: Systematic representation of SEM model 2-A.

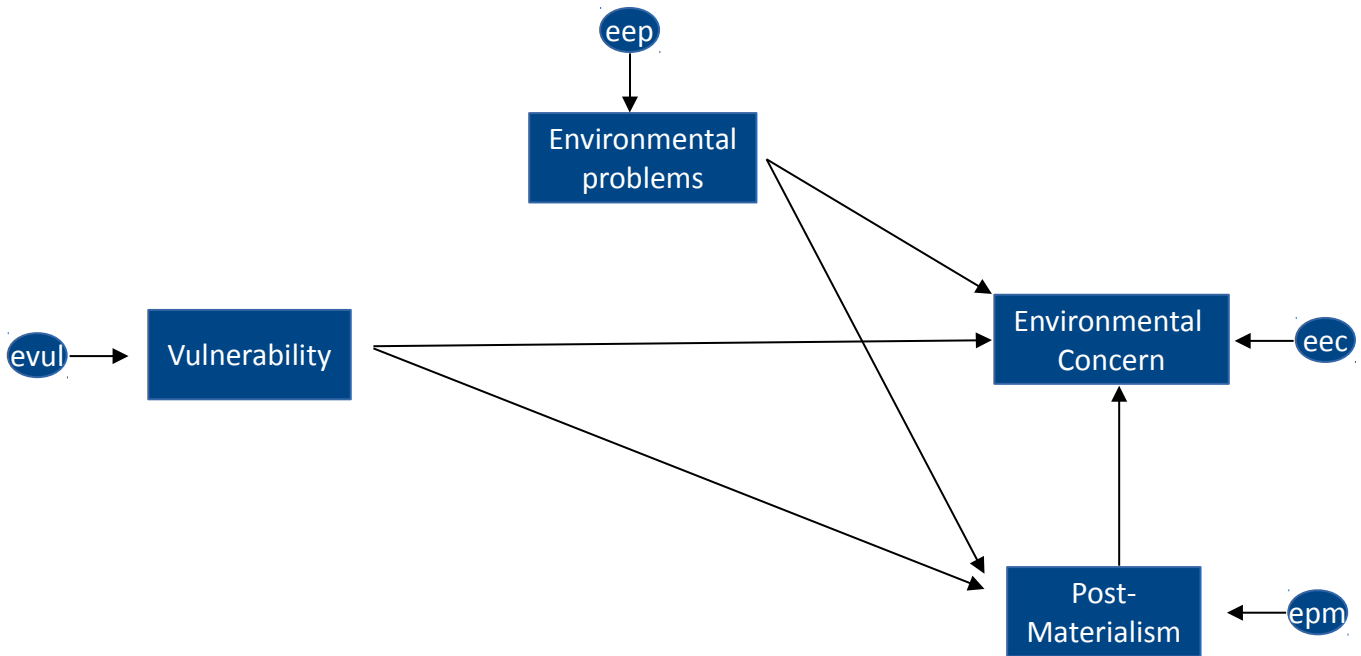
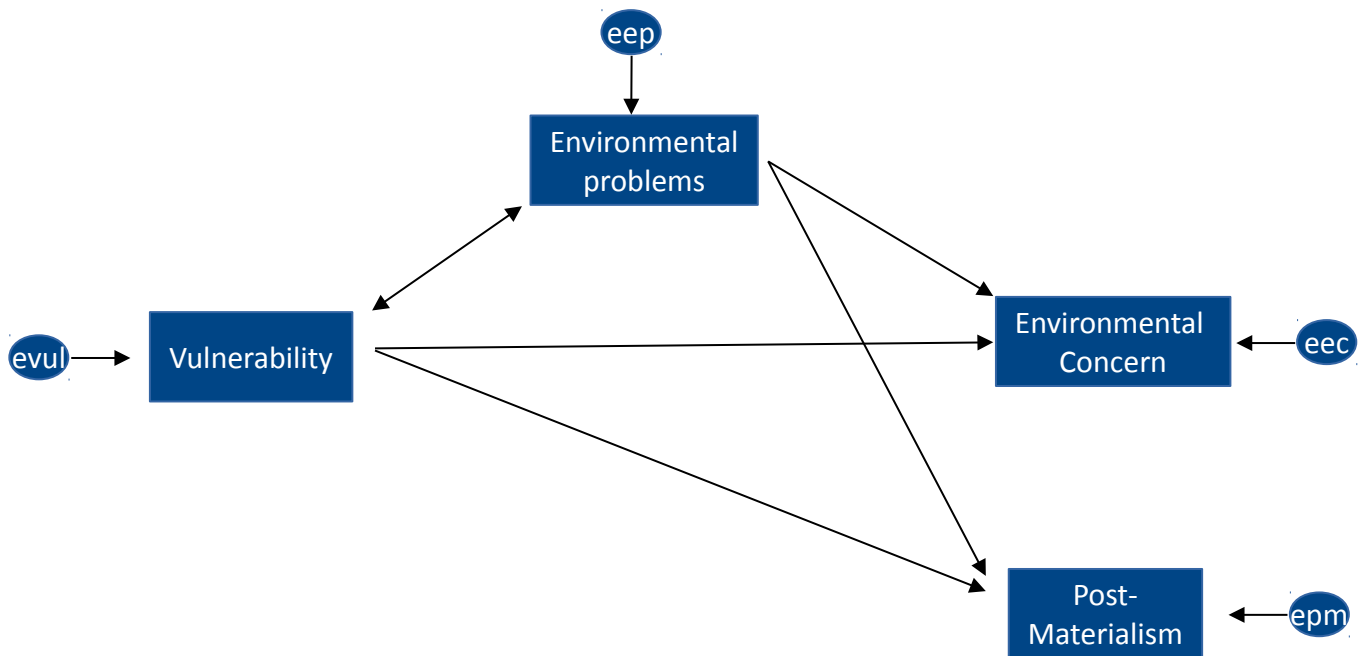


Figure 5: Systematic representation of SEM model 2-B.



5. DISCUSSION

5.1. INTERPERTATION OF RESULTS

In this study I have tested two models. One model to test associations between core-periphery, water quality, vulnerability, post-materialism and environmental concern. A second model to test associations between water quality, vulnerability, post-materialism and environmental concern. In the following section I will discuss the result according to the theory. Caution should be placed with the interpretation since the interpretation are not certainties.

5.1.1. Objective Problems-Subjective Value Thesis

To verify Inglehart's objective problem-subjective value thesis (Ingehart 1995) two hypotheses were formulated. (1) A higher level of environmental problems leads to a higher level of environmental concern. (2) A higher level of post-materialism within a country leads to a higher level of environmental concern. In both models an increase in water quality has a negative effect on environmental concern and a positive effect on post-materialism. Although the fit of the first model is slightly better, it provides less explanation than the second model which also has a good fit. This means that countries with more environmental problems (i.e., lower levels of water quality) are more concerned for the environment. We can conclude that hypothesis one is confirmed.

The subjective values part of Inglehart's (1995) thesis (i.e., the association between environmental concern and post-materialism) is in none of the models significant. This is contrary to the hypothesis. Here we can see that materialistic countries or post-materialistic countries are not more concerned for the environment. Martinez-Aliez (1995, 2-3) explains why post-materialists are not more concerned about the environment compared to materialists, because post-materialism does “[...] not [consider] the material roots of the environmentalism of the rich. Admittedly, what is materialist and what is post-materialist in the western environmental movement is not always easy to discern.” What is noticeable is that countries with materialistic values are more locally concerned about the environment. Being concerned about the environment is not something that is affected by post-materialism. On the contrary we can see that materialistic countries are more locally concerned (Brechin 1999). In other words it depends on the framing of the concept environmental concern. Martinez-Aliez (1995, 9) concludes about the post-materialism thesis that it “[...] share a common blindness towards the resource constraints on and the environmental effects of the mass-production and consumption of material commodities.” Additionally, various other

critique suggests that post-materialism is a bidimensional construct and not a unidimensional continuum with materialism on one side and post-materialism at the other side as Inglehart (1990) suggest (Marks 1997; Giacalone, Jurkiewicz, & Deckop 2008). Bean & Papadakis (1994) even found that most Western countries do not demonstrate any significant difference with regards between materialist or postmaterialist.

Another reason for the lack of association between post-materialism and environmental concern within this research is that Inglehart (1990; 1997) sees post-materialism as an individual phenomena that changes among individuals within society, not among countries. Kidd & Lee (1997, 14) presented this problem within their research. They pointed out that “[...] the population of given country still comprises people of materialist- and postmaterialist-value orientations”. This critique will be further explained in the limitations of this research.

5.1.2. World-Systems Theory

Wallerstein's world-system theory (1974; 1979; 1984; 2004) was tested by the following hypothesis: (3) Peripheral and semi-peripheral countries will have a higher level of environmental concern, then core countries. In the first model of the structural equation modeling analysis is the hypothesis tested. The results show that peripheral and semi-peripheral countries have a higher environmental concern than core countries. That is to say there is statistical proof that Wallerstein's world-system theory is verified. Additionally, Martinez-Alie's (1995) explanation fits right in with the results as peripheral and semi-peripheral countries are more concerned for the environment as Wallerstein (1974; 1984; 2004) explains through the exploitation of the peripheral and semi-peripheral resources (e.g., natural resources) by the core countries. Therefore peripheral and semi-peripheral countries are more concerned about environmental degradation (Brechtin & Kempton 1994). Rosa & York (2000) showed similar findings when investigating the environmental impact of highly modernised countries in the form of a high GDP, high levels of urbanisation and economic structures (i.e., core countries). “Taken together, these results suggest that basic economic and ecological factors largely determine human impact on the environment.” (York, Rosa & Dietz 2003, 295) In the structural equation modeling we can find similar results. Since core-periphery have a significant effect on the environmental concern (i.e., core countries are less concerned about the environment). At the same time the effect of environmental factors (i.e., water quality) demonstrate a positive significant effect on environmental concern. York, Rosa & Dietz (2003) found the similar result for the underlying results towards environmental

concern as I proposed. The results demonstrated that environmental concern is [...] not directly the result of capitalism or world-system position per se, but rather are generated by more basic material conditions, which in turn may be mediated by capitalism and world-system position.” (York, Rosa & Dietz 2003, 294) In the following we will see that vulnerability (i.e., basic material conditions within a country) are a more suitable explanation for the underlying relations towards environmental concern.

5.1.3. Vulnerability

In the second model of the structural equation modeling analysis vulnerability has a negative effect on post-materialism and a positive effect on environmental concern. I can conclude that higher levels of wealth and income equality, access to healthcare, good governance, life expectancy are accompanied by higher levels of post-materialism but with lower levels of environmental concern. The composition of a country on a social, economic, physical, cultural, environmental and institutional dimensions (Birkmann et al 2013a) has an influence on environmental concern. The human-environment interactions that is demonstrated within the analysis gives an important explanation on how countries differ from each other. The social-ecological sphere (i.e., vulnerability) gives support to the notion that a broad societal framework makes a difference on how concerned people are about the environment. That is to say that countries with a high the level of public infrastructure, lack of poverty and dependencies, a high economic capacity and income distribution, government and authorities, proper medical services, proper material coverage, high levels of education and research, a high level gender equity and a high level of environmental status will lead to lower environmental concern. This is according to the formulated hypothesis: (4) A higher level of vulnerability will lead to a higher level of environmental concern.

In the structural equation modeling vulnerability demonstrate a positive effect towards environmental problems (i.e., vulnerable countries have a lower water quality) and a positive effect towards post-materialism (i.e., less vulnerable countries have a more post-materialistic values). Only environmental problems presents a significant effect on environmental concern. Also Kimmelmeier, Krol, & Kim (2002, 270) found evidence that the data “[...] do not yield any evidence that postmaterialist values mediated the relationship between economic affluence and environmental attitudes.” A possible reason for the lack of effect of post-materialism could be an underlying trend, while the data clearly suggest a relation between vulnerability, environmental problems and post-materialism. Dückers, Frerks & Birkmann (2015, 93) found

that “[...] [p]articularly countries with a small power distance and higher degrees of individualism are found to be less vulnerable [...]” and that there is “[...] an association between both cultural aspects and socio-economic country features.” The cultural aspect of vulnerability and post-materialism is also proven by Inglehart (1995, 68) “[p]ostmaterialist values also prove to be correlated with a surprisingly wide range of other values, relating to work, leisure, gender roles, and a variety of other social and political orientation.” Further research is needed to investigate the underlying effect on cultural effects of post-materialism on environmental concern.

In less vulnerable country we can see a higher level of post-materialism, but this effect is not translated into environmental concern. This could have significant consequences towards the threat of worldwide environmental and sustainability initiatives which rely on the behaviour and attitudes of citizens. The results of this study show that countries who have an imminent threat of environmental problems and are more vulnerable, are more concerned for the environment. These countries do not have the means or are not in a position to bring this change. Paradoxically, the citizens of vulnerable countries need to make a sacrifice towards the (economic) development as an individual and as a country, against the global sustainability interests. The conflict of interest is a prominent factor as shown within this study. The exploitation of the natural resources of the vulnerable countries lead to environmental problems (i.e., lower water quality). In order to have global successful sustainability initiatives a change needs to be achieved, but the future looks gloomy.

5.2. LIMITATIONS

5.2.1. Dataset Limitations

One of the reasons for the inconclusiveness with previous research is due to various datasets. Gelissen (2007) and Dunlap & York (2008) for example used data from the World Values Survey, while Franzen & Meyer (2010), Haller & Hadler (2008) and Marquart-Pyatt (2012) used the ISSP Environment data. While the World Values Survey consist of a larger country sample, the ISSP Environment data excels in the amount of questions on environmental topics. In this research the importance of the amount of countries, especially the amount of peripheral countries, was a trade-off that was needed to test Wallerstein's world-system theory. Plus the amount of countries would give a better understanding of the relation between vulnerability and environmental concern within a global context. Data to investigate

environmental problems is hard to come by. As EPI (2010b, 41) addresses, the problem of data is “[...] either incomplete or difficult to use in global comparisons”. The monitoring systems of countries differ considerably from one and other resulting in producing dissimilar data. As well as that the amount of monitoring systems that are in certain countries is too low in order to produce representative samples. The WorldRiskReport (2013) demonstrates the same limitations as it gathers the data from a wide array of datasets from various sources. “The properties and validity of the datasets present a limitation towards the homogeneity of the data.” (Dückers, Frerks & Birmann 2015, 93) The homogeneity of the data varies between countries. For example the populations of Switzerland and China will have a different level of homogeneity since the country sizes differ significantly.

5.2.3. Methodological Limitations

Within this study all the variables are measured or calculated on a country level. By looking at country characteristics is provide a great asset towards the research, but it has its limitations. Certain variables, for example post-materialism, would be more suitable on an individual level. The use of a multilevel analysis would have given a deeper understanding of the relationship between environmental concern and individual factors explaining the differences within countries. Franzen & Meyer (2010, 229) found in their multilevel analysis that “[...] within-country differences are much larger (85 per cent of the total variance) than the between-country differences (15 per cent of the total variance)”. I would therefore suggest for future studies with a larger sample of countries with a more varied contexts to examine cross-national differences on an individual and contextual level. With a multilevel analysis the effects of vulnerability can be further explored and tested. An interesting question would be if vulnerability still holds its ground when individual factors are tested. Marquart-Pyatt (2012) have found that at the individual level education, age and gender have an influence on environmental concern. Or that willingness to pay is most depended on individual characteristics (Haller & Hadler 2008). Additionally, a further relation between post-materialism and environmental concern is interesting. A multilevel model where the post-materialistic values are measured on an individual level could present some interesting results and is suggested for further research.

6. Conclusion

To conclude, after the structural equation modeling analysis we can answer the proposed research questions: What determines the environmental concern of a country? With the

following sub-research questions: (1) To what extent have environmental problems an affect on environmental concern? (2) To what extent has post-materialistic values an affect on environmental concern? (3) To what extent differ the core countries from peripheral and semi-peripheral countries on environmental concern? (4) To what extent has vulnerability an affect on the environmental concern?

Environmental problems provide a significant explanation into the environmental concern of a country. We can see in both models of the structural equation modeling that more environmental problems (i.e., water quality) lead to a higher environmental concern. The objective problems aspect of Inglehart's (1995) objective problem-subjective value thesis provide a sufficient explanation towards the relation of environmental problems on environmental concern. Inglehart (1995, 64) pointed out that “[...] water pollution poses a direct threat to one's health and survival, this concern by itself leads people to take an active interest in the environment.”

The subjective value part of the Inglehart's (1995) thesis is not evident. In the structural equation modeling analysis we can find no significant effect of post-materialism on environmental concern. We can therefore conclude that post-materialism is to no extent an explanation towards environmental concern. Inglehart gives the following explanations why post-materialism alone is not a sufficient answer towards environmental concern. "Changing cultural factors such as these interact with technological and environmental factors, and efforts to solve problems in the global environment must take account of both sets of factors." (Inglehart 1995, 70) “[...] But in advanced industrial societies where the immediate threat to one's survival has been receding rather than advancing, a simple stimulus-response model of this kind is less plausible.” (Inglehart 1995, 64) The world-system and vulnerability will provide a plausible answer towards these problems.

Within this research we can see that the human impacts on the environment are incorporated with basic economic, social, political and ecological factors which determine the environmental concern within a country. The impacts of environmental problems are largely related within the world-system together with socio-economic and political factors as public infrastructure, nutrition, poverty and dependencies, economic capacity and, income distribution, government and authorities, medical services, material coverage, education and

research, gender equity and such. The power discrepancies between the core countries and peripheral and semi-peripheral countries provide a significant relation towards environmental concern. The results showed that the power relations between the core countries and peripheral and semi-peripheral countries not only had direct effect towards environmental concern (i.e., peripheral and semi-peripheral countries have a higher level of environmental concern) but had an indirect effect. The variation between the core countries and peripheral and semi-peripheral countries is related to environmental problems and post-materialism. The ecological impact of the human interaction within the environment by the core countries and peripheral and semi-peripheral countries is mostly noticeable in peripheral and semi-peripheral countries. Additionally, the cultural discrepancy between the core countries and peripheral and semi-peripheral countries is expressed in the form of a decrease in post-materialistic values for core countries. Unfortunately, the structural equation modeling analysis can not indicate if the variance between core countries and peripheral and semi-peripheral countries is the primary cause for the discrepancies of the ecological impacts (i.e., environmental problems) or the cultural aspects (i.e., post-materialism). Future research should indicate whenever this is the case.

In the structural equation modeling analysis the result showed that core-periphery is strongly related towards vulnerability (i.e., the core countries are significantly less vulnerable and have higher water quality). In the second model of the structural equation modeling core-periphery was excluded from the analysis, because the dummy variable core-periphery is less sensitive than vulnerability score because it only distinguishes between 0 and 1 while vulnerability is measured on a scale from 1 to 100. The results demonstrated that provided vulnerability similar results in comparison with core-periphery. York, Rosa & Dietz (2003) found that the basic material conditions of a country are related towards the environmental conditions (e.g., water quality).

Finally, in this research I have found significant evidence for an explanation towards environmental concern. As seen in the explanation of the differences between core countries and semi-peripheral and peripheral countries, the level of vulnerability and the amount of environmental problems towards the environmental concern between countries. But there is still uncertainty towards the underlying relationships. In the words of Inglehart (1995, 70) “[a] human component of subjective values and perceptions interacts with the hard science

side, sometimes in a decisive way. Thus far, these subjective factors remain poorly understood." The same results are shown in the structural equation modeling analysis, where post-materialism has no effect on environmental concern.

I. REFERENCE

- Adger, W Neil. 2006. "Vulnerability." *Global environmental change* 16 (3):268-281.
- Allison, Paul D. 1999. *Multiple regression: A primer*: Pine Forge Press.
- Bean, Clive, and Elim Papadakis. 1994. "Polarized priorities or flexible alternatives? Dimensionality in Inglehart's materialism—postmaterialism scale." *International Journal of Public Opinion Research* 6 (3):264-288.
- Birkmann, Joern, OD Cardona, ML Carreño, AH Barbat, M Pelling, S Schneiderbauer, S Kienberger, M Keiler, D Alexander, and P Zeil. 2013a. "Framing vulnerability, risk and societal responses: the MOVE framework." *Natural Hazards* 67 (2):193-211.
- Birkmann, Joern, Susan L Cutter, Dale S Rothman, Torsten Welle, Matthias Garschagen, Bas van Ruijven, Brian O'Neill, Benjamin L Preston, Stefan Kienberger, and Omar D Cardona. 2013b. "Scenarios for vulnerability: opportunities and constraints in the context of climate change and disaster risk." *Climatic Change*:1-16.
- Brechin, Steven R. 1999. "Objective problems, subjective values, and global environmentalism: Evaluating the postmaterialist argument and challenging a new explanation." *Social Science Quarterly*:793-809.
- Brechin, Steven R, and Willett Kempton. 1994. "Global environmentalism: a challenge to the postmaterialism thesis?" *Social Science Quarterly* 75 (2):245-269.
- Brechin, Steven R, and Willett Kempton. 1997. "Beyond postmaterialist values: National versus individual explanations of global environmentalism." *Social Science Quarterly*:16-20.
- Bunker, Stephen G. 1984. "Modes of extraction, unequal exchange, and the progressive underdevelopment of an extreme periphery: The Brazilian Amazon, 1600-1980." *American Journal of Sociology*:1017-1064.
- Buskirk, Trent D. 2008. "P-value." In *Encyclopedia of Survey Research Methods*, edited by Paul J. Lavrakas, 648-649. Thousand Oaks, CA: Sage Publications, Inc.
- Buttel, Frederick H. 1987. "New directions in environmental sociology." *Annual review of sociology*:465-488.
- Chase-Dunn, Christopher, and Thomas D Hall. 1992. "World-systems and modes of production: Toward the comparative study of transformations." *Humboldt Journal of Social Relations*:81-117.
- Chase-Dunn, Christopher, Yukio Kawano, and Benjamin D Brewer. 2000. "Trade globalization since 1795: Waves of integration in the world-system." *American Sociological Review*:77-95.
- Chen, Peter Y, and Autumn D Krauss. 2004. "Cronbach's Alpha." In *The SAGE Encyclopedia of Social Science Research Methods.*, edited by Michael Lewis-Beck, Alan E Bryman and Tim Futing Liao, 226-227. Thousand Oaks, CA: Sage Publications, Inc.
- Chen, Peter Y., and Paula M. Popovich. 2002. *Correlation*. Thousand Oaks, CA: SAGE Publications, Inc.
- Cramer, Duncan, and Dennis Howitt. 2004. "interquartile range." In *The SAGE Dictionary of Statistics.*, 81. London, England: SAGE Publications, Ltd.
- DiStefano, Christine, Min Zhu, and Diana Mindrila. 2009. "Understanding and using factor scores: Considerations for the applied researcher." *Practical Assessment, Research & Evaluation* 14 (20):1-11.

- Dunlap, Riley E, and Robert Emmet Jones. 2002. "Environmental concern: Conceptual and measurement issues". In *Handbook of environmental sociology*, ed. R. Dunlap and W. Michelson. London: Greenwood.
- Dunlap, Riley E, K Van Liere, A Mertig, and Robert Emmet Jones. 2005. "Measuring Endorsement of the New Ecological Paradigm: A Revised NEP Scale." *The Earthscan Reader in Environmental Values, Earthscan, London*.
- Dunlap, Riley E, and Kent D Van Liere. 1984. "Commitment to the dominant social paradigm and concern for environmental quality." *Social Science Quarterly*:1013-1028.
- Dunlap, Riley E, and Richard York. 2008. "The globalization of environmental concern and the limits of the postmaterialist values explanation: Evidence from four multinational surveys." *The Sociological Quarterly* 49 (3):529-563.
- Dunlap, Riley E. and Brent K. Marshall. 2007. "Environmental Sociology." In *21st Century Sociology: A Reference Handbook, Vol. 2*, edited by C. D. Bryant and D. L. Peck. Thousands Oaks, CA: SAGE Publications, Inc.
- Dückers, Michel, Georg Frerks, and Joern Birkmann. 2015. "Exploring the plexus of context and circumstances: An empirical test of a theory of disaster vulnerability." *International Journal of Disaster Risk Reduction* 13 (0):85-95.
- Environmental Performance Index. 2010a. Environmental Performance Index dataset. edited by Yale University (YCELP) & Columbia University (CIESIN). New Haven: Yale Center for Environmental Law and Policy.
- Environmental Performance Index. 2010b. Environmental Performance Index Report. edited by J. Emerson, D.C. Levy M.A Esty, C.H. Kim, V. Mara, A. de Sherbinin and T. Srebotnjak. New Haven: Yale Center for Environmental Law and Policy.
- Ehrlich, Paul R, and John P Holdren. 1971. "Impact of population growth." *Science* 171:1212-17.
- Fransson, Niklas, and Tommy Gärling. 1999. "Environmental concern: Conceptual definitions, measurement methods, and research findings." *Journal of environmental psychology* 19 (4):369-382.
- Franzen, Axel. 2003. "Environmental attitudes in international comparison: An analysis of the ISSP surveys 1993 and 2000*." *Social science quarterly* 84 (2):297-308.
- Franzen, Axel, and Reto Meyer. 2010. "Environmental attitudes in cross-national perspective: A multilevel analysis of the ISSP 1993 and 2000." *European Sociological Review* 26 (2):219-234.
- Gelissen, John. 2007. "Explaining Popular Support for Environmental Protection A Multilevel Analysis of 50 Nations." *Environment and Behavior* 39 (3):392-415.
- Giacalone, Robert A, Carole L Jurkiewicz, and John R Deckop. 2008. "On ethics and social responsibility: The impact of materialism, postmaterialism, and hope." *Human Relations* 61 (4):483-514.
- Greenbaum, Allan. 1995. "Taking stock of two decades of research on the social bases of environmental concern." *Environmental sociology: Theory and practice*:125-152.
- Guha, Ramachandra, and Juan Martinez-Alier. 2013. *Varieties of environmentalism: essays North and South*: Routledge.
- Haller, Max, and Markus Hadler. 2008. "Dispositions to Act in Favor of the Environment: Fatalism and Readiness to Make Sacrifices in a Cross-National Perspective1." *Sociological Forum*.
- Hardy, Melissa A. 2004. "Dummy Variable." In *The SAGE Encyclopedia of Social Science Research Methods*, edited by Michael Lewis-Beck, Alan E Bryman and Tim Futing Liao, 289-291. Thousand Oaks, CA: Sage Publications, Inc.
- Hinkle, Dennis E, William Wiersma, and Stephen G Jurs. 2003. *Applied statistics for the*

- behavioral sciences*. 5th ed. Boston: Houghton Mifflin Publish.
- IMF (International Monetary Fund). 2014. *World economic outlook: Recovery Strengthens, Remains Uneven*. Washington, DC: International Monetary Fund.
- Inglehart, Ronald. 1971. "The silent revolution in Europe: Intergenerational change in post-industrial societies." *American political science review* 65 (04):991-1017.
- Inglehart, Ronald. 1977. *The silent revolution*. Princeton: Princeton University Press.
- Inglehart, Ronald. 1990. *Culture shift in advanced industrial society*: Princeton University Press.
- Inglehart, Ronald. 1995. "Public support for environmental protection: Objective problems and subjective values in 43 societies." *PS: Political Science & Politics* 28 (01):57-72.
- Inglehart, Ronald. 1997. *Modernization and postmodernization: Cultural, economic, and political change in 43 societies*. Vol. 19: Cambridge Univ Press.
- Inglehart, Ronald, and Paul R Abramson. 1999. "Measuring postmaterialism." *American Political Science Review* 93 (03):665-677.
- IPCC (Intergovernmental Panel on Climate Change). 2012. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, Special Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK: Cambridge University Press.
- Kaplan, David M. 2004. "Structural Equation Modeling". In *The SAGE Encyclopedia of Social Science Research Methods*, edited by Michael Lewis-Beck, Alan E Bryman and Tim Futing Liao, 1089-1093. Thousand Oaks, CA: Sage Publications, Inc.
- Kemmelmeier, Markus, Grzegorz Krol, and Young Hun Kim. 2002. "Values, economics, and proenvironmental attitudes in 22 societies." *Cross-Cultural Research* 36 (3):256-285.
- Kidd, Quentin, and Aie-Rie Lee. 1997. "Postmaterialist values and the environment: A critique and reappraisal." *Social Science Quarterly*:1-15.
- Lewis-Beck, Michael S. 2004a. "Regression." In *The SAGE Encyclopedia of Social Science Research Methods*, edited by Michael Lewis-Beck, Alan E Bryman and Tim Futing Liao, 936-939. Thousand Oaks, CA: Sage Publications, Inc.
- Maslow, Abraham Harold. 1970. *Motivation and personality*. Vol. 2: Harper & Row New York.
- Marks, Gary N. 1997. "The formation of materialist and postmaterialist values." *Social Science Research* 26 (1):52-68.
- Marquart-Pyatt, Sandra T. 2012. "Contextual influences on environmental concerns cross-nationally: A multilevel investigation." *Social science research* 41 (5):1085-1099.
- Marquart-Pyatt, Sandra T. 2008. "Are There Similar Sources of Environmental Concern? Comparing Industrialized Countries." *Social Science Quarterly* 89 (5):1312-1335.
- Martinez-Alier, Juan. 1995. "The environment as a luxury good or "too poor to be green"?" *Ecological Economics* 13 (1):1-10.
- Martinez-Alier, Juan. 2002. *The environmentalism of the poor: a study of ecological conflicts and valuation*: Edward Elgar Publishing.
- Menard, Scott. 2004. "Standardized Regression Coefficients." In *The SAGE Encyclopedia of Social Science Research Methods*, edited by Michael Lewis-Beck, Alan E Bryman and Tim Futing Liao, 1070-1071. Thousand Oaks, CA: Sage Publications, Inc.
- Mulaik, Stanley A. 2004. "Factor Analysis." In *The SAGE Encyclopedia of Social Science Research Methods*, edited by Michael Lewis-Beck, Alan E Bryman and Tim Futing Liao, 369-375. Thousand Oaks, CA: Sage Publications, Inc.
- O'Brien, Karen, Siri EH Eriksen, Ane Schjolden, and Lynn P Nygaard. 2004. "What's in a word? Conflicting interpretations of vulnerability in climate change research." *CICERO Working Paper*.
- Pedhazur, Elazar J, and Liora Pedhazur Schmelkin. 2013. *Measurement, design, and analysis: An integrated approach*: Psychology Press.

- Peter Y. Chen, Autumn D. Krauss. 2004. "Cronbach's Alpha." In *The SAGE Encyclopedia of Social Science Research Methods*, edited by Michael Lewis-Beck, Alan E Bryman and Tim Futing Liao, 226-227. Thousand Oaks, CA: Sage Publications, Inc.
- Rickwood, CJ, and GM Carr. 2009. "Development and sensitivity analysis of a global drinking water quality index." *Environmental monitoring and assessment* 156 (1-4):73-90.
- Rokeach, Milton. 1968a. "Beliefs, attitudes and values: A theory of organization and change."
- Rokeach, Milton. 1968b. "The role of values in public opinion research." *Public Opinion Quarterly* 32 (4):547-559.
- Rudiak-Gould, Peter. 2013. "Cross-cultural insights into climate change skepticism." *Bulletin of the American Meteorological Society* 94 (11):1707-1713.
- Stern, Paul C, and Thomas Dietz. 1994. "The value basis of environmental concern." *Journal of social issues* 50 (3):65-84.
- Straussfogel, Debra. 1997. "A systems perspective on world-systems theory." *Journal of Geography* 96 (2):119-126.
- Templ, Matthias, Karel Hron, and Peter Filzmoser. 2011. *robCompositions: an R-package for robust statistical analysis of compositional data*: na.
- Tol, Richard SJ, and Gary W Yohe. 2007. "The weakest link hypothesis for adaptive capacity: an empirical test." *Global Environmental Change* 17 (2):218-227.
- UNDESA (United Nations Department of Economic and Social Affairs). 2013. *World Economic Situation and Prospects 2013*. New York: United Nations publication.
- UNDP (United Nations Development Programme). 2010. *Human Development Report 2010: The Real Wealth of Nations: Pathways to Human Development*. New York: Palgrave Macmillan, UNDP.
- UNDP (United Nations Development Programme). 2014. *Human Development Report - Sustaining Human Progress: Reducing Vulnerabilities and Building Resilience*. New York, NY: One United Nations Plaza.
- UNISDR (United Nations Office for Disaster Risk Reduction). 2009. *UNISDR terminology on disaster risk reduction*. Geneva, Switzerland: United Nations International Strategy for Disaster Reduction.
- Van Liere, Kent D, and Riley E Dunlap. 1980. "The social bases of environmental concern: A review of hypotheses, explanations and empirical evidence." *Public opinion quarterly* 44 (2):181-197.
- Vogt, Paul W. 2005a. "KMO Test." In *Dictionary of Statistics & Methodology, Third Edition* 167-168. Thousand Oaks, CA: SAGE Publications, Inc.
- Vogt, Paul W. 2005b. "Hierarchical Regression Analysis." In *Dictionary of Statistics & Methodology*, 144. Thousand Oaks, CA: SAGE Publications, Inc.
- Vogt, Paul W. 2005c. "Interaction Effect." In *Dictionary of Statistics & Methodology*, 156-157. Thousand Oaks, CA: SAGE Publications, Inc.
- Wallerstein, Immanuel. 1974. *The modern world-system I: capitalist agriculture and the origins of the European world-economy in the sixteenth century (Volume. 1)*: University of California Press.
- Wallerstein, Immanuel. 1979. *The capitalist world-economy*: Cambridge University Press.
- Wallerstein, Immanuel. 1984. *The politics of the world-economy: The states, the movements and the civilizations*: Cambridge University Press.
- Wallerstein, Immanuel. 2004. *World-systems analysis: An introduction*: Duke University Press.
- Weigel, Russell H. 1977. "Ideological and demographic correlates of proecology behavior." *The Journal of Social Psychology* 103 (1):39-47.
- World Bank. 2010. *World Development Report 2010: Development and Climate Change*. Washington, DC: World Bank Publishers.

- World Values Survey. 2007. World Values Survey wave 5: 2005-2008. edited by Asep/JDS. Madrid Spain.
- WorldRiskReport. 2013. *World Risk Report focus: health and healthcare*. Berlin, Germany: Alliance Development Works.
- Xiao, Chenyang, and Riley E Dunlap. 2007. "Validating a Comprehensive Model of Environmental Concern Cross-Nationally: A US-Canadian Comparison*." *Social Science Quarterly* 88 (2):471-493.
- Xiao, Chenyang, and Aaron M McCright. 2007. "Environmental concern and sociodemographic variables: A study of statistical models." *The Journal of Environmental Education* 38 (2):3-14.
- York, Richard, Eugene A Rosa, and Thomas Dietz. 2003. "Footprints on the earth: The environmental consequences of modernity." *American Sociological Review*: 279-300.