Domains and indicators of life satisfaction: Case studies in Costa Rica and Northern Australia

Thesis submitted by

Adriana Chacón Calvo

BSc (Hons)

July 2016

For the degree of Master of Philosophy in Economics

College of Business, Law and Governance

And Australian Research Council Centre of Excellence for Coral Reef Studies

James Cook University

Townsville, Australia, 4811

Primary supervisor: Prof Natalie Stoeckl

Co-supervisors: Prof Bob Pressey and Assoc Prof Riccardo Welters

Statement of Access

I, the undersigned, author of this work, understand that James Cook University will make this thesis available for use within the University Library and, via the Australian Digital Theses network, for use elsewhere. I understand that, as an unpublished work, a thesis has significant protection under the Copyright Act and; I do not wish to place any further restriction on access to this work.

_____ 28/07/2016

Signature Date

Statement of Contribution of Others

Research funding

James Cook University Research Tuition Scholarship	AUS$ 48,000
James Cook University Postgraduate Research Scholarship	AUS$ 49,603
College of Law, Business and Governance	AUS$ 3,000
Supervisory support	AUS$ 1,000

Overall research project

Prof Natalie Stoeckl, Prof Robert L. Pressey and Assoc Prof Riccardo Welters

Questionnaire design

Prof Natalie Stoeckl, Adrián Arias, Elmer Arias

Data collection

Rebeca Vega, Mercedes Hidalgo, Mariana Mora, Mariam Huezo

Logistical support

Prof Natalie Stoeckl and Adrián Arias

Editorial support

Prof Natalie Stoeckl, Prof Robert L. Pressey and Assoc Prof Riccardo Welters

Permits and Ethics

The proposed research received human ethics approval from the JCU Research Ethics Committee Approval Number H5358 and H4541. Prior to all interviews and focus groups informed consent was obtained verbally from all respondents.

Inclusion of published papers in the thesis:

Chapter 4:

Detail of publication on which chapter is based:

Chacón, A., Stoeckl, N., Jarvis, D. & Pressey, R.L. (Accepted). Using insights about key factors impacting 'quality of life' to draw inferences about characteristics of effective on-farm conservation programs: a case study in Northern Australia. Australasian Journal of Environmental Management.

Nature and extent of the intellectual input of each author:

Data for Chapter 3 was provided by research project called: Project 1.3 Improving the efficiency of biodiversity investment, funded by the Australian Government's National Environmental Research Project (NERP). The project was undertaken by researchers from James Cook University and led by Prof Natalie Stoeckl. Assistance thanks to Taha Chaiechi, Marina Farr, Michelle Esparon, Silva Larson, Diane Jarvis, Adriana Chacon, Lai Thi Tran, Vanessa Adams and Jorge Álvarez-Romero. Diane Jarvis added the database and made the maps. Prof Natalie Stoeckl and Prof Robert L. Pressey assisted with the helped with design of research questions, analysis, interpretation of results and editing. Assoc Prof Riccardo Welters assisted with the editing too.

This thesis is dedicated to my grandfather Apín

And my great grandaunt tía Emi

Your love, support and inspiration will be forever with us

Acknowledgements

Firstly, I would like to thank my advisory committee: Natalie Stoeckl, Bob Pressey and Riccardo Welters; without your support this project would not have been possible. Natalie you have been a great support not only for this project but for my time in Australia. You have been very understanding and have given me great guidance throughout the whole process. You have believed in this project and in me since day one. You have kept me grounded but have also helped me grow in so many ways.

Bob, I do not have enough words to thank you. Because of you I met Natalie and was able to do this project. You are truly inspiring, and your passion to save the World is contagious. Thank you for introducing me to conservation planning and for teaching me so much about it. Working with you has been a great ride.

Riccardo, you have been such a great addition to the team. I cannot thank you enough for all your support and feedback. You joined us half way through and your set of fresh eyes brought this project to the next level. Your calmness and intuition have helped me stayed focused and to see things from a different perspective. It has been a pleasure to work with you.

Natalie, Bob and Riccardo: you taught me so much, I have become a more knowledgeable person; you have helped me think in a more critical way and to look at science in a different way. I will be forever thankful.

Secondly, I would like to thank the respective 'labs' and collaborators that have helped me. Natalie's lab: Christina, Aurelie, Diane, Cheryl, Michelle, Silva, Marina, Diana, Melissa, Qian, Mark and Daniel. Christina, you have been so kind and have been very helpful since day one. When I first thought about this project and my ideas where all over the place you helped me put it all into perspective. Setting that solid base really helped me continue and gain direction. Aurelie, thank you for showing me the ropes and for being such a good mentor; those first days were easy because of you. Diane, even though you are in Cairns it felt like you were here. Thank you for invariably being there to help, offer advice and support it was great to be on the same boat! Cheryl, I could not have asked for a better office mate. You were always offering me a hand when I needed it and thank you for providing enough chocolate for all the long hours of work. Michele, thank you for introducing me to doing fieldwork in Australia; you kindly provided an ear to listen and advice when needed.

Bob's mob, I have never been part of such a disciplinary and culturally diverse group; and the fact that everyone is in different career levels makes it so unique and rich to work with. Whenever I faced an obstacle you were there to offer support; most likely one of you had faced something similar and offered a kind word. Bec, Gerogie, Alana, Mel, Jorge, Amélie, Mari, Rafa, Ian, Heather, Milena, Jess, Amelia, Jon, April, Steve and Mirjam; thank you! Thank you for your feedback and your advice to make my case a much stronger one.

Rebeca, Mercedes, Mariana, Diane, Jorge, Vanessa, Sam and other collaborators thank you for your help with: feedback, data collection and entry, and advice on this project. Without you I would not had been able to gather all the information for this project. Thank you for putting in all the hard work no matter what and for believing in this project.

Thirdly, I would like to thank the College of Business, Law and Governance and the ARC Centre of Excellence for Coral Reef Studies both at James Cook University; without their funding and support this project would not have been possible.

I would also like to thank my family and my friends for being so supportive throughout the whole process.

Adrián if it wasn't for you I would not have moved to Australia. Thank you for encouraging and supporting me to continue studying. You have been with me through the good and the bad and have stood by me no matter what. This has been a great opportunity for both of us, which I'm sure we will be grateful for the rest of our lives.

Mom and Dad I owe you everything and more; thank you for being my number one fans and for believing I could do anything I set my mind on and for always being there for me. Agüe, thank you for showing us all on how to stay strong throughout the toughest times of our lives and for holding us all together; you are a champion! Doña Laura and don Elmer, the family that I chose or chose me; without your support all of this would not have been possible; thanks for raising such a wonderful son and for always making me feel so welcome in your family. To all my aunts, uncles and cousins; I'm very grateful to be part of such an awesome bunch!

Apín, I wish you were here. Every time I think of you I get tears in my eyes; you were always very supportive and kind. You always had time to listen to all my stories, I'm so sad you will not hear the end of this one. I can't say you left us too soon because I know you had such a

great journey and had taught us everything you could. I hope I can always make you proud. You filled the job of two and never ceased to amaze me. Tía Emi, you were the strongest of all and had overcome such adversity that you always made everything look so simple. Our time together will always be with me, thank you for being so encouraging and for always helping us all out; I will be forever grateful.

Thank you to my friends from Townsville, and from overseas. All of my chicas: Amy, Tess, Chiara, Kirsty, Georgie, Mel, Pip, Cora, Bec, Lisa, Rosie, Cindy, Jodie, Kim, Mari and Na'ama; thanks for keeping me balanced and keep reminding me to work hard but not to forget to have fun. And the boys: Josh, Leo, Chris, Paul, Pete, Phil, Mark and Chancey; you guys rock! To my Crossfit buddies for keeping me accountable to my workouts and for all the fun times! And from overseas: Vera, In, Dani, Luca, Cata, Fer, Paulie, Tayu, Diego, Aileen, Moni and the happy gang; thank you for all the long distance love and support.

And finally, for all the respondents of my surveys, I sincerely appreciate the time you took to answer my questions; without you this project would have not been possible.

Table of Contents

List of Tables

List of Figures

Abstract

Measuring the progress of nations by only focusing on economic growth is inadequate. New measures such as life satisfaction have been put forward as an option to use alongside gross domestic product (GDP). The notions of life satisfaction or subjective wellbeing have been around for many years as central elements of quality of life, but until recently they were not generally accepted as serious, replicable indicators. During the last two decades, however, there has been an increasing body of evidence showing that life satisfaction can be measured in surveys, and that these are reliable and valid measures.

There is a large and growing body of research that seeks to learn more about the contribution different factors make to overall 'life satisfaction' (Ambrey & Fleming, 2011). The enumeration and demarcation of factors contributing to life satisfaction is often arbitrary. Some researchers use a small number of relatively aggregated indicators (Gross Domestic Product is a well-known example of an aggregate indicator, in that it is a single number that captures information about a very large variety of factors); others use a very large number of indicators (Rojas, 2006a). There remains little certainty and no agreed rules for the operationalization of a life-satisfaction construct (Cummins, 1998; Hsieh, 2015; Rojas, 2006b); but much effort has sought to determine which indicators (i.e., what numbers or what type of data), from which domains are better for predicting life satisfaction.

The aim of this thesis is to test the life satisfaction approach in two case studies separately, my main objective being to identify ways of assessing and monitoring the contribution of the domains and types of indicators to people's life satisfaction in each case. I also specifically focused on the environmental domain, and the indicators that are being used. To achieve this aim I focused on three core questions:

> **RESEARCH QUESTION 1:** Do some domains appear to contribute more to life satisfaction in developed countries than in developing countries?
>
> **RESEARCH QUESTION 2:** Which indicators (objective and/or subjective) best represent which domains when measuring the contribution of different domains to life satisfaction in different socio-economic contexts?
>
> **RESEARCH QUESTION 3:** Do environmental factors, other than those 'normally' considered (such as those relating to climate and pollution) contribute to life satisfaction?

The case study sites used include Costa Rica and the Northern Territory and outback Queensland in Australia (referred to as Northern Australia). In Costa Rica, I collected primary data from a sample of residents. I designed my own questionnaire to collect data about overall life satisfaction and about contributors to life satisfaction. Following previous literature I included questions about five life domains relating to: society, economy, the environment, health and safety. I then asked a series of questions designed to gather both 'subjective' and 'objective' information about each of the five life domains. I also collected some background information on income and occupational status plus other sociodemographic factors known to influence life satisfaction (including age, gender and education). Where-ever possible, I endeavoured to collect 'matching' subjective and objective indicators for variables (e.g. satisfaction with, and actual time spent with family).

For the case study in Northern Australia I used sub-set of secondary data from a cross-sectional survey of land managers (gathered as part of a research project funded by the Australian Government's National Environmental Research Project (NERP)). The data provided from this project included subjective information regarding the perceptions of land managers about their overall life satisfaction and additional objective and subjective indicators across the social and economic domains, and a subjective indicator from the environmental domain. Recognising that the environment may also be important to land managers for non-productive purposes, I thus also compiled additional information relating to aquatic biodiversity data from other resources, in addition to other biophysical information about vegetation type, soil type and places of interest (e.g. national heritage places, wetlands of national or international significance).

I found evidence to suggest that the economic domain is probably the most important domain for Costa Rican residents – at least some variables from this domain were statistically significant for the entire sample and for each sub-sample that I tested. Regarding the type of indicators from each domain, both subjective and objective indicators had a statistically significant relationship with measures of overall life satisfaction; but the type of indicators that were relevant for each domain were different. It was a subjective (rather than objective) indicator of satisfaction with housing (mostly associated with the economic domain) that had a positive association with life satisfaction for Costa Rican residents. But for the health domain, it was the objective (rather than the subjective) indicator – specifically, time spent exercising – that had a positive association with life satisfaction. Only within one sub-sample (employed

persons living in an urban area adjacent to beaches and/or protected areas), did an environmental indicator – in this case, frequency of interaction with the environment – have a positive association with life satisfaction.

My analysis of land managers in Northern Australia also demonstrated that life satisfaction depends on multiple domains and that, using both subjective and objective indicators adds value to the analysis. In this case, the social domain had the strongest statistical association with life satisfaction: the single most important indicator of land managers' life satisfaction was having good relationships with family and friends. In contrast to the Costa Rican case, I did not find a statistically significant relationship between the economic domain indicators and life satisfaction.

Different people in different places value different things, according to my study. GDP alone is not a good indicator of life satisfaction; other indicators should be considered. My research demonstrates that there is a need to monitor multiple domains (including, at minimum, those from the social, economic, environmental and probably also health and safety domains), using both objective and subjective indicators. My research also demonstrates that one can expect different indicators to 'matter' at different stages of development of a country. If governments lack the resources to monitor a large variety of indicators, it may be possible to, at the very least, include a single question about overall life satisfaction within their regular censuses, thus readily monitoring more than mere GDP, in a cost-effective way.

1 Chapter 1: Introduction

1.1 GDP is not a good measure of progress

For the past 70 years countries around the World have measured their economic progress using GDP; often making GDP growth a policy goal. But measuring the progress of nations by only focusing on economic growth is inadequate. This is because GDP only includes marketed economic activity; so it leaves out important factors known to influence people's wellbeing, and fails to account for some of the unpleasant social and environmental impacts of economic growth (Costanza et al., 2014). As a result of the focus on economic growth our natural environment is in a critical state (Barnosky et al., 2012).

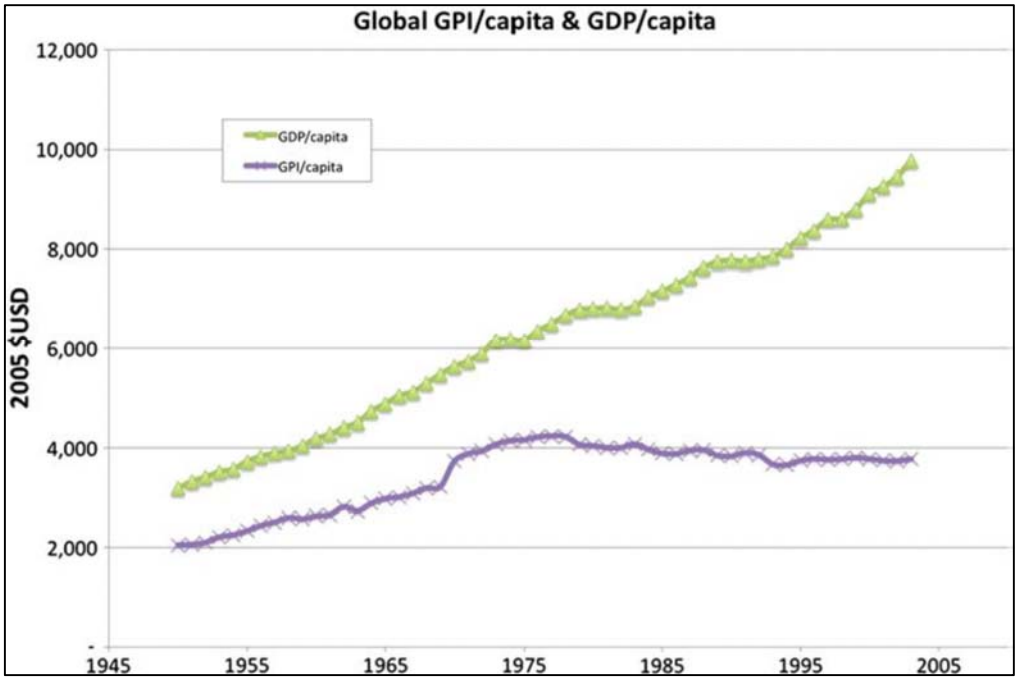
Kubiszewski et al. (2013) argue that one should not only look at GDP but should look beyond it; they constructed a Global Genuine Progress Indicator (GPI)[1] by aggregating data for the 17 countries for which either a GPI or an Index of Sustainable Economic Welfare (ISEW)[2] had been estimated, and adjusting for discrepancies (in 2005 US$). They compared GPI and GDP (per capita), as shown in

Figure 1, noting that around 1978 GPI/capita levels off and begins to decrease slightly, while GDP/capita continues to increase. This clearly indicates that GDP can increase without creating genuine progress. Regarding environmental degradation GDP fails to account for it; for example, in the USA despite the destruction wrought by the Deepwater Horizon oil spill in 2010 and Hurricane Sandy in 2012, both events boosted US GDP (Costanza et al., 2014).

[1] Redefining Progress created the Genuine Progress Indicator (GPI) in 1995 as an alternative to the gross domestic product (GDP). The GPI enables policymakers at the national, state, regional, or local level to measure how well their citizens are doing both economically and socially.

[2] Computation of an ISEW usually starts from the value of personal consumption expenditures which is a sub-component of GDP since GDP = Personal consumption + Public consumption + Investment + (Exports – Imports). Consumption expenditures are weighted with an index of "distributional inequality" of income (usually a modified Gini Coefficient). Then, certain welfare relevant contributions are added and certain welfare relevant losses are subtracted. (Source: http://www.lse.ac.uk/geographyAndEnvironment/whosWho/profiles/neumayer/pdf/Article%20in%20Social%20Indicators%20Research%20(ISEW).pdf)

Figure 1 Adjusted Global Genuine Progress Indicator (GPI) and Gross Domestic Product (GDP), both per capita



Source: Kubiszewski et al. (2013)

There have been numerous other calls for countries to embrace new metrics such as the GPI to account for people's wellbeing. According to Stiglitz, Sen, and Fitoussi (2010): "*We will not change our behaviour unless we change the ways we measure our economic performance*." The deficiencies of GDP are particularly pertinent since the United Nations' 2015 Sustainable Development Goals are likely to include a set of international goals to improve global wellbeing (Costanza et al., 2014). But while GPI is a vast improvement on GDP, it is a complex index that requires much data and relatively sophisticated analysis to estimate.

The GPI starts with the same personal consumption data that the GDP is based on, but then makes some crucial distinctions. It adjusts for factors such as income distribution, adds factors such as the value of household and volunteer work, and subtracts factors such as the costs of crime and pollution. Because the GDP and the GPI are both measured in monetary terms, they can be compared on the same scale.[3] But it is a non-trivial task to measure some things in

[3] Source: http://rprogress.org/sustainability_indicators/genuine_progress_indicator.htm

monetary terms (indeed, there is a vast and complex literature associated with non-market valuation). As such it may not be possible to use monetary metrics of 'genuine progress' in all countries or in regions within countries. Thus it may be useful to employ progress research that looks at simpler (non-monetary) measures of national progress (beyond GDP); measures of subjective wellbeing (SWB) or life satisfaction (LS) offer themselves as an intriguing possibility.

1.2 Life satisfaction (or wellbeing) may be a workable alternative

The terms 'life satisfaction', 'subjective wellbeing', 'happiness' and 'wellbeing' are often used interchangeably within the literature (MacKerron & Mourato, 2013), even though their meanings are different. For example, subjective wellbeing refers to people's evaluations of their lives—evaluations that are both affective and cognitive (Diener, 2000). Happiness is commonly understood as a subjective appreciation of one's life as a whole, which refers to a state of mind, but it leaves some ambiguity about the precise nature of that state (Rojas & Veenhoven, 2013). On the other hand, life satisfaction has been used in surveys and is thought to complement existing indicators such as subjective wellbeing, by reflecting the influences of diverse facets of quality of life and allowing respondents to freely weight different aspects (Diener, Inglehart, & Tay, 2013).

In this thesis I generally use the term 'life satisfaction' (LS), since countries such as Germany, Australia and the United Kingdom are already collecting national life satisfaction statistics for possible policy use, and other nations such as Japan and Chile are considering such measures (Diener et al., 2013). But I also refer to these other terms where appropriate. There are many ways to define life satisfaction, an example being the degree to which an individual makes favourable judgements about the overall quality of his or her life (Veenhoven, 1991, 1993). Diener (2006) defined life satisfaction as a term for the different (subjective) valuations people make regarding their lives, the events happening to them, their bodies and minds, and the circumstances in which they live. There are additional features of a valuable life and of mental health, but the main point to make here is that life satisfaction tends to focus on individuals' own affective and cognitive evaluations of their lives. Life satisfaction is thus a subjective notion; a personal perspective. The term life satisfaction can thus be thought of as an umbrella term for how we think and feel about our lives (see Diener, Suh, Lucas, and Smith (1999).

For centuries, life satisfaction has been a central theme in philosophy (Frey, 2008): Aristotle declared it to be the *summum bonum* (the most important good), arguing that life satisfaction (or happiness) is the highest good and the end at which all our activities ultimately aim. Nowadays, some countries even have specific initiatives to measure factors that are thought to influence, or at least be associated with, life satisfaction. These studies, arguably, began in 1948 and involved nine countries (Veenhoven (2005). This seminal piece of research was undertaken by Buchanan and Cantril (1953) and was sponsored by United Nations Educational Scientific and Cultural Organization's (UNESCO) Tensions Project, which assumed that "wars begin in the minds of men". As such, they sponsored public opinion surveys in Australia, Britain, France, Italy, Mexico, Netherlands, Norway, United States and West Germany (Barbour, 1954) – perhaps hoping to avert future wars by learning more about the minds of men.

A second comparative study in 1960 covered 13 nations, ranging from the United States, West Germany, and Israel, to India, Brazil, and Nigeria. It also included respondents from Cuba and the Dominican Republic; from the Communist nations of Poland and Yugoslavia; and from Israeli Kibbutzim (Klineberg, 1967). This study was led by Cantril (1965), who spent six years assessing how satisfied people were with their individual situations and which qualities of life were most important to them (Gallup, 1976).

In 1975, 10 years after the Buchanan and Cantril study, a global survey was carried out by the 30 members of the Gallup International Research Institute. Questions were administered to national samples in 60 countries representing nearly two-thirds of the world's population (Gallup, 1976), with responses collected in the World Database of Happiness. The database has since been updated, and now contains information collected from 112 countries between 1945-2002, as well as some time series data (20 years) for 15 countries (Veenhoven, 2004).

On a national level, periodic Quality-of-Life-Surveys involving life satisfaction items have been held in Japan, the Netherlands, South Africa and the USA (Veenhoven, 1993). The Eurobarometer surveys provide bi-annual data on happiness in all European Commission countries. Some countries also have large scale panel studies that follow the same persons longitudinally. Occasionally, such nationwide panel studies include indicators of life satisfaction, for instance the American Panel Study on Income Dynamics and the yearly German 'Socio Economic Panel' (SOEP). Nowadays, the two largest datasets containing

comparable measures of life satisfaction are the Gallup World Poll, with data from 132 countries, and the World Values Survey, a longitudinal database covering 15 countries between 1981 and 1983 with five additional waves conducted between 2010 and 2014 in 50 countries (OECD, 2013).

Evidently life satisfaction data can – and does – provide an important complement to other measures that are already used for monitoring and benchmarking countries performance, for guiding people's choices, and for designing and delivering policies (OECD, 2013). Indeed a growing consensus has emerged within the research community regarding the robustness of LS measures. They have been used by researchers from a wide range of disciplines (from neuroscience and psychology, to philosophy and more recently, economics) in various contexts (Ballas & Tranmer, 2012). Their validity has been assessed in a large number of experimental and neurobiological studies (Di Tella, MacCulloch, & Oswald, 2003; Pavot, Diener, Colvin, & Sandvik, 1991). They have been found to exhibit a high degree of internal consistency, validity, reliability, and stability over time (Diener et al., 1999) and are thus able to accurately reflect individuals' feelings about their own lives.

That consensus extends outside the community of behavior science researchers. The Organisation for Economic Co-operation and Development (OECD, 2013) reports that LS measures are valid and reliable, and can be useful to inform policy-making. And economists have also begun to accept LS as a 'proxy' for measures of utility, previously assumed to be only measurable on an ordinal scale. Kristoffersen (2010) found that the theoretical and empirical basis for assuming cardinality (of LS measures) is strong[4] and according to Frey, Luechinger, and Stutzer (2009) the measurement of individual welfare, using data on reported life satisfaction, has made great progress and has led to a new field of research in economics (particularly that which focuses on the 'value' of non-priced goods and services).

1.3 Applied LS studies – General overview

At the risk of oversimplifying what can be a complex task, empirical researchers interested in assessing the contribution of various factors to LS often assume that reported LS is a function of 'true' LS, and that 'true' LS is determined by a range of different factors (*X*'s) – e.g. income,

[4] Although more research may be required to confirm.

age, gender. The relationship between life satisfaction and these other factors is then modelled as:

$$\boldsymbol{LS_i} = \propto + \boldsymbol{\beta_1 X_{1i}} + \boldsymbol{\beta_2 X_{2i}} + \cdots + \boldsymbol{\varepsilon_i} \quad (1)$$

where

LS_i is the average life satisfaction of individual i

X_{ji} is a set of indicators that are expected to explain LS_i and

ε_i is the error term

the relationship between life satisfaction and various life domains can be represented using an additive specification of the LS function (Rojas, 2006b)

The core challenges facing these researchers thus revolve around determining how to (a) measure LS; (b) identify factors (the X's) that influence LS, and (b) measure those factors. The following sub-sections address each of those issues in detail.

1.3.1 Measuring LS

As noted earlier, the terms 'happiness' and 'life satisfaction' are often used interchangeably, but there are important differences. More specifically, Hirata (2011) defines happiness as an inherently subjective, value-laden, and indeterminate, but nonetheless real, mental concept that cannot be separated from an underlying judgment. As such, happiness cannot be measured; what can be measured is a closely related psychological construct called life satisfaction.

Life satisfaction is usually measured in surveys (SDRN, 2005) – with most empirical researchers simply asking respondents direct questions about their overall life satisfaction. There are numerous different ways of framing the question, (Cummins, McCabe, Romeo, Reid, & Waters, 1997), the most common being to ask people a direct question such as: 'Taken all together, how would you say things are these days - would you say that you are very happy, pretty happy, or not too happy?' (Davis & Smith, 1991). Responses are most often recorded on a Likert scale – a key scale (Cantril's "Self-Anchoring Ladder") having been developed in

the mid-1950s and using a nine-rung ladder anchored at the top with "best life for you" and at the bottom with "worst possible life for you" (Diener, 2009)[5].

There are an almost infinite number of ways in which one can alter the wording of life satisfaction questions, subtly altering the essence of the data collected (e.g. 'How satisfied are you with your life as a whole?'; 'How satisfied are you with your overall quality of life?' (Michalos & Kahlke, 2010). Because different research organisations measure life satisfaction in different ways, measures cannot always be compared. According to Welsch (2009) some relevant surveys of life satisfaction are conducted within individual countries, such as the General Social Surveys in the U.S. or the German Socio-Economic Panel. Other surveys, like the Eurobarometer Surveys or the World Values Surveys, use a common format for eliciting life satisfaction for several countries, but there are only two large datasets, according to Organisation for Economic Co-operation and Development (OECD, 2013), that contain comparable measures of life satisfaction (Gallup World Poll and the World Values Survey) – although they do not contain official statistics (e.g. statistics published by government agencies).

1.3.2 Factors thought to contribute to life satisfaction

There is a large and growing body of research that seeks to learn more about the contribution which different factors (such as health, family and community, education and training, work, economic resources, housing, crime and justice, and culture and leisure) make to overall 'life satisfaction' (Ambrey & Fleming, 2011). Historically, most of these studies have focused on the relationship between LS and demographic factors such as income, gender, education, marital status, and age (Diener, 2009); they also considered other social, economic and health factors (Dolan, Peasgood, & White, 2008; Frey & Stutzer, 1999; Helliwell, 2003; Powdthavee, 2010). The focus on socioeconomic and demographic factors is, arguably, because LS research was a major research focus within the discipline of psychology for many decades (Guven, 2007) – with Warner Wilson, in 1967, being one of the first to consider factors that contribute

[5] The Cantril Ladder is one of the most common scales used to measure life satisfaction today, although there are other techniques. Frey et al. (2009), for example, identified two general methods: the Experience Sampling Method (ESM) and the Day Reconstruction Method (DRM). These measures are elicited in surveys, with the Experience Sampling Method (ESM) collecting information on individuals' actual experiences in real time in their natural environments, and the Day Reconstruction Method (DRM) asking people to reflect on how satisfied they felt at various times during the dayMeasures and measurement techniques are not independent of each other. For example, measures with an inherent time component are best captured by the ESM or DRM.

to an individual's happiness (wellbeing/life satisfaction). Wilson (1967), for example, found that a happy person is a "young, healthy, well-educated, well-paid, extroverted, optimistic, worry-free, religious, married person with high self-esteem, job morale, and modest aspirations, of either sex and of a wide range of intelligence".

Since Wilson's time there have been important contributions to the life satisfaction literature by sociologists (Veenhoven, 1993, 1999, 2000a) and political scientists (Inglehart, 1990; Inglehart, Foa, Peterson, & Welzel, 2008; Lane, 2000). More recently life satisfaction research has also been linked to economics (Frey, 2008), starting with the early contribution by Easterlin (1974). Currently life satisfaction research is a result of the integration among multiple disciplines, this often goes so far that it is not possible to identify whether a particular contribution is due to an economist, a psychologist, a sociologist or a political scientist (Frey, 2008).

Some examples of factors known to influence life satisfaction, for example include:

- Gender: a common finding is that men are less happy than women (Blanchflower & Oswald, 2004), although the difference is not great and some recent studies have found the reverse to be true (Ambrey & Fleming, 2011);
- Age: the relationship between age and LS is U-shaped, with life satisfaction reaching a minimum in a person's 30s and 40s (Blanchflower & Oswald, 2008);
- Marriage: improves a person's life satisfaction (Ambrey & Fleming, 2011). However, Blanchflower and Oswald (2004) found that second and subsequent marriages appear to be associated with lower levels of LS than first marriages;
- Children: evidence is mixed, although recent evidence suggests life satisfaction decreases as the number of dependent children increases (Ambrey & Fleming, 2011; Margolis & Myrskyl, 2011);
- Health: poor health invariably lowers life satisfaction (Frijters, Haisken-DeNew, & Shields, 2004);
- Employment: unemployment also decreases life satisfaction (Frijters et al., 2004) (Frijters et al., 2004);
- Education: the influence of education is not straightforward; most authors find that in developed countries, education has a negative influence on life satisfaction (Hartog & Oosterbeek, 1998; Shields, Price, & Wooden, 2009);

- Temperature: increases in the January minimum and July maximum temperatures emerge as amenities and increase life satisfaction (Brereton, Clinch, & Ferreira, 2008); another study found that higher mean temperatures in the coldest month and lower temperatures in the hottest month also rise life satisfaction (Rehdanz & Maddison, 2005); and a previous study found that high levels of humidity together with high temperature had a strong negative effect on life satisfaction (Frijters & Van Praag, 1998);
- Wind: wind speed affects life satisfaction negatively (Brereton et al., 2008);
- Sunshine: total annual sunshine is negatively related to life satisfaction (Brereton et al., 2008); another study found that number of sun hours increases life satisfaction (Frijters & Van Praag, 1998);
- Rainfall: increased rainfall slightly increases life satisfaction (Brereton et al., 2008); also people living in regions with many dry months would prefer more precipitation (Rehdanz & Maddison, 2005);
- Airport noise has a negative influence on LS (Van Praag & Baarsma, 2005);
- Natural disasters such as droughts (Carroll, Frijters, & Shields, 2009) and floods (Luechinger & Raschky, 2009; Tan et al., 2004) have a negative impact on life satisfaction;
- Scenic amenity (Ambrey & Fleming, 2011), and protected areas (Ambrey & Fleming, 2012) contributes positively;
- Air pollution - the most widely studied environmental condition – has a negative impact (Ambrey, Fleming, & Chan, 2014; MacKerron & Mourato, 2009; Welsch, 2002, 2006, 2007); and
- Geography, and other associated environmental features of the surrounding area can also influence LS (Brereton et al., 2008).

The key problem here however, is that one cannot include measures of every factor thought to influence life satisfaction within a single study. Given the large number of factors that have been found to influence life satisfaction (Lawton 1983; Cummins 1996), it is thus not surprising to find that researchers often group factors into discrete domains (e.g. social, economic, and environmental) – and then attempt to include at least some factors from each domain when assessing life satisfaction. The exact names and classifications of domains, however, differ across researchers (Cummins, 1997; Dolan et al., 2008), for example:

- The Personal Wellbeing Index consists of seven questions, collecting information relating to seven domains (responses are then aggregated, using equal weights to calculate an overall index (Group, 2006)).
    1. Standard of living
    2. Health status
    3. Achievement in life
    4. Personal relationships
    5. Personal safety
    6. Feeling part of a community
    7. Future security
- The OECD (2013) focused on ten life domains, using the seven from the Personal Wellbeing Index (above) and three additional domains:
    - Time to do what you like doing
    - Quality of the environment
    - Your job (for the employed)
- Van Praag, Frijters, and Ferrer-i-Carbonell (2003) use panel data from the German Socio-Economic Panel to estimate overall life satisfaction as a function of satisfaction with six specific life domains (job satisfaction, financial satisfaction, house satisfaction, health satisfaction, leisure satisfaction and environmental satisfaction), while controlling for the effect of individual personality.

Cummins (1997) reviewed 27 definitions of life satisfaction attempting to identify a common set of domains. He found that a clear majority of studies supported five domains (**Error! Reference source not found.**) although there is a high degree of overlap between the various factors associated with those domains (OECD (2013).

Table 1 Comparison of domains considered in life satisfaction studies

Domain	SSF	BLI	ONS	NZGSS	PWI
Economic	Economic insecurity		The economy		Future security
		Jobs and earnings	What we do	Paid work	
		Housing			
Social	Personal activities	Work and life balance		Leisure and recreation	
	Education	Education and skills	Education and skills	Knowledge and skills	
	Social connections	Social connections	Our relationships	Social connectedness	Personal relationships

Domain	SSF	BLI	ONS	NZGSS	PWI
	Political voice and governance	Civic engagement and governance	Governance	Civil and political rights	
					Community connectedness
Environment	Environmental conditions	Environmental quality	The environment	The environment	
				Culture identity	
Health	Health	Health status	Health (physical and mental)	Health	Personal health
Safety	Personal insecurity	Personal security	Where we live	Safety	Personal safety

Source: Adapted from OECD (2013)
The acronyms used in Table 1 are:
SSF: Sen, Stiglitz, Fitoussi - Commission on the Measurement of Economic Performance and Social Progress
BLI: OECD - Your Better Life Index
ONS: Office for National Statistics
NZGSS: New Zealand - General Social Survey
PWI: Personal Wellbeing Index

As noted earlier, most research on life satisfaction has been done by social scientists and in developed countries, so much of the literature has focused on the contribution which factors from the social and economic domains make to life satisfaction. This focus might also be due to the fact that social and economic data are usually relatively easy to access since government agencies and international organizations have been collecting it for a long time; until recently the environment domain has not been considered in detail (see Section 1.4, for a more detailed discussion). But despite the fact that there is ample evidence to suggest that different domains are likely to be important to people in different settings/contexts, few studies have sought to compare the contribution that t different domains (e.g. economic, social and environment) make to overall life satisfaction in different contexts (e.g. in both a developed and a developing country setting).

It is important to look beyond the developed world if seeking to understand the contribution of life satisfaction' domains to people's life satisfaction. According to a report by the Pew Research Centre (Simons, Wike, & Oates, 2014), while wealth is a key factor in life satisfaction, it is not the only one, and countries vary considerably in how happy they are; for example Latin American countries are much more satisfied than other nations – irrespective of the (generally) low per-capita incomes. The report also finds that countries prioritize a few key essentials in life, including their health and being safe from crime, with financial security not far behind.

This issue thus identifies the first core research question addressed in my thesis.

> **RESEARCH QUESTION 1:** Do some domains appear to contribute more to life satisfaction in developed countries than in developing countries?

1.3.3 Measuring factors thought to contribute to life satisfaction

Not only do different research organisations focus on different life domains and/or 'factors' thought to influence life satisfaction, but they also tend to measure factors using different types of indicators (or variables). For example, two researchers may both agree that one should include a measure of income within an equation describing life satisfaction, but they may disagree about how to measure income – e.g. as individual income, household income, or using some other indicator/variable.

Of most interest to this thesis, is the fact that the indicators used to capture information about specific factors can be measured using subjective and/or objective data. Here, I define an 'objective' indicator as a quantitative fact (e.g. income is $50,000 per year; there were 200 crimes against property last year in the city) which can be externally verified. I define a 'subjective' indicator as being a report from individuals about their own perceptions and feelings (Dale, 1980) (e.g. How satisfied are you with your income? How satisfied are you with the government's operation?). LS – as normally measured in the literature – is an example of a subjective indicator[6].

Error! Reference source not found. (derived from Schneider, 1975) summarises some examples of the indicators that have been used previously.

Table 2 Examples of objective and subjective indicators

Subjective indicators	**Objective indicators**
Satisfaction with:	Income (e.g. per capita income)
Job	Environment (e.g. air quality)
Home	Health (e.g. reported suicide rates)
Money and Income	Education (e.g. school years completed)
Government operation	Participation and alienation (e.g. % population that voted)
Level of services	Social disorganization (e.g. reported robberies)
Constructed measure of total life satisfaction	

[6] When describing indicators used to capture information about specific factors that contribute to life satisfaction other researchers use terms such as: correlates or influential factors.

Historically, life satisfaction research has been dominated by the use of objective measures (see Jarvis, Stoeckl, and Liu (2016) who tabulated common indicators) and government data-collection agencies also generally rely on 'objective indicators' of life satisfaction[7] – but more recently, organisations have started to include a greater number of subjective indicators in their compilations (discussed in more detail in chapter 2). The OECD better life index (BLI from **Error! Reference source not found.**), for example, assumes that numerous factors contribute to a 'better life' including: income, housing, jobs, community, education, environment, civic engagement, help, safety, work-life balance and (self-reported) overall perception of life satisfaction. Each factor is measured using between one and four indicators – some of which are subjective and some of which are objective. **Error! Reference source not found.** lists the factors that have been measured using both types of indicators (see also, Table 5Table 6, in chapter 2, which summarises environmental indicators used in 5 different countries).

Table 3 OECD Better Life Index: Factors that are measured using both objective and subjective indicators

Domain	Factors	Objective indicators	Subjective indicators
Social	Civic engagement and governance	Percentage of the registered population that voted during an election	Consultation on rule-making
Environment	Environmental quality	Air pollution (PM10)	Satisfaction with water quality
Health	Health status	Life expectancy at birth	Self-reported health status
Safety	Personal security	Intentional homicides/ homicides rates	Self-reported victimisation/ assault rate

Interestingly, relatively little work has been done that considers in which contexts (or for which factors/domains) it is 'better' to use objective or subjective indicators (Dale, 1980; Oswald & Wu, 2010; Schneider, 1975), two notable exceptions being that of Schneider (1975) and Oswald and Wu (2010). Schneider (1975) found no evidence of a statistically significant relationship between a wide range of commonly used objective social indicators and the quality of life subjectively experienced by individuals in an urban environment. But a later study by Oswald and Wu (2010) reported at least some correspondence.

[7] Economists, unlike psychologists and sociologists, have traditionally also avoided using subjective indicators (Graham & Pettinato, 2001).

To be more specific, Oswald and Wu (2010) attempted to assess the extent to which collections of objective indicators of life satisfaction (such as those discussed above) help to explain observed differences in life satisfaction (measured directly by, for example, asking how satisfied people are with their lives). Their study examined life satisfaction across a random sample of 1.3 million U.S. inhabitants. Basically they compared stated life satisfaction with results from a previous study by Gabriel, Mattey, and Wascher (2003) that used objective indicators such as precipitation, temperature, wind speed, sunshine, coastal land, inland water, public land, National Parks, hazardous waste sites, environmental "greenness," commuting time, violent crime, air quality, student-teacher ratio, local taxes, local spending on education and highways and cost of living. They compared places, not people, and found that across the United States, the average life satisfaction in different places correlated well with objective indicators. Whether or not that correlation prevails in different countries / contexts and across a variety of different domains/factors stands as a worthy topic of investigation.

To the best of my knowledge no previous study has systematically compared life satisfaction models that have used objective and subjective indicators in different contexts. We thus do not know which types of indicators (objective or subjective) of which domains (e.g. for the economic, social or environmental domain), do a 'better' job of explaining differences in LS in different contexts (e.g. in a developed and a developing country setting). This issue thus identifies the second core research question addressed in my thesis.

> **RESEARCH QUESTION 2:** Which indicators (objective and/or subjective) best represent which domains when measuring the contribution of different domains to life satisfaction in different socio-economic contexts?

1.4 Life satisfaction and environment

Each individual's life satisfaction depends not only on that individual's consumption of private goods and services, but also on the quantities and qualities of the goods and services they receive from the natural environment, many of which are not bought or sold in the market (Freeman III, Herriges, & Kling, 2013). That is why GDP is not a good measure of wellbeing – because it focuses only on the goods and services that are exchanged in the market place. The life satisfaction approach offers a new way (compared to traditional non-market valuation methods such as contingent valuation – see Appendix A.1) to value the environment (Ferreira

& Moro, 2010; Welsch, 2009); and in a way that welfare and progress can be separated from consumption and growth (Gowdy, 2005). But if the concern is to take the natural environment into consideration there is still a lot to be done, since most of the international data collections that consider life satisfaction contain relatively few indicators from the environmental domain (see chapter two for a more complete discussion of this issue).

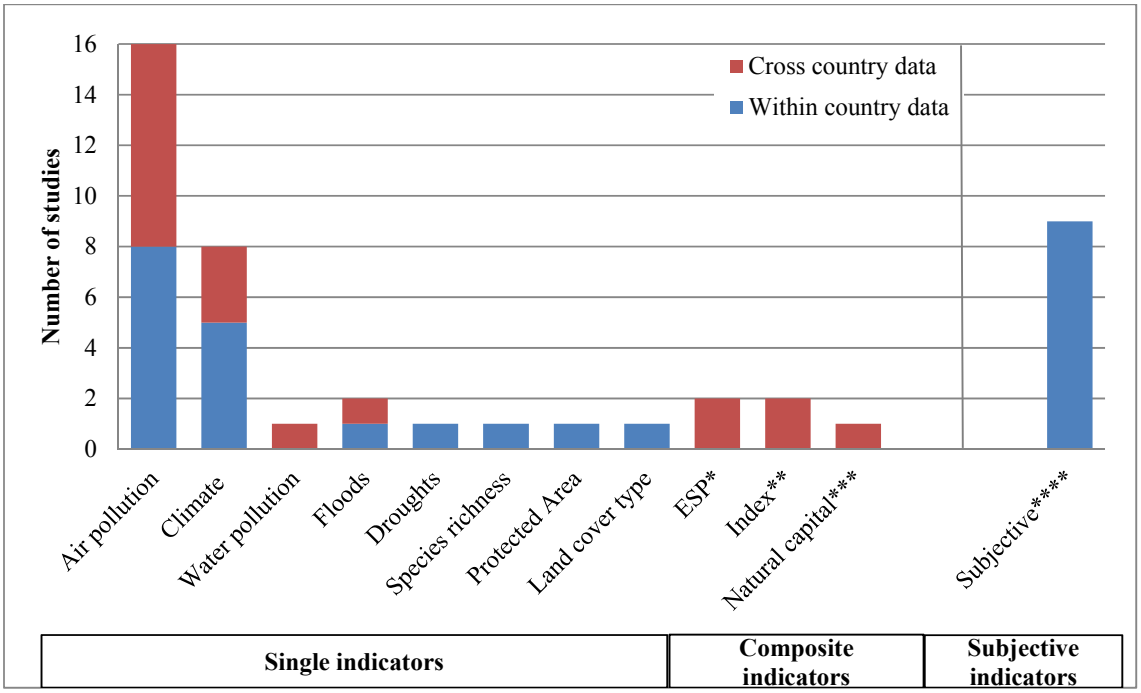
The United Nations Statistical Division (UNSD) is an important exception: working in cooperation with other organizations (such as the OECD, secretariats of international conventions and NGOs), they have led various working groups who have agreed on a list of environmental and socioeconomic indicators designed to help monitor progress (or otherwise) towards sustainable development. The UNSD is in charge of collecting international data in all countries (except country members of the OECD) using a questionnaire that has been revised several times. Core themes of the questionnaire used during 2004 were: water resources and pollution; air pollution; waste generation and management; and land use and land degradation. Since 2006, the questionnaire has focused mainly on water and waste, although the Division disseminates global environmental statistics on ten indicator themes compiled from a wide range of data sources. The themes are: air and climate; biodiversity; energy and minerals; forests; governance; inland water resources; land and agriculture; marine and coastal areas; natural disasters; and waste.

Having access to data about life satisfaction, and also about the environment, enables researchers to formally investigate the relationship between environmental indicators and wellbeing. Despite the fact that the relationship between the environment and human psychology is a long-established field of research, this particular line of enquiry is relatively new (Ferrer-i-Carbonell & Gowdy, 2007). Although economists have, for many decades, used non-market valuation methods to draw inferences about the contribution which the environment makes to individual wellbeing; this has generally been done using indirect expenditure and/or utility functions. Relative few economists have directly examined the relationship between life satisfaction and environmental issues, but examples do exist.

In an extensive review of articles from mainstream economics journals that studied life satisfaction and its determinants, I found 40 studies from 1998-2014 that investigate a broad group of environmental contributors to life satisfaction (see **Error! Reference source not found.**). I used the EconLit and Web of Science databases of bibliographic information to find

articles from 1998-2014 that included life satisfaction and environmental issues; I refined the search to only include articles that were from economics, psychology, behavioural, environmental and social sciences. In **Error! Reference source not found.** I grouped the studies according to the type of environmental issues they addressed; around 58% of the studies used within country data and only 23% used a type of subjective assessment of the environment – the large majority focused on objective indicators.

Figure 2 Studies on life satisfaction and environmental issues



* Ecosystem Service Product
**Environmental Sustainability Index and Environmental Performance Index
*** Natural capital per capita (World Bank, 2006)
**** Environmental attitudes (towards ozone, pollution and species extinction), urban species richness, air pollution, satisfaction with the quality of the environment, scenic amenity value, nature relatedness, nature connectedness, nature satisfaction and importance

In **Error! Reference source not found.** it can be observed that most researchers who have examined the role of the environment on life satisfaction have focused on air pollution and climate – using both cross-country and within-country (objective) indicators. This focus is likely to at least partially reflect the fact that air pollution and climate issues indicators are widely available, and are collected by Governments' agencies. The complete list of studies is included in Appendix A.2.

For climate the indicators most widely used are precipitation and temperature; these are indicators that are collected in most countries. Precipitation has been collected mostly as the annual average precipitation and temperature as the average temperature in the hot and cold months. Regarding air pollution, the indicator that has been used in most of the reviewed studies is the annual mean concentration of PM10 (micrograms per cubic meter). For location the indicators of proximity to the coast and a landfill or waste facility are the mostly used. And for subjective assessments of environmental issues the quality of the air was used in 5 of the studies that I reviewed.

There are other studies that are not specifically related to life satisfaction, but have focused on people´s interaction with nature such as access to green spaces, parklands and yards, and attitudes towards conservation. One study found that individuals that live in urban areas that have more green space present higher wellbeing (White, Alcock, Wheeler, & Depledge, 2013). Another study looked at how tree and native remnant vegetation cover within public parkland and residential yards varies across the socio-economic gradient, they found that most tree cover was provided on residential land, and was strongly positively related to socio-economic advantage while most remnant vegetation cover was located on public parkland, and this was only weakly positively related to socio-economic status (Shanahan, Lin, Gaston, Bush, & Fuller, 2014). Furthering this study, the authors investigated the role of trees and remnant vegetation in attracting people to urban parks, they found that park visitation rates reflected the availability of parks, suggesting that people do not preferentially visit parks with greater vegetation cover despite the potential for improved nature-based experiences and greater wellbeing benefits (Shanahan, Lin, Gaston, Bush, & Fuller, 2015). Lin, Fuller, Bush, Gaston, and Shanahan (2014) measured the importance of both opportunity and orientation factors in explaining urban park use; they found that while both opportunity and orientation are important drivers for park visitation, nature orientation is the primary effect. And regarding attitudes towards conservation, Pelletier, Legault, and Tuson (1996) were trying to validate the Environmental Satisfaction Scale (consists of two subscales measuring individuals' satisfaction with local environmental conditions and with government policies) and found that it does possess good psychometric properties, higher levels of dissatisfaction with both environmental conditions and with government environmental policies were associated with activism.

In short, compared to research that considers the importance of social and economic factors to life satisfaction, relatively little research considers the contribution of factors from the

environmental domain. When the environment is considered in life satisfaction studies, researchers tend to use indicators that describe environmental conditions – often at a fairly coarse geographic scale (e.g. air quality in a large city) with relatively little attention paid to the importance of local environmental factors (SDRN, 2005). Moreover, very little research has considered the interaction of individuals with the environment in different contexts (e.g. depending upon whether or not individuals are directly dependent upon the environment for their livelihoods – as is the case for farmers). Even though some government agencies are now regularly collecting data on LS, they do not always include environmental indicators when assessing the importance of various factors to LS. They instead tend to include proxies such as air pollution, which may in fact have a negative impact on the environment (which may thus reduce wellbeing). This issue thus identifies the third core research question addressed in my thesis

> **RESEARCH QUESTION 3:** Do environmental factors, other than those 'normally' considered (such as those relating to climate and pollution) contribute to life satisfaction?

1.5 Summary

The main aim of this thesis is to help identify simple indicators (and methods of measuring indicators) that could be used – alongside GDP – to better reflect genuine 'progress', to guide policy, and to inform policy makers about the effects of their decisions. I am primarily interested in the contribution which the environment makes to LS, but consider the environment relative to other factors known to be important, addressing three key research questions.

> **RESEARCH QUESTION 1:** Do some domains appear to contribute more to life satisfaction in developed countries than in developing countries?

> **RESEARCH QUESTION 2:** Which indicators (objective and/or subjective) best represent which domains when measuring the contribution of different domains to life satisfaction in different socio-economic contexts?

RESEARCH QUESTION 3: Do environmental factors, other than those 'normally' considered (such as those relating to climate and pollution) contribute to life satisfaction?

The material highlighted in this chapter, underscores a key point: namely that to date most of the research that has been done on life satisfaction has been undertaken within developed, western countries (Graham & Pettinato, 2001) (Camfield, 2004). Little in-depth research exists on life satisfaction in the developing world—especially among the poor and extremely poor (Cox, 2012). If income makes a diminishing marginal contribution to LS then one would expect income to be more important to the LS of individuals within a developing country than to individuals in a developed country. But other factors may still be important in developing countries (Graham & Pettinato, 2001). Hence the importance of exploring their relevance relative to income. In addition to directly address the research questions above, this thesis thus also contributes to the literature, by seeking to determine the extent to which the environment and other factors influence life satisfaction in both a developed and developing country (Australia and Costa Rica). Not only is that information, in itself, of interest, but insights from the analysis are useful to those interested in identifying a suite of indicators to complement GDP, capturing changes in factors known to impact life satisfaction in both developed and developing countries.

The case study sites I use in this study include Northern Territory and outback Queensland (Northern Australia), as well as Costa Rica. As highlighted in Table 4, both countries have relatively intact ecosystems and are both regions with similar 'happiness' rankings, but their socioeconomic context differs markedly. In stark contrast to Northern Australia (which covers an area of approximately 1.19 million km^2 – see chapter 4), Costa Rica is a very small (approximately 51,100 km^2) developing country located in Central America. The World Happiness Report of 2013 indicates that their happiness rankings are similar; Australia is number 10 in the world and Costa Rica number 12 (Helliwell, Layard, & Sachs, 2013)[8]. Choice of two such contrasting regions (described in more detail in chapters 3 and 4) enables me to

[8] This ranking is of each country in general, of Australia and Costa Rica, I will not be working with the whole countries but think it is important to set things into perspective. The case study area in Australia is in the Northern Territory and the north of Queensland, which has very different characteristics compared to the rest of the country which I will be describing in Chapter 3. And in Costa Rica I will be working with urban and rural residents; which I will explain in more detail in Chapter 4.

test models and hypotheses in two very different socio-economic contexts. Moreover, as noted by Pearce and Moran (1994): *"much of the world's threatened biological diversity is in the developing world, whereas the theory and practice of economic valuation has been developed and applied mainly in the developed world."* So the inclusion of Costa Rica as a case study makes a contribution by, and of itself to the literature.

Table 4: Indicators: Australia and Costa Rica

Indicators	**Australia**	**Costa Rica**
Population (millions)	23.49	4.76
Area (km2)	7,692,024	51,100
GDP (current US$ millions)	$1,453.770	$40.870
GNI per capita (current US$)	$64,680	$10,120
Life expectancy at birth, total (years)	82	80
Ranking of happiness (WHR,2012-2014)	10	12
(Terrestrial) Protected Areas (% area, 2010)	12.47	17.64
Marine Protected Areas (% waters)	28.3	12.2
Terrestrial PA (% of total surface area)	10.55	20.92
CO_2 emissions (kilotons, 2011-2015)	369,040	7,844
CO_2 emissions (tons per capita, 2011-15)	16.5	1.7

Sources: UN, IMF, World Bank, Happy Planet Index, OECD

The remainder of the thesis is structured as follows. A more complete review of literature relating to life satisfaction and the environment, and of government and other efforts to collect data relevant to life satisfaction and the environment is provided in Chapter 2. My core research questions are addressed in chapters 3 and 4 where I analyse data relating to life satisfaction in Costa Rica and Northern Australia. Chapter 5 summarises and synthesises key findings in a manner that allows me to answer each of my three key research questions. It also discusses some of the limitations of the research making associated suggestions for future work in this area. Finally, it discusses some wider implications of this research.

2 Chapter 2: Additional background literature

In this chapter, I present an expanded discussion of literature relating to life satisfaction, domains (particularly the environment) and indicators – focusing primarily on studies undertaken in my two case-study sites (Northern Australia and Costa Rica), but also contrasting that research with relevant research in the USA, UK and Ireland (chosen because more than one-half of the studies included in the review of **Error! Reference source not found.** were undertaken in the USA, UK, Ireland and Australia). Although primarily motivated by the desire to understand the research context in which my study is situated, insights from this review could be useful for many developing countries, which have adopted international conventions and treaties regarding sustainability, conservation and climate change, but which have not yet formally started to collect data on life satisfaction or on the contribution of the environment to life satisfaction.

For example, during the 1992 United Nations Conference on Environment and Development (in Brazil) most country members who attended (Costa Rica included) chose to adopt the international environmental agreements drawn up during that Conference. These include: the Convention on Biological Diversity (an international legally-binding treaty with an overall objective to encourage actions which will lead to a sustainable future[9]), the United Nations Convention to Combat Desertification, the United Nations Framework Convention on Climate Change; and the Johannesburg Plan of Implementation. Most countries are committed to reach the goals established by these conventions; creating a need for systems and measurable indicators (metrics) that can be monitored to determine if these goals have been reached. If countries use different measures of LS and/or different measures of the factors thought to influence LS, they are likely to come to different conclusions about who is doing well and who is doing badly, making it difficult to use information about LS, and factors thought to influence it, to inform policy decisions (Dolan & Peasgood, 2008) or to monitor progress towards those goals. Creating a better understanding of which countries are monitoring progress in which ways, is thus a useful exercise by, and of itself.

In the following sections I examine one country at a time (starting with Costa Rica and Australia, my case studies, and then moving on to the USA, the UK and Ireland). I begin by

[9] Many developed countries such as Australia, UK and Ireland, have ratified it, although the USA only signed it.

discussing the availability and breadth of data collected on life satisfaction and environmental indicators; I then discuss research within each country that has focused on the link between the environment and life satisfaction. I then compare and contrast that research across the five countries (section 2.6), using insights from that overview to highlight key knowledge gaps for the monitoring of 'sustainable' development in those countries in the concluding section of this chapter.

2.1 Costa Rica

2.1.1 Data collection on life satisfaction and environmental indicators

Researchers from the School of Mathematics at the University of Costa Rica (in Spanish Universidad de Costa Rica) lead an annual survey in which for the years 2004, 2006 and 2008 they have included questions on life satisfaction (Rojas and Elizondo-Lara (2012)). Their sample included 1900 respondents and the question used to measure life satisfaction was: "Considering everything in your life, how satisfied are you with life?" The domains of life included in the survey were the following: economic (economic situation); work (paid work); community (public community services); friendship (relationship with friends and neighbours); time (availability of free time for leisure activities), family (related to the partner and children); and other family (relationship with other family members). To the best of my knowledge, no other institutes gather or have gathered LS data.

Regarding environmental indicators, recently the National Institute of Statistics and Censuses (in Spanish Instituto Nacional de Estadística y Censos, acronym INEC) started gathering this information. According to their website the management of environmental statistics and indicators in Costa Rica, is done through an Ad Hoc Liaison Committee between the Ministry of Environment and Energy (in Spanish Ministerio de Ambiente y EnergíaI) and the National Institute of Statistics and Census. This Committee was formed expressly to consolidate a National Environmental Information System (in Spanish Sistema Nacional de Información Ambiental), as a basis for determining the state of the environment and natural resources and the development of public policies that are required for their protection. The environmental indicators mentioned on the Institute's website are the following: solid waste management; coverage, operators and use categories of water and sanitation. It is stated also that this process is not finished and that more indicators will be added in the close future.

Another institution from the Costa Rican Government, called State of the Nation Program (in Spanish Programa del Estado de la Nación, acronym PEN) also gathers statistics on environmental indicators. These indicators are of: land and forest; atmosphere; waste; energy consumption; and water and coastal marine resources. At first glance it seems as if both institutions are gathering the same information regarding waste and water; but they are not. The waste data collected by the National Institute of Statistics and Census regarding relates to the total houses per garbage disposal system; while the State of the Nation Program collects data on the average daily garbage entry per deposit. Regarding water, the National Institute of Statistics and Census gathers information about the type of water supply by region; and the State of the Nation Program collects information on: percentage of coverage of drinking water service; volume of surface water concession and the volume of water exploitation by wells. I did not find any studies that use life satisfaction and environmental indicators simultaneously.

2.1.2 Studies on the contribution which the environment makes to LS

To the best of my knowledge, there are no studies that relate the environment to life satisfaction in Costa Rica. A big step forward has been the collection of environmental indicators by national institutions which, if increased will help the studying of the relation between the environment and life satisfaction. However, there is a lack of life satisfaction indicators collected at the national level, which restrains research since researchers have to gather their own data or use the limited data form the School of Mathematics of the University of Costa Rica.

2.2 Australia

2.2.1 Data collection on LS and environmental indicators

The Household, Income and Labour Dynamics in Australia (HILDA) Survey, is a household-based panel study which began in 2001 and one of its key features is that it collects information about life satisfaction and a wide range of aspects of life known to influence LS. This includes information about family dynamics, economic and subjective indicators of wellbeing and labour market dynamics, household and family relationships, child care, employment, education, income, expenditure, health and attitudes and values on a variety of subjects, and various life events and experiences.

An important distinguishing feature of the HILDA Survey is that the same households and individuals are interviewed every year, which allows the gathering of important information on how life is changing (panel data). According to the Families, Incomes and Jobs, Volume 8 of 2013 report for the population as a whole the average life satisfaction has not changed much over the ten-year period, with average levels remaining at about 8 out of 10. In general, women reported slightly higher levels of life satisfaction than men.

Presented in the HILDA: Selected Findings from Waves 1 to 12 (full report can be found at: https://www.melbourneinstitute.com/downloads/hilda/Stat_Report/statreport_2015.pdf); these factors are summarized in nine topics: family life; economic wellbeing; labour market outcomes; health and subjective wellbeing; cognitive activity and cognitive ability; education and labour market outcomes; family background and economic wellbeing; expenditure on food; and sexual identity.

For each of the nine topics included in HILDA different indicators are collected and grouped in each topic; I will not go into details of each but I will present two examples. For the case of economic wellbeing, which is the main concern of HILDA, in addition to objective financial data (such as income), information is regularly collected on subjective indicators such as the experience of financial stress, the ability to raise funds at short notice, perceived adequacy of household income, savings habits, saving horizon, attitudes to financial risk and satisfaction with one's financial situation. Extensive information is also collected on the health and subjective wellbeing topic; it includes indicators on lifestyle behaviours, social activity and education participation of respondents; in addition to views and perceptions on a variety of life domains are elicited, including levels of satisfaction with these life domains. According to Wooden (2001), these domains are based on the seven domains by Cummins (1996); the indicators included within the personal questionnaire includes eight items which are:

(i) the home in which you live;
(ii) your employment opportunities;
(iii) your financial situation (included also in the economic wellbeing topic);
(iv) how safe you feel;
(v) feeling part of your local community;
(vi) your health;

(vii) the neighbourhood in which you live; and

(viii) the amount of free time you have.

The intimacy domain, however, which was represented by satisfaction with intra-family relationships, was removed to a separate question included within the self-administered questionnaire (Wooden, 2001).

Furthermore there is the Australian Unity Wellbeing Index (2002-2013), which is part of the Australian Unity Longitudinal Wellbeing Study from the Australian Centre on Quality of Life at Deakin University. According to their website (http://www.acqol.com.au/), the project started in early 2001 and the aim was of creating an index of perceived wellbeing for the Australian population. The Australian Unity Wellbeing Index investigates satisfaction with economic, environmental and social conditions in Australia, and gives insights into individual wellbeing. General population surveys are conducted from one to four times each year, each survey comprises 2,000 new respondents selected randomly on a demographically proportional basis and the data are collected by telephone using a call centre.

The Australian Unity Wellbeing Index uses two measurement tools to provide a simple comparison of wellbeing (Mead & Cummins, 2012). The first is the Personal Wellbeing Index (PWI); which asks survey participants to assess their satisfaction on a 0–10 scale across seven domains: standard of living; health; achieving in life; personal relationships; safety; community connection; and future security. And second, in addition to measuring personal wellbeing, the Australian Unity Wellbeing Index measures national wellbeing on issues such as satisfaction with the economic situation, government, social conditions, business, the environment and national security.

Regarding environmental indicators, the Australian Bureau of Statistics has an Environment Statistics Program which contributes to meeting the demand for comprehensive and coordinated information about Australia's environment, focusing on key themes such as: water; energy; land; waste and households; and the environment. The Information Paper: Towards the Australian Environmental-Economic Accounts of 2013 by the Australian Bureau of Statistics, explains that environmental policy decisions are particularly challenging because they need to consider both the contribution of the environment to wellbeing; and the way in which human interaction with the environment affects its capacity to support humanity's future wellbeing.

2.2.2 Studies on the contribution which the environment makes to LS

I found only 4 studies that have investigated the contribution of the environment to the LS or residents of Australia. All four studies were done at the individual level and addressed 5 types of environmental issues: droughts, scenic amenity value, proximity to Protected Areas, air pollution and nature satisfaction and importance.[10]

Carroll et al. (2009) investigated the cost of droughts by matching rainfall data from the Australian Bureau of Meteorology (BOM) and life satisfaction from the Australian Centre on Quality of Life based at Deakin University. They found that having very low rainfall during spring (this rainfall according to the authors is the most crucial for agricultural production) is negatively related to life satisfaction for the full sample, the effect is far larger for rural communities compared to urban.

Ambrey and Fleming (2011) used data from wave 5 of the HILDA survey and Geographic Information Systems (GIS) to examine the influence of scenic amenity on the life satisfaction of residents of South East Queensland (SEQ), Australia. They measured scenic amenity on a 10-point scale, and found that on average a respondent is willing to pay approximately AUD$14,000 in household income per year to obtain a one-unit improvement in scenic amenity. Ambrey et al. (2014) employed the life satisfaction approach to estimate the cost of PM10 exceedances from human activities in SEQ. The life satisfaction data was obtained from wave 1 of the HILDA survey and the air pollution data from The Air Pollution Model (TAPM) 4.0 developed by the Commonwealth Scientific and Industrial Organisation (CSIRO) and Marine and Atmospheric Research Group (Hurley, 2008). Ambrey et al. (2014) considered the following air pollution indicators: PM_{10}, $PM_{2.5}$, O_3, SO_2 and NO_2; PM_{10} is the pollutant that exceeds health guidelines in SEQ which makes it of highest priority to policy makers, hence the focus of the study. They found that PM_{10} concentrations within a respondent's collection district are negatively associated with life satisfaction.

The last study I found was done by McCrea, Shyy, and Stimson (2014) in which they compared satisfaction and preference measures in 4 broad types of urban environment in South East Queensland (SEQ). The urban environments studied were: affluent inner urban areas,

[10] I did not find any studies that jointly studied HILDA and PWI data.

disadvantaged suburban areas, retired coastal areas and family outer suburban areas. McCrea et al. (2014) used data from the 2003 Quality of Life Survey in SEQ, Australia. For environmental indicators they used subjective satisfaction measures and subjective importance measures of nature. Nature satisfaction was measured using a single item (rate the natural environment) and nature importance was the mean of 2 items: openness/spaciousness of area and close to natural areas (bush, creeks, beaches, etc.). McCrea et al. (2014) found that life satisfaction varied little between residents living in the different types of urban environments, similarly was the case for satisfaction with nature; the importance of nature varied significantly. For example, residents in disadvantaged suburban areas tended to place more importance to community than on access and nature.

2.3 United States of America (USA)

2.3.1 Data collection on LS and environmental indicators

The United States of America has had a Behavioural Risk Factor Surveillance System (BRFSS) since the 1980's; this system was created mainly to gather information regarding health but in 2005 is started including an optional module: Module 30: Emotional Support and Life Satisfaction. Even though the survey is intended to gather information about health it now also gathers information on life satisfaction; for example Oswald and Wu (2010) examine study examines the life satisfaction among a recent random sample of 1.3 million U.S. inhabitants using BRFSS data between 2005 and 2008.

More recently the American Time Use Survey (ATUS) included a life satisfaction module in 2010 and 2012. The purpose of including the module was to evaluate measures of self-reported wellbeing and offer guidance about their adoption in official government surveys. The ATUS mentions that the contribution of the information gathered could be used to inform policy in areas such as health care and transportation, there is no mention of anything related to the environment. According to the report of the National Research Council Panel on Measuring Subjective Well-Being in a Policy-Relevant Framework (2012), in a second wave of the survey (conducted in 2012), it included two additional questions, one on overall life satisfaction and one on whether or not recent emotional experience was typical. The life satisfaction responses were collected using the Cantril ladder scale.

There is also the General Social Survey (GSS) conducted by the National Opinion Research Centre (NORC) at the University of Chicago, which according to their website (www.norc.org) has been monitoring societal change and studying the growing complexity of American society since 1972. GSS questions include such items as national spending priorities, marijuana use, crime and punishment, race relations, quality of life, and confidence in institutions. GSS happiness results were used by Levinson (2012) in his study to value air quality.

The United States Environmental Protection Agency has an Environmental Dataset Gateway (EDG), which is a web-based metadata portal that supports the discovery of and access to the Environmental Protection Agency's environmental dataset resources. The data finder contains information regarding: air, chemicals, pesticides, pollutants and contaminants, soils and land, species, wastes and water, among others. These types of indicators are useful when trying to estimate the impact of environmental indicators on life satisfaction.

2.3.2 Studies on the contribution which the environment makes to life satisfaction

In the USA, I found 4 studies regarding the impact of environmental indicators on life satisfaction. Gabriel et al. (2003) studied, among other issues, the impact of air pollution on quality-of-life rankings on a state level. Vemuri, Grove, Wilson, and Burch (2009) investigated the relationship between life satisfaction and satisfaction with the quality of the environment at an individual and neighbourhood level. And Levinson (2012) studied air pollution and happiness at an individual level. Each of the studies used different datasets for life satisfaction and environmental indicators.

Levinson (2012) used the General Social Survey (GSS), which the National Opinion Research Centre conducts annually, which asks, "Taken all together, how would you say things are these days? Would you say that you are very happy, pretty happy, or not too happy?". The environmental indicators Levinson used pollution indicators from the EPA's Air Quality System (AQS) and for weather conditions data from the National Climate Data Centre. The main air pollution indicator used was airborne particulates smaller than 10 μm (PM10) (daily, previous day and average per county and year); and for weather conditions temperature (mean, squared and daily difference between the maximum and minimum) and rain (indicator and in inches). He found two main results: life satisfaction captures something meaningful about

people's circumstances (the quality of their daily local environments) and that pollution has a direct effect on people's welfare, at least on self-reported wellbeing.

Gabriel et al. (2003) used a comprehensive time-series of state-level ranking of quality-of-life, which is based on a set of location amenities. The environmental indicators were obtained from the Environmental Protection Agency's Air Quality System (AQS) and National Climate Data Centre. The environmental indicators included were: precipitation, humidity, heating degree days, cooling degree days, wind speed, and sunshine; proximity to an ocean or inland body of water; number of hazardous waste sites, acreage in federal lands, visitors to state and federal parks, and the index of environmental regulatory leniency; and air pollution (the levels of ozone and carbon monoxide). They found that elevated air pollution is one of the most important contributors to the deterioration in the quality of life in the states that recorded substantial deterioration in estimated quality-of-life ranks.

Oswald and Wu (2010), another study done in the USA, compared quality-of-life objective indicators from Gabriel et al. (2003) and life satisfaction indicators of the Behavioural Risk Factor Surveillance System (BRFSS) survey. They found a notable match between the fully adjusted life satisfaction levels and the objectively calculated Gabriel ranking; in other words, the life satisfaction and the objective indicators matched. This is one of the most recent studies that compare subjective and objective indicators of life satisfaction, and that also finds the results are similar. Previously, Schneider (1975) found no relation between the level of wellbeing found in a city measured by a wide range of objective social indicators and the quality of life subjectively experienced by individuals in the same city.

Vemuri et al. (2009) used the Baltimore Ecosystem Study (BES) survey which collected data in the Baltimore Metropolitan Region regarding neighbourhood life satisfaction, individual life satisfaction, number of trees, environment satisfaction, canopy cover and to capture water quality they use the benthic index of biotic integrity from the Maryland Department of Natural Resources. They worked on the individual and neighbourhood scale levels. They found that satisfaction with environmental quality contributes significantly to life satisfaction at both scale levels.

2.4 United Kingdom (UK)

2.4.1 Data collection on LS and environmental indicators

The Office for National Statistics of the United Kingdom established the Measuring National Wellbeing programme in 2010. On their website they justify the measurement of wellbeing by stating the following: "It has long been argued that the progress of the country should not be measured by looking just at growth in GDP. For a full picture of how a country is doing we need to look at wider measures of economic and social progress, including the impact on the environment."

The programme for measuring wellbeing began with a six month National Debate asking people 'what matters', to understand what measures of wellbeing should be included. From the debate around 73% of respondents mentioned the local and global environment as an important factor in wellbeing. The programme looks at wellbeing under three broad headings: economic, social and environmental wellbeing.

The United Kingdom also has the British Household Panel survey, which is a large household survey conducted by the Institute for Social and Economic Research of the University of Essex. According to their website (https://www.iser.essex.ac.uk/bhps), the survey started in 1991 and its main objective is to further the understanding of social and economic change at the individual and household level in Britain and the United Kingdom. In the dataset, all participating adult individuals respond to an individual questionnaire in which a life satisfaction and two environmental attitude questions are included (Ferrer-i-Carbonell & Gowdy, 2007).

According to the Office on National Statistics website, the environmental indicators that the United Kingdom collects are grouped in: air quality; climate change; environmental accounts; environmental impacts; land and inland waters; waste and recycling; and wildlife. According to the United Kingdom Statistics Authority's website the environment statistics are calculated mainly by the Department for Environment, Food and Rural Affairs.

The Office on National Statistics of the United Kingdom, in a release from November 7th, 2011 titled: *Air pollution and its impact on people's health and well-being* (part of the Measuring National Well-being, The Natural Environment), stated that environmental issues such as air

pollution, loss of green spaces, and waste from the process of producing and using natural resources are an important consideration when looking at wellbeing. In fact, the natural environment is one of the measures in the Office for National Statistics' Measures of National Wellbeing programme.

2.4.2 Studies on the contribution which the environment makes to life satisfaction

Even though there is limited evidence relating the natural environment and life satisfaction, in the case of the United Kingdom there are relatively more studies. I found 4 studies that used life satisfaction and environmental issues. The most recent one was done by MacKerron and Mourato (2013), they used a smartphone application to conduct a brief questionnaire to explore the relationship between momentary (at the exact moment) LS and the individual's immediate environment. Another study was done by Ballas and Tranmer (2012) using data from the British Household Panel Survey and the population Census. They tried to determine if the variations in life satisfaction depend on the surroundings, the household or the individual's characteristics; although they did not attend an environmental issue specifically it is important to mention that proximity and location are often indicators used with environmental issues in some studies (Ambrey & Fleming, 2011, 2012; Brereton et al., 2008; Ferreira & Moro, 2010, 2013; Ferreira, Moro, & Clinch, 2006; Gabriel et al., 2003; MacKerron & Mourato, 2013; Maddison & Rehdanz, 2011; Moro, Brereton, Ferreira, & Clinch, 2008).

MacKerron and Mourato (2009) did a study for which they collected primary survey data, in this case to assess the use of environmental quality data at a very high spatial resolution to examine connections between life satisfaction and air quality. They found that life satisfaction is significantly negatively associated both with subjectively perceived levels of air pollution and with air pollutant measurements at a very high spatial resolution. Fuller, Irvine, Devine-Wright, Warren, and Gaston (2007) did research in Sheffield, U.K., by conducting semi-structured interviews with 312 green space users and collecting data on species richness (woody and herbaceous plants, butterflies and birds). During the interviews they asked respondents about their perceptions of green space species richness. Similar to MacKerron and Mourato (2009), they also used an objective and a subjective indicator of the same environmental issue. Fuller et al. (2007) found a positive association between the species richness of urban green spaces and the life satisfaction of green space visitors in Sheffield.

The other study I found was done by Ferrer-i-Carbonell and Gowdy (2007), they used the British Household Panel Survey of 1996 and looked at the relationship between LS and individual environmental attitudes toward air quality (ozone layer specifically) and animal extinction. They found a negative link between concern about the ozone layer and LS; and a positive link between concern about biodiversity loss and LS.

2.5 Ireland

2.5.1 Data collection on LS and environmental indicators

The Central Statistics Office of Ireland is the institution in charge of measuring the quality of life in this country. A social partnership agreement between 2003 and 2005 requested the Central Statistics Office to support a move towards evidence based policy making with the emphasis on disaggregation by key domains such: population, housing, lifestyles, transport and travel, health and care, education, economy and environment. The National Statistics Board further requested that the Central Statistics Office provide a comprehensive set of social indicators. This was the background to the production of the first report on the Regional Quality of Life in Ireland in 2008, and then a second and last report in 2013. Prior to this, as far as I am aware, there was no focus on life satisfaction by the Central Statistics Office.

The other life satisfaction data that I found available from Ireland was from the Urban Institute Ireland National Survey on Quality of Life, for which a representative sample of 1,500 men and women aged 18 and over and living in Ireland were interviewed in 2001 (Brereton et al., 2008; Ferreira & Moro, 2010, 2013; Ferreira et al., 2006; Moro et al., 2008). More recently, the Survey of Lifestyle, Attitudes and Nutrition in Ireland (SLÁN); it was first undertaken in 1998 and repeated again in the 2002 and 2007 (Barry et al., 2009). The SLÁN 2007 survey was commissioned by the Department of Health and Children, involved face-to-face interviews at home addresses with 10,364 respondents (62% response rate), aged 18 years and over; full details are given in the SLÁN 2007 Main Report (Morgan et al, 2008); but this survey was mainly focused on health and I couldn't find any studies that used this data for life satisfaction purposes.

According to the 2012 release of Environmental Indicators of Ireland from the Central Statistics Office; in comparison with social and economic statistics, the environment domain is undeveloped in terms of depth and coverage. A total of 92 indicators covering nine separate

domains were selected for the publication. The nine domains are: air; greenhouse gasses and climate change; water; land use; energy; transport; waste; biodiversity and heritage; and environmental economy. The following publication in 2014 also included the same nine domains; and mainly found that there is better air quality, improved drinking water quality, increased recycling of packaging waste, an increase in the use of renewable energy and an increase in the numbers of low emission vehicles. The datasets on the environment that were used in the studies I reviewed from Ireland are from Collins and Cummins (1996), Environmental Protection Agency (EPA, 2005) and Urbis Database (UII, 2006). All the studies were done at the individual level.

2.5.2 Studies on the contribution which the environment makes to life satisfaction

For the case of Ireland I found 4 studies which measured the contribution of the environment to life satisfaction, the difference to the other countries we looked at is that all 4 studies used the same datasets.

The first study I found was done by Ferreira et al. (2006) in which they linked respondents' life satisfaction to their objective living circumstances at a very high level of disaggregation using Geographic Information System (GIS) to overcome difficulties that have prevented previous researchers to address this issue comprehensively. They were specifically interested in 2 environmental issues: air pollution, and climate. For the air pollution indicator they used the annual mean ambient mass concentration of PM10 in micrograms per cubic meter indicator. The climate indicators used were: January mean daily minimum air temperature, July mean daily maximum air temperature, mean annual precipitation, mean annual duration of bright sunshine and mean annual wind speed (from Collins and Cummins (1996)). And they also used location indicators such as proximity to a: Natural Heritage Area, blue flag beaches, seriously polluted rivers and waste facilities. A total of 9 environmental indicators were used. Ferreira et al. (2006) found that the warmer climate in winter affects life satisfaction positively, the vicinity to seriously polluted rivers is negatively related to life satisfaction and that being exposed to local air pollution also reduces significantly individual's life satisfaction.

Another study about Ireland was done by Brereton et al. (2008), they looked at the way in which geography and the environment influence happiness. Similar to Ferreira et al. (2006) they also used proximity measures to examine if the influence of spatial amenities on life

satisfaction is a function of the distance to the amenities. Brereton et al. (2008) were mainly interested in climate, the indicators they used were: precipitation, wind speed, January minimum temperature, July maximum temperature and average annual sunshine (hours). For proximity they used proximity to: landfill, hazardous waste facility, coast and beach, among others. Finally, they found that the explanatory power of their LS function increases when spatial variables (e.g. distance) are included; which according to them indicates that the geography and the environment have a larger influence on life satisfaction than previously thought.

Ferreira and Moro (2010) revisited climate and air pollution effects on life satisfaction. For this study they dropped mean annual duration of bright sunshine and mean annual wind speed; and regarding proximity indicators they only used 3, proximity to: severely polluted river, landfill and coast. In this case they found that the factors that affect life satiscaction are warmer temperatures (positively) and local mass concentration of PM10 (negatively). And finally Ferreira and Moro (2013) revisit the same data but in this case they group individuals by their level of income. They found no evidence that the marginal utility of environmental factors increases monotonically with income; if anything, the life satisfaction of the poor seems to be most negatively affected by air and water pollution (Ferreira & Moro, 2013).

2.6 Australian and Costa Rican research contrasted with other nations

In this section I compare what the governments of the UK, the USA and Ireland are doing, with that of my two case study countries (Australia and Costa Rica). Interestingly, all 5 countries are using a subjective indicator of life satisfaction – asking people about their overall life satisfaction. They each use a different question to ask about life satisfaction, they each include different domains and most use both subjective and objective indicators for the different domains; these can be observed in

Table 5. Likewise, environmental indicators have been gathered in all 5 countries.

Table 5 is a summary of the main findings regarding life satisfaction, domains, types of indicators and environmental indicators that I found for each case study.

Table 5 Case studies: instrument, life satisfaction, domains, type of indicators and environmental indicators

Case Study	Instrument	Life satisfaction	Domains	Type of indicators	Environmental indicators
USA	Behavioural Risk Factor Surveillance System (BRFSS)	1. How often do you get the social and emotional support you need? 2. In general, how satisfied are you with your life? [11]	The BRFSS is mainly focused on the health domain, and it included life satisfaction	Health: both objective and subjective	Air, chemicals, pesticides, pollutants and contaminants, soils and land, species, wastes and water, among others
	Subjective Well-Being Module of the American Time Use Survey (ATUS)	Overall life satisfaction and whether or not recent emotional experience was typical.[12]	SWB module of the ATUS is linked to the Current Population Survey (CPS), which covers several domains	Both, for example the CPS asks about objective indicators about their jobs while the SWB asks about the quality of their jobs	
UK	British Household Panel Survey	In general, how satisfied are you with your life as a whole these days?[13]	Several domains such as social, economic, health and environment	Both, objective (household income) and subjective(satisfaction with household income)	Air quality; climate change; environmental accounts; environmental impacts; land and inland waters; waste and recycling; and wildlife
	Office for National Statistics Annual Population Survey	Overall, how satisfied are you with your life nowadays?[14]	10 domains, such as health, education and natural environment	Both, objective (for example, healthy life expectancy) and subjective(for example, satisfaction with health)	
Ireland	Urban Institute Ireland National Survey on Quality of Life	Thinking about the good and the bad things in your life, which of these answers best describes your life as a whole? (year 2001) [15]	8 domains; e.g. population, housing, lifestyles, and environment	Most use objective indicators	Air; greenhouse gasses and climate change; water; land use; energy; transport; waste; biodiversity and heritage; and environmental economy
Australia	Household, Income and Labour Dynamics in Australia (HILDA)	All things considered, how satisfied are you with your life?[16]	Based on Cummins (1996) mainly 7 domains	Both	Water, energy, land, waste and households, and the environment

[11] Scale 1-4 (Very satisfied, satisfied, dissatisfied and very dissatisfied)
[12] Using a 10-point scale (Cantril ladder scale)
[13] Scale 1-7 (1 = Completely dissatisfied; 7 = Completely satisfied; 4 = neither satisfied nor dissatisfied)
[14] Where 0 is 'not at all satisfied' and 10 is 'completely satisfied'
[15] Scale 1-7 ("As bad as can be", "very bad", "bad", "alright", "good", "very good", and "as good as can be")
[16] Scale 0-10 (Pick a number between 0 and 10 to indicate how satisfied you are)

Case Study	Instrument	Life satisfaction	Domains	Type of indicators	Environmental indicators
Costa Rica	School of Mathematics, Universidad de Costa Rica	Considering everything in your life, how satisfied are you with life?[17]	7 domains: economic, work, community, friendship, time, family and other family	Subjective for life satisfaction and domains; and objective for sociodemographic	Solid waste management; coverage, operators and use categories of water and sanitation, land and forest; atmosphere; waste; energy consumption; and water and coastal marine resources

Just because a country collects data on environmental indicators, does not mean that the government includes those indicators in assessments of well-being. The USA, for example, does not include any environmental indicators in its national datasets regarding wellbeing – despite much research demonstrating the link between environmental indicators (such as air pollution) and wellbeing.

It is also interesting to note that many countries consider only 'negative' environmental indicators (e.g. air pollution); they neglect the 'positive side' of the environment (e.g. green spaces, frequency of interaction, etc.) and may thus be missing key pieces of information. The UK has done a very good job in including these kinds of indicators.

Ireland does not measure life satisfaction; instead it measures quality of life which is very similar to asking people about their life satisfaction. Some studies, such as Brereton et al. (2008), have used local life satisfaction data and have merged it with detailed geographical information of the area in which the respondents live,or have collected their own data. The 4 studies I reviewed from Ireland used the Urban Institute Ireland National Survey on Quality of Life data conducted in 2001, in which the life satisfaction scores are based on the answers to the following question: 'Thinking about the good and the bad things in your life, which of these answers best describes your life as a whole?'.

Australia regularly monitors life satisfaction and communities have participated in scoping studies to determine which factors should be included in these assessments—very similar to the UK. An important point is that Australia has plenty of biodiversity indicators by location that could be included for future research (e.g. land cover).

[17] Scale 1-7 (1 = Completely dissatisfied; 2= 7 = Completely satisfied; 4 = neither satisfied nor dissatisfied)

Regarding environmental indicators, most of the studies I reviewed that used data from the USA, UK, Ireland or Australia focused on air pollution and used objective indicators. In Table 6, it can be observed that only 4 studies reported a statistically significant link between life satisfaction and subjective environmental indicators. The subjective environmental indicators used were: satisfaction with the environment, whether the individual cares about the ozone layer and animal extinction, perceptions of scenic amenity, and people's perceptions of the importance of nature and their satisfaction with it.

Generally the measurement of life satisfaction is done at an individual scale; here it is important not to confuse the measurement with the type of responses, which in most cases is done on a Likert type scale (e.g. 0 to 10 or 1-7). In most cases the indicators used with life satisfaction are also measured on an individual scale, such as income and age. But when it comes to environmental indicators the measurement scale is usually not done at an individual level, since most are collected at a state or national level. Some studies have found that using different scales can lead to different results, and recommend that future research should match the "scale" of life satisfaction measurements with the explanatory variables used (Vemuri et al., 2009). Because of this I was also interested in the spatial scale the studies were using for their environmental indicators, and I found that most of the studies in Table 6 used the individual scale (e.g. one indicator per person). Only one study in the USA used neighbourhood (e.g. city block or street that people currently live in, and several blocks or streets in each direction are grouped into a neighbourhood) scale (Vemuri et al., 2009) and one in Ireland used county scale (Moro et al., 2008). Resources such as geographic information system (GIS) allows to match individual responses on life satisfaction with local environmental indicators; or to group life satisfaction responses per neighbourhood or county and match with neighbourhood or county level indicators.

Table 6 Country studies, LS and environmental indicators

Country	LS indicator	Environmental issue	Environmental indicators	Spatial scale
United States of America	Quality of life	Air pollution	Levels of ozone and carbon monoxide	States
	Life satisfaction	Satisfaction with the environment	Environment satisfaction: 10 very satisfied to 0 very dissatisfied	Individual and neighbourhood
	Happiness	Air pollution	PM10 daily and average PM10 by county and year	County

Country	LS indicator	Environmental issue	Environmental indicators	Spatial scale
United Kingdom	Life satisfaction	Environmental attitudes	Individual cares about ozone layer and animal extinction	Individual
	Wellbeing	Urban species richness	Species richness of: woody and herbaceous plants, butterflies and birds sampled within quadrats in each greenspace	Greenspaces
	Life satisfaction	Air pollution	Perceived levels of air pollution and NO2	Individual
	Happiness	Land cover type/ Climate	Land cover type and rain (using the GPS location data)	Individual
Ireland	Life satisfaction	Air pollution	Annual mean ambient mass concentration of PM10 in micrograms per cubic meter	Zones[18]
	Life satisfaction	Climate	Wind speed, January minimum temperature and July maximum temperature	Electoral division
	Life satisfaction	Climate	Mean annual duration of sunshine and mean annual wind speed	County
	Life satisfaction	Air pollution	January mean daily minimum temperature, July mean daily maximum temperature and annual mean concentration of PM10	Electoral division
	Life satisfaction	Climate	January mean daily minimum temperature, July mean daily maximum temperature and annual mean concentration of PM10	Electoral division
Australia	Life satisfaction	Droughts	Less than 60 mm of rainfall in spring	Postcode level
	Life satisfaction	Scenic amenity value	Level of scenic amenity on a scale 1 to 10	Individual
	Life satisfaction	Protected Areas proximity	Percentage of protected area within the individual's Statistical Local Area (SLA)	Individual
	Life satisfaction	Air pollution	Annual average number of days of PM10 exceedances	Individual's collection district[19]
	Quality of life	Nature satisfaction and importance	Nature satisfaction: 5-point scale from 5 very good to 1 very poor. Nature importance: mean of 2 items, openness/spaciousness of area and close to natural areas	Individual

[18] They are Dublin city and environs (zone A), Cork city and environs (zone B), 16 urban areas with population greater than 15,000 (zone C) and the rural areas in the rest of the Country (zone D).

[19] The collection district (CD) is the smallest spatial unit in the Australian Standard Geographical Classification: Australian Bureau of Statistics, 2010 (http://www.abs.gov.au/websitedbs/D3310114.nsf/home/Australian+Standard+Geographical+Classification+(ASGC)

2.7 Summary and overview of research approaches used within case-studies

Globally, GDP is the most well-known indicator of economic growth; but it does not measure economic welfare or *genuine progress*. Other methods of assessing genuine progress exist, but it can be difficult to collect enough data to populate these indicators – particularly those requiring one to convert all metrics into monetary measures to facility aggregation. So research that considers wellbeing directly, may have much to offer: if we can determine which factors contribute most/least to overall life satisfaction (welfare) then we can identify indicators which could usefully supplement more commonly used statistics, giving better guidance to those wanting to improve social welfare.

Countries throughout the world now routinely collect such indicators –but there is no universally accepted suite of indicators, nor guidelines on how to measure the indicators. In this chapter, I reviewed indicators used in the USA, the UK and Ireland (accounting for more than 40% of indicator research – as identified in Figure 2), contrasting those with the indicators used in my two case-study sites (Northern Australia and Costa Rica). I considered indicators of life satisfaction in general, indicators of satisfaction with particular life domains (focusing specifically on the environmental domain) and research relating the environment to life satisfaction.

First, I found that life satisfaction is usually measured in surveys (SDRN, 2005) – with most empirical researchers simply asking respondents direct questions about their overall life satisfaction. Second I found that the set of domains included are diverse, but the most usual ones are social and economic. Third I found that the types of indicators used to measure the impact of different domains on life satisfaction can be objective or subjective. Fourth, I found that the environmental domain is relatively under-represented in suites of indicators. Despite the fact that the relationship between the environment and life satisfaction has been long acknowledged (e.g. within the environmental economics literature), studies that seek to estimate direct links between LS and the environment (rather than indirect, through for example, willingness to pay) are a relatively new line of enquiry (Ferrer-i-Carbonell & Gowdy, 2007).

Developed countries such as the USA, UK, Ireland and Australia have established their own measurements of life satisfaction by their governments; in Costa Rica instead it was done by one institution and just for three years (2004, 2006 and 2008). However, there is now more acceptance in using life satisfaction data and a great amount of research has been done by asking people directly how satisfied they are with their lives or how happy they feel overall. However, each country has developed their own question, they are all different and each country uses different answering scales.

Each nation uses a different set of domains to explain life satisfaction, ranging from just one domain (the Behavioural Risk Factor Surveillance System (BRFSS) in the USA which only considers the health domain) to 10 domains (Office for National Statistics Annual Population Survey in the UK). As mentioned previously since there are no set guidelines most studies come up with their own set of domains; but the social and economic domain seem to be present in most cases probably because the indicators included in both domains are widely available in most countries. For both my case studies I thus choose to include the social, economic and environment domains, and specifically for Costa Rica I also include the health and safety domain which I explain in more detail in Chapter 3.

Regarding types of indicators, most countries do not collect both objective and subjective indicators for the same domain; this means one cannot assess which type is better. Only one survey from the USA (the SWB module of the ATUS) and both surveys from the UK (British Household Panel Survey and the Office for National Statistics Annual Population Survey) collect both types of indicators for the same domains. Potentially these datasets could be used in the future to measure the impact of both type of indicators from each domain on life satisfaction. In both of my case-study regions, I thus test the use of both objective and subjective indicators from each selected domain, seeking to determine which, if any, is most strongly associated with indicators of overall life satisfaction.

Regarding the environment domain, I found that most researchers who have examined the role of the environment on life satisfaction have focused on air pollution and climate – using both cross-country and within-country (objective) indicators (see Figure 2). There are only a few studies that have used subjective environmental indicators (Ferrer-i-Carbonell & Gowdy, 2007; MacKerron & Mourato, 2013; Nisbet, Zelenski, & Murphy, 2011). From all the studies I reviewed the indicator of precipitation was the most widely used (in 15 studies), followed by

temperature (in 13) and annual mean concentration of PM10 (in 12). The first two indicators are related to climate and the last one to air pollution. These indicators seemed to be the most widely available; they are collected by Government agencies for other purposes like monitoring climate and pollution; especially because most countries (like Costa Rica and Australia) have signed international conservation agreements and have committed to reporting, planning, clarifying policy objectives and priorities, budgeting, and assessing performance to measure environmental progress (OECD, 2008).

Below, I re-state my three core research questions, using the additional insights gleaned form literature discussed in this chapter, to more clearly articulate the general methodological approaches I use to address each.

> **RESEARCH QUESTION 1:** Do some domains appear to contribute more to life satisfaction in developed countries than in developing countries?
>
> When answering this question, I focus primarily on three domains: social, economic, and environmental, examining the statistical significance of the relationship between indicators form each domain, and an overall measure of life satisfaction. This is fewer than the number of domains which social scientists often consider when exploring factors influencing life satisfaction (between five and seven). As such, my results do not provide as much detailed information about social and economic domains as other studies. But by excluding detailed information about the social and economic domains, I am able to broaden the investigation to also consider the environmental domain.
>
> In the Northern Australian case-study (Chapter 4) I focus on the three domains, paying more attention to the environmental domain since the case study is focused on land managers and they are dependent on the environment for their profits. In the Costa Rican case-study I also include two additional domains: health and safety; the literature suggests that people in developing countries prioritize a few key essentials in life, including their health and safety.
>
> To be more specific, life satisfaction has been linked to people living long and healthy lives; even though people in Costa Rica, on average, live long lives they face different challenges than people in developed countries such as Australia. According to the Health Index (http://hdr.undp.org/en/content/health-index) which is one of the

components of the Human Development Index (HDI), measured by the life expectancy at birth expressed as an index using a minimum value of 20 years and a maximum value of 85 years in 2013: for Australia life expectancy at birth is 82.5 years (very high human development) and for Costa Rica it is 79.9 years (high human development). Overall Australia's HDI score in 2013 was 0.933 (ranked number 2) and Costa Rica's score was 0.763 (ranked number 68).

Costa Rica – similar to Australia – has a 'universal' health care system (which provides health care and financial protection to all citizens), but being a developing country this system is about to collapse (http://www.ticotimes.net/2011/04/15/costa-rica-s-public-health-system-in-critical-condition). Some studies have found that in countries with generous social security schemes people are not healthier or happier than in equally affluent countries where the state is less open-handed (Kirkcaldy, Furnham, & Veenhoven, 2005; Veenhoven, 2000b). For example the USA is a nation that substantially invests in health care and is not yielding returns in terms of public satisfaction with the health care system (Davis et al., 2007). Since Costa Ricans, especially the ones on lower incomes might not be able to afford private health care and are probably not getting the medical treatment or attention that they need their health could have a negative effect on their life satisfaction and hence it is important to monitor it.

The other domain that I included in the Costa Rican case study is safety. Another component of the HDI is the Homicide Rate (per 100.000 people, years 2008–2011) (http://hdr.undp.org/en/content/homicide-rate-100000), which is the number of unlawful deaths purposefully inflicted on a person by another person; Australia's score is 1.1 (very high human development) and Costa Rica's score is 10.0 (low human development). Recently Costa Rica's crime rate has hit a record high; after 2010 homicides dropped until reaching a low of 407 in 2012, killings started increasing up to 411 in 2013 and 477 in 2014 (http://www.ticotimes.net/2015/12/15/costa-rica-homicide-rate-hits-record-high). The effect of the crime rate or the number of homicides on life satisfaction has had mixed results. One study found that being burglarized has a large and significant effect on a victim's overall life satisfaction, neither county-level crime rates nor neighbourhood safety appear to have very large effects on daily life satisfaction for the average American(Cohen, 2008). Another study,

in South Africa, found that respondents from victimized households report a substantially lower life satisfaction score, on average, than those from non-victimized households; and that crime on others in the area is associated with lower levels of perceived quality of life for the respondents from non-victimized households (Powdthavee, 2005). For this study case I decided given that safety seems to be an issue in Costa Rica, and that studies have shown that it has an effect on life satisfaction that it was important to include it; such safety concerns are not a significant issue in the Australian outback (the location of my other case study).

.

RESEARCH QUESTION 2: Which indicators (objective and/or subjective) best represent which domains when measuring the contribution of different domains to life satisfaction in different socio-economic contexts?

Recognising that no single approach was likely to be 'best' in all situations, I chose to use both subjective and objective indicators from each domain in both case studies and in different models, comparing the statistical performance of each. Details of indicators and tests used in those comparisons are provided in the relevant chapters.

RESEARCH QUESTION 3: Do environmental factors, other than those 'normally' considered (such as those relating to climate and pollution) contribute to life satisfaction

By testing to see if indicators of environmental condition affect the life satisfaction of people in different contexts, this work generates insights about people's relationship with the environment which can be used to help devise more appropriate policies that can help improve the conservation of the natural environment (which, since it contributes to life satisfaction, will also improve life satisfaction). The Northern Australian case study focuses exclusively on farmers (land managers), who depend upon their land for livelihoods; this is not so for all respondents in the Costa Rican case study, where I do not only consider the condition of the environment, but also people's interaction with the environment. The two case-studies thus offer new, context specific insights into the contribution which the environment makes to people's wellbeing.

Specific methods are discussed in detail in relevant chapters (2.7 and 4), but to briefly summarise here: I use the life satisfaction approach (LSA) to measure life satisfaction and regressions to assess the extent to which different factors contribute to it. This approach uses surveys in which respondents are asked to evaluate their overall satisfaction with life (Ferreira & Moro, 2010). I also use survey data relating to life satisfaction and to domains that are known to influence life satisfaction. For each domain I use objective indicators such as income, education, and employment, together with subjective indicators for similar factors (based on direct reports from individuals about their own perceptions and feelings (Dale, 1980)). I also include environmental indicators (relating to the quality of the environment and to people's interaction with the environment) in the regression equations. I then used various statistical techniques to test the relationship between overall life satisfaction with objective and subjective indicators of wellbeing, the aim being to determine which variables are most strongly associated with life satisfaction, in which contexts.

In addition to providing information to help answer the core research questions, these two case-studies provide some other interesting insights. The Costa Rican case study (Chapter 3) also contributes to the life satisfaction literature by highlighting the important role that people play in creating their own wellbeing, and by examining the link between their life satisfaction, their attitudes towards, and level of interaction with, the natural environment. To the best of my knowledge, this has not been done before in a developing country; it is only in the UK that interaction with the environment (in this case, frequency of interaction) has been included. I thus explore an interaction indicator in a developing country with my Costa Rica case study site.

In Australia (Chapter 4), I focus on land managers in Northern Australia – looking at the extent to which insights from the life satisfaction literature can be used to inform policy makers on issues relating to on-farm conservation (something, which to the best of my knowledge has never been done before). Most countries face the ongoing challenge of conservation of biodiversity. Governments are not only monitoring environmental issues but in most cases the trend has been to set aside areas for the preservation of natural values (Margules & Pressey, 2000). Governments usually face many constraints when pursuing conservation, one of the most pervasive being limited budgets for buying land for conservation. To achieve conservation goals, an alternative to acquisition is on-farm conservation. Research suggests that the success of on-farm conservation programs depends primarily on land managers'

behaviour. In the past, one of the tools used for on-farm conservation has been financial incentives but these may be ineffective if they do not align with the intrinsic motivations of land managers. My Northern Australian case study thus seeks to learn more about the intrinsic motivations of land managers by learning more about what contributes to their overall quality of life (life satisfaction). In addition to providing information to inform my three core research questions, and thus better guide the development of indicators to monitor wellbeing in a variety of different contexts, this study also demonstrates how, by learning more about life satisfaction; one might also be able to develop policies that further improve the conservation of the natural environment. Moreover, I believe this is the first study to have used the life satisfaction approach to assess the wellbeing of people who derive income from the land, requiring amendments to be made to standard indicators (such as income) to ensure contextual relevance.

3 Chapter 3: Costa Rica: Life satisfaction, domains and indicators

Abstract

In this Chapter I focus on answering my three main questions about domains, type of indicators (objective versus subjective) and importance of the environment using Costa Rica as a case study. As mentioned previously I focus on five domains in this chapter: social, economic, environment, health and safety. For each domain I use both subjective and objective indicators when possible/available to measure their impact on Costa Ricans' life satisfaction.

This chapter contributes to the life satisfaction literature, focusing, in particular, on the contribution which the environment makes to people's subjective assessment of their wellbeing (captured by asking about their satisfaction with life overall). Previous research on life satisfaction has been, for the most part, conducted in developed countries and has used indicators of environmental condition to quantify the relationship between life satisfaction and the environment. This research extends that literature in two ways. First it focuses on a developing country – using insights from a survey of more than 500 people in two different regions of a developing country (Costa Rica). Second, it considers the role people play in creating their own wellbeing, by examining the link between their life satisfaction, their attitudes towards, and level of interaction with, the natural environment.

Key words: life satisfaction, interaction, environment, beaches

3.1 Introduction

As highlighted in section 2.7.2, most studies that include the environment as a determinant of life satisfaction rely on objective indicators of the state of the environment. Examples include studies that have used environmental indicators such as: temperature or rainfall (Brereton et al., 2008; Frijters & Van Praag, 1998; Rehdanz & Maddison, 2005) and air pollution (Ambrey et al., 2014; MacKerron & Mourato, 2009; Welsch, 2002, 2006, 2007). But the role that subjective assessments of the 'state of the environment' play in subjective assessments of life satisfaction overall is relatively under researched: from the 40 studies reviewed in Chapter 1, only 23% used subjective indicators of environmental quality (**Error! Reference source not found.**). Notable exceptions include: Ferrer-i-Carbonell and Gowdy (2007) who included environmental attitudes, and Vemuri et al. (2009) who used satisfaction with the quality of the environment.

Even less research has focused on the relationship between life satisfaction and an individual's frequency of interaction with the natural environment; there are only a few exceptions (Ferrer-i-Carbonell & Gowdy, 2007; MacKerron & Mourato, 2013; Nisbet et al., 2011).

Interaction with the environment includes any activity that involves spending time in the natural environment, most likely in green places (e.g. gardens, natural parks). Previous studies on mental health have demonstrated that exercising in green spaces is therapeutic (green care), hence the recommendation that planners and architects should improve access to greenspace (green design), and children should be given opportunities to learn in outdoor settings (green education) (Barton & Pretty, 2010). But to the best of my knowledge, no previous researcher has attempted to assess the role that this type of activity plays in overall life satisfaction.

Therefore, in this chapter I focus on the contribution of the environment to life satisfaction, including measures of other factors known to be important to life satisfaction so as to (a) control for confounding factors and determine which domain contributes most/least to overall LS (research question 1); and (b) learn more about the importance of the environment to life satisfaction, relative to other life domains (overall research question 3). For each domain I include both subjective and objective indicators to reveal the potential relevance of each (overall research question 2).

I also include a variable that allows me to extend current (environmental) life satisfaction research beyond that which assesses the contribution that, for example, the presence or absence of green space makes to overall life satisfaction, to also assess the significance of time spent there. This extra variable allows me to ask: is having a protected area in the vicinity itself enough to enhance life satisfaction, or does one also needs to spend time within it? (a sub-question related to overall research question 3). I specifically worked with a sub-set of respondents who responded to the question about satisfaction with job, and thus represent only working residents (somewhat analogous to the Northern Australian case-Study which focuses on land-managers, all of whom are thus also 'working').

3.2 Methods

3.2.1 Study area

The research is situated in Costa Rica, a small developing country located in Central America. Costa Rica has a serious political commitment to conservation and climate change mitigation. The country is aiming to become carbon neutral by 2021. The government makes huge efforts to preserve the environment, and many policies are being developed to reach the carbon neutrality goal. So far there has been some effort to increase the conservation and the sustainable use of biodiversity; but many economic and social aspects of conservation have been poorly addressed. People's opinions and preferences regarding their wellbeing and the environment have not been taken into account.

According to the Happy Planet Index (Index, 2012) in 2009 Costa Rica was the greenest and happiest country in the world. In the World Economic Outlook Report (IMF, 2015). Costa Rica is classified, amongst 152 countries, within the group of emerging markets and developing economies (which includes all those that are not classified as advanced economies). The World Bank (http://www.worldbank.org/en/country/costarica/overview) classifies Costa Rica as an upper-middle-income economy (gross national income per capita in the upper-middle-income bracket ranges from US$4,126 to $12,735). Costa Rica has only about 0.1% of the world's landmass, but nonetheless contains 5% of the world's biodiversity (Honey, 1999); and it is considered to be one of the 'top' 20 countries with greatest biodiversity in the world (INBIO, 2015).

Costa Rica (literally translated to English means “Rich Coast”) is situated in Central America, bordered by Nicaragua (north) and Panama (south); and has coastlines on the Pacific Ocean (west) and the Caribbean Sea (east). It has seven provinces (*provincias* in Spanish), which are subdivided into 81 cantons (*cantones* in Spanish) (e.g. San José has 20 cantons, Limón has 6) – see

Figure 3. The cantons are, in turn, subdivided into 463 districts (*distritos* in Spanish) (e.g. San José has 121 districts, Limón has 27). The country has 51,100 km2 of land area and 589,000 km2 of territorial waters; the district size ranges from 0.5 km2 (district of San Francisco, of the Goicoechea canton of the San José province) to 2,223.26 km2 (district of Telire, of the Talamanca canton of the Limón province). The provinces of Guanacaste and Puntarenas have access to the Pacific coastline and Limón has access to the Caribbean. While both coastlines are important for Costa Rica’s development, the Pacific coastline is six times longer than the Caribbean’s (Cortés & Wehrtmann, 2009) and its drainage basin supports most of the country’s population (INEC, 2011). Costa Rica has a population of around 5 million people, and around 50% is concentrated in the San José metropolitan area.

Figure 3 Map of Costa Rica

Rojas and Elizondo-Lara (2012) found that Costa Ricans have a high level of life satisfaction; and that this can be explained as the result of an average income that is sufficient to generate adequate economic satisfaction, and relatively high satisfaction in other domains of life that

are of great importance to wellbeing, such as the domains of family, work and time. Their research suggests that for people to enjoy a high level of life satisfaction it is necessary to take care of all those domains important to wellbeing and that public policy should also approach the promotion of wellbeing by recognizing the multiplicity of facets that influence wellbeing.

3.2.2 Questionnaire design

My questionnaire was designed to collect data about overall life satisfaction and about contributors to life satisfaction (including the environment). As discussed in Chapter 2, Costa Rican institutions do not collect official data on life satisfaction or its' contributors. Since the enumeration and demarcation of factors contributing to life satisfaction is often arbitrary, there are no set guidelines to follow regarding what to include. Following previous literature, I included questions about five life domains relating to: society, economy, the environment, health and safety.

As discussed in the introduction, numerous studies have focused on environmental conditions but relatively little attention has been paid to the importance of local environmental factors, and very little research has considered the interaction of individuals with the environment in different contexts. One of my thesis objectives was to test the contribution of environmental factors, other than those 'normally' considered (such as those relating to climate and pollution) to life satisfaction. Focus more on the 'positive side', hence the pictures included in the surveys to try to interest respondents (Appendix B.1). Including pictures may have led to only attracting respondents who liked the pictures and chose to participate, hence the potential for survey response bias. Response biases are most prevalent in surveys that involve participant self-report (Furnham, 1986).

I first asked people where they lived and then I asked about their overall life satisfaction. As mentioned in Chapter 2, there are numerous ways of measuring life satisfaction (Cummins, 1997). I used the Cantril Self-Anchoring Striving Scale (Cantril, 1965), which has been included in several Gallup research initiatives, including Gallup's World Poll of more than 150 countries which represent more than 98% of the world's population,[20] specifically asking the following:

[20] Source: http://www.gallup.com/poll/105226/world-poll-methodology.aspx

- Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?

I then asked a series of questions designed to gather both 'subjective' and 'objective' information about each of my core domains. As regards subjective indicators, I asked respondents to indicate how much they agreed or disagreed (using a 5 point Likert scale) with a series of statements relating to each of numerous factors relating to the core domains (see Table 7)[21]. As mentioned before I included questions relating to the economic, social and environmental domains and also two additional domains (health and safety) known to be important in emerging and developing economies.

I then endeavoured to collect some 'objective' indicators – asking about their frequency of interaction with the environment (places and activities) and the frequency with which they participated in other activities. Specifically, respondents were asked how often they did a range of activities, and were given the following response categories:

- Almost every day (coded as 300 days per year)
- About once a week (coded as 52 days per year)
- About once a month (coded as 12 days per year)
- 3-4 times per year (coded as 3.5 days per year)
- About once a year (coded as 1 day per year)
- Less than once a year (Coded as 0.5 day per year)
- Never (Coded as 0)

I also collected some background information on income and occupational status plus other sociodemographic factors known to influence life satisfaction (including age, gender and

[21] I also asked responses to indicate how important they thought each factor listed in the left hand column of Table 7, was to their overall life satisfaction, specifically asking them

- How important are the following to your overall life satisfaction (or happiness)?

Responses were recorded on an 11 point Likert scale (from 0 to 10). Many of these responses were highly correlated with responses to the other 'subjective' questions (as suggested by Chen and Lin (2014); Russell, Hubley, Palepu, and Zumbo (2006); Trauer and MacKinnon (2001); Wu and Yao (2006) who note that measures of importance are often captured in measures of satisfaction) and were thus excluded from the analysis.

education). Where-ever possible, I endeavoured to collect 'matching' subjective and objective indicators for variables (e.g. satisfaction with, and actual time spent with family) – these variables are summarised in

Table 7.

Table 7 Indicators from questionnaire from each domain

Domain	Factor	*Subjective statements relating to specific factor (answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))*	*Frequency of activity (answered from never to almost every day)*	*Additional variables collected in the questionnaire*
Social	**Politicians**	I am satisfied with the work my local governors are doing		
	Religion	I am a very religious person	Participate in religious activities	
	Family	I have a strong and positive relationship with my family	Spend time with immediate family	# of family members; marital status; age
	Friends	I have enough friends to hang out with	Spend time with friends	
Economic	**Income**	I earn enough money for myself and my dependents		Average income
	Employment[22]	I really like my job		Education level, employment status, employment sector, employment industry
	House	I live in a nice house		# of bedrooms in the house
Safety	**Safety**	I feel very safe where I live		
Health	**Health**	I am in very good health		
	Exercising	I am a very active person	Spend time exercising	
	Family health	My immediate family is in very good health		
	Relaxing	I usually have enough time to relax	Spend time relaxing	
Environment	**Rivers**	I have access to clean rivers close to where I live		
	Outdoors	I enjoy doing activities outdoors	Spend time doing outdoors activities	
	Nature	I enjoy spending time in contact with nature	Spend time in contact with nature	

[22] The employment factors are important to note that restrict the survey sample, since these factors only apply for respondents that have a job (subsequent analysis only focuses on a sub-set of respondents, excluding unemployed and non-participants in labour force, I will explain in more detail).

Domain	Factor	*Subjective statements relating to specific factor (answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))*	*Frequency of activity (answered from never to almost every day)*	*Additional variables collected in the questionnaire*
	Conservation	I think it is important to conserve the environment	Spend time doing something for the environment	Contribution to conservation organizations

The questionnaire was first tested in face to face interviews in a public park in San José, Costa Rica with 10 randomly selected individuals. This test revealed that two questions were unclear, and they were subsequently removed. The final questionnaire (included in Appendix B1) included 25 questions, and took respondents between 15-30 minutes to complete.

3.2.3 Sampling

I was interested in finding out if people's interaction with the environment had an impact on their life satisfaction and for this I specifically targeted people from different regions with access to different environments. Moreover, from the literature it is known that levels of life satisfaction differ between people that live in a rural area and people that live in an urban area (Easterlin, Angelescu, & Zweig, 2011); and it has been found that scenic amenities have a positive and significant effect on life satisfaction (Ambrey & Fleming, 2011). Specifically, Ambrey and Fleming (2012) found that living close to protected areas has significant positive effects on life satisfaction of Australia's residents. Data were thus collected using a geographically stratified random sample of residents in four types of regions: inland-urban, coastal-urban, inland-rural and coastal-rural.

Data were collected between December, 2013 and March, 2015. Most data were collected in the inland-urban region (where 68% of people live) and in the coastal-rural region (where about 7% of people live). I used two different techniques: face to face (44% of respondents) and drop-off (56%); which is not ideal since it could affect the results but it was a practical solution in a difficult field setting. I will discuss the implications of this decision later on in this chapter. Both techniques were used to try to reach the maximum number of respondents. Face to face interviews were used in public spaces (parks, bus stops, etc.), visiting homes (only in rural areas) and drop off at certain locations (only in urban areas). I hired three research assistants to help me collect data in the inland-urban and inland-rural region.

3.2.4 Additional data relating to the environment

Since I asked people in which district they lived in, I could – through the use of geographical information system (GIS) coded data – link some regional level objective environmental indicators to other data collected from respondents. Specifically I used the following environmental indicators from the Atlas Digital Costa Rica 2014:

- Presence of beaches
- Presence of protected areas
- Living in an urban or rural area

These indicators were coded as dummy variables to enable me to test if the presence of each had an effect on the respondent's life satisfaction.

3.2.5 Preliminary analysis of data before modelling

3.2.5.1 Overview of respondents and responses to key questions in the survey

In total 663 people were approached and asked to participate in the study, and 553 agreed. As previously mentioned, I used two data gathering techniques: face to face (44% of respondents) and drop off (56% of respondents). My data are approximately representative of the Costa Rican population in terms of type of region, gender and age – see Table 8. However, the highly educated, the employed and people with income in the lowest and highest quintiles were overrepresented.

Table 8 Sociodemographic characteristics of sample compared to Costa Rica's population

	National (# of people)[a]	%	Survey (# of people)	%
Total people	**4,773,119**	**100%**	**553**	**0.01%**
Regions				
Urban	3,460,231	73%	429	78%
Rural	1,301,576	27%	120	22%
Total regions[b]	4,761,807	100%	549	100%
Gender				
Female	2,362,804	50%	261	50%
Male	2,410,315	50%	263	50%
Total gender	4,773,119		524	
Age ranges				
18-24	612,170	19%	128	23%

	National (# of people)[a]	%	Survey (# of people)	%
25-34	795,766	25%	169	31%
35-44	613,682	19%	99	18%
45-54	542,934	17%	65	12%
55-64	339,625	11%	45	8%
65-74	179,640	6%	27	5%
75 or more	124,671	4%	12	2%
Total ages[c]	3,208,488		545	
Education level				
Without instruction	135,372	5%	9	2%
Incomplete primary	425,670	15%	20	4%
Primary	897,921	32%	132	25%
Secondary	523,957	19%	134	26%
Undergrad and diploma	754,626	27%	216	41%
Postgrad	68,404	2%	11	2%
Total education level [d]	2,805,950		522	
Employment status				
Employed	2,084,210	90%	370	96%
Unemployed	225,903	10%	15	4%
Non-participation rate	1,318,250	36%	161	29%
Total employment status [e]	3,628,363		553	
Per capita income per quintile[f]				
Quintile 1	1,044,739	22%	173	34%
Quintile 2	1,058,734	22%	34	7%
Quintile 3	991,927	21%	80	16%
Quintile 4	906,215	19%	71	14%
Quintile 5	760,192	16%	146	29%
Total income quintiles	4,761,807		504	

[a] Source: Instituto Nacional de Estadística de Costa Rica (2015)
[b] Does not include domestic servants and pensioners
[c] Does not include people with ages under 18 years old
[d] Only includes people 15 years old or older that answered the question and who have completed the education level (except for primary)
[e] Only includes people 15 years old or older
[f] Groups households according to their income per capita, but numbers and percentages presented are total number of persons to be able to compare with the survey (in the survey persons were interviewed and not households)

I also asked respondents about their marital status, gender, employment status, if they had children (50% had no children, 24% had one and 16% had two, 7% had three, and 3% had four), and about the number of rooms in their house (5% had one, 23% had two, 34% had three, 20% had four, 8% had five, 4% had six, 1% had seven and 2% had eight). I created dummy variables to summarize the following responses: couple (respondents who are married or in a relationship = one; zero otherwise), male (for men = one; zero otherwise), paid employment (respondents who earn a wage or are self-employed = one, zero otherwise), rural (respondents

who live in a rural area = one; zero otherwise) and agriculture (respondents who work in the agriculture, forestry and fishing industry = one; zero otherwise).

Figure 4 shows the distribution of responses to the question about satisfaction with life overall. Figure 5 shows responses to questions that sought subjective assessments of different life domains, whilst Figure 6 shows frequencies of interactions. In these last two figures, responses are categorized by domains (Figures 4-6 do not include missing values and non-responses).

Figure 4 Respondents' answer to the question about overall: *Life satisfaction*

Answered on a scale from 0 to 10; 0 being the lowest and 10 the highest

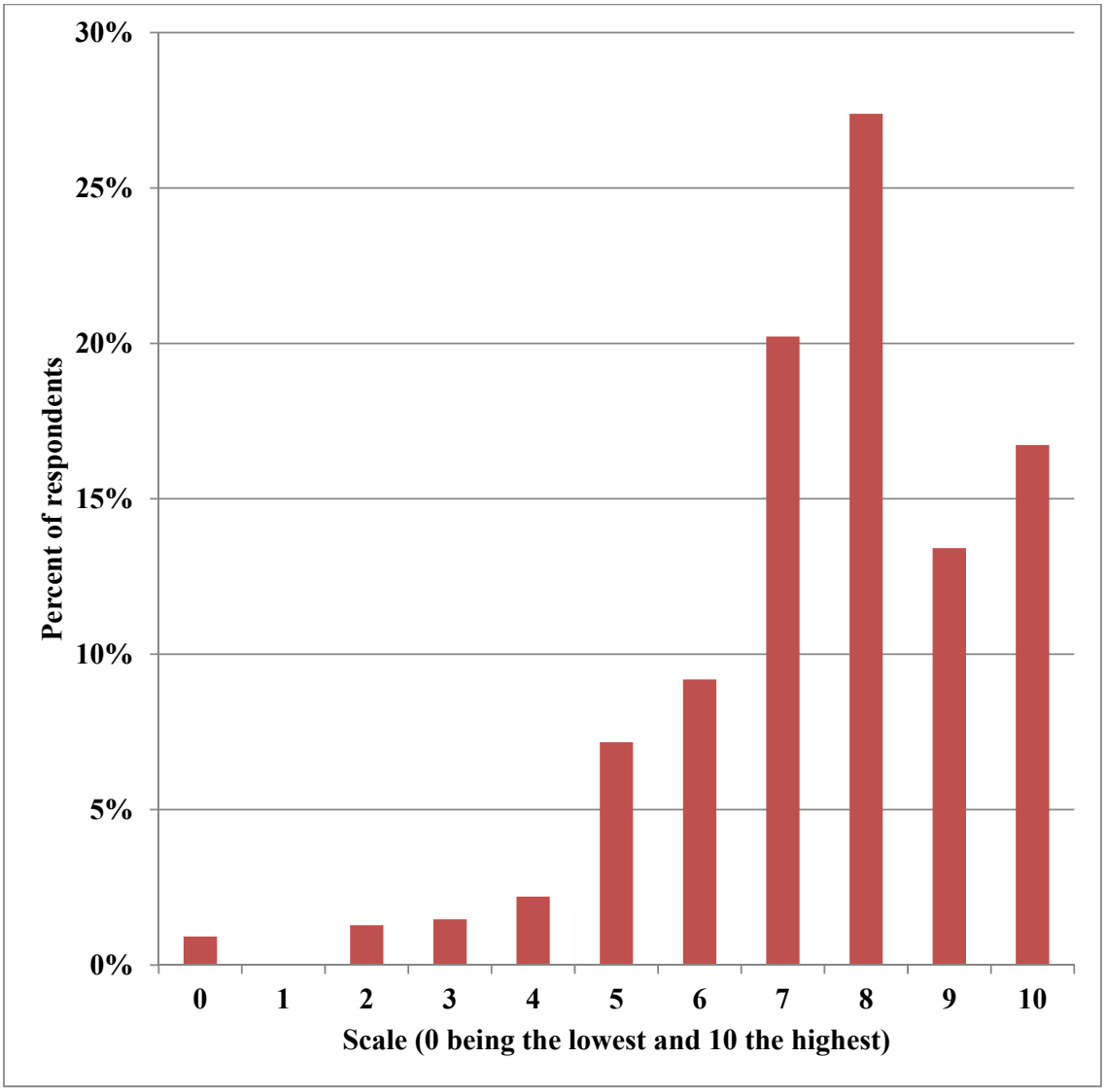


Figure 5 Subjective statements about different life domains

Answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))

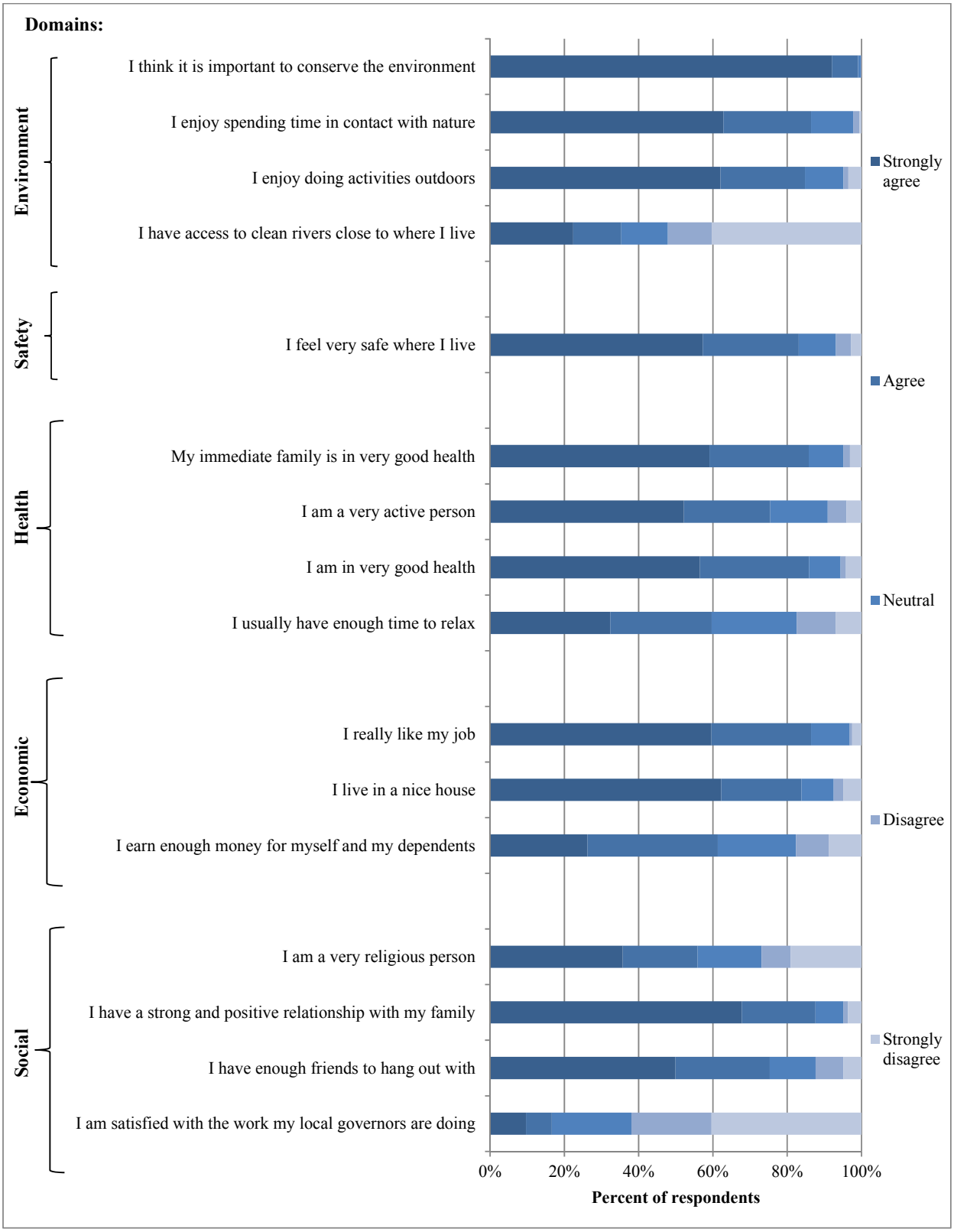


Figure 6 Respondents' answers to questions about the *Frequency* of different activities

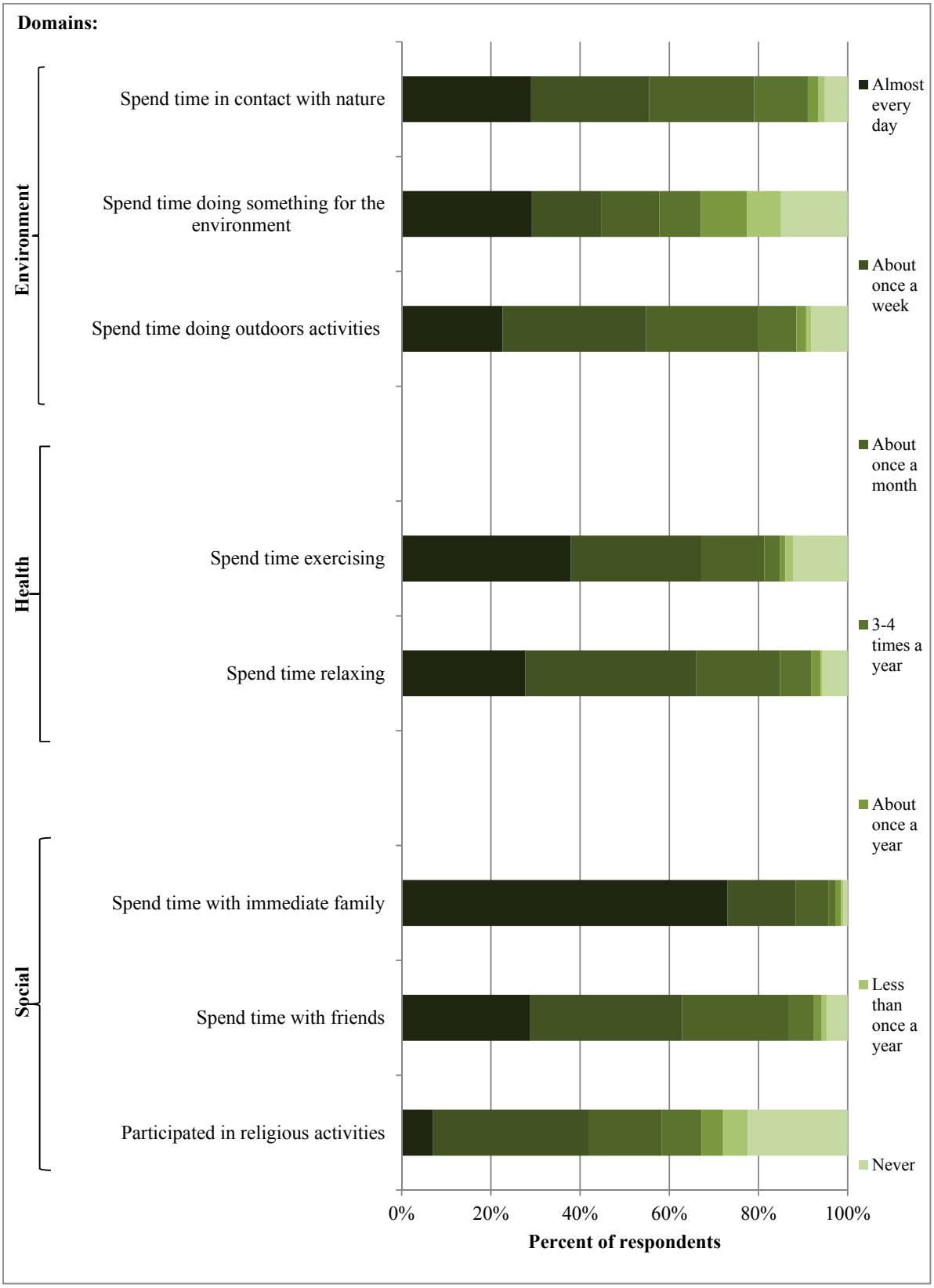


Table 9 includes a summary (mean values) of 'other' objective indicators obtained from the questionnaire, missing values and non-responses were not included (for totals please refer to Table 8).

Table 9 Other objective indicators from questionnaires

Domains	Indicators from questionnaire	Indicators used in model	Mean	Standard Deviation
Social	Age	Age (years)	37.36	15
	Age squared	Age squared (years)	1,634.15	1391
	Marital status	Couple (in a relationship)	0.44	0.49
	Gender	Male	0.52	0.50
	Number of children	# of children	0.94	1.17
	Education level	Formal years of education	11.66	4.42
Economic	Average (monthly) income	Squared average income (in Colones)	539.38	904,659
	Employment industry	Works in agriculture	0.05	0.23
	Employment status	Paid employment	0.66	0.47
	Number of rooms in the house	Rooms per person	1.04	0.65
Environment	Rural	Rural	0.24	0.41

The objective environmental indicators obtained from the *Atlas Digital Costa Rica 2014*, which were included in my model, were presence of beaches and presence of Protected Areas. Of the total of respondents 14% lived in a district that contained at least one beach; while 37% of respondents lived in a district that contained a Protected Areas.

3.2.5.2 Data reduction

Recognising that there were many questions relating to similar factors, I pre-tested data to see if some responses could be grouped. First I organised data according to which life domain the question related to, and according to whether the indicator was subjective and objective – see

Table 7,

Figure 5 and Figure 6). Ideally I wanted to include a subjective and objective indicator for each factor; but as shown in

Table 7 for some factors I only had subjective indicators (e.g. for politicians).

First, I used Cronbach's alpha to test how closely related my subjective indicators were for each domain separately (results presented on Table 10). I did similarly for responses to questions about frequency. For subjective indicators, the Cronbach's alpha scores were all low, indicating that the indicators could not be grouped together as a single variable. For the frequency indicators, the questions relating to the environment were all closely related (with a Cronbach's alpha of almost 0.7), indicating that grouping was appropriate. To do this I added responses to each individual question about the frequency with which he/she interacted with the environment (that had been coded into days per annum – as described in section 3.2.2 Questionnaire design, above). I then simply added them to estimate the total number of days per year each respondent interacted with the environment (e.g. days spent outdoors + days spent in contact with nature + days spent doing something for the environment, divided by 365 days)[23]. This is the objective indicator of the environment domain from the questionnaire which I include in my final model.

Table 10 Cronbach's alpha for the satisfaction and frequency indicators per domain

Domain	Factors	Subjective	*Cronbach's alpha per domain*	Objective	*Cronbach's alpha per domain*
		Satisfaction with (answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))		***Frequency of (answered from never to almost every day)***	
Social	**Politicians**	I am satisfied with the work my local governors are doing	0.468		0.174
	Religion	I am a very religious person		Participated in religious activities	
	Family	I have a strong and positive relationship with my family		Spent time with immediate family	
	Friends	I have enough friends to hang out with		Spent time with friends	
Economic	**Income**	I earn enough money for myself and my dependents	0.503		
	Employment	I really like my job[24]			

[23] I acknowledge this new indicator of interaction with the environment is vulnerable to double counting; a day spent in contact with nature can also count as a day spent outdoors. But since the Cronbach's alpha was almost 0.7, I decided best to add them and coded into days per annum so it was represented the same way as the other frequency variables.

[24] By including this variable I limited my analysis to a subset of respondents, to just the respondents that had a job at the time of the survey. Costa Rica being a developing country that does not offer unemployment benefits, with a very low minimum wage (around US$2.20 per hour for unskilled worker: http://www.wageindicator.org/main/salary/minimum-wage/costa-rica) and one of the most expensive destination

Domain	Factors	Subjective *Satisfaction with (answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))*	*Cronbach's alpha per domain*	Objective *Frequency of (answered from never to almost every day)*	*Cronbach's alpha per domain*
	House	I live in a nice house			
Health	**Health**	I am in very good health	0.434		
	Family health	My immediate family is in very good health			
	Exercising			Spent time exercising	0.624
	Relaxing	I usually have enough time to relax		Spent time relaxing	
Environment	**Outdoors**	I enjoy doing activities outdoors	0.498	Spent time doing outdoors activities	0.693
	Nature	I enjoy spending time in contact with nature		Spent time in contact with nature	
	Conservation			Spent time doing something for the environment	

The next step I took to verify if other variables could be grouped together was to check what would happen to the Cronbach's alpha if any item was deleted from the group. Here again, I looked at my subjective and objective (frequency) indicators separately for each domain (also separate), where there were more than two relevant indicators. All Cronbach's alphas deteriorated or if improved they did not reach the 0.700 cut-off (Table 11), suggesting that further grouping would be inappropriate.

Table 11 Recalculating Cronbach's alpha for the <u>subjective and frequency</u> indicators per domain

Domain	Factors	Subjective *(answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))*	*Cronbach's alpha if item deleted per domain*	Objective *Frequency of (answered from never (coded as 0 days per year) to almost every day (coded as 300 days per year)*	*Cronbach's alpha if item deleted per domain*
Social	**Politicians**	I am satisfied with the work my local governors are doing	0.373		
	Religion	I am a very religious person	0.345	Participated in religious activities	0.148

in Central America (http://www.ticotimes.net/2015/05/25/costa-rica-expensive-destination-central-america-says-wef) it is very important to consider income and having a job as having an impact on residents' life satisfaction.

Domain	Factors	Subjective *(answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))*	*Cronbach's alpha if item deleted per domain*	Objective *Frequency of (answered from never (coded as 0 days per year) to almost every day (coded as 300 days per year)*	*Cronbach's alpha if item deleted per domain*
	Family	I have a strong and positive relationship with my family	0.391	Spent time with immediate family	0.041
	Friends	I have enough friends to hang out with	0.464	Spent time with friends	0.199
Economic	**Income**	I earn enough money for myself and my dependents	0.342		
	Employment	I really like my job	0.291		
	House	I live in a nice house	0.556		
Health	**Health**	I am in very good health	0.210		
	Family health	My immediate family is in very good health	0.296		
	Exercising			Spent time exercising	0.624
	Relaxing	I usually have enough time to relax	0.554	Spent time relaxing	
Environment	**Outdoors**	I enjoy doing activities outdoors	0.498	Spent time doing outdoors activities	0.693
	Nature	I enjoy spending time in contact with nature		Spent time in contact with nature	
	Conservation			Spent time doing something for the environment	

The social domain had four subjective indicators – so further investigation was required (to determine if pairs of variables could be appropriately grouped). I looked at the distribution of responses, noting that those relating to politicians had a very different distribution to the others factors (see Appendix Tables and Graphs B2-B42). Clearly this indicator needed to remain separate. I then focused on the other three social indicators, checking what would happen to Cronbach's alpha if one item was removed. All scores were below 0.700, which can be observed in Table 12. Evidently, all the subjective indicators within the social domain need to be included separately in the model.

Table 12 Recalculating Cronbach's alpha for the subjective indicators of the social domain (with the factor politicians)

Domain	Factors	Subjective	*Cronbach's alpha if item deleted*
		(answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))	
Social	**Religion**	I am a very religious person	0.192
	Family	I have a strong and positive relationship with my family	0.191
	Friends	I have enough friends to hang out with	0.424

Table 13 lists indicators from the questionnaire, which (according to the preceding analysis) each provide distinctly different types of information and cannot be 'grouped'. The regression models which I subsequently use thus enter each of these variables separately.

Table 13 Indicators from questionnaire included in model

Domain	Factors	Subjective	Objective
		(answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))	***Frequency of (answered from never (coded as 0 days per year) to almost every day (coded as 300 days per year)***
Social	**Politicians**	I am satisfied with the work my local governors are doing	
	Religion	I am a very religious person	Participated in religious activities
	Family	I have a strong and positive relationship with my family	Spent time with immediate family
	Friends	I have enough friends to hang out with	Spent time with friends
Economic	**Income**	I earn enough money for myself and my dependents	
	Employment	I really like my job	
	House	I live in a nice house	
Health	**Health**	I am in very good health	
	Family health	My immediate family is in very good health	
	Exercising		Spent time exercising
	Relaxing	I usually have enough time to relax	Spent time relaxing
Environment	**Outdoors**	I enjoy doing activities outdoors	Environment
	Nature	I enjoy spending time in contact with nature	

Domain	Factors	Subjective	Objective
		(answered on a 5 point Likert scale, from 1 (strongly disagree) to 5 (strongly Agree))	*Frequency of (answered from never (coded as 0 days per year) to almost every day (coded as 300 days per year)*
	Conservation		

In line with the literature (Diener & Biswas-Diener, 2002), I also included additional sociodemographic and environmental indicators within the regression model which previous researchers have found to be associated with LS: age, marital status, gender, number of children, education level, income, employment status and number of rooms in the house. I also included the dummy variables (mentioned previously) which indicate the presence (or absence) of beaches, the presence of a protected area, and whether or not the respondent was in a rural (rather than urban) area.

As previously, I grouped these additional factors by domains and have called them 'other' objective indicators (Table 14). The only exception here relates to the variable measuring education, which I included in two domains (social and economic) since it is not clear cut to which one it belongs. Also as previously, I looked at relationships between these variables to see if they were each measuring separable factors, or if they should instead be treated as a grouped variable.

Table 14 Other objective indicators from questionnaire

Domain	Factors	Objective (others)
Social	**Age**	Age
	Age	Age squared
	Gender	Male
	Marital status	Dummy for couple
	Children	Number of children
Economic	***Education***	*Level of education in years*
	Income	Squared average income
	Employment	Paid employment
	House	Rooms per person
Environment	**Rural**	Dummy variable for rural
	Beaches	Presence of beaches
	Protected Areas	Presence of protected areas

First, I used Cronbach's alpha to test how closely related the variables were in each domain. For the economic domain, I first tested all the variables of the economic domain together (education, income, employment and house). I also tested the following groups: education, paid employment and rooms per person; income, education and paid employment; and education and rooms per person. But none of the economic domain's group of variables resulted with the Cronbach's alpha higher than 0.700. That said, the variables 'paid employment' and 'income' were highly correlated (0.727, corrected item total correlation), so I decided to omit paid employment from the analysis (reasoning that income was capturing most information from that variable).

Within the social domain, no grouping of variables resulted in a Cronbach's alpha that exceeded 0.700, suggesting that each variable should be entered separately in the regression.

In the case of the environmental domain, when tested all together (rural, beaches and protected areas) Cronbach's alpha was 0.735 (higher than the critical value of 0.700). It would be inappropriate to add these (dummy) variables however, I looked at which ones were present in the same places; for example, all respondents who had a beach close by, also had a protected area close by. So I re-named the variable "presence of either beach or protected area", and omitted the dummy variable that considered only the presence of beaches from the analysis. The literature shows that people living in urban areas sometimes have a higher level of life satisfaction in comparison to people in rural areas and this difference is larger at lower level of developments, but tends to disappear or even reverse at advanced levels. Given the substantial economic divide between rural and urban Costa Rica and the fact that more than half of the respondents that live in a rural area do not live near a beach or a Protected area, I retained the dummy variable associated with 'rural' areas to test if there were statistically significant differences in life satisfaction between those living in urban and rural areas (as has been found by other researchers – e.g. Easterlin et al. (2011). Table 13 and Table 14 together, thus provide a full list of all the variables tested in the regression equations, as described below.

3.3 Modelling

I ran two sets of regressions; both using overall life satisfaction as the dependent variable. In order to be able to estimate the regressions using Ordinary Least Squares (OLS) the dependent variable should have a normal distribution (or similar), if not, it is conventional to transform

the LS by applying the natural logarithm. In this case, however, the untransformed life satisfaction variable had a distribution that was approximately normal (see Appendix Figure B2) – and to log transform it would have been to create a dependent variable with a non-normal distribution. So I entered it in its raw form.

I did, however, log transform the independent variables because most of their distributions were skewed to the right (for variables measured on a Likert scale ranging from 0 to 4, I added 1 to obtain a range from 1 to 5 before logging). I also log transformed income and the variable measuring the number of formal years of education each respondent had undertaken (both according to the literature).

For the final regressions I used both 'enter' and 'stepwise' OLS, with all variables in Table 13 and Table 14 (except Age squared) included as regressors. I used both regressions to compare the results; since the stepwise regression uses an automatic procedure to choose the predictive variables, I then tested the results using the enter procedure. The sample size was 306 (meaning that I had 306 respondents who answered all relevant questions). Importantly, this sub-set of respondents who had answered all relevant questions, are those who responded to the question about satisfaction with job, and thus represent only working residents (somewhat analogous to the Northern Australian case-Study which focuses on land-managers, all of whom are thus also 'working'). The model thus allows one to draw inferences about the contribution which various factors make to the overall life satisfaction of employed residents; more will be said about this later.

In the full model, three variables had a statistically significant and positive association with life satisfaction, these were: satisfaction with house, frequency of exercise and age. In the stepwise model, the same three variables were identified as having a statistically significant associatyion with life satisfaction (marked in yellow). The stepwise regression yielded two additional variables which have a statistically significant association with life satisfaction: satisfaction with money and satisfaction with friends had a statistically significant and positive association with life satisfaction.

Table 15 Results OLS regression enter and stepwise: all respondents

Domain	Factors	Variables	All	
			Enter	Stepwise
			Unstandardized Coefficients (*Standard Error*)	
		(Constant)	**2.689** ** *(1.215)*	**3.331** *** *(0.556)*
Social		***Subjective***		
	Politicians	LN Satisfied with politicians	**0.228** *(0.175)*	
	Religion	LN Satisfied with religion	**0.079** *(0.241)*	
	Family	LN Satisfied with family	**-0.391** *(0.425)*	
	Friends	LN Satisfied with friends	**0.242** *(0.328)*	**0.464** * *(0.256)*
		Objective		
	Religion	LN days spent doing religious activities	**0.061** *(0.077)*	
	Family	LN days spent with family	**0.069** *(0.075)*	
	Friends	LN days spent with friends	**0.023** *(0.073)*	
		Objective (others)		
	Age	Age	**0.014** * *(0.008)*	**0.026** *** *(0.007)*
	Gender	Male	**-0.152** *(0.195)*	
	Marital status	Dummy for couple	**0.167** *(0.204)*	
	Children	Number of children	**-0.079** *(0.091)*	
	Education	LN level of education in years	**-0.073** *(0.206)*	
Economic		***Subjective***		
	Income	LN Satisfied with money	**0.464** *(0.282)*	**0.521** ** *(0.250)*
	Employment	LN Satisfied with job	**0.281** *0.386*	
	House	LN Satisfied with house	**1.095** ***	**1.205** ***

Domain	Factors	Variables	All	
			Enter	Stepwise
			Unstandardized Coefficients (*Standard Error*)	
			(0.326)	*(0.281)*
		Objective (others)		
	Income	LN average income	**0.035** *(0.024)*	
	House	Rooms per person	**0.183** *(0.168)*	
Health		***Subjective***		
	Health	LN Satisfied with health	**0.498** *(0.412)*	
	Family health	LN Satisfied with family health	**0.087**	
			(0.467)	
	Relaxing	LN Satisfied with relaxing time	**-0.102** *(0.273)*	
		Objective		
	Exercising	LN days spent time exercising	**0.114** * *(0.058)*	**0.113** ** *(0.051)*
	Relaxing	LN days spent time relaxing	**0.036** *(0.076)*	
Environment		***Subjective***		
	Outdoors	LN Satisfied with outdoor activities	**-0.512** *(0.347)*	
	Nature	LN Satisfied with nature contact	**0.270** *(0.573)*	
		Objective		
	Interaction	LN days interaction with environment	**0.008** *(0.079)*	
		Objective (others)		
	Protected Areas	Dummy presence of protected areas	**0.128** *(0.223)*	
	Rural	Dummy variable for rural	**0.124** *(0.291)*	

Domain	Factors	Variables	All	
			Enter	Stepwise
			Unstandardized Coefficients (*Standard Error*)	
		Number of observations:	**306**	**306**
		Adjusted R2:	**0.166**	**0.174**
			(1.568)	***1.560***
		F:	**3.251**	**13.921**

Note: Significance at the 10% level is indicated by*, significance at the 5% level is indicated by** and significance at the 1% level is indicated by***

All of these results are in line with the literature. For example, Rohe and Stegman (1994) found that housing condition and housing ownership have important effects on life satisfaction. Barger, Donoho, and Wayment (2009) found that having good health is one of the strong and independent predictors of being satisfied with life. Age has been found to have a U-shaped effect, with life satisfaction reaching a minimum in a person's 30s and 40s (Blanchflower & Oswald, 2008), and generally, the relationship between income and life satisfaction is positive but exhibits diminishing returns (Dolan et al., 2008)

In relation to my overall research questions, the stepwise regression identified indicators across four of the five domains that were included in the regression. Within the economic domain both objective and subjective indicators were important; while it was only an objective indicator that was important in the social domain, and it was only subjective indicators that were important in the health domain. No environmental indicators were statistically significant.

To test if there were any differences between people who lived in different regions and had access to different environments, I re-ran the regression models, but used different subsets of respondents:

A. People that live in an urban area and have access to beaches and/or protected areas (N=63)
B. People that live in an urban area and do not have access to beaches or protected areas (N=179)
C. People that live in rural area and have access to beaches and/or protected areas (N=55)
D. People that live in rural area and included a dummy variable of presence of protected areas in the regression (N=63)

In Table 16 I have included the results of the statistically significant variables (leaving out the domains column due to space restrictions, but all the results are included in Appendix (Table B51). For subset A, the four variables that had a statistically significant impact on LS (in the full model) were: satisfied with family health, time spent doing religious activities, frequency of interaction with the environment and average income. In this case one variable from each domain: health, social, environment and economic was significant. And the satisfied variable was the only subjective indicator. In the stepwise model, the variables that were statistically significant were the same as those in the full model; although age was also statistically significant.

For subset B, two variables were statistically significant in the full model: satisfaction with house and average income; both from the economic domain and including one for each type if indicator (subjective and objective, respectively). The results were the same for the stepwise model, plus age (social domain, and objective) and satisfied with friends (social domain and subjective).

Fore subset C (with a relatively small N), only satisfied with house was statistically significant and positive in both models; only one variable form the social domain was significant and it was subjective. And for subset D, the full model identified: satisfied with house, satisfied with money and number of children as significant. This included two variables from the economic domain, both of which are subjective, and one from the social domain which was objective and had a negative effect on life satisfaction. The stepwise (D) model had the same significant variables as the full model; additionally satisfaction with outdoor activities was significant, albeit with a negative effect.

Despite the relatively small samples in some models (particularly C), some trends are evident. For example, in most subsets (except A) satisfaction with house is statistically significant and has a positive effect on life satisfaction (which is similar to the all respondents' results). But for people who live in urban areas and live near a beach and/or a protected area it does not seem to be the case.

Regarding my overall research questions, first the domain that is most important to Costa Rican residents' life satisfaction (who have a job) is the economic domain, except for group A for which it is health. Regarding my second question for Costa Rican respondents it seems that subjective indicators are 'better' at explaining life satisfaction than objective indicators – but

this is not a definitive rule. For the third question: it seems that spending time 'interacting' with the environment has a positive impact on LS for a subset of respondents – namely those living in an urban area with access to a beach and/or a protected area.

Table 16 Results OLS regression enter and stepwise: subsets

Variables	A: Urban + Beach and PA		B: Urban + No Beach + No PA		C: Rural + Beach and PA		D: Rural	
	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise
	Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)	
(Constant)	3.174	1.142	1.633	3.288 ***	8.492	4.873 ***	9.350 *	8.431 ***
	(4.027)	*(1.686)*	*(1.503)*	*(0.669)*	*(7.517)*	*(0.806)*	*(5.282)*	*(1.185)*
LN Satisfied with friends	0.911		0.244	0.733 **	0.003		0.135	
	(1.210)		*(0.405)*	*(0.305)*	*(1.216)*		*(1.095)*	
LN days spent doing religious activities	0.475 **		0.007		0.301		0.239	
	(0.210)		*(0.096)*		*(0.329)*		*(0.265)*	
Age	0.010	0.028 **	0.016	0.026 ***	0.014		0.022	
	(0.022)	*(0.013)*	*(0.011)*	*(0.009)*	*(0.023)*		*(0.020)*	
Number of children	0.297		-0.128		-0.523		-0.566 *	
	(0.254)		*(0.126)*		*(0.348)*		*(0.290)*	
LN Satisfied with money	-0.310		-0.102		1.721		2.105 **	
	(0.871)		*(0.351)*		*(1.069)*		*(0.926)*	
LN Satisfied with house	-0.460		1.178 ***	1.181 ***	1.705 *	2.178 ***	1.854 **	1.967 ***
	(1.102)		*(0.465)*	*(0.382)*	*(0.907)*	*(0.562)*	*(0.789)*	*(0.518)*
LN average income	0.102 *		0.072 **	0.062 **	-0.103		-0.086	
	(0.061)		*(0.032)*	*(0.027)*	*(0.093)*		*(0.074)*	
LN Satisfied with family health	5.425 **	3.057 ***	-0.407		0.152		-0.081	
	(2.260)	*(1.079)*	*(0.687)*		*(0.997)*		*(0.897)*	
LN Satisfied with relaxing time	-0.383		0.237		-1.048		-0.924	
	(0.576)		*(0.360)*		*(1.564)*		*(1.289)*	
LN Satisfied with outdoor activities	0.066		-0.312		-4.193		-2.727	-2.119 ***
	(0.846)		*(0.456)*		*(2.862)*		*(1.777)*	*(0.741)*
LN days interaction with environment	0.320 *	0.250 **	-0.038		0.308		0.303	
	(0.188)	*(0.111)*	*(0.101)*		*(0.569)*		*(0.480)*	

Variables	A: Urban + Beach and PA		B: Urban + No Beach + No PA		C: Rural + Beach and PA		D: Rural	
	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise
	Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)	
Dummy presence of protected areas							1.146	
							(1.037)	
Number of observations:	63	63	179	179	55	55	63	63
Adjusted R2:	0.145	0.244	0.149	0.183	0.088	0.203	0.193	0.205
	(1.478)	*(1.390)*	*(1.522)*	*(1.491)*	*(1.905)*	*(1.781)*	*(1.774)*	*(1.761)*
F:	1.427	7.763	2.252	11.038	1.213	15.032	1.580	9.142

Note: significance at the 10% level is indicated by*, significance at the 5% level is indicated by** and significance at the 1% level is indicated by***

A. People that live in an urban area and have access to beaches and protected areas
B. People that live in an urban area and do not have access to beaches and protected areas
C. People that live in rural area and have access to beaches and protected areas
D. People that live in rural area and included a dummy variable of presence of protected areas in the regression

3.4 Discussion and conclusions

Monitoring people's satisfaction with several life domains is generally considered to provide better information than to monitor only satisfaction with life overall. But to date, most researchers have focused on just three domains: social, economic and health (Dolan et al., 2008; Frey & Stutzer, 1999; Helliwell, 2003; Powdthavee, 2010). I tested five domains in this chapter: social, economic, health, safety and environment. In line with the literature, the economic, social and health domains are found to be important contributors to life satisfaction of residents in all areas in Costa Rica. Although it has not been widely studied, the environmental domain was also an important contributor to life satisfaction for one of the subsets of respondents – those living in urban areas with access to a beach or protected area.

I found evidence to suggest that the economic domain is probably the most important domain for Costa Rican residents – at least some variables from this domain were statistically significant for the entire sample and for each sub-sample. In my analysis, I only included a sub-set of respondents: those who were employed at the time of the survey. Although this limits my analysis I was very interested in the impact of the economic domain specifically on the income variable since it has been widely studied in the literature (Cummins, 2000). Moreover, this focus (on the employed) is similar to the focus of my second case study (land managers who are also all 'employed'). On the other hand I was also interested in the impact of the safety

domain, but it was not important; although it has been found that living in an unsafe or deprived area is detrimental to life satisfaction (Ferrer-i-Carbonell & Gowdy, 2007; Lelkes, 2006) and in Costa Rica crime rates have increased in the last few years.[25]

Satisfaction with housing, an individual level subjective indicator, had a positive effect on life satisfaction for Costa Rican residents. There is relatively little literature studying the relationship between housing and life satisfaction, and most of it has focused on home ownership (Boarini, Comola, Smith, Manchin, & De Keulenaer, 2012). For example, Rohe and Stegman (1994) found that housing ownership has important effects on life satisfaction; and Oswald, Wahl, Mollenkopf, and Schilling (2003) found that renting had a negative impact on life satisfaction, while owning a house had a positive effect. A particularly interesting finding here is that it is not the objective indicator of housing (specifically, size of house) that mattered in this study, but rather the subjective indicator of satisfaction with housing; this subjective indicator presumably captures much more than just size of house, and ownership but rather whether the size of house and tenure arrangement are suitable for the respondent. There is often a reluctance to report subjective indicators (people seem to believe objective indicators are somehow more 'defensible'), so future research could usefully explore the relationship between various objective and subjective indicators of housing to determine which (if any) objective indicators best describe the suitability of housing and its contribution to people's welfare.

Regarding objective indicators in the model that includes all the employed respondents (see Appendix Table B51), frequency of time spent exercising had a positive effect on respondents' life satisfaction. Research on the relationship between health and life satisfaction is extensive (Boarini et al., 2012). Previous studies have consistently shown a strong relationship between life satisfaction and both physical and psychological health (Dolan et al., 2008). As mentioned before, Barger et al. (2009) found that having good health is one of the strong and independent predictors of being satisfied with life.

Only within one data set (people that live in urban area and have presence of beaches and protected areas), environmental indicators seemed to influence life satisfaction. In this case, frequency of interaction with the environment, an objective indicator, had a positive effect on life satisfaction. Although the influence of the environment is a relatively new area of research,

[25] Source: http://www.insightcrime.org/news-briefs/costa-rica-homicides-to-reach-pandemic-level

Capaldi, Dopko, and Zelenski (2014) did a meta-analysis investigating whether the trait of nature connectedness is associated with life satisfaction, and found that those who are more connected to nature tend to experience more positive life satisfaction than those less connected to nature. There is also extensive literature in health and in economics as well on the importance of green spaces in urban environments and their positive effect on people's life satisfaction; my results suggest that green spaces are indeed important but is not only about the presence but also about the access, about creating the time and opportunity for people to spend time in those places and not only looking or having them. Presumably, those who live in rural areas may already be fairly well connected to nature (e.g. may all have easier access to green spaces than people in urban areas), so for them it is less necessary to make the additional effort to get out and enjoy nature.

Other indicators that were tested in the whole dataset and in the data subsets which did not have a statistically significant relationship with life satisfaction were: satisfied with friends (it was only statistically significant for all employed persons and then only within the model that used stepwise regression), days spent doing religious activities (only subset A and using enter), number of children (only subset D and using enter), satisfied with money (all employed and using stepwise, and subset D and using enter), satisfied with relaxing time (none) and satisfied with outdoor activities (subset D and using stepwise). These indicators did not have an impact on my survey participants, but I cannot infer for all the residents of Costa Rica. It may also be possible that my sample size is not large enough to tell. As I mentioned previously in the questionnaire design section (3.2.2) most social surveys suffer from some sort of bias (e.g. the pictures included in the surveys), it would require further research to understand the impact of these indicators on all Costa Rican residents that I did not survey.

In summary, this exploration of life satisfaction of Costa Rican residents who were employed demonstrates that (1) life satisfaction depends on multiple domains, (2) using both subjective and objective indicators adds value to the analysis and (3) in an urban environment, it is not just the presence or absence of the environment that matters; being able to spend time interacting with the environment is an important determinant of life satisfaction.

These findings suggest that if governments want to improve resident life satisfaction, they need to monitor much more than GDP – that policies which exclusively focus on income or employment at the expense of housing, health, the environment (or leisure time to enjoy the

environment) may not necessarily improve social welfare. More research needs to be done to determine which indicators (subjective or objective) should be used, but it seems that to focus on objective indicators only, may be to miss important pieces of information. It is also clear that future studies of the contribution that the environment makes to LS could usefully include indicators about people's interaction with the environment alongside objective indicators capturing environmental quality (e.g. pollution) or presence (e.g. having a protected area or green space nearby).

4 Chapter 4: Northern Australia: Life satisfaction, domains and indicators

Adapted from: Chacón, A., Stoeckl, N., Jarvis, D., & Pressey, R. L. (2016). Using insights about key factors impacting 'quality of life' to inform effective on-farm conservation programs: a case study in Northern Australia. Australasian Journal of Environmental Management, 1-18. doi:10.1080/14486563.2016.1251345.

Abstract

On this Chapter I focus on answering my three main questions about domains, type of indicators and specifically about the environment domain using as case study Northern Australia. As mentioned previously I focus on three domains in this chapter: social, economic, and environment; for each domain I used both subjective and objective indicators when possible/available to measure their impact on Northern Australian land managers' life satisfaction. In addition, this chapter contributes to the life satisfaction literature, focusing, in particular, on the intrinsic motivations of land managers to participate on on-farm conservation programs by learning more about what contributes to their life satisfaction. Research suggests that the success of on-farm conservation programs depends primarily on land managers' behaviour. In the past one of the tools used for on-farm conservation has been financial incentives but these may be ineffective if they do not align with the intrinsic motivations of land managers. This paper seeks to learn more about the intrinsic motivations of land managers by learning more about what contributes to their life satisfaction. I hypothesize that by understanding the drivers of land manager's subjective assessments of their own life satisfaction I will be able to shed light on the types of incentives that could help promote on-farm conservation.

Key words: on-farm conservation, life satisfaction, social relationships, intrinsic motivators, financial incentives

4.1 Introduction

Conservation activities must be prioritized so that scarce funds and resources are used efficiently and effectively to prevent long-term loss and degradation of biodiversity and ecological processes (Wilson, Carwardine, & Possingham, 2009). Governments lack sufficient resources to accomplish their conservation goals so, for the last few decades, they have turned to the private sector (Adams, Pressey, & Stoeckl, 2012). Increasingly, therefore, conservation is directly involving rural communities, individual landholders, non-government organizations, and the corporate sector (Dibden, Mautner, & Cocklin, 2005).

Conservation on private land is integral to Australia's conservation goals (Adams et al. 2014), at least partially because farmers, Indigenous owners, and other private landholders manage approximately 77% of Australia's land area. In addition, high-priority areas for biodiversity conservation are often concentrated on private land because of the momentum of transformation in these landscapes (Pressey et al. 2000, Groves et al. 2000). As such, it is not surprising to find that Australia has longstanding programs of private land conservation (e.g. Tasmania Private Land Conservation Program, NSW Conservation Partners Program, and Victoria Bush Tender Program).

Different classes of policy instruments (which include, but are not limited to financial incentives (such as taxes or subsidies), standards (rules and regulations), education/outreach and extension) can and have been used to promote on-farm conservation; but around the world, financial incentives are playing an increasingly prominent role (Ferraro & Kiss, 2002). The key problem with financial incentives, however, is that they do not always have an unambiguously positive affect. People respond to what are termed 'intrinsic' and 'extrinsic' incentives (Gneezy, Meier, & Rey-Biel, 2011) and financial incentives (which are extrinsic) may alter intrinsic motivations. For example, when offered money to undertake a particular task (say planting a riparian strip) it is possible that people who may have previously planted trees for "intrinsic" (moral/ethical) reasons, may refuse to plant more unless offered a financial reward (Arias, 2015). More worrying, is the possibility that people may stop planting new riparian strips altogether once a reward has been offered, so as to avoid appearing 'greedy' (Gneezy et al., 2011). It is perhaps for these reasons that some researchers have found evidence to suggest that financial incentives can actually reduce the performance of agents or their compliance with

rules (Fehr & Falk, 2002), and that financial incentives for on-farm conservation initiatives do not always generate genuine 'additionality' (Wunder, 2007).

Clearly people are motivated by a range of different factors – some may be motivated by predominantly external/extrinsic factors (such as financial rewards), others may be more strongly motivated to do something because they intrinsically value that activity (Ryan & Deci, 2000) or because it inherently interests them (Gagné & Deci, 2005). There is evidence to suggest that people may adjust their behaviour to avoid aspects of their life with which they are dissatisfied (Frijters, 2000) and that when making decisions about how best to adjust their behaviours so as to improve quality of life, people may focus attention on the aspects of life which are most important to them (Oishi, Diener, Lucas, & Suh, 1999). So there is a link between people's perceptions of what is important to them, their behaviours, and intrinsic / extrinsic motivators.

There is a large and growing body of research that seeks to learn more about the contribution which different factors make to overall 'life satisfaction' (Ambrey & Fleming, 2011) and numerous researchers have sought to learn more about factors that motivate land managers to undertake conservation related activities (Greiner, Patterson, & Miller, 2009; Knowler & Bradshaw, 2007). But to the best of my knowledge, no one has sought to learn more about which factors impact the 'life satisfaction' of land managers, with a view towards using that information to help inform conservation policy. This is a potentially important knowledge gap: understanding what drives peoples' life satisfaction is crucial to the success of conservation measures that seek to change the relationship between humans and the environments in which they live (Milner-Gulland et al., 2014). So learning more about what is most / least important to the quality of life for those managing farms may help us develop on-farm conservation policies with extrinsic incentives that support and complement, rather than undermine, intrinsic incentives.

Using Northern Australia as a case study, I thus set out to learn more about what contributes most (and least) to the life satisfaction of land managers. To do so, I needed to make slight alterations to the 'standard' life satisfaction method (explained in more detail below) – to ensure that questions asked were relevant to land-managers (e.g. using the value of on-farm production rather than 'income'). My research thus makes both an empirical contribution to the literature (identifying the biggest drivers of life satisfaction for land managers in Northern

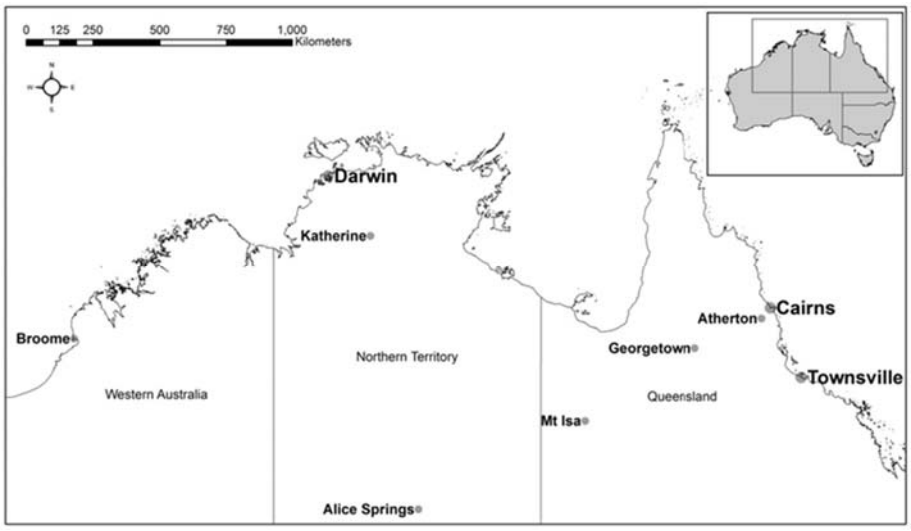
Australia), and a methodological one, in that it demonstrates how to apply the life satisfaction approach to land managers. Moreover, my key finding (that social relations are the most important determinant of life satisfaction) is consistent with findings from the international literature, so my key conclusion (that the effectiveness of on-farm conservation programs could be enhanced if they were designed to support social relationships) may be more broadly generalizable to regions outside my study area.

4.2 Methods

4.2.1 Study areas

I focused on Northern Australia, specifically the Daly River catchment in the Northern Territory (near the town of Katherine) and northern Queensland (near the towns of Atherton and Georgetown, with others scattered from south of Townsville, to north of Mt Isa - see Figure 1). These areas contain some of the most intact landscapes and environmental assets in Australia, which makes them very valuable for production and also for conservation (Coasts, 2014). The predominant landscapes are forest, woodlands and grasslands. These landscapes constitute much of the less-developed portion of Australia and support a large pastoral industry, although pastoralism has led in some places to extensive tree-clearing and other problems of vegetation management (CRC, 2014).

Figure 7 Study area Northern Australia



4.2.2 Questionnaire design

I chose to use secondary data from a set of a cross-sectional survey (gathered as part of a research project funded by the Australian Government's National Environmental Research Project (NERP) for this chapter. Collecting sufficient primary data across the region would have been beyond the financial and time limits placed on this research; and it was unnecessary as the data was already available and appropriate for the task at hand. The NERP funded project is called: Project 1.3 Improving the efficiency of biodiversity investment; the overarching aim of this project was to provide information that would help improve the efficiency of biodiversity investments in northern Australia (see Figure 7). I was a member of the research team for this project, with my role including subsequent data analysis.

The dataset offered a number of advantages making this data highly suitable for the purposes of this research, compared to alternate options.

1) The data was available for a region identified as ideal for my study, as discussed in the previous section.

2) The surveys gathered subjective data relating to the respondents' perceptions of their life satisfaction and across the three domains of life; economic, social and environmental factors.

3) The data could be precisely matched to the specific geographic location of the land managers' farms; this enabled survey responses to be matched precisely to environmental indicators available from other sources.

The data provided from this project was thus able to provide me with subjective information regarding the perceptions of land managers about their overall life satisfaction and additional objective and subjective indicators across the social and economic domains, and a subjective indicator from the environmental domain. It was important to be able to utilise data on perceptions in addition to objective data to enable full exploration of the types of indicators (subjective and objective) that can be used when measuring life satisfaction. This data was also available at fine enough geographic detail to enable the responses to be analysed within the context of specific spatial features within which the economic, social and environmental factors are rooted which was also vital for this study.

For this case study, the question regarding life satisfaction was framed on the overall quality of life since it was aiming to capture a sense of people's contentment with the course (path) of their life, not just a sense of people's contentment with life at a given point in time (Eger & Maridal, 2015). This is particularly important given the likely influence of factors such as 'drought' or 'flood' on temporal perceptions of land managers' satisfaction; for this study case I was particularly interested in their overall quality of life and not to tap into any temporal or forecasted aspect, also I was working with secondary data therefore I did not have the opportunity to ask about future or long-term plans.

Respondents were asked to indicate how much they agreed or disagreed with the statement: I am satisfied with my overall quality of life (hereafter life satisfaction). Following the lead of Diener, Emmons, Larsen, and Griffin (1985) and Diener and Diener (2009), a 7-point scale was used (from strongly agree (3) to strongly disagree (-3)).

Additionally, to add subjective indicators across the social and economic domains, and a subjective indicator from the environmental domain; land managers were asked to indicate, also on a 7 point scale (matching the scale used to capture overall life satisfaction) how strongly they agreed or disagreed with the following statements:

I am satisfied with:

- The ecological/physical 'health' of my land (Eco Health)
- The relationships I have with family, friends, and others in the community (Relationships)
- My ability to 'control' what is happening on my land (Control)
- The income (dollar returns) from my land (Income)
  (These questions were intended to capture information about the contribution that different domains make to overall life satisfaction).

In addition, I also sought information about priorities/attitudes, asking respondents to indicate (again on a 7 point scale) how much they agreed/disagreed with the following statements:

- My main reason for living here is for 'lifestyle' (rather than money) (Lifestyle)
- My main reason for living here is to make money (Money)
- Conserving biodiversity is a priority in my land management (Conservation)

Unlike most previous research which has sought information from the general population, this study was focused on land managers who – for example – do not generally draw a salary but instead, must do what they can to earn money from the land, retaining surplus after paying costs. As such indicators that are commonly used to assess determinants of life satisfaction for the population at large (particularly for urban populations) needed to be assessed for their utility in this context.

As regards to 'objective' indicators, some indicators that are often used in life satisfaction studies of individuals had to be adjusted. For example, it would not have been useful to ask about personal income (since land owners many not have been drawing a salary). So the questionnaire included questions about livestock numbers, crops, tourism, and other revenues, as well as about costs. This allowed to estimate economic profits (formally calculated as the value of on farm production minus costs) and to assess the diversification of revenue streams (although it is important to note that the profit indicator should be considered with care; I consider it to be an objective indicator but since it is reported by land managers it cannot be verified and it may be misreported). Similarly, instead of asking about occupation (known to be land manager), information about land tenure and whether or not they were managers, or owner-managers of their land was collected. Respondents were also asked about the length of time they had managed the land and whether or not they had a university degree, and whether they had recently been affected by drought, flood/cyclone or other issues (left for individuals to specify).

Regarding objective environment indicators, those who depend upon the environment for their livelihoods, their life satisfaction is more likely to be affected instead by indicators of land productivity. For example information about size of farm, soil quality, vegetation, rainfall, presence/absence of perennial and non-perennial watercourses, and about the number of different weeds, pest animals, invasive species present on each farm. Because farm boundaries can be identified using a cadastral database, each farm was represented by a polygon feature (a closed shape defined by a connected sequence of X,Y coordinate pairs) in a map using Geographical Information System (GIS) software. The biophysical data were added to the GIS database. Some indicators were recorded in percentages, such as the percentage of the farm that comprised a certain soil or vegetation type. Other indicators were recorded as continuous indicators represented by simple counts on farms (e.g. number of weeds or pests present) or as

more extensive records (e.g. total rainfall, in millimetres, received in the year leading up to September 2013). See Table 17 for a summary.

Recognising that the environment may also be important to land managers for non-productive purposes, I thus also compiled additional information about aquatic species from other resources (as shown in Table 18) (e.g. turtles, fish, water birds), places of interest (e.g. national heritage places, wetlands of national or international significance) and others (also in Table 17). To the best of my knowledge, no other researchers have used these types of indicators in studies of life satisfaction. I acknowledge that they are likely to be somewhat inadequate or may represent surrogates for other indicators that are not presently available. They are, however, the only environmental indicators available consistently across my study areas.

However, whilst the use of this dataset enabled this study to address the research objectives posed in Chapter 1, the dataset is not perfect. Particularly, because it only provides cross-sectional data, the view presented by this study can only reflect a snapshot in time. This prevents a full investigation into cause and effect over time of the trade-offs within these complex, interrelated, dynamic systems. Accordingly, alternate sources of data were considered, but none were as well able to meet the requirements of this study.

Further detailed information regarding this project is available at: http://www.nespnorthern.edu.au/projects/nerp/improving-the-efficiency-of-biodiversity-investment/ (Stoeckl et al., 2015).

4.2.3 Data collection

Farms were identified using a cadastral database containing a unique identifier per farm to enable linking of social and economic data to spatial environmental data. Rural residential properties that were smaller than 3 hectares and properties with a primary land use of: urban residential and commercial services; manufacturing and industry; and airports and aerodromes were excluded. This filtering process left me with 253 unique farms in the Daly River catchment in Northern Territory, but the Queensland cadastral database contained almost 78,000 records. Therefore, for Queensland, properties were ordered by size and then randomly selected 100 properties from each size decile for inclusion in my survey. The sampling design thus sought to ensure that data would be collected from a broad cross-section of different sized

properties. After screening for duplicates, 570 potential farms from Queensland were left (in addition to the 253 from the Northern Territory)

In April 2013, a copy of the questionnaire was sent to all the selected farms. Following the Dillman, Smyth, and Christian (2014) method, a follow-up was sent two months later (the longer than normal time-lag between reminders was deliberate, and set to account for the long lags in mail delivery in remote areas like these), and a third and final follow-up two months after that. Mail-out surveys were supplemented with face-to-face interviews, using the same questionnaire, in the Gilbert River Catchment, in north-west Queensland.

4.2.4 Model estimation

In Model 1 I used subjective indicators obtained from the survey. Model 1 was analysed first using Ordinal regression and with a complementary log-log link-function (most responses were on the positive end of the scale). Because responses to satisfaction questions were collected on a 7 point scale, which had been visually represented to respondents as a continuum, I decided to also use Ordinary Least Squares (OLS) regression[26] and compare the results. I found few substantial differences (both regression approaches identified the same variables as statistically significant), so I continued with OLS approach and focus on it from now on.

For Model 2 I used objective indicators *from across my three domains (social and economic indicators from Table 17 and environment indicators from Table 18)*. I used stepwise OLS regression to identify statistically significant objective indicators in each of the three domains. I 'forced' the inclusion of profits to ensure I could test findings from previous research about the link between income and life satisfaction. Also, in line with other researchers (Diener & Biswas-Diener, 2002), I used the natural logarithm of life satisfaction because it allows for diminishing returns; this also helps estimate a clearer relationship between the different indicators and life satisfaction since it 'normalises' the distribution of life satisfaction.

[26] Differences between results derived from ordinal and continuous analysis techniques have been empirically tested. The general consensus is that choice of technique is more important in theory than in practice (Ferrer-i-Carbonell & Frijters, 2004; Helliwell, 2003; MacKerron & Mourato, 2009)

For Model 3 I included all indicators from models 1 and 2 that had been identified as being statistically significant; again I used stepwise OLS to select which of those indicators were statistically significant when combined within a single model although here too, I forced the inclusion of profits.

4.3 Results

4.3.1 Overview of responses, respondents and indicators used in models

A total of 136 responses were received: 27 land managers in the Daly River Catchment (Northern Territory) and 109 land managers in the Northern parts of Queensland. As expected (given my sampling strategies), my farms varied markedly in size: from 5 to 1.5 million hectares (mean ≈ 112,000 hectares; standard error ≈ 18,000, a bi-modal distribution with modes of 50 and 300). I classified the farms according to the land managers' reported main (more than 70%) source of profits: most reported profits from livestock (approximately 52%); 18% reported non-agricultural activities, 17% reported having a diversified income stream[27] and 14% from other agricultural activities.

MOST RESPONDENTS WERE SATISFIED WITH THEIR OVERALL QUALITY OF LIFE (LIFE SATISFACTION), THEIR RELATIONSHIPS WITH FAMILY, FRIENDS, AND OTHERS IN THE COMMUNITY (RELATIONSHIPS); THE ECOLOGICAL AND PHYSICAL 'HEALTH' OF THEIR LAND (ECO HEALTH); AND THE ABILITY TO 'CONTROL' WHAT HAPPENS ON THEIR LAND (CONTROL). THEY WERE DISSATISFIED WITH THE INCOME FROM THEIR LAND (INCOME). LIFESTYLE AND CONSERVATION WERE EVIDENTLY VIEWED AS MORE IMPORTANT THAN MAKING MONEY (

Figure 8).

[27] Land managers that reported revenue from multiple sources different from livestock, such as non-agricultural activities or other agricultural activities; meaning they have an income from 2 or more types of activities

Figure 8 Subjective indicators from questionnaires[28]

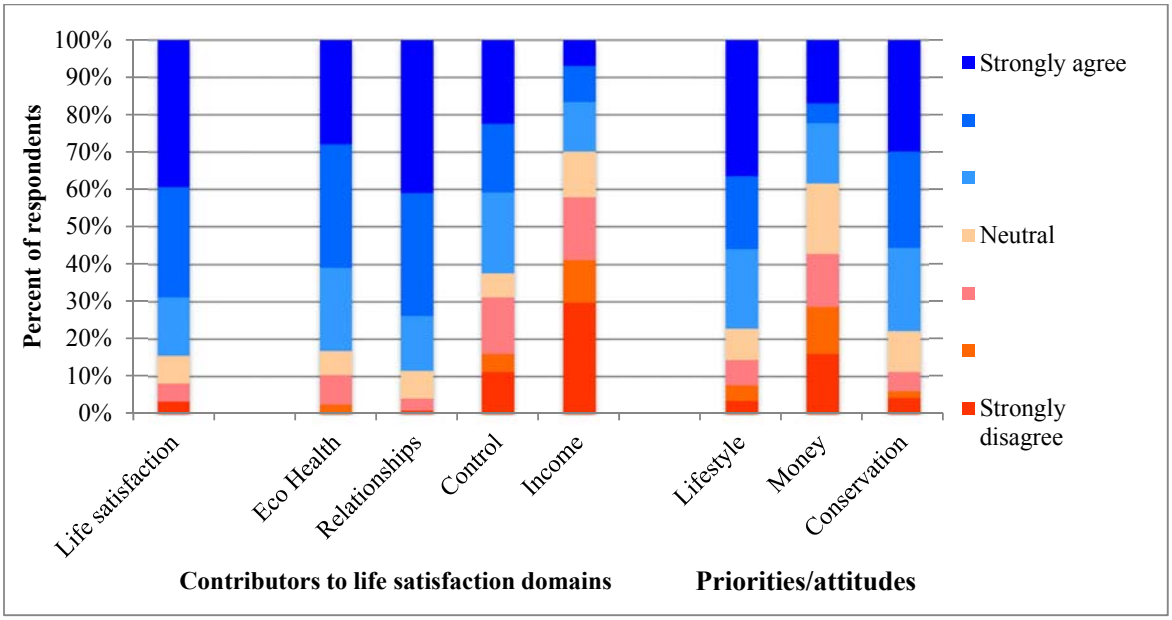


Table 17 provides more information about our respondents – showing descriptive statistics for the objective indicators collected in the survey.

Table 17 Objective social and economic indicators from questionnaires

Indicators from literature	Domains	Indicators from questionnaire	My indicators	Summary
Income	Economic	Value of on-farm production[29] minus imputed total costs excluding capital expenditure = Economic Profits	Economic Profits	$435,942 average
Occupational status	Social	Which best describes you and your 'relationship' to this land?	Owner/manager	61 land managers were owners

[28] Appendix Table C1 includes all descriptive statistics for all variables.

[29] The value of on farm production was the income from crops, horticulture, and tourism plus the 'value' of beef produced during the year. The 'value' of beef produced during the year was calculated as: $3 (the average price per kilo of beef that graziers were receiving in January 2014) multiplied by estimated live-weight gain (calculated by comparing stock numbers and weights from beginning to end of year). In some cases (Table C1), the value of on-farm production was negative because there had been a drought on about one-third of farms and many were losing stock or seeing the condition of the stock deteriorate.

Indicators from literature	Domains	Indicators from questionnaire	My indicators	Summary
		Which best describes the legal tenure of your land?	Land tenure	61 farms were at least 50% freehold
		How many years have you owned or managed this land?	Years managing /owning the land	From 3 to 50 years, average 21
		Primary economic activity	Diversified income stream	21 farmers had a diversified income[30]
		Livestock	Cattle on the farm	94 farmers had cattle on their land
Education	Social	What types of education, training, and experience do you and other owner/managers have?	University degree	31 land managers had a university degree

Table 18 shows the objective environmental indicators obtained from our questionnaire and government agencies.

Table 18 Objective environmental indicators for analysis

Biodiversity factors that may influence	Environmental indicators tested	Presence (Number of farms)[31]	Average per farm	Source (date)
Area (hectares)	Farm size	137	111,918.70	Questionnaire (April 2013)
Water (represented in the model as a dummy variable set equal to 1 if present; 0 otherwise)	Watercourse (only 4 farms had perennial water courses so I did not distinguish between perennial and non-perennial)	77	-	
Rainfall (millimetres)	Rainfall 2013	136	769	BOM (Available data for the year ended on September 2013 from the rain station closest to the farm)
	Rainfall 2012	136	1127	
Soil type (% of farm)	Chromosol	32	10.60%	ASRIS[32]: Australian Soil Classification - Dominant Soil Order (250m raster) (Compiled by CSIRO
	Dermosol	17	4.50%	
	Ferrosol	34	13.50%	
	Hydrosol	2	0.70%	
	Kandosol	68	23.80%	

[30] Dummy variable equal to one if revenue from multiple sources different from livestock, such as non-agricultural activities or other agricultural activities; meaning they have an income from 2 or more types of activities.
[31] Presence in a property is considered when the number is greater than zero.
[32] Website: http://www.asris.csiro.au/

Biodiversity factors that may influence	Environmental indicators tested	Presence (Number of farms)[31]	Average per farm	Source (date)
	Rudosol	24	2.50%	over the period 1960-1991)
	Sodosol	26	4.90%	
	Tenosol	57	17.60%	
	Vertosol	52	20.80%	
Vegetation type (% of farm)	Forest and Woodlands	118	58.10%	NVIS Version 4.1 (Albers 100m analysis product)[33] (Based on 2001 data for QLD and 2004 for NT)
	Grasslands	44	13.00%	
	Cleared Vegetation	64	23.50%	
	Naturally Bare	2	0.10%	
	Rainforests	17	3.80%	
	Shrubland	8	0.90%	
	Unclassified Unmodified Native	9	0.30%	
Weeds (number of occurrences)	Queensland Government listing[34]	30	2	Atlas of Living Australia[35]: State of Queensland, Department of Agriculture and Fisheries (Last updated on March 2013)[36]
	National significance	13	1	
Species (number of occurrences)	Australian iconic species	73	5	Protected matters[37] (Website notes that this data was submitted to the site on 23/10/12)
	Listed threatened species	137	12	
	Migratory species	137	9	
	Endemic species	113	3	
	Pest animals	14	1	
Places (number of occurrences)	National heritage places	12	2	
	Wetlands of national or international significance	20	1	
	Commonwealth, stat or territory reserves	20	3	
	Places on the RNE	22	1	
	Threatened ecological communities	32	2	
Aquatic biodiversity (average diversity measures)	Fish	88	0.9	(Kennard, 2010)
	Turtles	83	0.4	
	Water birds	83	1.4	
	Riverine	84	0.4	
	Lacustrine[38]	37	0.3	

[33] Website: http://www.environment.gov.au/fed/catalog/search/resource/details.page?uuid=
[34] Plants that are declared or identified as significant weeds in Queensland.
[35] Website: http://www.ala.org.au/
[36] Website: https://www.daf.qld.gov.au/plants/weeds-pest-animals-ants/weeds
[37] Website: http://www.environment.gov.au/epbc/pmst/
[38] Relating to a lake

Biodiversity factors that may influence	Environmental indicators tested	Presence (Number of farms)[31]	Average per farm	Source (date)
	Palustrine[39]	39	0.4	

4.3.2 Model results

4.3.2.1 Model 1: Which subjective indicators have the highest contribution to land managers' life satisfaction?

In total, 108 land managers provided information about all the variables used in Model 1. Table 19 summarises key results from my OLS (1A) and Ordinal (1B) regressions. Both models had an overall good fit (OLS adjusted R^2 of 0.226 and Ordinal with a Chi-Square of 54.639). In both regressions, relationships were the most significant predictor of life satisfaction (significant at 1%). My indicator of Ecological Health was also statistically significant, at 5%, in Model 1B (Table 19).

Table 19 Life satisfaction and subjective indicators modelled with Ordinary Least Square [a] and Ordinal [b] regressions

	Model 1A: OLS		Model 1B: Ordinal regression	
Variable	**Coefficient**	**Std. Error**	**Coefficient**	**Std. Error**
Ecological Health	-0.003	0.027	0.263 **	0.107
Relationships	0.123 ***	0.024	0.644 ***	0.116
Control	0.013	0.018	0.018	0.076
Satisfaction with Income	0.021	0.017	0.123	0.076
	[a] Number of observations	108	*[b] Number of observations*	108
	Adjusted R^2	0.226	*-2 Log Likelihood Chi-Square*	54.639***
	F	8.809***	*McFadden Pseudo R-Square*	0.172

Note: Significance at the 10% level is indicated by*, significance at the 5% level is indicated by** and significance at the 1% level is indicated by***

4.3.2.2 Model 2: What is the relationship between objective indicators and land managers' life satisfaction?

MODEL 2 WAS STATISTICALLY SIGNIFICANT AND HAD AN ADJUSTED R^2 OF 0.376 (

[39] Relating to inland wetlands including marshes, swamps and fens

Table 20), with significantly influential indicators from the social, economic, and environmental domains: the % farm with dermosol and having a diversified income were associated with lower levels of life satisfaction; having a university degree or a larger percentage of the farm with rainforest was associated with higher levels of satisfaction. Profits, which were 'forced' in the model, did not have a statistically significant impact.

Table 20 Life satisfaction and objective indicators

Variable	Coefficient	Std. Error
(Constant)	1.799	.055
Profits	0.000	.000
% farm dermosol soil type	-1.183 ***	.271
Diversified	-0.419 ***	.119
University degree	0.300 **	.122
% of farm comprising rainforests	0.640 **	.307
	Number of observations	50
	Adjusted R^2	.376
	F	7.033***

Note: Significance at the 10% level is indicated by*, significance at the 5% level is indicated by** and significance at the 1% level is indicated by***

4.3.2.3 Model 3: Is life satisfaction better explained when using both subjective and objective indicators across three different domains?

The overall fit of model 3 was good (with an adjusted R^2 of 0.611, the highest of all the models tested, as observed on Table 21). Similar to Model 1, the effect of Relationships on life satisfaction was statistically significant at the 1% level and positive. Notice also that, in accordance to Model 2, having more dermosol on the farm was negatively associated with life satisfaction. The profits indicator was not statistically significant in this model, as in Model 2. Regarding environmental indicators, as mentioned before, this may represent surrogates for other indicators that are not available and could be better at explaining land manager's life satisfaction.

Table 21 Life satisfaction and subjective and objective indicators

Variable	Coefficient	Std. Error
(Constant)	1.290	.062
Profits	0.000	.000
Relationships	0.227 ***	.026

% farm dermosol soil type	-0.543 ***	.149
	Number of observations	62
	R^2	.611
	F	33.447***

Note: Significance at the 10% level is indicated by*, significance at the 5% level is indicated by** and significance at the one percent level is indicated by***

4.4 Discussion and conclusions

My analyses of pastoral farms in Northern Australia confirms that life satisfaction derives from multiple domains, as demonstrated in chapter 3 and previous studies (Rojas, 2006a). My analysis also demonstrates that those interested in understanding contributors to life satisfaction may need to work with both subjective and objective indicators (Stiglitz, Sen, & Fitoussi, 2009). My models explained up to 60 % of variance in responses to the question about overall quality of life – a relatively robust statistic, given that previous research has demonstrated that around 30-40% of variation in responses to questions about life satisfaction can be attributed to genetic factors (Rietveld et al., 2013) and I did not have access to that (missing) data.

My results suggest that the single most important subjective indicator of life satisfaction (for land managers in Northern Australia), is having good relationships with family and friends. Previous researchers in the region also noted the importance of personal and family factors to land managers (Brodt, Klonsky, & Tourte, 2006; Farmar-Bowers & Lane, 2009; Greiner & Gregg, 2011). International research (from 'non' land managers) demonstrated that healthy social contact is essential for life satisfaction (Diener & Biswas-Diener, 2011); indeed relationships have been found to be the strongest predictor of life satisfaction (Achor, 2010).

Models 2 and 3 show that the physical and biological environment also matters to life satisfaction, as has been demonstrated in previous work (Welsch & Kühling, 2009). However, it is difficult to place an exact interpretation on the significance of these environmental indicators (% of farm with dermosol; % of farm with rainforest – with only 9 farms within my sample having both present). The small sample size and the spatial concentration of those particular soil and vegetation types suggest that these variables are a surrogate measure of something else. Since I did not include indicators of vegetation preference (or any environmental preferences for that matter) or indicators of interaction with the environment, I do not have enough information to understand the whole story. As noted earlier, my research

was designed to provide preliminary evidence of the likely contribution of different domains to life satisfaction; my findings suggest that the environment is important, but data deficiencies prevent me from teasing out 'the why'. More research, with more comprehensive data, is needed.

Contrary to expectations, I did not find a statistically significant relationship between profits and life satisfaction in Models 2 and 3. Noting that it is only owners who directly benefit from profits (land managers instead draw a salary), I tested for statistically significant differences in the contribution that profit makes to life satisfaction between owners and managers, finding none. Neither did I find that being satisfied with the income from one's land (my subjective parallel to profit) increased overall life satisfaction. Other studies, however, have demonstrated the association between income and life satisfaction. A study in East Germany found that about 35-40% of the increase in life satisfaction was attributable to a large increase in income (Frijters et al., 2004). However, raising the incomes of all does not increase the happiness of all because the material norms on which judgments of wellbeing are based increase in the same proportion as the actual income of the society (Easterlin, 1995). Money is a means to an end, and that end is wellbeing; money is thus an inexact surrogate for wellbeing, and the more prosperous a society becomes, the more inexact this surrogate becomes (Diener & Seligman, 2004). It is thus possible that profits were not statistically significant because those who responded to the survey were already relatively well off. I also acknowledge that this lack-of statistical significance may be related to the fact that my study is looking at profits, rather than income (the usual measure).

Diversification of income from managers' primary economic activity had a negative association with life satisfaction. I was expecting that diversified sources of income could have a positive effect since land managers would be able to overcome difficult financial situations if one or more of their income sources failed. Another study found that income diversification was associated with higher incomes (Delgado, Matlon, & Reardon, 1992). But since my results indicate that profits do not seem to affect land managers' life satisfaction this relationship is not clear. My findings could mean that diversifying is more stressful for land managers and consequently reduces their level of life satisfaction. Another possible explanation is that diversifying is a response to difficult times, which would mean that the decrease of land managers' life satisfaction is not due to diversification, but rather to some other, external (and bad) situation.

Model 1A identified ecological health, control and satisfaction with income as statistically insignificant; while Model 1B identified control and satisfaction with income as statistically insignificant. Similar to the Costa Rica case study, when interpreting results from social surveys there are a few things that need to be taken into consideration such as samples size, survey response bias. In any social survey, it is not possible to force people to participate (even with national census), so survey response bias will almost certainly be present. As such, one needs to be careful if wishing to generalize results. Ecological health, control and satisfaction with income did not have an impact on my survey participants, but I cannot infer this to be the case for all land managers in Australia. Lack of significance could be due to my small sample size. Alternatively the possibility of sample selection bias means that the views of my sample may not reflect the views of other land managers. Also, although using secondary data on land managers in Northern Australia was convenient and extremely helpful, I was unable to ask identical questions in both case studies, so was limited in my compare case study results using quantitative methods. But for both cases future research is needed to be able to have further understanding of the contribution of the indicators that resulted non-significant and could have contributed to LS.

In summary, this exploration of the life satisfaction of Northern Australian land managers demonstrates that (1) life satisfaction depends on multiple domains, (2) using both subjective and objective indicators adds value to the analysis and (3) the physical and biological environment also matters to life satisfaction.

My key message is thus, that in contrast to financial indicators (which had a weak link to LS), social indicators had a strong, unambiguous and positive impact on life satisfaction. Gneezy et al. (2011) argue that for *public goods* (on-farm conservation is a particular type of public good) the most effective incentives will be those which (a) promote (or at least do no degrade) trust amongst participants; (b) maintain a social, rather than a monetary frame; and (c) do not undermine people's 'public good' image. My findings certainly support their conclusions regarding the maintenance of a social frame, and might help explain the apparent lack of 'additionality' associated with financially incentivized on-farm conservation programs (Claassen, Duquette, & Horowitz, 2013; Wunder, 2007). They may be 'converting' a social frame into a monetary one. Moreover, my findings support the conclusions of Farmar-Bowers and Lane (2009) who argue (with the support of data collected in southern Australia) that because 'caring for family' is key to many landholders, conservation policies which support,

facilitate and further promote that core goal may achieve much more than those that simply offer extrinsic (financial) incentives. Evidently, such a focus might also work for land managers in Australia's North. A core priority for future research is to identify methods of doing so, and to then test the effectiveness of such policies relative to other approaches to further improve the development of cost-effective policies that create genuine improvements in on-farm biodiversity.

5 Chapter 5: Discussion

5.1 Problem, aim and core research questions

Gross domestic product (GDP) is the primary measure used to quantify the progress of a country's economy; unfortunately this has focused thought on goods and services that are exchanged in the market place and thus have a price associated with them. Non-priced goods and services (such as the ones obtained from the environment), which are known to contribute to people's wellbeing, are not accounted for within GDP; they have thus usually been neglected and at worst have been degraded by those seeking to maximize GDP growth. Global GDP has trebled since 1950, but economic welfare, as estimated by the Genuine Progress Indicator (GPI), is lower now than it was in 1978. There is a need for measures that go beyond the standard economic ones like GDP; that can bring economic, environmental and social measures into a common framework and that can tell whether countries are making real, net progress (Costanza et al., 2004). Life Satisfaction, a measure of subjective wellbeing based upon responses to questions about overall life satisfaction and personal values (Diener et al., 1999), offers itself as a viable indicator to be used alongside GDP or other measures such as GPI.

Developed countries such as the USA, UK, Ireland and Australia have established their own measurements of life satisfaction. Much research has been done that asks people directly how satisfied they are with their lives or how happy they feel overall (at a country level and in individual studies). However, even though there appears to be broad consensus across disciplines, organisations and countries that such measures are valid, reliable, and replicable (Stiglitz et al., 2010), there are no general guidelines about which life-domains should be considered by those interested in monitoring wellbeing (life satisfaction) or about the type of indicators that should be included in such assessments.

The main aim of this thesis was thus to help identify simple indicators (and methods of measuring indicators) that could be used – alongside GDP – to better reflect genuine 'progress', to guide policy, and to inform policy makers about the effects of their decisions. I was primarily interested in the contribution which the environment makes to LS, but considered the environment relative to other factors known to be important, addressing three key research questions.

RESEARCH QUESTION 1: Do some domains appear to contribute more to life satisfaction in developed countries than in developing countries?

RESEARCH QUESTION 2: Which indicators (objective and/or subjective) best represent which domains when measuring the contribution of different domains to life satisfaction in different socio-economic contexts?

RESEARCH QUESTION 3: Do environmental factors, other than those 'normally' considered (such as those relating to climate and pollution) contribute to life satisfaction?

I did this in two separate case studies, briefly summarised below.

5.2 Case studies used to inform research questions

5.2.1 Costa Rica

In Chapter 3 I focus on five domains: social, economic, environment, health and safety; for each domain I used both subjective and objective indicators when possible/available to measure their impact on Costa Ricans' life satisfaction. In my analysis, I only included a sub-set of respondents: those who were employed at the time of the survey. This was done to help facilitate a (qualitative) comparison of insights across case-studies, since the Australian case-study focused only on land managers who are all, by definition, employed.

I found evidence to suggest that for the whole sample of employed respondents the indicators that had a statistically significant relationship with overall life satisfaction came from the economic, social and health domains. The economic domain is probably the most important domain for the Costa Rican sample – at least some variables from this domain were statistically significant for the entire sample and for each sub-sample. Regarding types of indicators, both subjective and objective indicators were statistically significant but from different domains. Satisfaction with housing, an individual level subjective indicator, was positively associated with life satisfaction for Costa Rican residents; in contrast, within the health domain, it was an objective indicator - frequency of time spent exercising that had a (positive) and statistically significant relationship with life satisfaction.

In the Costa Rica study case I tested a range of environmental indicators that came from the literature such as presence of beaches and protected areas. I also included an environmental indicator of interaction with the environment; the likes of which have, to the best of my knowledge, only been used in one previous study, in the UK. I was also interested in testing for differences in life satisfaction of residents in urban and rural areas. I found that presence of beaches and protected areas and interaction with the environment was positively associated with life satisfaction for residents of urban areas; but for resident in rural areas having protected areas and beaches close by and interacting with the environment did not have an effect on their life satisfaction.

In addition to providing insights to inform those core research questions, this chapter contributes to the life satisfaction literature. Previous research on life satisfaction has been, for the most part, conducted in developed countries and has used indicators of environmental condition to quantify the relationship between life satisfaction and the environment. This research extends that literature in two ways. First it focuses on a developing country – using insights from people in different regions of a developing country (Costa Rica). Second, it considers the role people play in creating their own wellbeing, by examining the link between their life satisfaction, their attitudes towards, and level of interaction with, the natural environment.

5.2.2 Northern Australian

I focused on three domains in Chapter 4: social, economic, and environment; for each domain I used both subjective and objective indicators when possible/available to measure their impact on Northern Australian land managers' life satisfaction.

In Northern Australia the social and environment domains yielded statistically significant indicators. My results suggest that the single most important subjective indicator of life satisfaction (for land managers in Northern Australia), is having good relationships with family and friends.

Since I also wanted to test the contribution of the environment to people that work with the environment in Northern Australia (i.e. land managers) I tested environmental indicators that could affect the productivity of their land such as rainfall, drought, vegetation and soil type and

weeds. I also asked whether they were satisfied with the ecological/physical 'health' of their land. The presence of rainforests on the land had a positive effect on land manager's life satisfaction; and the presence of dermosol soil type had a negative effect. It is difficult to place an exact interpretation on the significance of these environmental indicators. The small sample size and the spatial concentration of those particular soil and vegetation types suggest that these variables are a surrogate measure of something else (perhaps aesthetics or some other environmental amenity). But since I did not include indicators of vegetation preference (or any environmental preferences for that matter) or indicators of interaction with the environment, I do not have enough information to understand the whole story. More research on this important issue is needed.

In addition to providing data to inform my three core research questions, this chapter contributes to the life satisfaction literature, focusing, in particular, on the intrinsic motivations of land managers to participate in on-farm conservation programs by learning more about what contributes to their life satisfaction. Research suggests that the success of on-farm conservation programs depends primarily on land managers' behaviour. In the past one of the tools used for on-farm conservation has been financial incentives but these may be ineffective if they do not align with the intrinsic motivations of land managers. This paper seeks to learn more about the intrinsic motivations of land managers by learning more about what contributes to their life satisfaction. I hypothesize that by understanding the drivers of land manager's subjective assessments of their own life satisfaction I will be able to shed light on the types of incentives that could help promote on-farm conservation.

5.3 Findings relating to core research questions

Error! Reference source not found. provides a summary of the main results and overall findings from both case studies. Here I have included the domains I used for each case, the indicator, its impact on life satisfaction, the type of indicator and the overall findings from both case studies. The following sections use insights from those case-study specific findings to shed light on the core research questions of the thesis.

Table 22 Summary of results and findings of case studies

Case studies	Main results				Overall findings		
	Domains	**Factor**	**Impact**	**S/O**	**Domains**	**Indicators**	**Environment**
CR	Social	Age	(+)	Objective	Social domain is important in both case studies; economic domain is important in developing country. Health is also important in the developing country, but was not tested in NA.	Both objective and subjective indicators should be included (across multiple domains)	Include more than just measures of environmental quality or condition but also of interaction; time spent interacting with nature is also important for urban residents in CR that live close to a beach and Protected Area.
	Economic	Housing	(+)	Subjective			
	Environment	Interaction with environment (only for Urban + Beach and PA)	(+)	Objective			
	Health	Exercising	(+)	Objective			
	Safety	Not statistically significant					
NA	Social	Relationships	(+)	Subjective			
	Environment	Dermosol	(-)	Objective			
	Economic	Not statistically significant					

5.3.1 Do some domains appear to contribute more to life satisfaction in developed countries than in developing countries?

The first question regarding which domains contribute the most to life satisfaction was addressed in both study cases; but the number of domains included in each case was different. In the Costa Rica study case I included five domains: social, economic, environment, health and safety; and in Northern Australia I included three: economic, social and environment. Nonetheless, in both case studies it is clear that life satisfaction depends on multiple domains.

In the Costa Rica case, the social, economic and health domains had a positive impact on life satisfaction; while in Northern Australia the social domain. Even though the cases were analysed separately, and even though samples are (like all social surveys) likely subject to sample selection bias, these results are strongly suggestive of the fact that different domains are relevant in different contexts. In Costa Rica´s case, which is considered a developing country, I found that the economic domain represented by the income indicators is the most important one for the whole sample; although it is a small sample and this can have issues, it can also reflect the reality of the country where having extra money really does make a difference to people who are very poor. For both study cases the social domain was an important contributor to life satisfaction, this has also been found in the literature. I cannot be sure that my results can be generalized given the small samples sizes, but the consistency of my findings in both cases suggests that my results are robust. Developing countries may need

to focus on income, while richer countries could benefit by concentrating on social relationship instead of chasing GDP growth. It is time to embrace new metrics such as life satisfaction to account for people's wellbeing.

5.3.2 Should we include objective and/or subjective indicators when measuring life satisfaction?

My second question was about type of indicators, whether we should include objective and/or subjective indicators when measuring life satisfaction. From both case studies I found that it is better to include both types of indicators; besides the objective indicators (such as income, gender, marital status, etc.) that have already been tested in the literature, subjective indicators on how people feel need to be included, too. Including both types of indicators across the multiple domains (when available), resulted in better models. For the Costa Rica case study I tested all the indicators at the same time, and for the Northern Australia case study I decided to first test them separately (Model 1 and Model 2) and using the indicators that resulted statistically significant I ran a third model (Model 3).

5.3.3 Do environmental factors, other than those 'normally' considered (such as those relating to climate and pollution) contribute to life satisfaction?

Concerning my third and last research question I was interested in testing the contribution of environmental indicators to life satisfaction; I did this for both case studies but I used different indicators for each case. I found that life satisfaction is affected by environmental quality in both case studies; regardless of their level of development and the difference between both case studies. Because most of the previous research has focused mainly on the social and economic domain, a very important finding in both cases is that the environment domain makes an important contribution to life satisfaction; which suggest that it should be included in the future. As illustrated in the Australian case-study however, it is not always clear how best to measure those indicators, and/or how to interpret them.

5.4 Methodological contributions

In this thesis I used a well-established method in the social sciences, that until recently was not accepted in economics, which is the life satisfaction approach. Being a relatively new addition to the economics discipline, applying the life satisfaction approach presented challenges as well

as benefits. Choosing which domains and which indicators to include in my analysis was a challenge, but it also allowed me to test how to do it in a simple manner.

An important methodological contribution was to use data for both case studies at an individual scale; matching the "scale" of life satisfaction measurements with the explanatory environmental variables used (as recommended by Vemuri et al. (2009)). In the Costa Rica study case I did this by matching the residents' responses with the environmental indicators such as presence of beaches and of protected areas. In the Northern Australia case study I did the same but at the farm scale. I matched the land managers' responses with environmental indicators of the property such as the presence of different types of soils and of vegetation. Since these environmental indicators had not previously been tested, their contribution to life satisfaction could not be interpreted (e.g. dermosols for the Northern Australia case study) without specific environmental and biological knowledge; further interdisciplinary research is required to explain the contribution of dermosols to life satisfaction.

Another important methodological contribution was to test the life satisfaction approach with land managers in Northern Australia. I demonstrated how to adjust standard life satisfaction questions for use in a farm setting where the method of earning a living is inextricably linked to the environment (as if assessing life satisfaction of the owner of a business, rather than just a resident, and assuming life satisfaction can be separated from work/living). This proved to be challenging but worth testing since it provided a better understanding of what contributes the most to their life satisfaction and also to shed light on the types of incentives that could help promote on-farm conservation policies.

Testing the life satisfaction approach in a developing country is a final methodological contribution. Most of the literature has focused on developed countries and the little research that has been done in developing countries has been done using international datasets that tend to leave out a lot of detail and contextual characteristics. The Costa Rica case study is a comprehensive life satisfaction study for a developing country.

5.5 Limitations of this work and recommendations for future research

Measures of life satisfaction have been adopted by several nations and international organizations, and they have been around for a while; but there are no guidelines about which indicators to use, in which contexts. Working in such different contexts provided a great

understanding of the different contributors to life satisfaction of residents in Costa Rica and land managers in Northern Australia. The complexity of the comparison also has its limitation and provides future direction for research.

Because both case studies used slightly different definitions of life satisfaction, different sets of domains and indicators and were conducted at different times, the results are not comparable. Nevertheless, there is a clear suggestion that the economic domain is more important in Costa Rica than in Northern Australia. Future research that uses an identical set of survey questions and indicators would be extremely useful, since it would allow one to determine if these 'apparent' differences are borne out. Such work would also, ideally, include indicators from all five domains in all localities. Insights from a consistent comparison such as this would certainly help in setting guidelines for developed and developing countries to follow, which is fundamental for future measurements and comparisons of life satisfaction and indicators. To date, there are not enough studies that have studied this consistently, because each study is measuring life satisfaction differently and including different indicators from different domains.

Although growing in popularity, subjective indicators are still (in comparison to objective indicators) relatively uncommon – the important exception being the life satisfaction measure. This research highlights that subjective indicators may, indeed, lend greater insights than objective indicators in some contexts; but more research that is necessary to learn about the specific situations in which this hold. Subjective indicators are not always widely available; and rarely comparable (with different researchers and data-collection agencies framing questions differently). Nowadays governments mainly collect objective indicators, but if they were to incorporate questions in, for example, their regular censuses, they could glean insights that could greatly enhance our understanding of life satisfaction and of its determinants.

For future research a multidisciplinary approach is required. This work highlights that multiple domains contribute to life satisfaction, suggesting that insights from a broad range of scientists (with expertise relating to these different domains) is required. There is relatively little overlap between the social sciences and the environmental and biological sciences, so it may, for example, be difficult for a social scientist to choose, and interpret, appropriate environmental

indicators. Expert knowledge from the environmental and biological sciences could greatly enhance the life satisfaction research agenda.

Also, with respect to environmental indicators most countries use similar indicators regarding environmental quality but for interaction with the environment only the UK has collected information on the frequency of interaction with the environment. The interaction indicator is very important to study as it represents an opportunity, choice and a preference indicator. The presence of a (healthy) natural environment is an opportunity. A healthy environment must exist, if it is to contribute to life satisfaction. So its existence is a necessary condition – and it it thus important for people to monitor environmental quality. But the presence of a (healthy) natural environment it is not sufficient for the environment to promote well-being/life satisfaction. People choose how long they spend in the natural environment according to their preferences and to other constraints (such as leisure time). Hence, it is also important to include indicators that monitor the extent to which people are able to capitalise on the opportunities provided to them by a (healthy) environment.

Regarding sampling, invariably there is sample selection bias, which is likely to result in only having a sub-set of people (which happened in both case studies) answering the questionnaire. As such, one cannot be sure that the sample is representative of the population. In Northern Australia this is most problematic, since I only focused on land managers and this means that the results cannot be extrapolated to the wider population. In Costa Rica I ended up with a sample of only employed respondents, similar to Northern Australia, hence the results cannot be extrapolated to the whole population. For both cases I had relatively small samples size which made it hard to find statically significant relationships, hence the use of both stepwise and enter OLS to be able to get the best results. In the future both studies should be replicated elsewhere to help confirm the findings of both case studies. The analysis should be extended to include non-land managers (for Northern Australia) and residents that are not employed (for Costa Rica).

Concerning the analysis, I only used OLS and Cronbach's alpha test for the Costa Rica case study and for the Northern Australia I compared ordinal versus OLS and found few substantial differences. For future research, it might be worth testing other types of regressions and tests to check if the variables could be grouped differently and compare the results. For these cases studies I could not (properly) test for endogeneity because I only had cross sectional data. If

instead, I had access to time series or panel data, it would have been possible to explore the causal relationships between life satisfaction and the other variables. I Additionally, future research could usefully consider other variables that allow one to explore *relativities (*after the Easterlin Pardox – (Easterlin, 1995)), individual income relative to the income of other people. For example, Graham and Pettinato (2001) found that absolute income changes matter more for the poor, but after a certain absolute standard is met, relative income differences matter more.

5.6 Concluding comments

Measuring the progress of nations by only focusing on economic growth is inadequate. My study shows that different people in different places value different things and that GDP alone, is not a good indicator of life satisfaction; other indicators should be considered. My research demonstrates that there is a need to monitor multiple domains (including, at minimum, those from the social, economic, environmental and probably also health and safety domains), using both objective and subjective indicators. My research also demonstrates that one can expect different indicators to 'matter' at different stages of development of a country. If lacking the resources to monitor a large variety of indicators, it may be possible for governments to, at the very least, include a single question about overall life satisfaction within their regular censuses, thus readily monitoring more than mere GDP, in a cost-effective way. This would, at the very least, provide some base-line data which is useful by, and of, itself, but which could also be used in more detailed investigations, to identify which factors are contributing most/least to changes in the base. If GDP is growing and life satisfaction is declining, or vice versa, having both indicators provides core information to policy makers of what may be happening. Having information on life satisfaction, its' domains and both types of indicators, provides an opportunity for people to investigate what might be producing its' fall (or rise, if things are going well).

Regarding public policy, in the case of Northern Australia creating conservation policies which support, facilitate and further promote social relationships may achieve much more than those that simply offer extrinsic or monetary incentives. In contrast, in Costa Rica, my results suggest that income is one of the most important indicators of life satisfaction which represents the economic domain. In Costa Rica, it may thus be very important for the Government to consider the effects of its' policies on people's income. In urban areas, the Costa Rican Government

may also need to consider ensuring that residents have access to beaches and protected areas and opportunities to interact with the environment if seeking to promote, or support the population's satisfaction with life.

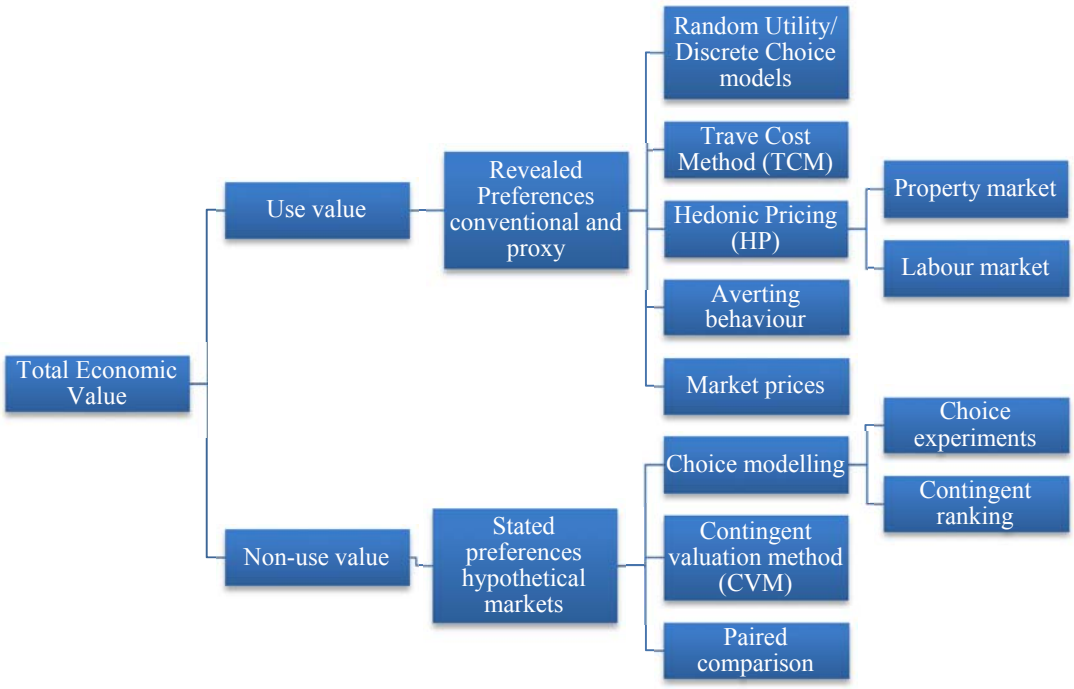
Appendices

Appendix A.1 Economic valuation techniques

Environmental resources are 'valued' in different ways (e.g. use, non-use) by different individuals, and trying to measure all these values is very difficult. In economics it is usual to rely on the markets to set the values or prices of goods and services; but when it comes to the natural environment this does not usually work. Why? Because many of the services provided by the natural environment are "priceless" (i.e. not exchanged in a market): like watching a sunset or talking a walk on the beach. Markets are "imperfect" when it comes to allocating resources for goods that are not explicitly included in markets. Indeed, some economists argue that price, as an allocation mechanism, has historically failed to reflect critical information about the state and quality of ecological resources (Georgescu-Roegen, 1975). Whilst Straton (2006) noted that neoclassical market-based economics are seriously challenged by ecosystem goods and services (natural resources in general) because these involve significant non-market values.

The purpose of economic valuation is thus to make the disparate services provided by ecosystems comparable to each other, using a common metric (MEA, 2005). Frey, Luechinger and Stutzer (2009) note that for measuring the value of environmental and other public goods economists have pursued two options. The first option is to ask individuals to state their preferences in hypothetical contingent markets or the second option is to infer preferences from their behaviour in markets for private goods that are complements or substitutes of these other goods. Ambrey and Fleming (2011) divide the valuation techniques into two approaches: stated preference and revealed preference. Stated preference approaches use surveys to question how respondents value that good or service, which is similar to the first option of Frey, Luechinger and Stutzer (2009). On the other hand, revealed preference approaches rely on observations about individuals' behaviours in markets that are in some way related to the environmental good or service under consideration; this is similar to the second option of Frey, Luechinger and Stutzer (2009). This division is loosely related to Total Economic Valuation (TEV), where the use values are divided into direct and indirect values.

Figure A.1 Economic valuation techniques modified from Bateman et al. (2002)



In Figure A.1 the TEV is divided into the main broad categories of values, showing different types of valuation techniques that are commonly used to estimate these types of values. It is important to point out that stated preferences can also be used to estimate use values – although Bateman et al. (2002) note that only stated preference techniques can be used when estimating non-use values. Also important, is that all of these valuation techniques rely mainly on dollar (or money) values and on identifying links between the environment and either 'real' or 'hypothetical' markets.

There are a few problems when money values are estimated for environmental resources, for example they sometimes add values that should not be summed or are sometimes accounted for twice. Serafy (1998) exposes the case of Constanza et al. (1997) when they calculated the value of the services of ecological systems and the natural capital stocks of the world. He stated that he had mixed reactions to their results. He believed there is a chance of double counting the ecological services they identified because they have already been counted in the global

gross product, or GNP. Their estimates of the value of all ecosystem services (US$16–54 trillion) are thus much higher than the global gross national product ($18 trillion).

Another very common mistake is adding preferences in dollar values, without taking into account income. According to Adler and Posner (1999) instead of estimating willingness to pay or willingness to accept as such, a better approach is estimated welfare or an income equivalent. Baker (1975) explains it in a different way; he states that any increase in wealth (or income) will alter the valuation of the resource and its use. And to give another perspective, Balckorby and Donaldson (1990) explain it from an ethical perspective. They say that if everyone's income, rich or poor, is treated the same way it is inconsistent with almost everyone's ethical preferences and with social policy. The consequence of not taking into account differences in income will result in misleading outcomes. A dollar is not a dollar for everyone: it is relative to income and their location.

Appendix A.2 Summary of valuation studies on SWB/life satisfaction/happiness/quality of life and environmental issues

Ref. #	Study	Environmental issue	Within country data	Cross country data	Subjective indicators
1	Frijters & Van Praag (1998)	Climate	X		
2	Welsch (2002)	Air pollution		X	
3	Gabriel, Mattey, & Wascher (2003)	Air pollution	X		
4	Israel & Levinson (2003)	Water pollution		X	
5	Tan, Luo, Wen, Liu, Li, Yang & Sun (2004)	Floods	X		
6	Rehdanz & Maddison (2005)	Climate		X	
7	Welsch (2006)	Air pollution		X	
8	Ferreira, Moro & Clinch (2006)	Air pollution	X		
9	Vemuri & Constanza (2006)	Ecosystem service product		X	
10	Welsch (2007)	Air pollution		X	
11	Di Tella & MacCulloch (2007)	Air pollution		X	
12	Ferrer-i-Carbonell & Gowdy (2007)	Environmental attitudes (ozone, pollution and species extinction)	X		X
13	Fuller, Irvine, Devine-Wright,Warren & Gaston (2007)	Urban species richness	X		X
14	Brereton, Clinch & Ferreira (2008)	Climate	X		
15	Rehdanz & Maddison (2008)	Air pollution	X		X
16	Abdallah, Thompson, & Marks (2008)	Ecosystem service product/ Climate		X	
17	Moro, Brereton, Ferreira & Clinch (2008)	Climate	X		
18	Bonini (2008)	Environmental Sustainability Index		X	
19	MacKerron and Mourato (2009)	Air pollution	X		X
20	Luechinger (2009)	Air pollution	X		
21	Carroll, Frijters & Shields (2009)	Droughts	X		
22	Luechinger & Raschky (2009)	Floods		X	
23	Engelbrecht (2009)	Natural capital per capita (World Bank, 2006)		X	
24	Vemuri, Grove, Wilson & Burch (2009)	Satisfaction with the quality of the environment	X		X
25	Menz & Welsh (2010)	Air pollution		X	
26	Ferreira & Moro (2010)	Air pollution	X		

Ref. #	Study	Environmental issue	Within country data	Cross country data	Subjective indicators
27	Luechinger (2010)	Air pollution		X	
28	Maddison & Rehdanz (2011)	Climate		X	
29	Menz (2011)	Air pollution		X	
30	Ambrey & Flemming (2011)	Scenic amenity value	X		X
31	Nisbet, Zelenski & Murphy (2011)	Nature relatedeness	X		X
32	Levinson (2012)	Air pollution	X		
33	Ambrey & Flemming (2012)	Protected Areas proximity	X		
34	Ferreira & Moro (2013)	Climate	X		
35	Silva & Brown (2013)	Air pollution		X	
36	Tandoc & Takahashi (2013)	Environmental Performance Index		X	
37	MacKerron & Moruato (2013)	Land cover type/ Climate	X		
38	Howell, Passmore & Burro (2013)	Nature connectedness	X		X
39	Ambrey, Flemming & Chan (2014)	Air pollution	X		
40	McCrea, Shyy & Stimson (2014)	Nature satisfaction and importance	X		X

Appendix A.1 Costa Rica - Survey 2013

JAMES COOK UNIVERSITY AUSTRALIA

What do YOU like most about the environment?










Hello!

My name is Adriana Chacón. I am a researcher at James Cook University, and I am working on a project which seeks to learn more about what people think is most (and least) important about the environment and how they interact with it.

Managers (in both the private and public sector) often have to make choices about development or conservation. But managers do not always know what people think is important when making those choices. This research project aims to inform these key decisions. This is your chance to be heard.

Specifically, we hope to find out:

- How satisfied are you with your overall life ...?
- What are the things that you consider are the most important ones when evaluating it?
- How do you interact with the environment and what do you value the most about it?

We would really like to hear what you have to say. If you'd like to make sure your voice is heard, please have one person in your house answer the questionnaire. We will be asking you for some contact details in order to contact you in a year time to ask you again a few related questions. We will not be linking any of those details to your answers. It will not take more than 15-20 minutes to complete. All of the information collected will be kept strictly confidential and results will only be released in summary form.

Should you have any questions about the project, or if you are interested in seeing the results please contact: **Phone: 2256-1758 or email:** adriana.chacon@my.jcu.edu.au.

I thank you in advance for your help.

Should you have any concerns about the ethical conduct of this survey, please contact: Helen Griffiths, Ethics Officer, Research Office, James Cook University, Townsville, QLD 4811, Tel: 07 4781 6575; Email: Helen.griffiths@jcu.edu.au

COSTA RICA - Survey 2013

ID#_____

Enumerator:_____ Date:_____ Time:_____ Place: _____

Gender: F or M

Costa Rica is home to a rich variety of plants, animals, and environments, which makes it a very unique place to live in. We would like to hear your say. By answering these questions you will be helping us understand your values, and the results will help us inform the government in order to create adequate environmental policies.

1. **Where do you live?** Province: _____ Canton:_____ District:_____ Post Code:_____

2. **Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time? Please circle a number.**
   Or: NOT SURE ❒NO RESPONSE ❒

3. **On which step do you think you will stand about five years from now? Please circle a number.**
   Or: NOT SURE ❒ NO RESPONSE ❒

4. **How IMPORTANT are the following to your OVERALL LIFE SATISFACTION (or happiness)? On a scale from 0 to 10, please write number.**

	On a scale of 0 to 10, how important are these things? (Write number)		
	(0 = Not important at all; 10 = Extremely important/ESSENTIAL)	Not sure (Tick one box)	No response (Tick one box)
1. Having a job		❒	❒
2. Making money		❒	❒
3. Having access to clean rivers		❒	❒
4. Having competent politicians		❒	❒
5. Having a nice house to live in		❒	❒
6. Being close to your family		❒	❒
7. Participating in religious activities		❒	❒
8. Having good health		❒	❒
9. Exercising regularly		❒	❒
10. Having friends to spend time with		❒	❒
11. Feeling safe		❒	❒
12. Doing outdoor activities		❒	❒
13. Having time to relax		❒	❒
14. Spending time in a natural environment		❒	❒
15. Doing something for conservation		❒	❒

5. When you interact with nature/environment in which places do you usually do it, how often and where? Tick one box in each row and specify where (what type of location, e.g. private property, public park, protected area, etc.).

	Almost every day	About once a week	About once a month	3-4 times a year	About once a year	Less than once a year	Never	Not sure	No response	Where? E.g. private property, protected areas, etc.
1. In urban open areas, e.g. municipal parks	❒	❒	❒	❒	❒	❒	❒	❒	❒	
2. In the forest	❒	❒	❒	❒	❒	❒	❒	❒	❒	
3. In mountains and volcanoes	❒	❒	❒	❒	❒	❒	❒	❒	❒	
4. In rivers, streams and waterfalls	❒	❒	❒	❒	❒	❒	❒	❒	❒	
5. In lakes, ponds and lagoons	❒	❒	❒	❒	❒	❒	❒	❒	❒	
6. At the beach	❒	❒	❒	❒	❒	❒	❒	❒	❒	
Other: (Please specify below) 8.....	❒	❒	❒	❒	❒	❒	❒	❒	❒	
9.....	❒	❒	❒	❒	❒	❒	❒	❒	❒	
10.....	❒	❒	❒	❒	❒	❒	❒	❒	❒	

6. From question #5, which of the previous places is your favorite? (Only choose one) Number:.....

7. From question #5, which place is your least favorite? (Only choose one) Number:.....

8. Do you know what a protected area is? ❒ Yes ❒ No
If yes, please define in a few simple words:
.....
.....

9. Have you visited a protected area? ❒ Yes (Go to question #10) ❒ No (Go to question #11)

10. If yes, how often do you visit protected areas?

❒ Almost everyday ❒ About once a month ❒ About once a year ❒ Never
❒ About once a week ❒ 3-4 times a year ❒ Rarely

11. The following question comprises two parts. First, please tell us <u>how IMPORTANT are each of the following items to YOUR OVERALL LIFE SATISFACTION</u>? *(Tick one box in each row – from 0 very unimportant to 10 very unimportant).* **Second, tell us <u>how OFTEN do you do each?</u>** *(Tick one box in each row – from very satisfied to very unsatisfied).*

		IMPORTANCE		FREQUENCY						
Type of environment	Type of activities	(0 = Not important at all; 10 = Extremely important/ESSENTIAL)	Not sure	Almost every day	About once a week	About once a month	3-4 times a year	About once a year	Less than once a year	Never
MIXED	1. Camping Type of place:		❒	❒	❒	❒	❒	❒	❒	❒
	2. Swimming Type of place:		❒	❒	❒	❒	❒	❒	❒	❒
	3. Relaxing in nature Type of place:		❒	❒	❒	❒	❒	❒	❒	❒
	4. Fishing Type of place: (Food ___ Recreation__)		❒	❒	❒	❒	❒	❒	❒	❒
	5. Hunting Type of place: (Food ___ Recreation__)		❒	❒	❒	❒	❒	❒	❒	❒
	6. Canoeing/kayaking Type of place:		❒	❒	❒	❒	❒	❒	❒	❒
	7. Other: (Please specify).....		❒	❒	❒	❒	❒	❒	❒	❒
AT HOME OR CLOSE	8. Gardening		❒	❒	❒	❒	❒	❒	❒	❒
	9. Playing sports outside (walk, run, cycle, etc.)		❒	❒	❒	❒	❒	❒	❒	❒
	10. Enjoying views		❒	❒	❒	❒	❒	❒	❒	❒
	11. Having picnics/BBQs outdoors		❒	❒	❒	❒	❒	❒	❒	❒
	12. Visiting/helping sanctuaries and rescue shelters		❒	❒	❒	❒	❒	❒	❒	❒
FOREST AND RIVERS	13. Fieldtrips or tours		❒	❒	❒	❒	❒	❒	❒	❒
	14. Wildlife/bird watching / Sightseeing		❒	❒	❒	❒	❒	❒	❒	❒
	15. Water rafting		❒	❒	❒	❒	❒	❒	❒	❒
	16. Mountain biking		❒	❒	❒	❒	❒	❒	❒	❒
	17. Canopy, sky rail, rappel		❒							
BEACH AND OCEAN	18. Sunbathing at the beach		❒	❒	❒	❒	❒	❒	❒	❒
	19. Surfing/ Stand up paddling		❒	❒	❒	❒	❒	❒	❒	❒
	20. Taking walks/runs on the beach		❒	❒	❒	❒	❒	❒	❒	❒
	21. Boating/ sailing		❒	❒	❒	❒	❒	❒	❒	❒
	22. Other water sports: (Please specify)_____		❒	❒	❒	❒	❒	❒	❒	❒
	23. Diving/ snorkeling in the ocean		❒	❒	❒	❒	❒	❒	❒	❒
	24. Whale/dolphin watching		❒	❒	❒	❒	❒	❒	❒	❒
25. Other: (Please specify).....			❒	❒	❒	❒	❒	❒	❒	❒

Finally, we would like to collect background information that is used to test if different people feel differently about the environment.

15. How many people, including yourself, normally live in your household? Adults_____ Children (Under 18)_____

16. How many bedrooms are there in your house? (Please specify) _____

17. What is your marital status? *(Tick one box)*

❒ De-facto ❒ Separated ❒ Widow/widower ❒ Other (please specify)_____
❒ Married ❒ Divorced ❒ Single

18. What is your age range? *(Tick one box)*

❒ 18-24 ❒ 35-44 ❒ 55-64 ❒ 75 or more
❒ 25-34 ❒ 45-54 ❒ 65-74

19. In what year were you born? *(Write the year)* 19_____

20. Where were you born? ❒ Costa Rica, which province? _____ and canton? _____ ❒ Overseas: _____

21. What is the highest level of education that you have completed? *(Tick one box)*

❒ None (0 years) ❒ Primary school (7 years) ❒ Trade / apprenticeship ❒ University or higher
❒ Prep school (1 year) ❒ High school (12 years) ❒ Diploma ❒ Other (please specify)_____

22. What is your employment status? *(Tick one box)*

❒ Own business ❒ Employed in the Public Sector ❒ Student ❒ Work at home
❒ Employed in the Private Sector ❒ Unemployed ❒ Retired ❒ Other (please specify)_____

23. Please indicate which of the industries listed below is the main source (i.e. most important source) of your income? *(Tick one box)*

❒ Manufacturing ❒ Accommodation and food service ❒ Teaching
❒ Agriculture, forestry and fishing ❒ Transport, storage, information and communication ❒ Activities of human health care and social assistance ❒ Other _____
❒ Electricity, gas and water ❒ Financial and insurance activities ❒ Arts, entertainment and recreation
❒ Construction ❒ Real estate, business activities ❒ Households as employers
❒ Wholesale, retail and repair ❒ Public administration ❒ Extraterritorial organizations

24. On average, how much pre-tax income do you earn each month? *(Tick one box)*

❒ $1 to $2 500 ❒ $7 500 to $12 500 ❒ $22 500 to $27 500
❒ $2 500 to $5 000 ❒ $12 500 to $17 500 ❒ above $27 500
❒ $5 000 to $7 500 ❒ $17 500 to $22 500 ❒ prefer not to specify ❒ I do not know

25. Do you make contributions to, or volunteer for any conservation organizations? *(Tick all that apply)*

❒ Yes, International Conservation Organizations ❒ Yes, National & Local Conservation Organizations ❒ No

Thank you for your help ☺

ID#_____

Please provide us with your contact details below if you would like us to contact you next year:

Name:_____ Telephone number: _____

Address:_____

E-mail: _____

Table B2. Costa Rica: Present Life satisfaction

Actual happiness

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	5	.9	.9	.9
	2	7	1.3	1.3	2.2
	3	8	1.4	1.5	3.7
	4	12	2.2	2.2	5.9
	5	39	7.1	7.2	13.1
	6	50	9.0	9.2	22.2
	7	110	19.9	20.2	42.5
	8	149	26.9	27.4	69.9
	9	73	13.2	13.4	83.3
	10	91	16.5	16.7	100.0
	Total	544	98.4	100.0	
Missing	7777	3	.5		
	8888	4	.7		
	System	2	.4		
	Total	9	1.6		
Total		553	100.0		

Figure B2. Costa Rica: Present Life satisfaction

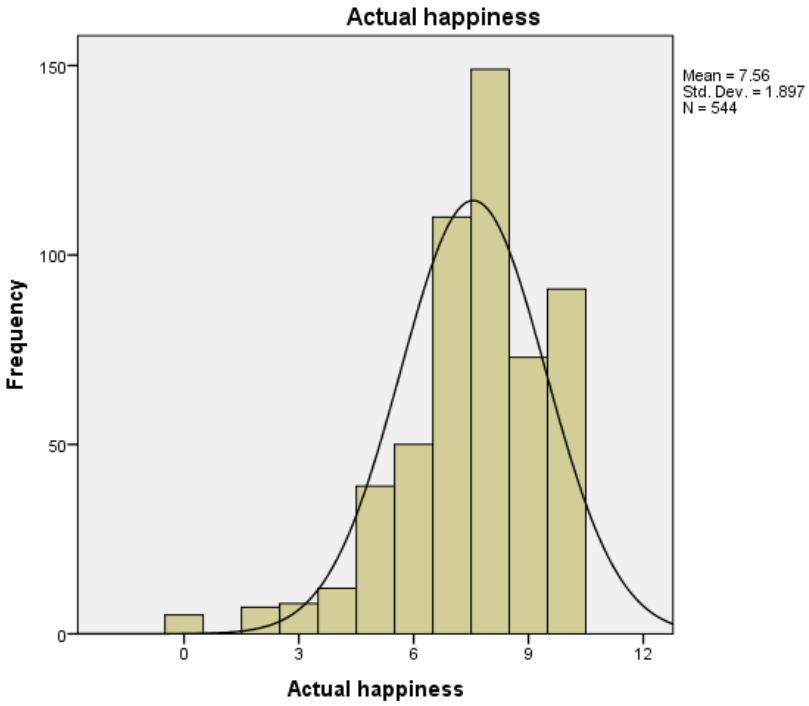


Table B3. Costa Rica: Importance of having competent politicians

Importance of having competent politicians

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	13	2.4	2.5	2.5
	1	3	.5	.6	3.0
	2	2	.4	.4	3.4
	3	3	.5	.6	4.0
	4	6	1.1	1.1	5.1
	5	21	3.8	4.0	9.1
	6	9	1.6	1.7	10.8
	7	31	5.6	5.9	16.6
	8	66	11.9	12.5	29.1
	9	68	12.3	12.9	42.0
	10	307	55.5	58.0	100.0
	Total	529	95.7	100.0	
Missing	7777	4	.7		
	8888	12	2.2		
	System	8	1.4		
	Total	24	4.3		
Total		553	100.0		

Figure B3. Costa Rica: Importance of having competent politicians

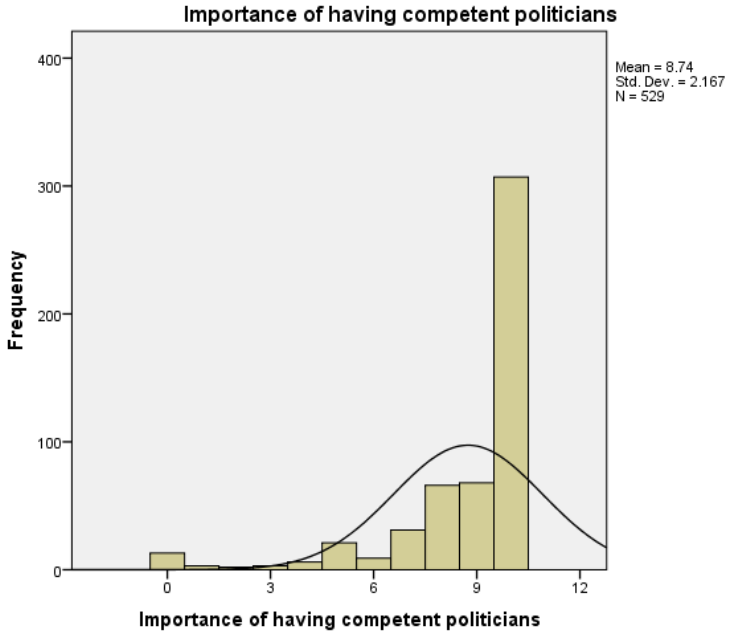


Table B4. Costa Rica: Importance of being close to your family

Importance of being close to your family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	4	.7	.7	.7
	1	1	.2	.2	.9
	2	2	.4	.4	1.3
	3	2	.4	.4	1.6
	4	2	.4	.4	2.0
	5	10	1.8	1.8	3.8
	6	8	1.4	1.5	5.3
	7	27	4.9	4.9	10.2
	8	42	7.6	7.7	17.9
	9	40	7.2	7.3	25.2
	10	409	74.0	74.8	100.0
	Total	547	98.9	100.0	
Missing	7777	5	.9		
	8888	1	.2		
	Total	6	1.1		
Total		553	100.0		

Figure B4. Costa Rica: Importance of being close to your family

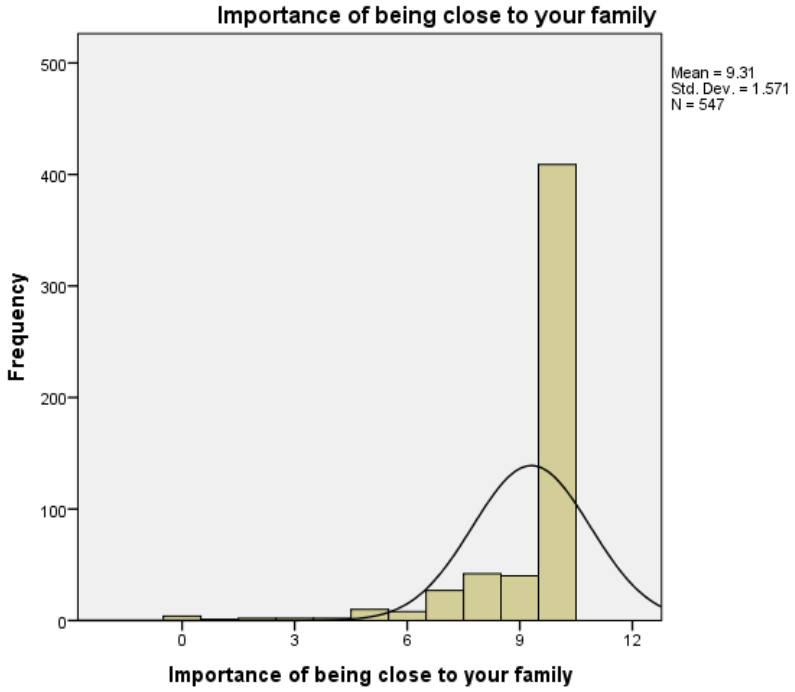


Table B5. Costa Rica: Importance of participating in religious activities

Importance of participating in religious activities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	61	11.0	11.3	11.3
	1	14	2.5	2.6	13.9
	2	17	3.1	3.2	17.1
	3	11	2.0	2.0	19.1
	4	13	2.4	2.4	21.6
	5	53	9.6	9.9	31.4
	6	21	3.8	3.9	35.3
	7	28	5.1	5.2	40.5
	8	75	13.6	13.9	54.5
	9	43	7.8	8.0	62.5
	10	202	36.5	37.5	100.0
	Total	538	97.3	100.0	
Missing	7777	8	1.4		
	8888	7	1.3		
	Total	15	2.7		
Total		553	100.0		

Figure B5. Costa Rica: Importance of participating in religious activities

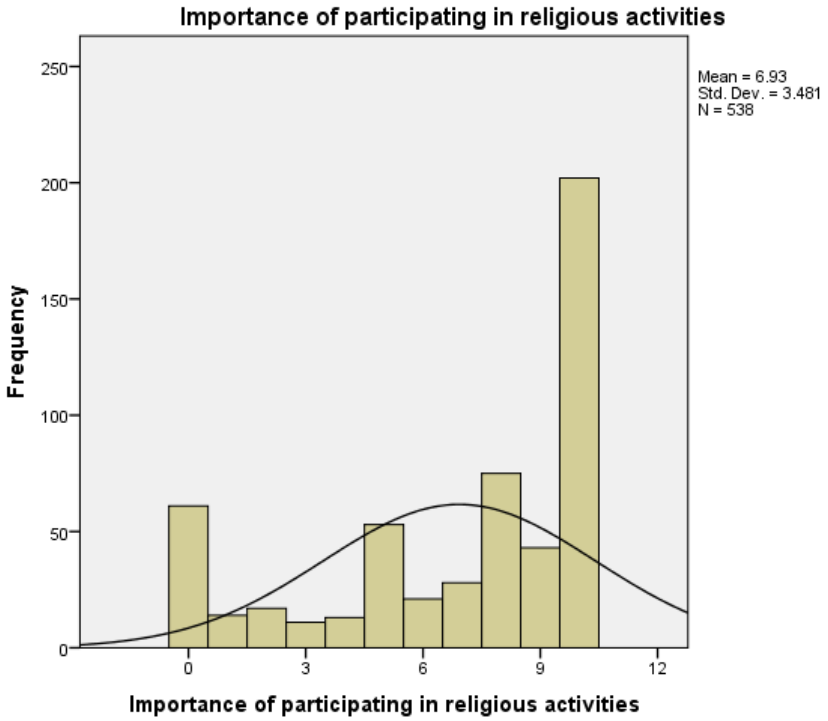


Table B6. Costa Rica: Importance of having friends to spend time with

Importance of having friends to spend time with

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	10	1.8	1.8	1.8
	2	4	.7	.7	2.6
	3	5	.9	.9	3.5
	4	4	.7	.7	4.2
	5	23	4.2	4.2	8.4
	6	18	3.3	3.3	11.7
	7	44	8.0	8.1	19.8
	8	106	19.2	19.4	39.2
	9	86	15.6	15.8	54.9
	10	246	44.5	45.1	100.0
	Total	546	98.7	100.0	
Missing	7777	4	.7		
	8888	3	.5		
	Total	7	1.3		
Total		553	100.0		

Figure B6. Costa Rica: Importance of having friends to spend time with

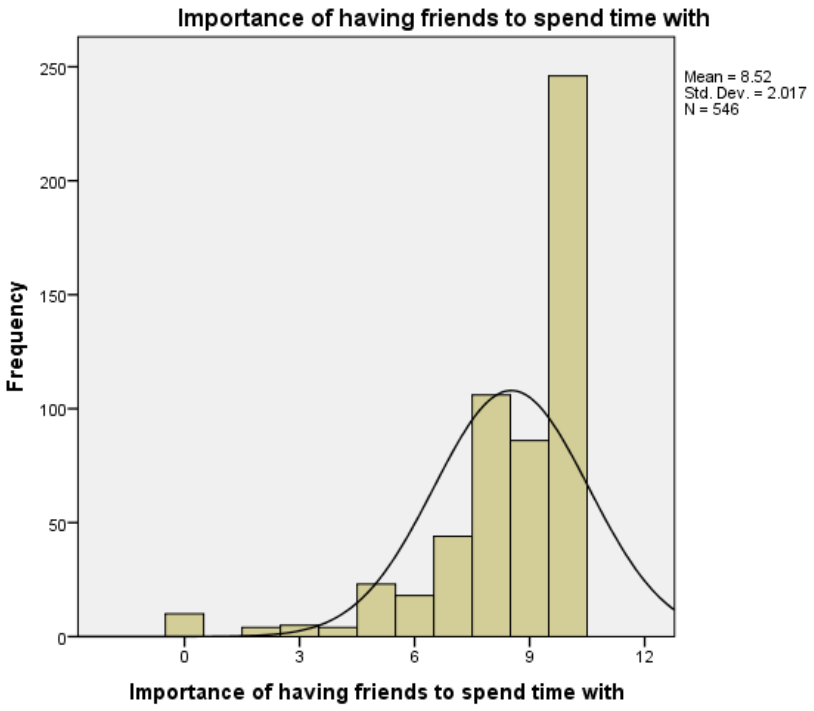


Table B7. Costa Rica: Satisfied with local governors

I am satisfied with the work my local governors are doing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	209	37.8	40.3	40.3
	Disagree	112	20.3	21.6	62.0
	Neutral	111	20.1	21.4	83.4
	Agree	36	6.5	6.9	90.3
	Strongly agree	50	9.0	9.7	100.0
	Total	518	93.7	100.0	
Missing	Not sure	10	1.8		
	No response	11	2.0		
	Not applicable	1	.2		
	System	13	2.4		
	Total	35	6.3		
Total		553	100.0		

Figure B7. Costa Rica: Satisfied with local governors

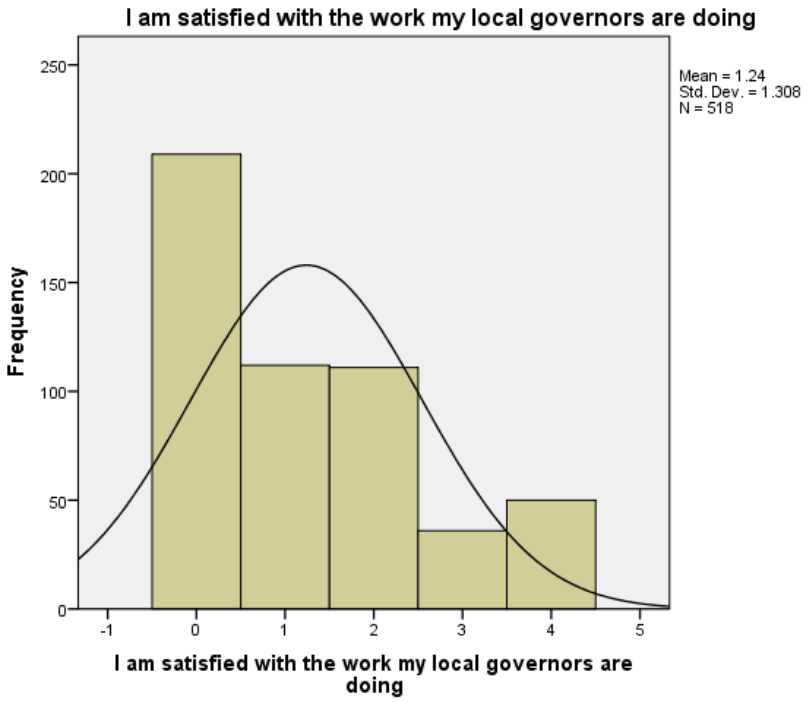


Table B8. Costa Rica: Satisfied with family

I have a strong and positive relationship with my family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	20	3.6	3.6	3.6
	Disagree	7	1.3	1.3	4.9
	Neutral	41	7.4	7.5	12.4
	Agree	109	19.7	19.9	32.2
	Strongly agree	372	67.3	67.8	100.0
	Total	549	99.3	100.0	
Missing	Not sure	1	.2		
	No response	2	.4		
	Not applicable	1	.2		
	Total	4	.7		
Total		553	100.0		

Figure B8. Costa Rica: Satisfied with family

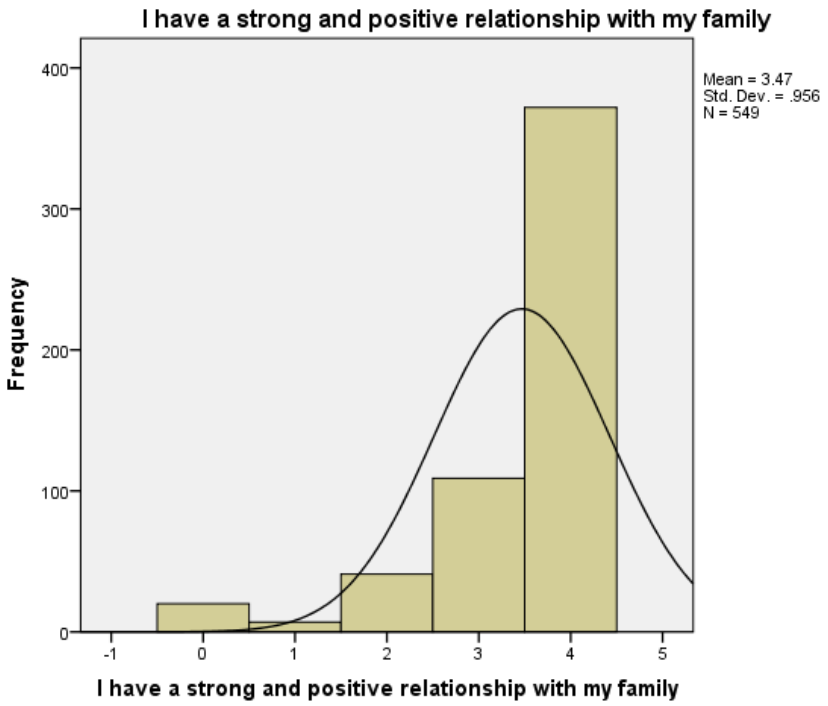


Table B9. Costa Rica: Satisfied with religion

I am a very religious person

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	104	18.8	19.0	19.0
	Disagree	43	7.8	7.9	26.9
	Neutral	94	17.0	17.2	44.1
	Agree	110	19.9	20.1	64.3
	Strongly agree	195	35.3	35.7	100.0
	Total	546	98.7	100.0	
Missing	Not sure	4	.7		
	No response	2	.4		
	Not applicable	1	.2		
	Total	7	1.3		
Total		553	100.0		

Figure B9. Costa Rica: Satisfied with religion

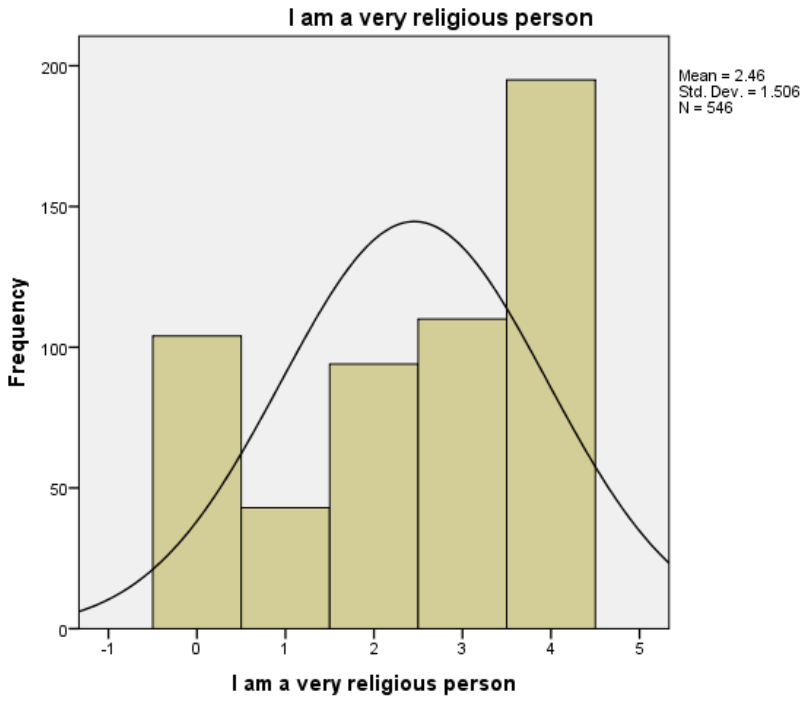


Table B10. Costa Rica: Satisfied with friends

I have enough friends to hang out with

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	26	4.7	4.9	4.9
	Disagree	40	7.2	7.5	12.3
	Neutral	66	11.9	12.3	24.7
	Agree	136	24.6	25.4	50.1
	Strongly agree	267	48.3	49.9	100.0
	Total	535	96.7	100.0	
Missing	Not sure	1	.2		
	System	17	3.1		
	Total	18	3.3		
Total		553	100.0		

Figure B10. Costa Rica: Satisfied with friends

Table B11. Costa Rica: Gender

Male

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	261	47.2	49.8	49.8
	1.00	263	47.6	50.2	100.0
	Total	524	94.8	100.0	
Missing	System	29	5.2		
Total		553	100.0		

Figure B11. Costa Rica: Gender

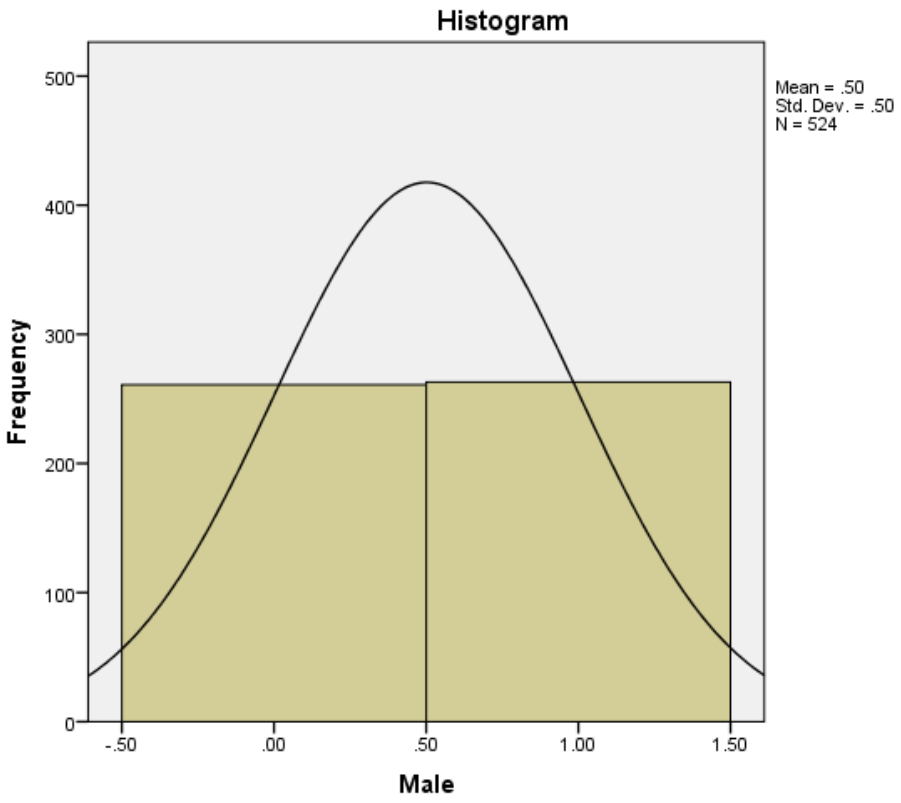


Table B12. Costa Rica: Age

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16.00	3	.5	.5	.5
	17.00	2	.4	.4	.9
	18.00	3	.5	.5	1.5
	19.00	12	2.2	2.2	3.7
	20.00	17	3.1	3.1	6.8
	21.00	20	3.6	3.7	10.4
	22.00	28	5.1	5.1	15.5
	23.00	13	2.4	2.4	17.9
	24.00	18	3.3	3.3	21.2
	25.00	20	3.6	3.7	24.9
	26.00	21	3.8	3.8	28.7
	27.00	15	2.7	2.7	31.4

Age

	Frequency	Percent	Valid Percent	Cumulative Percent
28.00	15	2.7	2.7	34.2
29.00	16	2.9	2.9	37.1
29.50	1	.2	.2	37.3
30.00	15	2.7	2.7	40.0
31.00	15	2.7	2.7	42.8
32.00	19	3.4	3.5	46.3
33.00	20	3.6	3.7	49.9
34.00	17	3.1	3.1	53.0
35.00	18	3.3	3.3	56.3
36.00	17	3.1	3.1	59.4
37.00	11	2.0	2.0	61.4
38.00	9	1.6	1.6	63.1
39.00	4	.7	.7	63.8
40.00	10	1.8	1.8	65.6
41.00	8	1.4	1.5	67.1
42.00	8	1.4	1.5	68.6
43.00	6	1.1	1.1	69.7
44.00	9	1.6	1.6	71.3
45.00	7	1.3	1.3	72.6
46.00	10	1.8	1.8	74.4
47.00	5	.9	.9	75.3
48.00	7	1.3	1.3	76.6
49.00	9	1.6	1.6	78.2
50.00	10	1.8	1.8	80.1
51.00	3	.5	.5	80.6
52.00	7	1.3	1.3	81.9
53.00	8	1.4	1.5	83.4
54.00	5	.9	.9	84.3
55.00	3	.5	.5	84.8
56.00	4	.7	.7	85.6
57.00	3	.5	.5	86.1
58.00	6	1.1	1.1	87.2
59.00	7	1.3	1.3	88.5
60.00	8	1.4	1.5	89.9
61.00	5	.9	.9	90.9

Age

		Frequency	Percent	Valid Percent	Cumulative Percent
	62.00	5	.9	.9	91.8
	63.00	1	.2	.2	92.0
	65.00	3	.5	.5	92.5
	66.00	4	.7	.7	93.2
	67.00	5	.9	.9	94.1
	68.00	4	.7	.7	94.9
	69.00	3	.5	.5	95.4
	70.00	5	.9	.9	96.3
	71.00	1	.2	.2	96.5
	72.00	2	.4	.4	96.9
	73.00	1	.2	.2	97.1
	74.00	2	.4	.4	97.4
	75.00	3	.5	.5	98.0
	76.00	2	.4	.4	98.4
	77.00	1	.2	.2	98.5
	79.00	1	.2	.2	98.7
	80.00	4	.7	.7	99.5
	83.00	2	.4	.4	99.8
	84.00	1	.2	.2	100.0
	Total	547	98.9	100.0	
Missing	System	6	1.1		
Total		553	100.0		

Figure B12. Costa Rica: Age

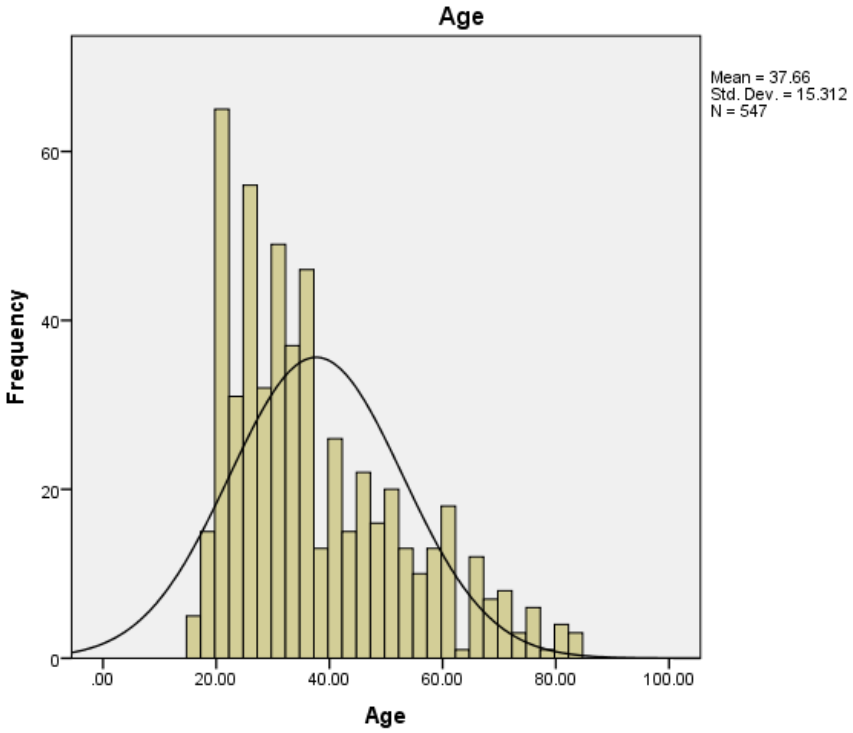


Table B13. Costa Rica: Age squared

Age squared

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	256.00	3	.5	.5	.5
	289.00	2	.4	.4	.9
	324.00	3	.5	.5	1.5
	361.00	12	2.2	2.2	3.7
	400.00	17	3.1	3.1	6.8
	441.00	20	3.6	3.7	10.4
	484.00	28	5.1	5.1	15.5
	529.00	13	2.4	2.4	17.9
	576.00	18	3.3	3.3	21.2
	625.00	20	3.6	3.7	24.9
	676.00	21	3.8	3.8	28.7
	729.00	15	2.7	2.7	31.4
	784.00	15	2.7	2.7	34.2
	841.00	16	2.9	2.9	37.1

Age squared

	Frequency	Percent	Valid Percent	Cumulative Percent
870.00	2	.4	.4	37.5
870.25	1	.2	.2	37.7
900.00	13	2.4	2.4	40.0
961.00	15	2.7	2.7	42.8
1024.00	19	3.4	3.5	46.3
1089.00	20	3.6	3.7	49.9
1156.00	17	3.1	3.1	53.0
1225.00	18	3.3	3.3	56.3
1296.00	17	3.1	3.1	59.4
1369.00	11	2.0	2.0	61.4
1444.00	9	1.6	1.6	63.1
1521.00	4	.7	.7	63.8
1560.00	4	.7	.7	64.5
1600.00	6	1.1	1.1	65.6
1681.00	8	1.4	1.5	67.1
1764.00	8	1.4	1.5	68.6
1849.00	6	1.1	1.1	69.7
1936.00	9	1.6	1.6	71.3
2025.00	7	1.3	1.3	72.6
2116.00	10	1.8	1.8	74.4
2209.00	5	.9	.9	75.3
2304.00	7	1.3	1.3	76.6
2401.00	9	1.6	1.6	78.2
2450.00	2	.4	.4	78.6
2500.00	8	1.4	1.5	80.1
2601.00	3	.5	.5	80.6
2704.00	7	1.3	1.3	81.9
2809.00	8	1.4	1.5	83.4
2916.00	5	.9	.9	84.3
3025.00	3	.5	.5	84.8
3136.00	4	.7	.7	85.6
3249.00	3	.5	.5	86.1
3364.00	6	1.1	1.1	87.2
3481.00	7	1.3	1.3	88.5
3600.00	8	1.4	1.5	89.9

Age squared

		Frequency	Percent	Valid Percent	Cumulative Percent
	3721.00	5	.9	.9	90.9
	3844.00	5	.9	.9	91.8
	3969.00	1	.2	.2	92.0
	4225.00	3	.5	.5	92.5
	4356.00	4	.7	.7	93.2
	4489.00	5	.9	.9	94.1
	4624.00	4	.7	.7	94.9
	4761.00	3	.5	.5	95.4
	4830.00	1	.2	.2	95.6
	4900.00	4	.7	.7	96.3
	5041.00	1	.2	.2	96.5
	5184.00	2	.4	.4	96.9
	5329.00	1	.2	.2	97.1
	5476.00	2	.4	.4	97.4
	5625.00	3	.5	.5	98.0
	5776.00	2	.4	.4	98.4
	5929.00	1	.2	.2	98.5
	6241.00	1	.2	.2	98.7
	6320.00	1	.2	.2	98.9
	6400.00	3	.5	.5	99.5
	6889.00	2	.4	.4	99.8
	7056.00	1	.2	.2	100.0
	Total	547	98.9	100.0	
Missing	System	6	1.1		
Total		553	100.0		

Figure B13. Costa Rica: Age squared

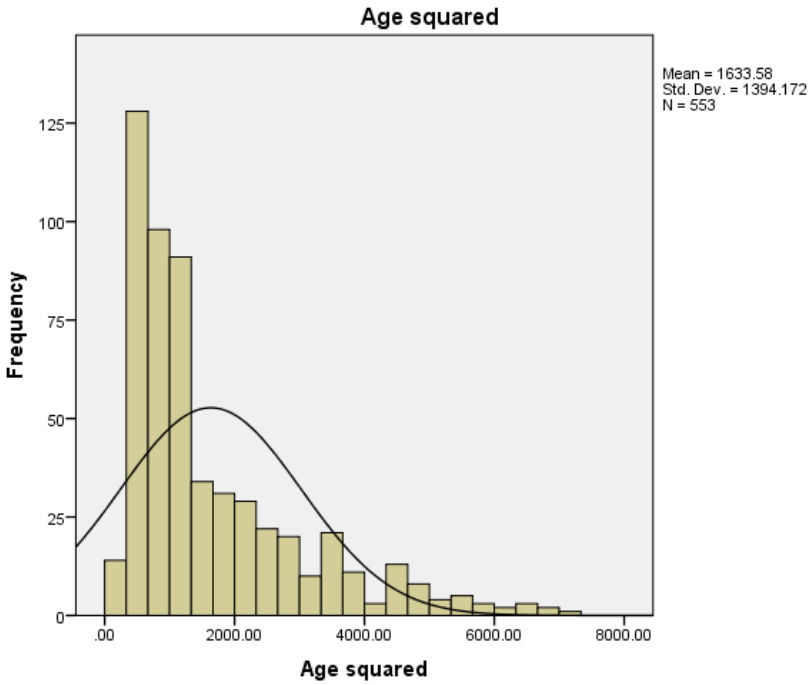


Table B14. Costa Rica: Number of children

Recalculated number of kids at home, when blank = 0

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	274	49.5	49.5	49.5
	1.00	134	24.2	24.2	73.8
	2.00	87	15.7	15.7	89.5
	3.00	39	7.1	7.1	96.6
	4.00	14	2.5	2.5	99.1
	5.00	2	.4	.4	99.5
	6.00	2	.4	.4	99.8
	7.00	1	.2	.2	100.0
	Total	553	100.0	100.0	

Figure B14. Costa Rica: Number of children

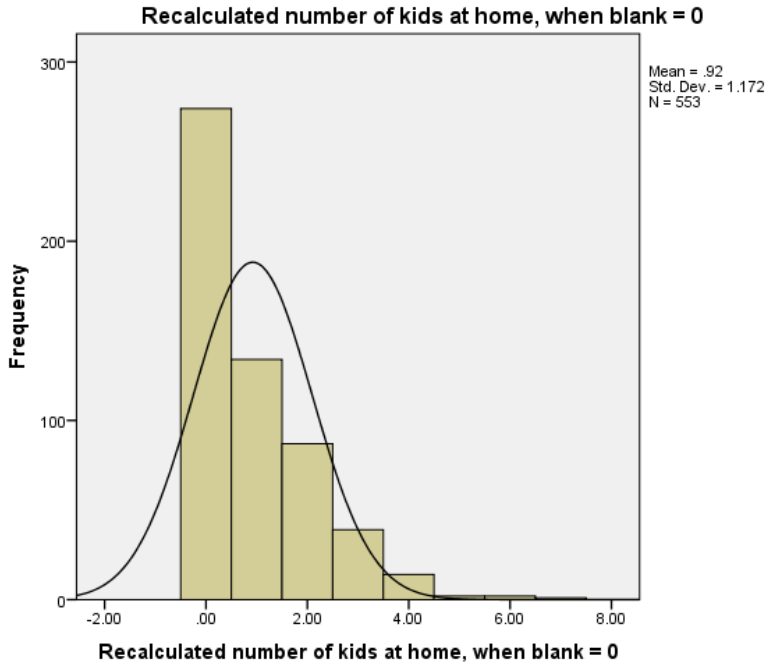


Table B15. Costa Rica: Married status

Dummy for married status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other martital status	373	67.5	67.5	67.5
	Married	180	32.5	32.5	100.0
	Total	553	100.0	100.0	

Figure B15. Costa Rica: Married status

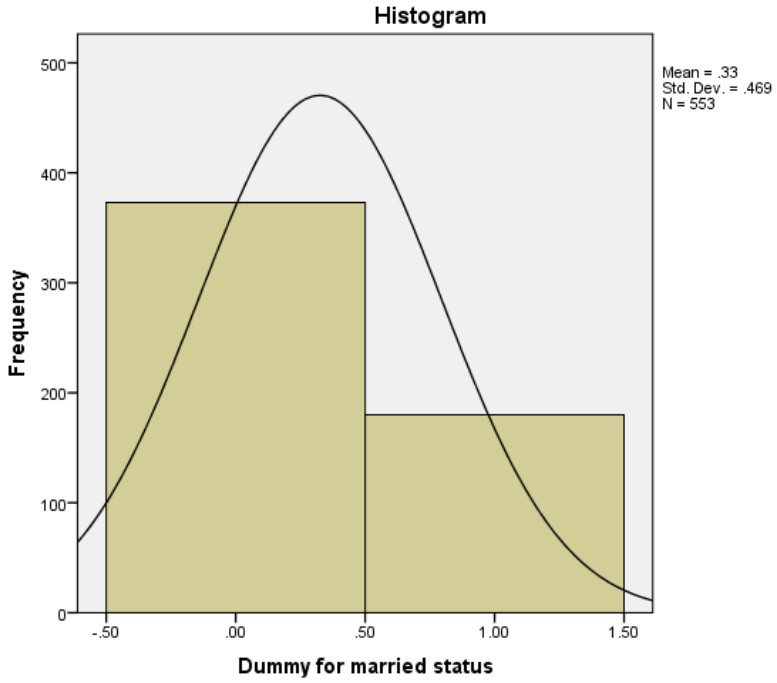


Table B16. Costa Rica: Level of education

Level of education in years

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	None	9	1.6	1.7	1.7
	Pre-school	20	3.6	3.7	5.3
	Primary	132	23.9	24.2	29.5
	Secondary/Technical	157	28.4	28.8	58.3
	Diploma	14	2.5	2.6	60.9
	Undergraduate	202	36.5	37.1	98.0
	Posgraduate	11	2.0	2.0	100.0
	Total	545	98.6	100.0	
Missing	System	8	1.4		
Total		553	100.0		

Figure A16. Costa Rica: Level of education

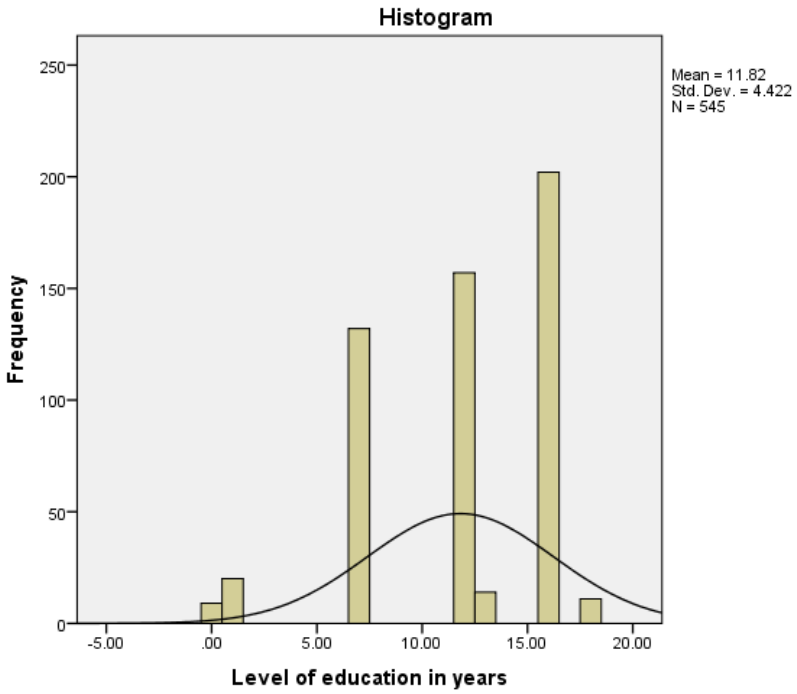


Table B17. Costa Rica: Frequency of spending time with family

Frequency of spending time with immediate family

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	5	.9	.9	.9
	Less than once a year	3	.5	.6	1.5
	About once a year	7	1.3	1.3	2.8
	3-4 times a year	8	1.4	1.5	4.3
	About once a month	40	7.2	7.4	11.6
	About once a week	83	15.0	15.3	27.0
	Almost everyday	395	71.4	73.0	100.0
	Total	541	97.8	100.0	
Missing	Not sure	1	.2		
	Not applicable	1	.2		
	System	10	1.8		
	Total	12	2.2		
Total		553	100.0		

Figure B17. Costa Rica: Frequency of spending time with family

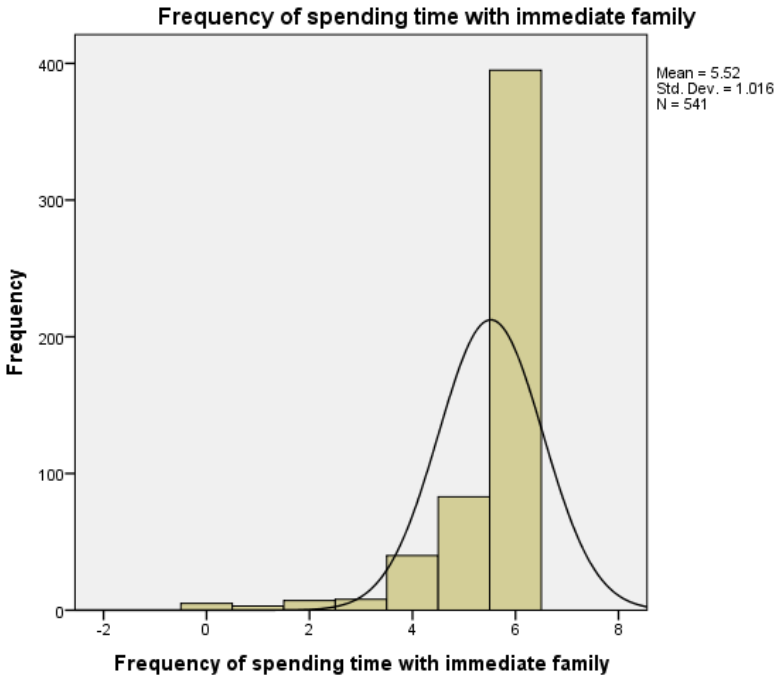


Table B18. Costa Rica: Frequency of spending time with friends

Frequency of spending time with friends

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	25	4.5	4.7	4.7
	Less than once a year	6	1.1	1.1	5.8
	About once a year	10	1.8	1.9	7.7
	3-4 times a year	30	5.4	5.6	13.3
	About once a month	127	23.0	23.8	37.1
	About once a week	182	32.9	34.1	71.3
	Almost everyday	153	27.7	28.7	100.0
	Total	533	96.4	100.0	
Missing	Not sure	4	.7		
	Not applicable	1	.2		
	System	15	2.7		
	Total	20	3.6		
Total		553	100.0		

Figure B18. Costa Rica: Frequency of spending time with friends

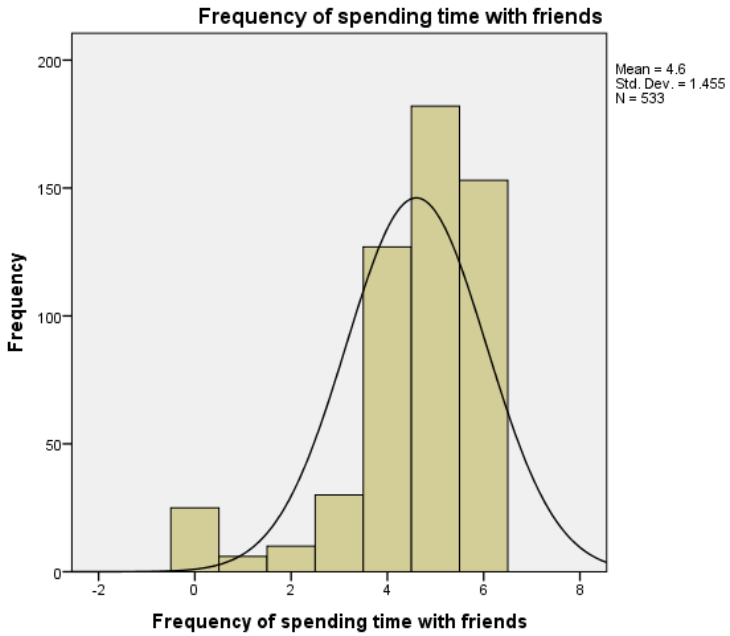


Table B19. Costa Rica: Frequency of participating in religious activities

Frequency of participating in religious activities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	121	21.9	22.4	22.4
	Less than once a year	30	5.4	5.6	28.0
	About once a year	26	4.7	4.8	32.8
	3-4 times a year	48	8.7	8.9	41.7
	About once a month	88	15.9	16.3	58.0
	About once a week	189	34.2	35.0	93.0
	Almost everyday	38	6.9	7.0	100.0
	Total	540	97.6	100.0	
Missing	Not sure	5	.9		
	No response	4	.7		
	Not applicable	4	.7		
	Total	13	2.4		
Total		553	100.0		

Figure B19. Costa Rica: Frequency of participating in religious activities

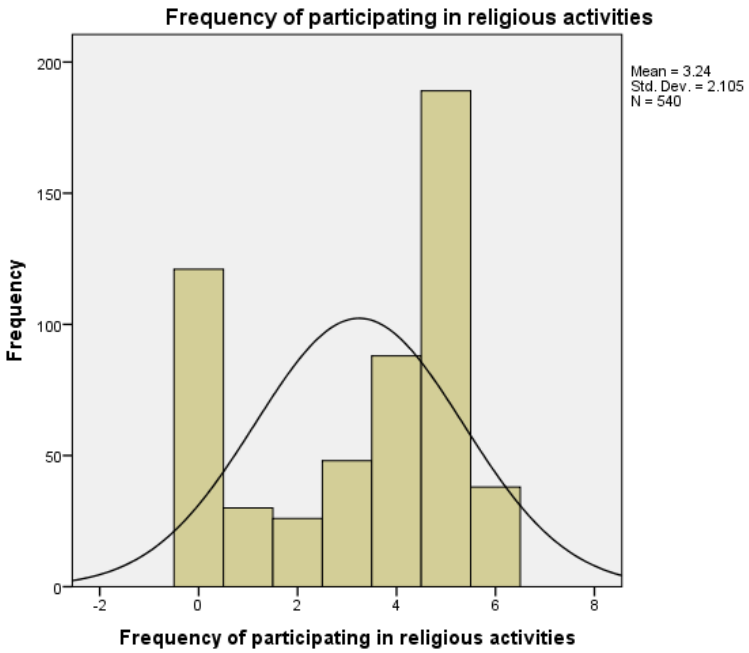


Table B20. Costa Rica: Importance of having a job

Importance of having a job

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	8	1.4	1.5	1.5
	1	2	.4	.4	1.9
	2	1	.2	.2	2.1
	3	1	.2	.2	2.3
	4	1	.2	.2	2.5
	5	11	2.0	2.1	4.6
	6	5	.9	.9	5.5
	7	14	2.5	2.7	8.2
	8	59	10.7	11.2	19.4
	9	41	7.4	7.8	27.1
	10	384	69.4	72.9	100.0
	Total	527	95.3	100.0	
Missing	7777	6	1.1		
	8888	16	2.9		
	System	4	.7		
	Total	26	4.7		
Total		553	100.0		

Figure B20. Costa Rica: Importance of having a job

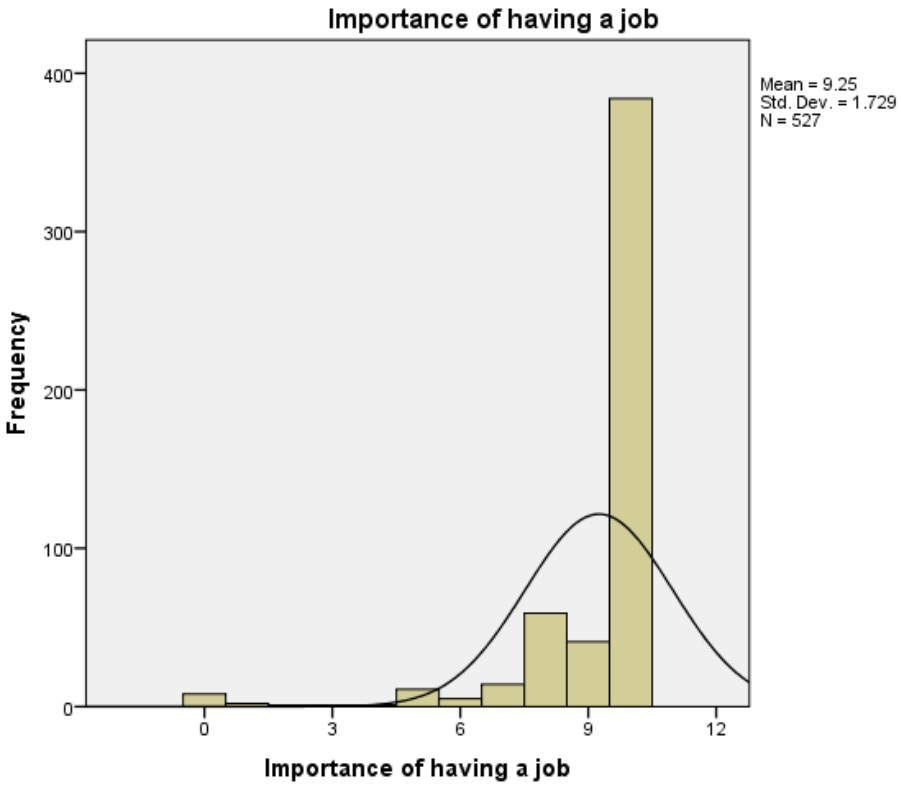


Table B21. Costa Rica: Importance of making money

Importance of making money

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	15	2.7	2.8	2.8
	1	2	.4	.4	3.2
	2	7	1.3	1.3	4.5
	3	4	.7	.7	5.2
	4	5	.9	.9	6.2
	5	52	9.4	9.7	15.9
	6	31	5.6	5.8	21.7
	7	74	13.4	13.8	35.5
	8	112	20.3	20.9	56.4
	9	57	10.3	10.7	67.1
	10	176	31.8	32.9	100.0
	Total	535	96.7	100.0	
Missing	7777	7	1.3		
	8888	11	2.0		
	Total	18	3.3		
Total		553	100.0		

Figure B21. Costa Rica: Importance of making money

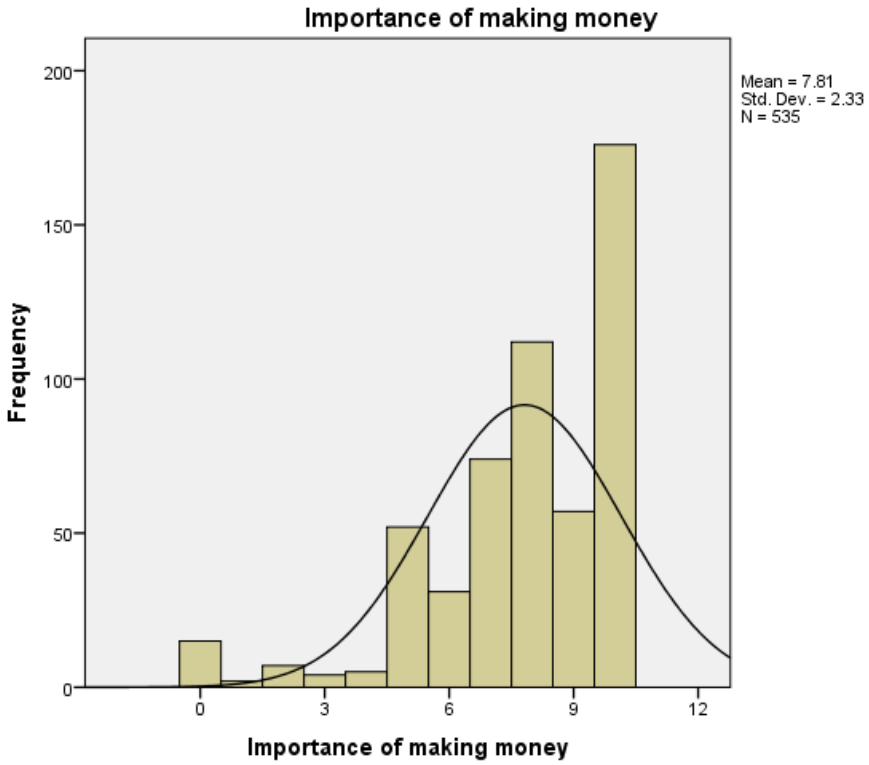


Table B22. Costa Rica: Satisfied with job

I really like my job

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	11	2.0	2.5	2.5
	Disagree	3	.5	.7	3.2
	Neutral	46	8.3	10.4	13.5
	Agree	119	21.5	26.9	40.4
	Strongly agree	264	47.7	59.6	100.0
	Total	443	80.1	100.0	
Missing	Not sure	4	.7		
	No response	23	4.2		
	Not applicable	71	12.8		
	System	12	2.2		
	Total	110	19.9		
Total		553	100.0		

Figure B22. Costa Rica: Satisfied with job

Table B23. Costa Rica: Satisfied with income

I earn enough money for myself and my dependents

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	39	7.1	8.8	8.8
	Disagree	39	7.1	8.8	17.6
	Neutral	93	16.8	21.0	38.7
	Agree	155	28.0	35.1	73.8
	Strongly agree	116	21.0	26.2	100.0
	Total	442	79.9	100.0	
Missing	Not sure	7	1.3		
	No response	22	4.0		
	Not applicable	82	14.8		
	Total	111	20.1		
Total		553	100.0		

Figure B23. Costa Rica: Satisfied with income

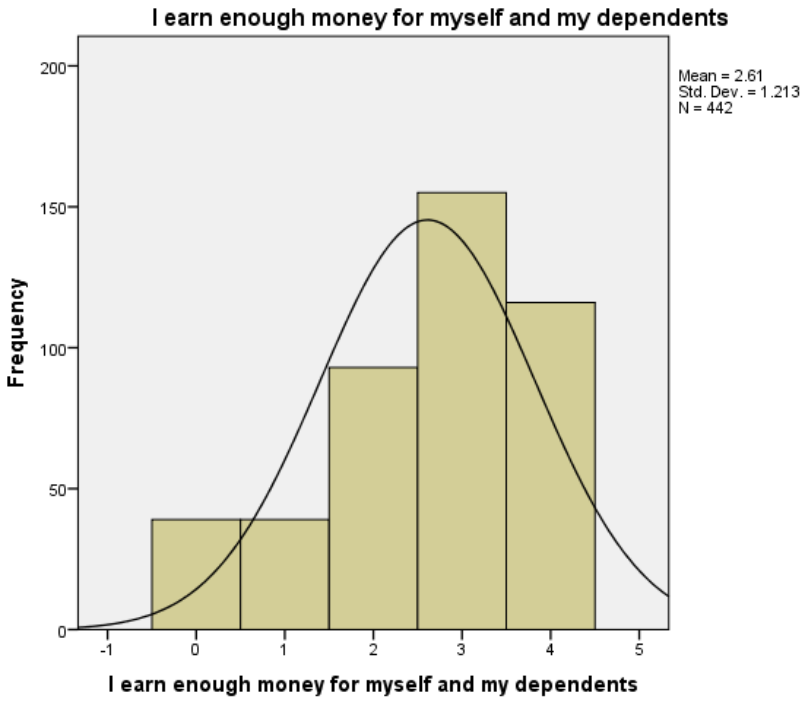


Table B24. Costa Rica: Satisfied with house

I live in a nice house

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	27	4.9	4.9	4.9
	Disagree	14	2.5	2.5	7.4
	Neutral	48	8.7	8.7	16.2
	Agree	119	21.5	21.6	37.7
	Strongly agree	343	62.0	62.3	100.0
	Total	551	99.6	100.0	
Missing	No response	2	.4		
Total		553	100.0		

Figure B24. Costa Rica: Satisfied with house

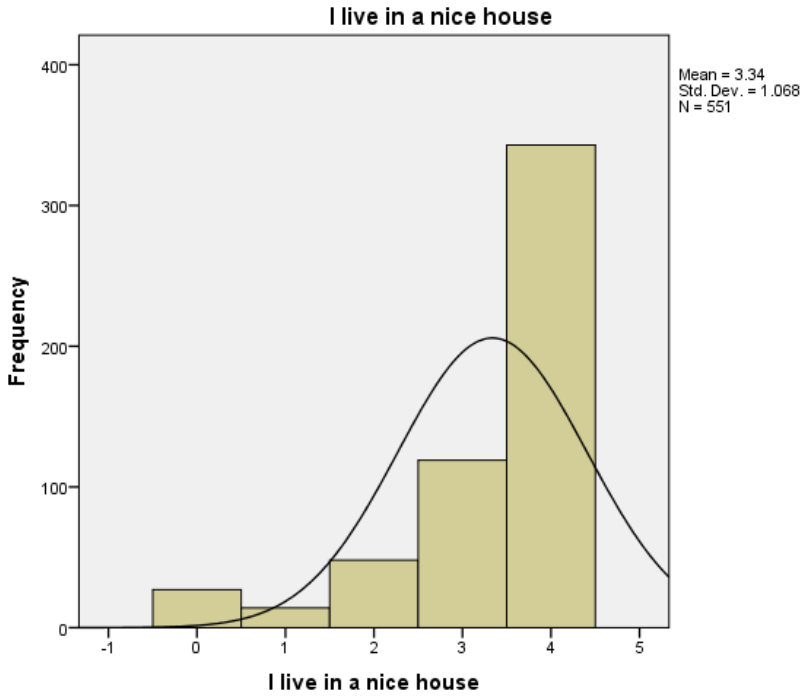


Table B25. Costa Rica: Paid employment

Dummy for employed (at home, salary, service and independent)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Other employment status	130	23.5	23.8	23.8
	Employed	417	75.4	76.2	100.0
	Total	547	98.9	100.0	
Missing	System	6	1.1		
Total		553	100.0		

Figure B25. Costa Rica: Paid employment

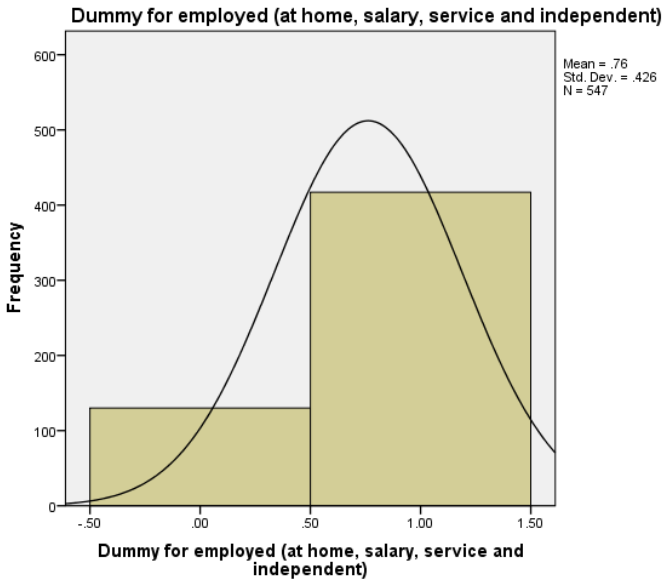


Table B26. Costa Rica: Income

Average income recalculated with retired = 0

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	146	26.4	29.0	29.0
	25000.00	13	2.4	2.6	31.5
	75000.00	14	2.5	2.8	34.3
	125000.00	12	2.2	2.4	36.7
	175000.00	22	4.0	4.4	41.1
	225000.00	38	6.9	7.5	48.6
	275000.00	42	7.6	8.3	56.9
	325000.00	25	4.5	5.0	61.9
	375000.00	17	3.1	3.4	65.3
	450000.00	29	5.2	5.8	71.0
	600000.00	43	7.8	8.5	79.6
	850000.00	38	6.9	7.5	87.1
	2000000.00	57	10.3	11.3	98.4
	4500000.00	5	.9	1.0	99.4
	7500000.00	3	.5	.6	100.0
	Total	504	91.1	100.0	
Missing	System	49	8.9		
Total		553	100.0		

Figure B26. Costa Rica: Income

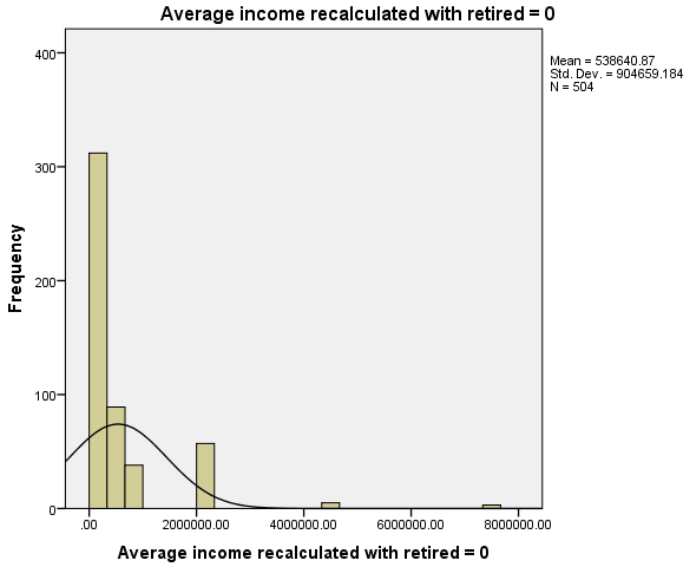


Table B27. Costa Rica: Number of rooms

How many rooms does the house have

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1	26	4.7	4.8	4.8
	2	128	23.1	23.7	28.6
	3	189	34.2	35.1	63.6
	4	110	19.9	20.4	84.0
	5	41	7.4	7.6	91.7
	6	23	4.2	4.3	95.9
	7	6	1.1	1.1	97.0
	8	10	1.8	1.9	98.9
	9	2	.4	.4	99.3
	10	2	.4	.4	99.6
	12	1	.2	.2	99.8
	75	1	.2	.2	100.0
	Total	539	97.5	100.0	
Missing	System	14	2.5		
Total		553	100.0		

Figure B27. Costa Rica: Number of rooms

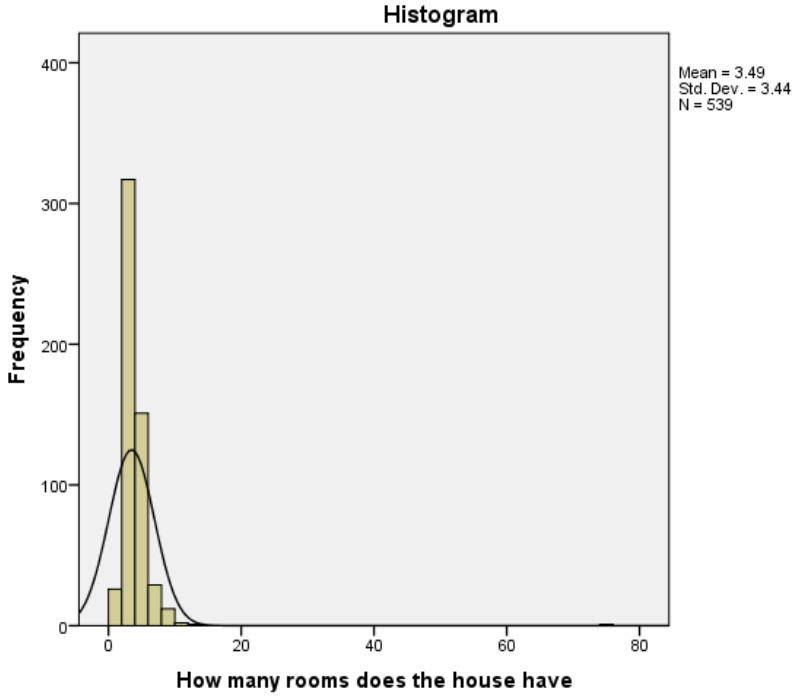


Table B28. Costa Rica: Importance of good health

Importance of having a good health

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	.4	.4	.4
	1	1	.2	.2	.5
	6	1	.2	.2	.7
	7	5	.9	.9	1.6
	8	14	2.5	2.6	4.2
	9	26	4.7	4.7	8.9
	10	499	90.2	91.1	100.0
	Total	548	99.1	100.0	
Missing	7777	3	.5		
	8888	2	.4		
	Total	5	.9		
Total		553	100.0		

Figure B28. Costa Rica: Importance of good health

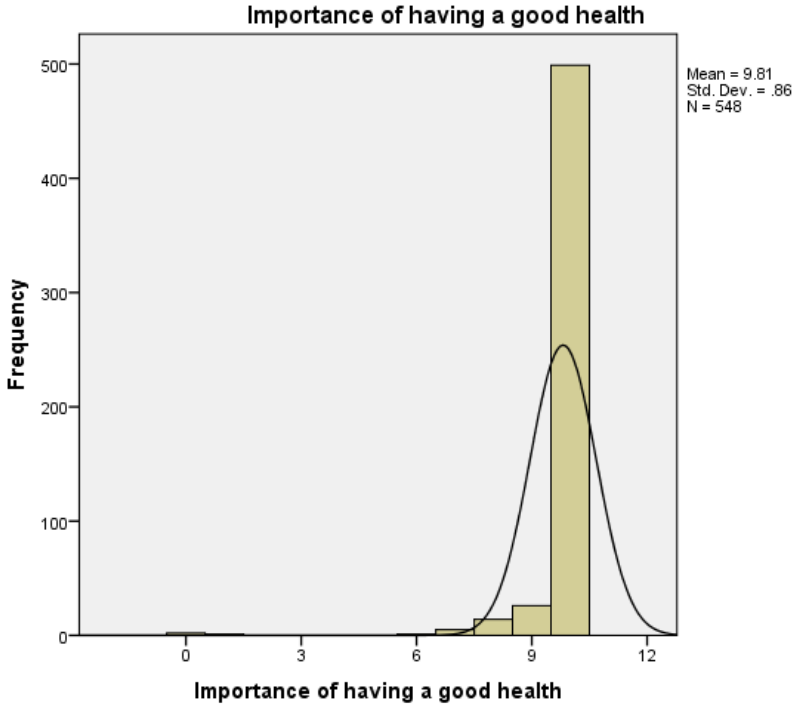


Table B29. Costa Rica: Importance of exercising

Importance of excersising regularly

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	.5	.5	.5
	1	3	.5	.5	1.1
	2	4	.7	.7	1.8
	3	3	.5	.5	2.4
	4	3	.5	.5	2.9
	5	26	4.7	4.7	7.7
	6	29	5.2	5.3	12.9
	7	44	8.0	8.0	20.9
	8	91	16.5	16.6	37.5
	9	75	13.6	13.7	51.2
	10	268	48.5	48.8	100.0
	Total	549	99.3	100.0	
Missing	7777	2	.4		
	8888	2	.4		
	Total	4	.7		
Total		553	100.0		

Figure B29. Costa Rica: Importance of exercising

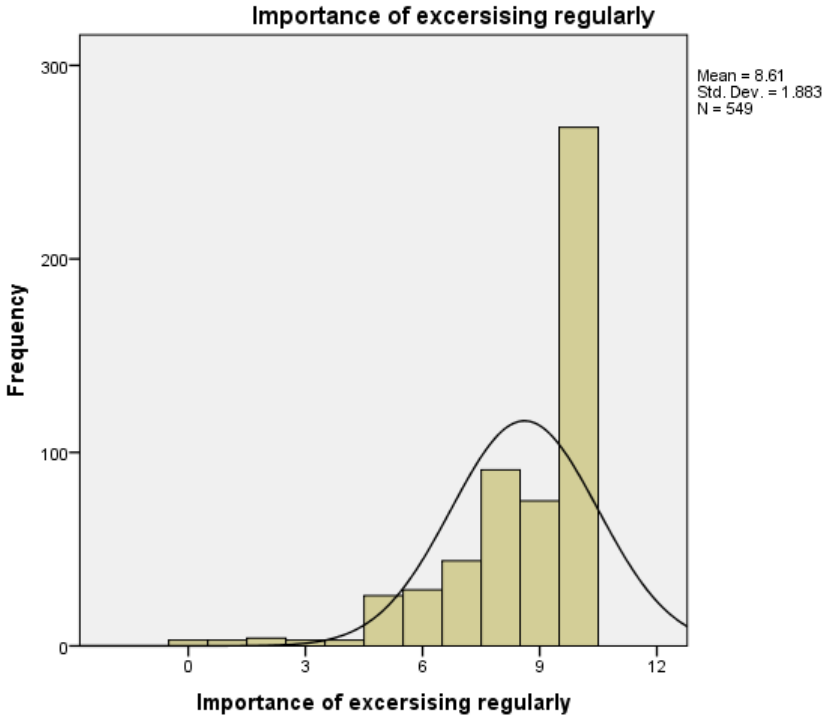


Table B30. Costa Rica: Importance of having time to relax

Importance of having time to relax

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	.2	.2	.2
	1	1	.2	.2	.4
	2	1	.2	.2	.6
	3	4	.7	.7	1.3
	4	2	.4	.4	1.7
	5	7	1.3	1.3	2.9
	6	6	1.1	1.1	4.1
	7	22	4.0	4.1	8.1
	8	86	15.6	15.8	23.9
	9	82	14.8	15.1	39.0
	10	331	59.9	61.0	100.0
	Total	543	98.2	100.0	
Missing	7777	4	.7		
	8888	2	.4		
	System	4	.7		
	Total	10	1.8		
Total		553	100.0		

Figure B30. Costa Rica: Importance of having time to relax

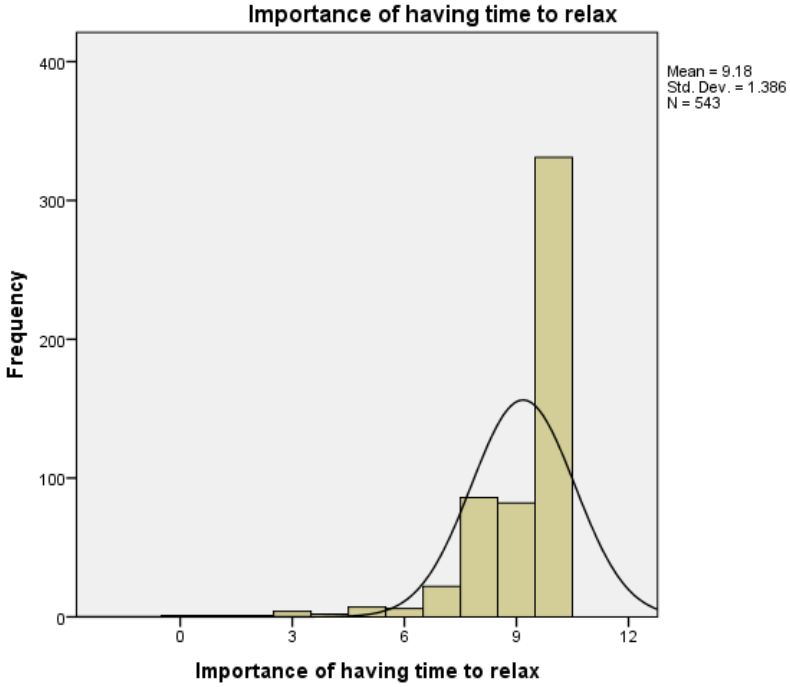


Table B31. Costa Rica: Satisfied with health

I am in very good health

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	23	4.2	4.2	4.2
	Disagree	8	1.4	1.4	5.6
	Neutral	47	8.5	8.5	14.1
	Agree	162	29.3	29.3	43.5
	Strongly agree	312	56.4	56.5	100.0
	Total	552	99.8	100.0	
Missing	Not sure	1	.2		
Total		553	100.0		

Figure B31. Costa Rica: Satisfied with health

Table B32. Costa Rica: Satisfied with family's health

My immediate family is in very good health

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	17	3.1	3.1	3.1
	Disagree	10	1.8	1.8	4.9
	Neutral	51	9.2	9.3	14.2
	Agree	147	26.6	26.7	40.9
	Strongly agree	325	58.8	59.1	100.0
	Total	550	99.5	100.0	
Missing	Not sure	2	.4		
	Not applicable	1	.2		
	Total	3	.5		
Total		553	100.0		

Figure B32. Costa Rica: Satisfied with family's health

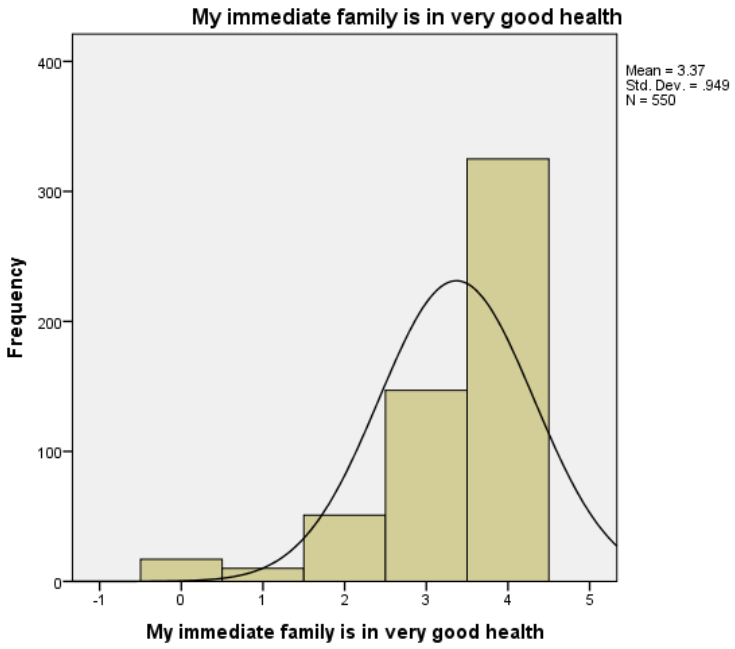


Table B33. Costa Rica: Frequency of exercising

Frequency of spending time exercising

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	67	12.1	12.2	12.2
	Less than once a year	10	1.8	1.8	14.0
	About once a year	7	1.3	1.3	15.2
	3-4 times a year	19	3.4	3.4	18.7
	About once a month	78	14.1	14.2	32.8
	About once a week	161	29.1	29.2	62.1
	Almost everyday	209	37.8	37.9	100.0
	Total	551	99.6	100.0	
Missing	Not sure	1	.2		
	No response	1	.2		
	Total	2	.4		
Total		553	100.0		

Figure B33. Costa Rica: Frequency of exercising

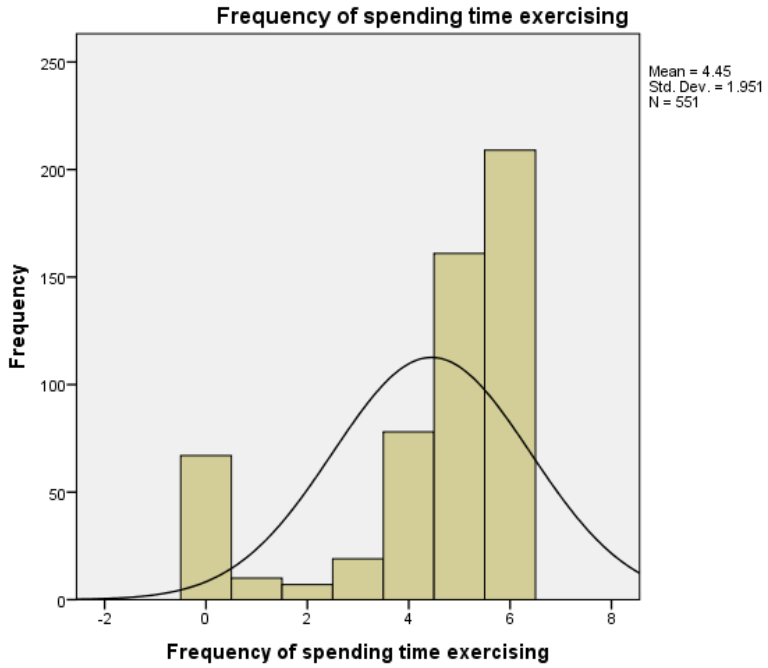


Table B33. Costa Rica: Frequency of spending time relaxing

Frequency of spending time relaxing

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	31	5.6	5.7	5.7
	Less than once a year	2	.4	.4	6.0
	About once a year	12	2.2	2.2	8.2
	3-4 times a year	38	6.9	6.9	15.1
	About once a month	103	18.6	18.8	33.9
	About once a week	210	38.0	38.3	72.3
	Almost everyday	152	27.5	27.7	100.0
	Total	548	99.1	100.0	
Missing	Not sure	4	.7		
	No response	1	.2		
	Total	5	.9		
Total		553	100.0		

Figure B33. Costa Rica: Frequency of spending time relaxing

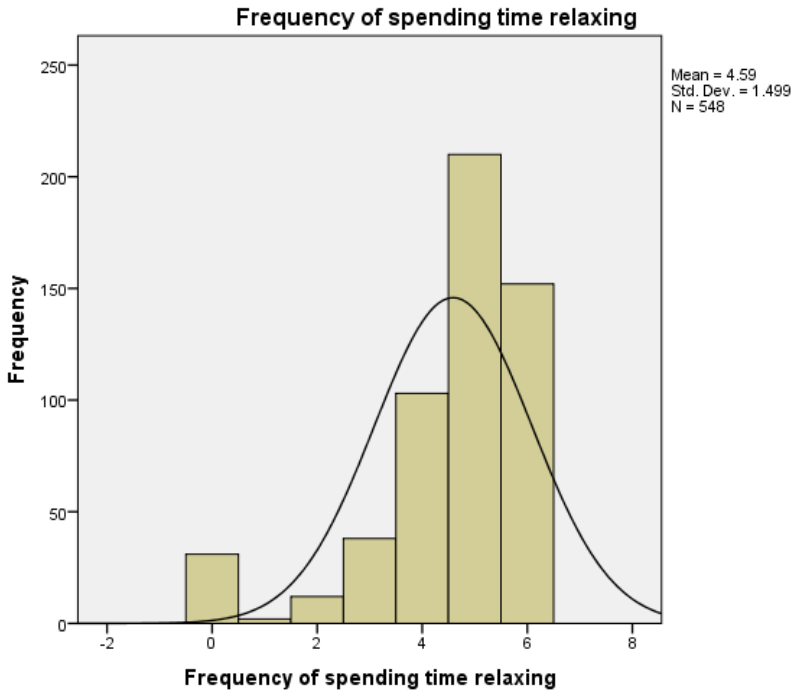


Table B34. Costa Rica: Importance of safety

Importance of feeling safe

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.2	.2	.2
	3	1	.2	.2	.4
	4	1	.2	.2	.6
	5	9	1.6	1.7	2.2
	6	5	.9	.9	3.1
	7	20	3.6	3.7	6.9
	8	37	6.7	6.9	13.7
	9	56	10.1	10.4	24.1
	10	410	74.1	75.9	100.0
	Total	540	97.6	100.0	
Missing	7777	6	1.1		
	8888	4	.7		
	System	3	.5		
	Total	13	2.4		
Total		553	100.0		

Figure B34. Costa Rica: Importance of safety

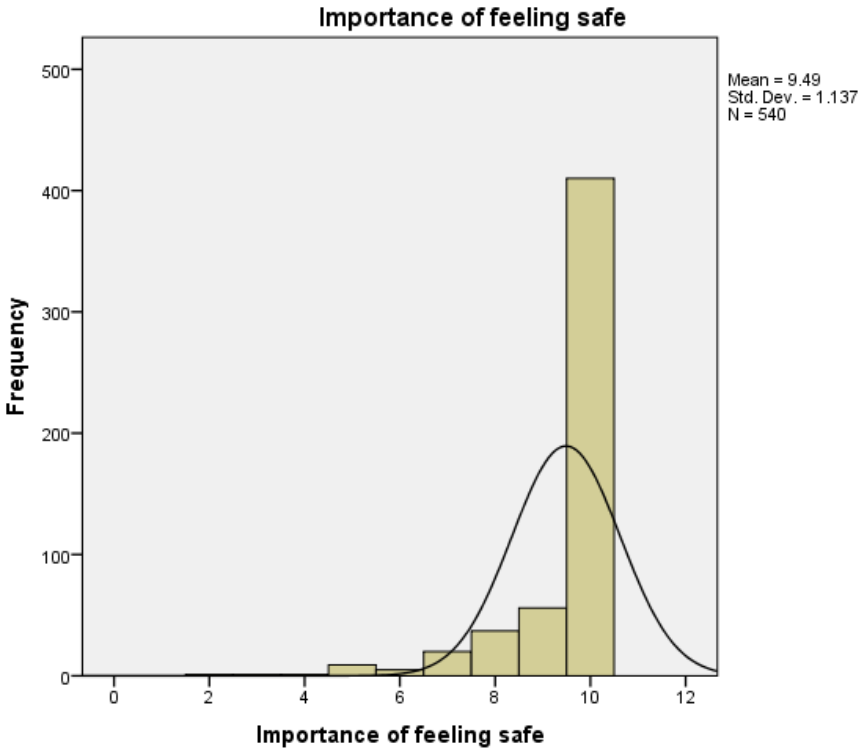


Table B34. Costa Rica: Satisfied with safety

I feel very save where I live

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	15	2.7	2.8	2.8
	Disagree	22	4.0	4.1	6.9
	Neutral	54	9.8	10.0	16.9
	Agree	139	25.1	25.8	42.8
	Strongly agree	308	55.7	57.2	100.0
	Total	538	97.3	100.0	
Missing	Not sure	2	.4		
	System	13	2.4		
	Total	15	2.7		
Total		553	100.0		

Figure B34. Costa Rica: Satisfied with safety

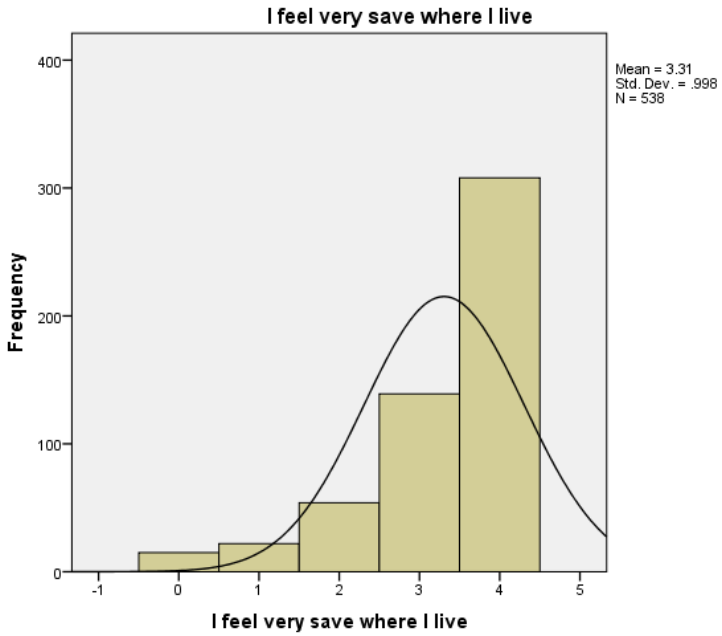


Table B35. Costa Rica: Importance of having access to clean rivers

Importance of having access to clean rivers

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	2	.4	.4	.4
	3	1	.2	.2	.6
	4	6	1.1	1.1	1.7
	5	10	1.8	1.8	3.5
	6	13	2.4	2.4	5.9
	7	26	4.7	4.8	10.7
	8	45	8.1	8.3	19.0
	9	49	8.9	9.0	28.0
	10	391	70.7	72.0	100.0
	Total	543	98.2	100.0	
Missing	7777	9	1.6		
	8888	1	.2		
	Total	10	1.8		
Total		553	100.0		

Figure B35. Costa Rica: Importance of having access to clean rivers

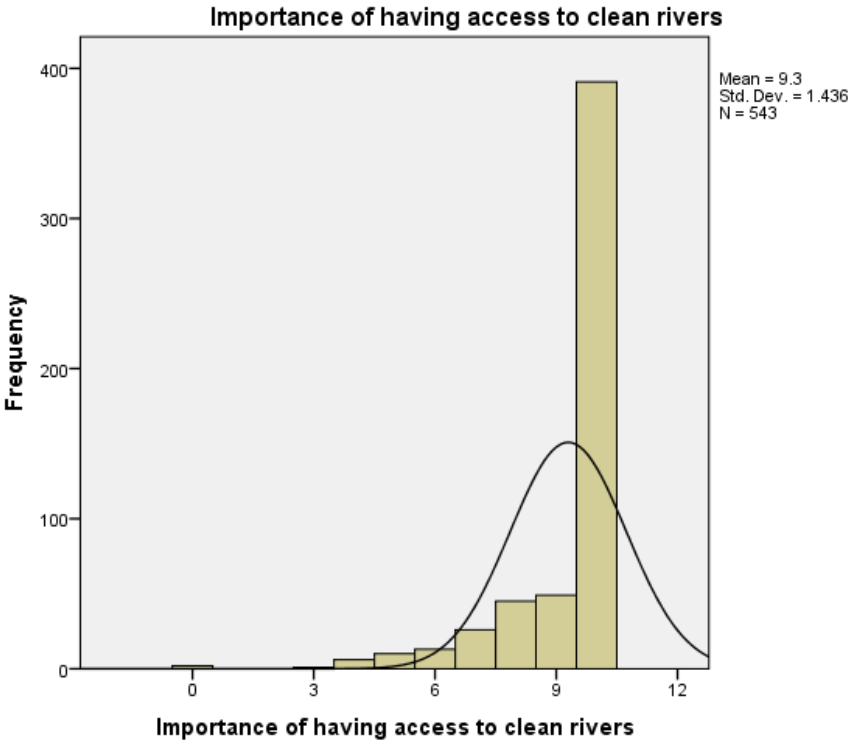


Table B36. Costa Rica: Importance of doing outdoor activities

Importance of doing outdoor activities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	3	.5	.6	.6
	2	4	.7	.7	1.3
	3	4	.7	.7	2.0
	4	2	.4	.4	2.4
	5	19	3.4	3.5	5.9
	6	15	2.7	2.8	8.7
	7	48	8.7	8.8	17.5
	8	104	18.8	19.2	36.6
	9	69	12.5	12.7	49.4
	10	275	49.7	50.6	100.0
	Total	543	98.2	100.0	
Missing	7777	5	.9		
	8888	4	.7		
	System	1	.2		
	Total	10	1.8		
Total		553	100.0		

Figure B36. Costa Rica: Importance of doing outdoor activities

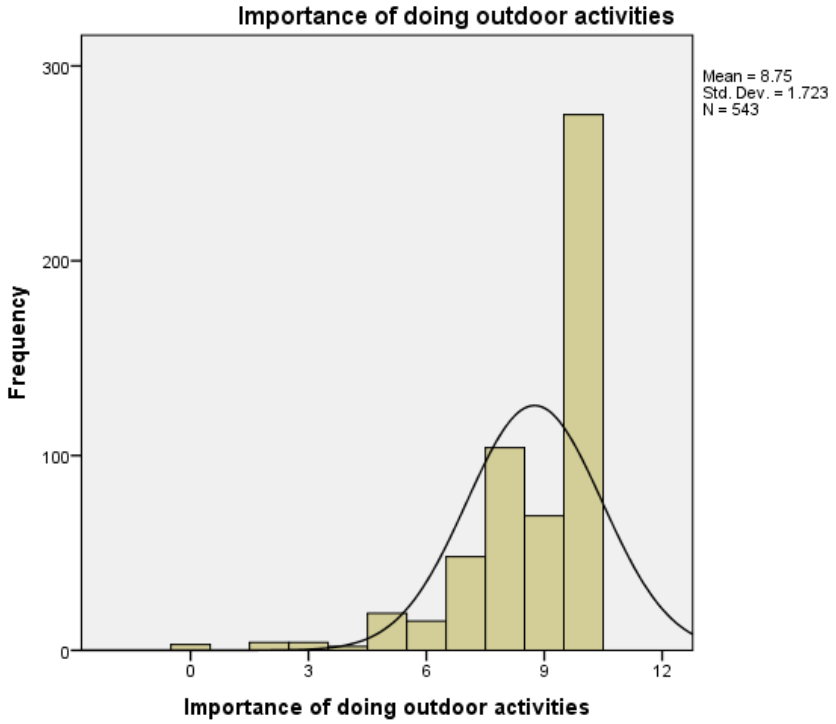


Table B37. Costa Rica: Importance of spending time in a natural environment

Importance of spending time in a natural environment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	2	1	.2	.2	.2
	3	1	.2	.2	.4
	4	2	.4	.4	.7
	5	12	2.2	2.2	2.9
	6	10	1.8	1.8	4.8
	7	36	6.5	6.6	11.4
	8	86	15.6	15.8	27.2
	9	82	14.8	15.1	42.3
	10	314	56.8	57.7	100.0
	Total	544	98.4	100.0	
Missing	7777	3	.5		
	8888	2	.4		
	System	4	.7		
	Total	9	1.6		
Total		553	100.0		

Figure B37. Costa Rica: Importance of spending time in a natural environment

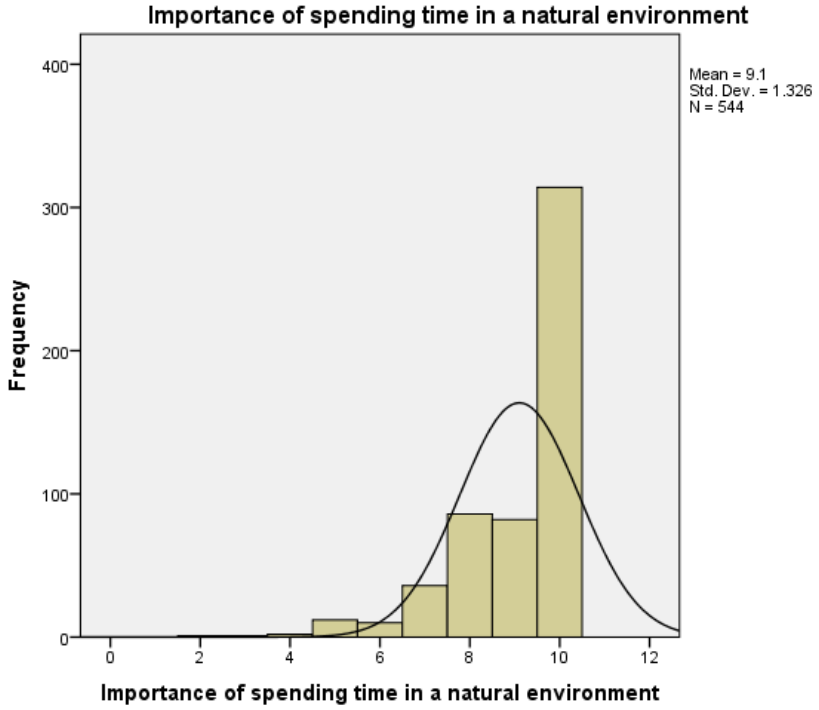


Table B38. Costa Rica: Importance of doing something for conservation

Importance of doing something for conservation

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0	1	.2	.2	.2
	2	4	.7	.7	.9
	3	2	.4	.4	1.3
	4	5	.9	.9	2.2
	5	17	3.1	3.1	5.4
	6	11	2.0	2.0	7.4
	7	41	7.4	7.6	14.9
	8	79	14.3	14.6	29.5
	9	65	11.8	12.0	41.5
	10	317	57.3	58.5	100.0
	Total	542	98.0	100.0	
Missing	7777	5	.9		
	8888	2	.4		
	System	4	.7		
	Total	11	2.0		
Total		553	100.0		

Figure B38. Costa Rica: Importance of doing something for conservation

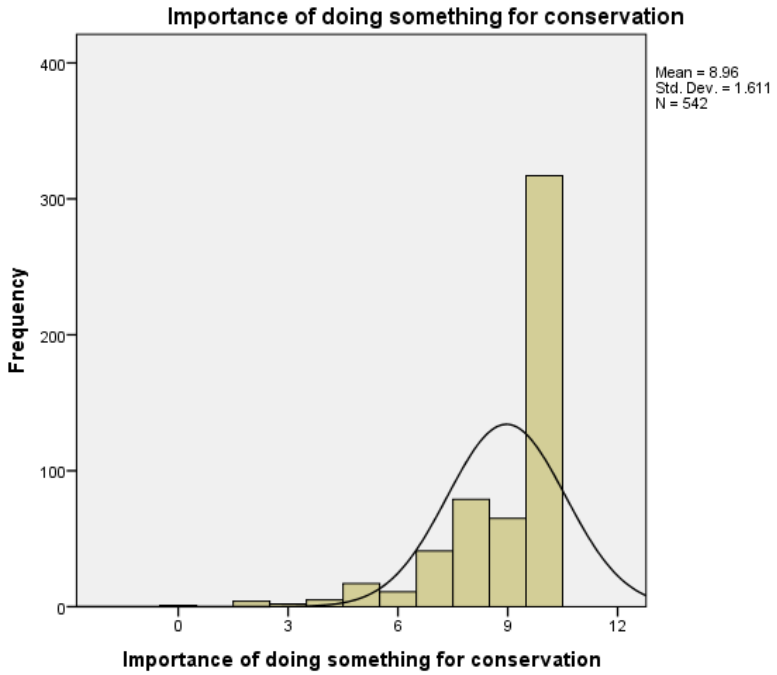


Table B39. Costa Rica: Satisfied with spending time in contact with nature

I enjoy spending time in contact with nature

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly disagree	3	.5	.6	.6
	Disagree	9	1.6	1.7	2.2
	Neutral	61	11.0	11.3	13.6
	Agree	127	23.0	23.6	37.2
	Strongly agree	338	61.1	62.8	100.0
	Total	538	97.3	100.0	
Missing	Not sure	2	.4		
	System	13	2.4		
	Total	15	2.7		
Total		553	100.0		

Figure B39. Costa Rica: Satisfied with spending time in contact with nature

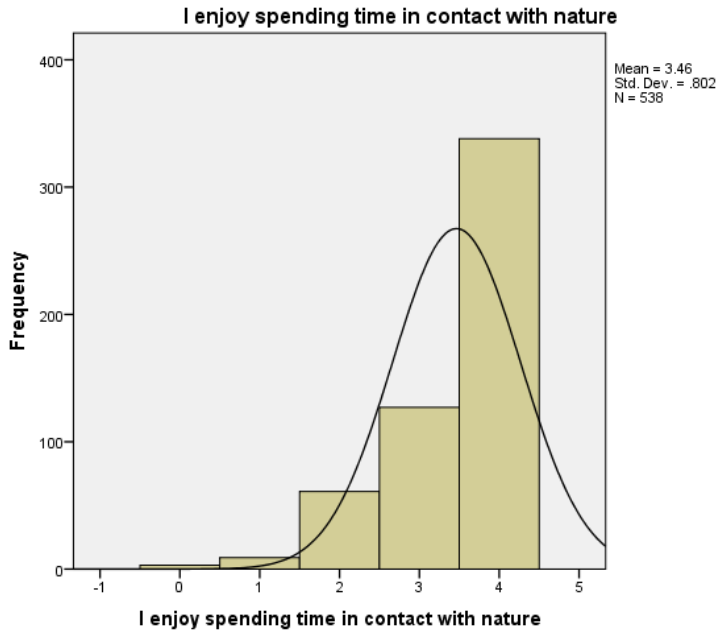


Table B40. Costa Rica: Satisfied with conservation of the environment

I think is important to conserve the environment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Disagree	1	.2	.2	.2
	Neutral	4	.7	.7	.9
	Agree	38	6.9	7.0	8.0
	Strongly agree	497	89.9	92.0	100.0
	Total	540	97.6	100.0	
Missing	No response	1	.2		
	System	12	2.2		
	Total	13	2.4		
Total		553	100.0		

Figure B40. Costa Rica: Satisfied with conservation of the environment

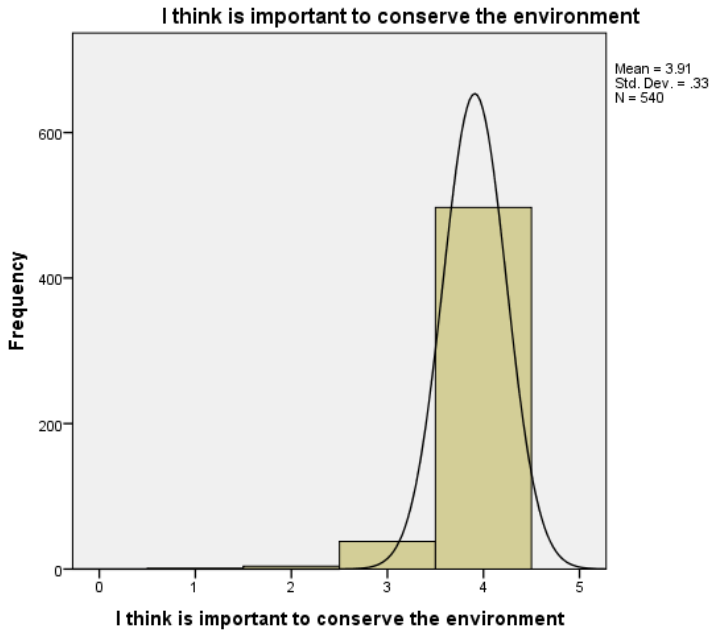


Table B41. Costa Rica: Frequency of spending time doing outdoors activities

Frequency of spending time doing outdoors activities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	45	8.1	8.2	8.2
	Less than once a year	6	1.1	1.1	9.3
	About once a year	12	2.2	2.2	11.5
	3-4 times a year	47	8.5	8.6	20.1
	About once a month	138	25.0	25.2	45.3
	About once a week	176	31.8	32.1	77.4
	Almost everyday	124	22.4	22.6	100.0
	Total	548	99.1	100.0	
Missing	Not sure	5	.9		
Total		553	100.0		

Figure B41. Costa Rica: Frequency of spending time doing outdoors activities

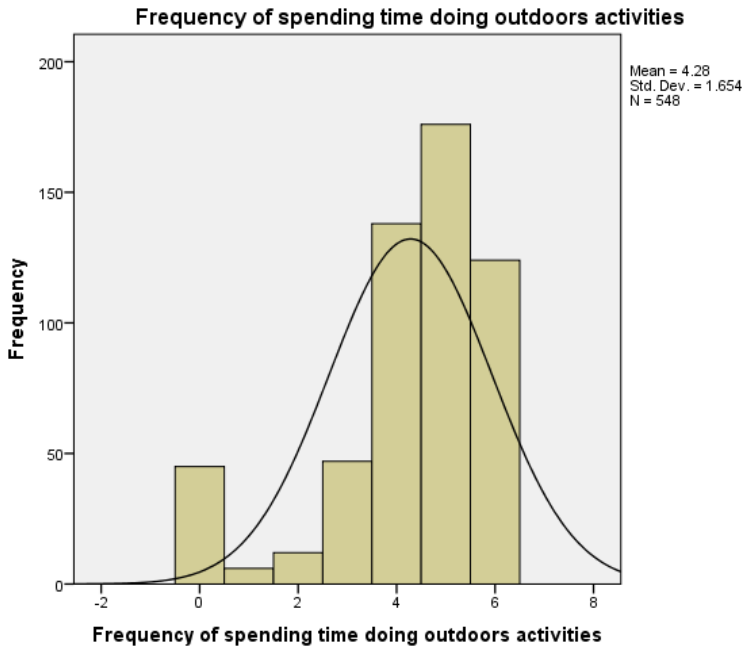


Table B42. Costa Rica: Frequency of spending time in contact with nature

Frequency of spending time in contact with nature

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	28	5.1	5.1	5.1
	Less than once a year	8	1.4	1.5	6.6
	About once a year	13	2.4	2.4	8.9
	3-4 times a year	66	11.9	12.0	21.0
	About once a month	129	23.3	23.5	44.5
	About once a week	145	26.2	26.5	71.0
	Almost everyday	159	28.8	29.0	100.0
	Total	548	99.1	100.0	
Missing	Not sure	4	.7		
	No response	1	.2		
	Total	5	.9		
Total		553	100.0		

Figure B42. Costa Rica: Frequency of spending time in contact with nature

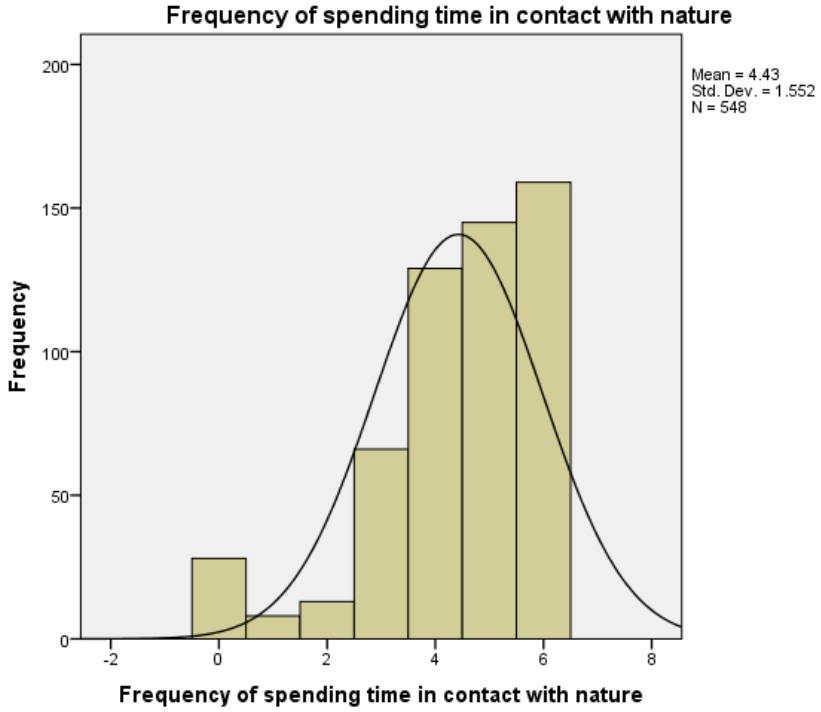


Table B43. Costa Rica: Frequency of doing something for the environment

Frequency of spending time doing something for the environment

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Never	79	14.3	15.0	15.0
	Less than once a year	40	7.2	7.6	22.5
	About once a year	55	9.9	10.4	33.0
	3-4 times a year	49	8.9	9.3	42.2
	About once a month	69	12.5	13.1	55.3
	About once a week	82	14.8	15.5	70.8
	Almost everyday	154	27.8	29.2	100.0
	Total	528	95.5	100.0	
Missing	Not sure	20	3.6		
	No response	3	.5		
	Not applicable	2	.4		
	Total	25	4.5		
Total		553	100.0		

Figure B43. Costa Rica: Frequency of doing something for the environment

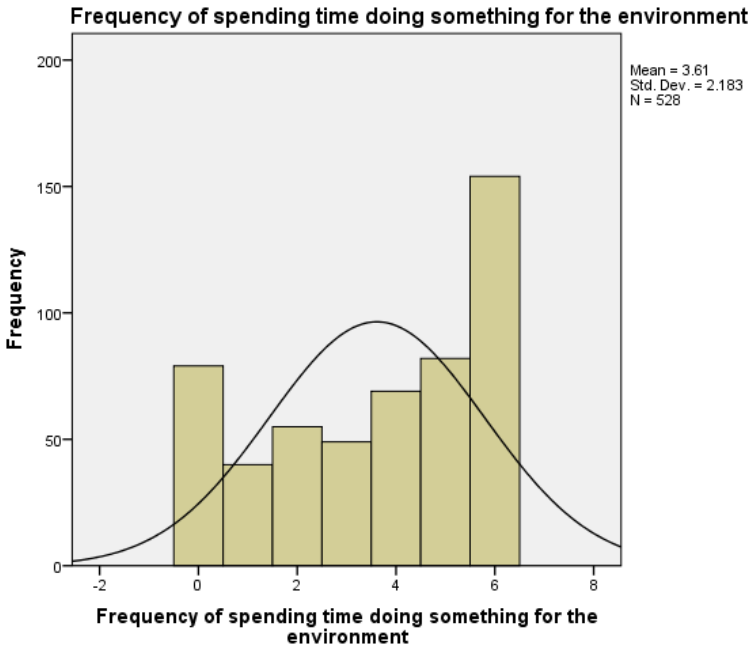


Table B44. Costa Rica: Urban residents

Dummy variable for urban

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rural	120	21.7	21.9	21.9
	Urban	429	77.6	78.1	100.0
	Total	549	99.3	100.0	
Missing	System	4	.7		
Total		553	100.0		

Figure B44. Costa Rica: Urban residents

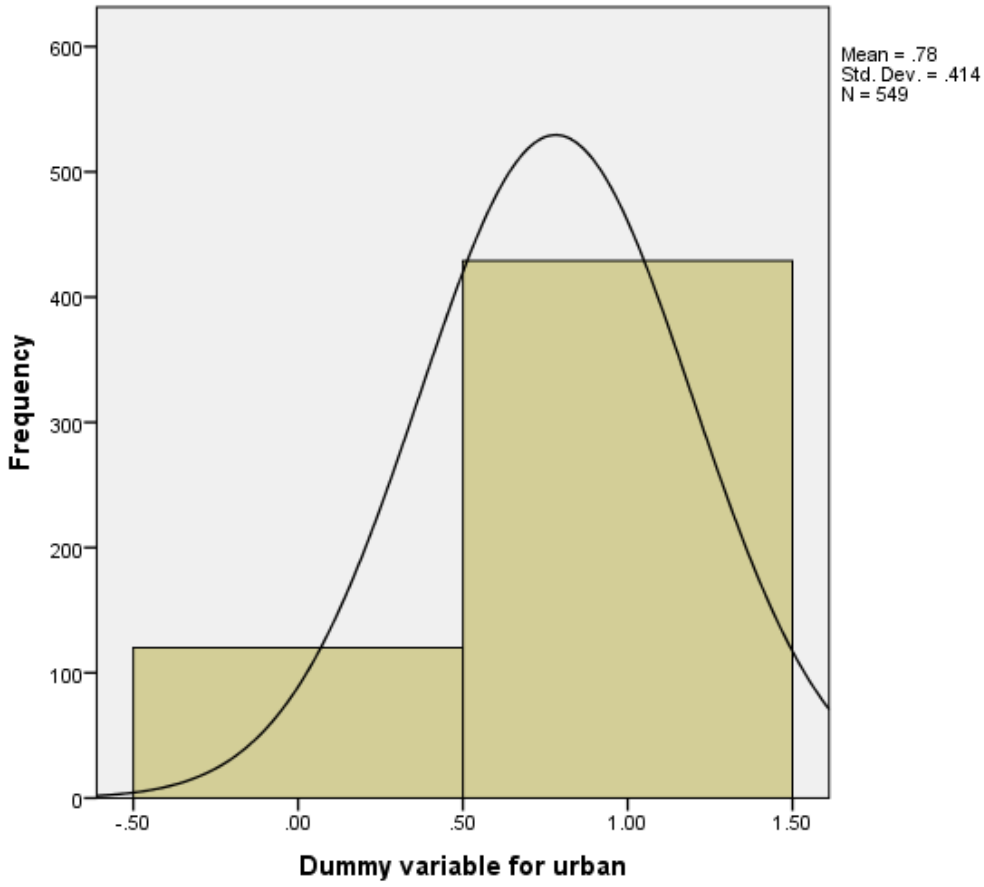


Table B45. Costa Rica: Rural residents

Dummy variable for rural

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Urban	428	77.4	78.1	78.1
	Rural	120	21.7	21.9	100.0
	Total	548	99.1	100.0	
Missing	System	5	.9		
Total		553	100.0		

Figure B45. Costa Rica: Rural residents

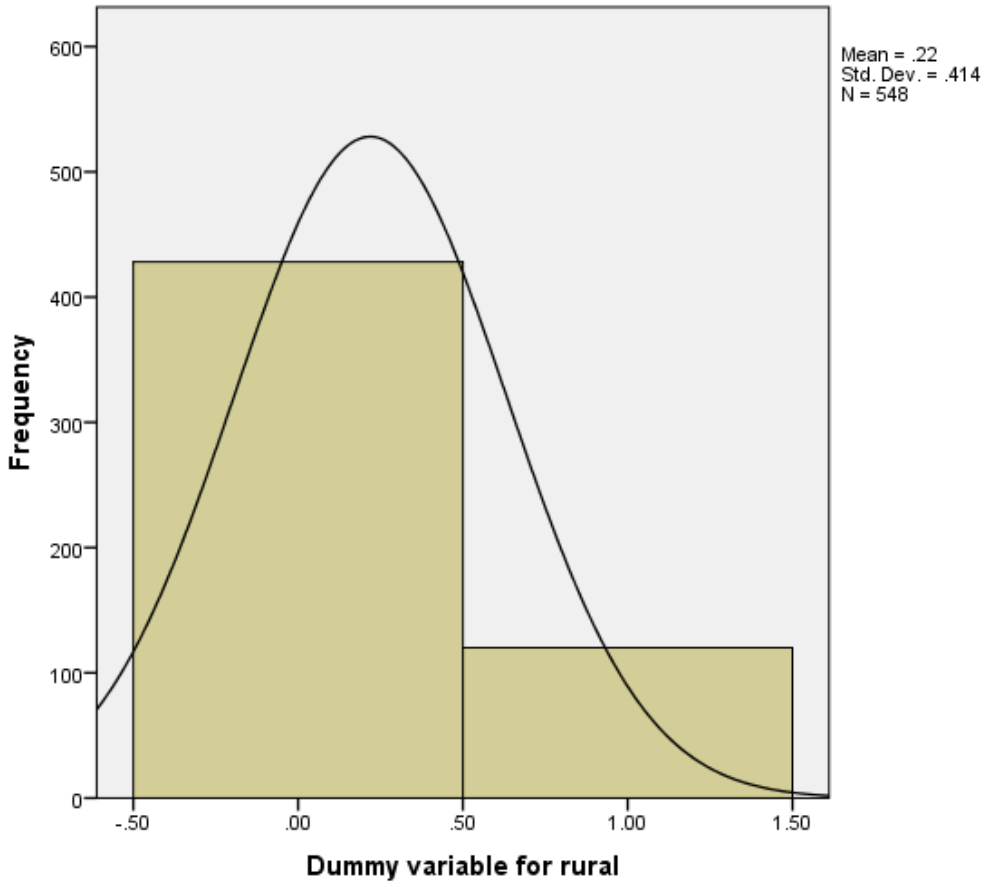


Table B46. Costa Rica: Presence of Protected Areas

Presence of Protected Areas

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	339	61.3	61.7	61.7
	1.00	210	38.0	38.3	100.0
	Total	549	99.3	100.0	
Missing	System	4	.7		
Total		553	100.0		

Figure B46. Costa Rica: Presence of Protected Areas

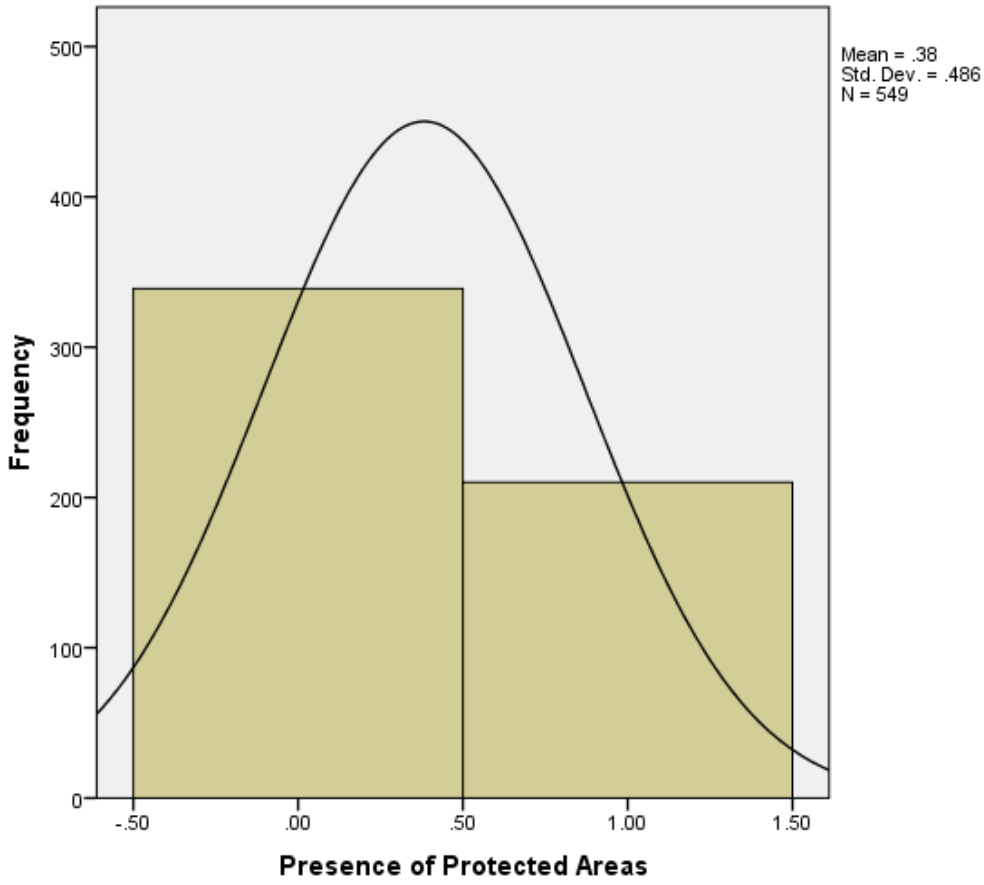


Table B47. Costa Rica: Presence of Beaches

Presence of beaches

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	483	87.3	88.0	88.0
	1.00	66	11.9	12.0	100.0
	Total	549	99.3	100.0	
Missing	System	4	.7		
Total		553	100.0		

Figure B47. Costa Rica: Presence of Beaches

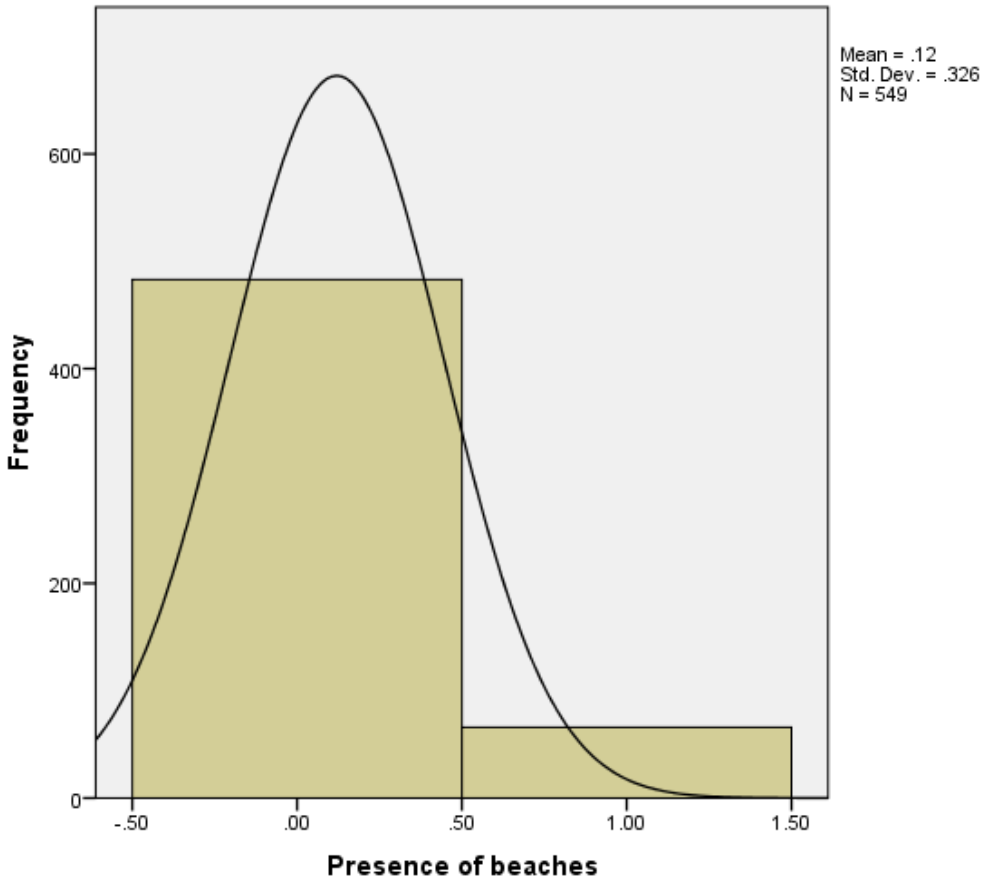


Table B48. Costa Rica: Correlations: importance and satisfaction variables

Correlations

		Importance of having a job	Importance of making money	Importance of having access to clean rivers	Importance of having competent politicians	Importance of having a nice house to live in	Importance of being close to your family	Importance of participating in religious activities	Importance of having a good health	Importance of exercising regularly	Importance of having friends to spend time with	Importance of feeling safe	Importance of doing outdoor activities	Importance of having time to relax	Importance of spending time in a natural environment	Importance of doing something for conservation	I really like my job	I earn enough money for myself and my dependents	I have access to clean rivers close to where I live	I am satisfied with the work my local governors are doing	I live in a nice house	I have a strong and positive relationship with my family	I am a very religious person	I am in very good health	My immediate family is in very good health	I am a very active person	I have enough friends to hang out with	I feel very save where I live	I enjoy doing activities outdoors	I usually have enough time to relax	I enjoy spending time in contact with nature	I think is important to conserve the environment
Importance of having a job	Pearson Correlation	1	.294**	.190**	.143**	.294**	.330**	.184**	.192**	.134**	.146**	.276**	.074	.132**	.166**	.180**	.072	.047	-.010	.045	-.014	.068	.090*	.050	.033	.028	.061	.126**	.017	-.016	.115**	.086
	Sig. (2-tailed)		.000	.000	.001	.000	.000	.000	.000	.002	.001	.000	.093	.003	.000	.000	.134	.330	.823	.322	.744	.118	.041	.253	.455	.522	.170	.004	.694	.721	.009	.051
	N	527	521	523	510	524	524	516	526	526	524	519	523	522	523	521	434	426	515	496	526	523	520	526	524	524	512	514	516	514	514	516
Importance of making money	Pearson Correlation	.294**	1	.206**	.028	.293**	.213**	.194**	.199**	.279**	.212**	.167**	.071	.069	.087*	.078	.106*	.072	-.005	.091*	.074	.071	.071	.118**	.083	.170**	.010	.086*	.013	.083	.045	.016
	Sig. (2-tailed)	.000		.000	.531	.000	.000	.000	.000	.000	.000	.000	.102	.114	.046	.075	.027	.138	.909	.042	.086	.100	.103	.006	.055	.000	.825	.049	.759	.059	.302	.709
	N	521	535	530	517	532	532	523	533	534	532	525	528	528	529	527	437	430	523	503	534	531	528	534	532	532	519	522	524	522	522	524
Importance of having access to clean rivers	Pearson Correlation	.190**	.206**	1	.256**	.381**	.293**	.290**	.553**	.420**	.265**	.363**	.325**	.269**	.448**	.498**	.107*	.082	.068	.042	.133**	.130**	.207**	.162**	.084	.175**	.054	.163**	.097*	.064	.260**	.214**
	Sig. (2-tailed)	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.025	.089	.119	.348	.002	.002	.000	.000	.050	.000	.212	.000	.025	.139	.000	.000
	N	523	530	543	525	541	540	531	543	543	542	536	538	539	539	537	437	433	532	511	541	539	536	542	540	540	528	530	532	530	530	532
Importance of having competent politicians	Pearson Correlation	.143**	.028	.256**	1	.179**	.127**	.077	.154**	.170**	.114**	.184**	.267**	.239**	.228**	.270**	-.078	-.018	-.050	-.057	.027	.055	-.035	-.048	-.122**	.010	.017	.066	.149**	-.070	.057	.083
	Sig. (2-tailed)	.001	.531	.000		.000	.003	.079	.000	.000	.009	.000	.000	.000	.000	.000	.109	.714	.256	.204	.536	.209	.430	.273	.005	.816	.704	.136	.001	.111	.197	.057
	N	510	517	525	529	528	527	521	529	529	527	525	527	526	526	525	426	424	517	502	527	525	522	528	526	527	515	517	519	518	517	519
Importance of having a nice	Pearson Correlation	.294**	.293**	.381**	.179**	1	.515**	.247**	.407**	.331**	.281**	.422**	.265**	.345**	.361**	.325**	.096*	.076	.047	.047	.082	.140**	.105*	.128**	.063	.110**	.024	.099*	.046	.037	.113**	.187**

house to live in	Sig. (2-tailed)	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.045	.143	.282	.285	.056	.001	.015	.003	.144	.010	.585	.022	.289	.392	.009	.000
	N	524	532	541	528	548	546	537	546	546	543	539	542	542	542	542	440	439	536	516	546	544	541	547	545	545	532	534	536	535	534	536
Importance of being close to your family	Pearson Correlation	.330**	.213**	.293**	.127**	.515**	1	.324**	.346**	.328**	.280**	.274**	.220**	.237**	.230**	.291**	.180**	.159**	.073	.147**	.151**	.319**	.191**	.103*	.186**	.112**	.059	.198**	.051	.078	.066	.099*
	Sig. (2-tailed)	.000	.000	.000	.003	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.001	.093	.001	.000	.000	.000	.016	.000	.009	.177	.000	.235	.070	.126	.022
	N	524	532	540	527	546	547	538	545	546	543	538	541	541	541	541	441	438	535	516	545	543	540	546	544	544	532	535	537	536	535	537
Importance of participating in religious activities	Pearson Correlation	.184**	.194**	.290**	.077	.241**	.324**	1	.148**	.352**	.203**	.271**	.252**	.111*	.310**	.374**	.192**	.077	.168**	.197**	.078	.161**	.707**	.080	.134**	.194**	.031	.127**	.022	.066	.097*	.067
	Sig. (2-tailed)	.000	.000	.000	.079	.000	.000		.001	.000	.000	.000	.000	.011	.000	.000	.000	.108	.000	.000	.070	.000	.000	.063	.002	.000	.486	.004	.618	.129	.027	.122
	N	516	523	531	521	537	538	538	536	537	534	530	532	532	532	532	437	433	526	508	536	535	534	538	535	535	523	526	528	527	527	528
Importance of having a good health	Pearson Correlation	.192**	.199**	.553**	.154**	.407**	.346**	.148**	1	.465**	.355**	.377**	.289**	.326**	.325**	.316**	.035	.065	.045	.040	.083	.114**	.062	.191**	.107*	.130**	.039	.083	.122**	.085*	.204**	.160**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.001		.000	.000	.000	.000	.000	.000	.000	.458	.174	.296	.360	.052	.008	.153	.000	.012	.002	.373	.055	.005	.048	.000	.000
	N	526	533	543	529	546	545	536	548	548	545	540	543	543	544	542	440	437	536	516	546	544	541	547	545	545	533	535	537	535	535	537
Importance of excersising regularly	Pearson Correlation	.134**	.279**	.420**	.170**	.331**	.328**	.352**	.465**	1	.431**	.372**	.481**	.375**	.444**	.433**	.111*	.041	.021	.018	.115**	.136**	.216**	.197**	.156**	.403**	.091*	.163**	.221**	.130**	.183**	.142**
	Sig. (2-tailed)	.002	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.020	.387	.623	.687	.007	.001	.000	.000	.000	.000	.036	.000	.000	.003	.000	.001
	N	526	534	543	529	546	546	537	548	549	546	540	543	543	544	542	441	438	537	516	547	545	542	548	546	546	533	536	538	536	536	538
Importance of having friends to spend time with	Pearson Correlation	.146**	.212**	.265**	.114**	.281**	.280**	.203**	.355**	.431**	1	.351**	.405**	.287**	.282**	.225**	.097*	.137**	.034	.165**	.175**	.169**	.151**	.253**	.151**	.185**	.376**	.225**	.160**	.191**	.112**	.131**
	Sig. (2-tailed)	.001	.000	.000	.009	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.041	.004	.436	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.010	.002
	N	524	532	542	527	543	543	534	545	546	546	538	541	541	541	539	440	436	534	513	544	542	539	545	543	543	530	533	535	533	533	535
Importance of feeling safe	Pearson Correlation	.276**	.167**	.363**	.184**	.422**	.274**	.271**	.377**	.372**	.351**	1	.347**	.379**	.375**	.412**	.120*	.043	.077	.039	.113**	.054	.160**	.104*	.016	.139**	.042	.138**	.029	.116**	.130**	.128**
	Sig. (2-tailed)	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.000	.013	.378	.079	.380	.009	.211	.000	.016	.704	.001	.338	.001	.502	.008	.003	.003

	N	519	525	536	525	539	538	530	540	540	538	540	537	539	538	537	434	433	528	511	539	537	533	539	537	537	526	529	530	529	528	531
Importance of doing outdoor activities	Pearson Correlation	.074	.071	.325**	.267**	.265**	.220**	.252**	.289**	.481**	.405**	.347**	1	.551**	.634**	.523**	.066	.042	-.012	.070	.137**	.081	.155**	.118**	.058	.229**	.139**	.110*	.297**	.086*	.291**	.216**
	Sig. (2-tailed)	.093	.102	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.168	.383	.786	.115	.001	.061	.000	.006	.177	.000	.001	.012	.000	.047	.000	.000
	N	523	528	538	527	542	541	532	543	543	541	537	543	540	540	540	436	434	531	512	541	539	536	542	540	540	528	530	532	531	530	532
Importance of having time to relax	Pearson Correlation	.132**	.069	.269**	.239**	.345**	.237**	.111*	.326**	.375**	.287**	.379**	.551**	1	.529**	.467**	.031	-.055	-.119**	.006	.115**	.029	.035	.061	.004	.086*	.089*	.050	.102*	.082	.120**	.119**
	Sig. (2-tailed)	.003	.114	.000	.000	.000	.000	.011	.000	.000	.000	.000	.000		.000	.000	.521	.250	.006	.886	.007	.508	.417	.156	.920	.045	.039	.252	.019	.060	.006	.006
	N	522	528	539	526	542	541	532	543	543	541	539	540	543	542	541	438	434	531	514	541	539	536	542	540	540	530	532	534	533	532	534
Importance of spending time in a natural environment	Pearson Correlation	.166**	.087*	.448**	.228**	.361**	.230**	.310**	.325**	.444**	.282**	.375**	.634**	.529**	1	.632**	.132**	.018	-.044	.030	.071	.060	.169**	.075	.027	.196**	.059	.127**	.235**	.100*	.401**	.244**
	Sig. (2-tailed)	.000	.046	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.005	.708	.307	.498	.100	.162	.000	.080	.530	.000	.178	.003	.000	.020	.000	.000
	N	523	529	539	526	542	541	532	544	544	541	538	540	542	544	541	438	433	532	514	542	540	537	543	541	541	531	533	535	533	533	535
Importance of doing something for conservation	Pearson Correlation	.180**	.078	.498**	.270**	.325**	.291**	.374**	.316**	.433**	.225**	.416**	.523**	.467**	.632**	1	.113*	.020	-.015	.043	.066	.050	.248**	.030	.042	.196**	.049	.174**	.159**	.108*	.339**	.250**
	Sig. (2-tailed)	.000	.075	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000		.018	.678	.729	.326	.128	.247	.000	.482	.325	.000	.258	.000	.000	.013	.000	.000
	N	521	527	537	525	542	541	532	542	542	539	537	540	541	541	542	437	433	530	513	540	538	535	541	539	539	529	531	533	532	531	533
I really like my job	Pearson Correlation	.072	.106*	.107*	-.078	.096*	.180**	.192**	.035	.111*	.097*	.120*	.066	.031	.132**	.113*	1	.398**	.116*	.158**	.213**	.322**	.186**	.240**	.264**	.271**	.195**	.238**	.095*	.179**	.149**	.138**
	Sig. (2-tailed)	.134	.027	.025	.109	.045	.000	.000	.458	.020	.041	.013	.168	.521	.005	.018		.000	.016	.001	.000	.000	.000	.000	.000	.000	.000	.000	.047	.000	.002	.004
	N	434	437	437	426	440	441	437	440	441	440	434	436	438	438	437	443	411	433	425	442	440	437	442	441	441	437	440	441	439	440	441
I earn enough money for myself and my dependents	Pearson Correlation	.047	.072	.082	-.018	.070	.159**	.077	.065	.041	.137**	.043	.042	-.055	.018	.020	.398**	1	.196**	.189**	.317**	.393**	.210**	.324**	.395**	.340**	.189**	.216**	.109*	.188**	.068	.031
	Sig. (2-tailed)	.330	.138	.089	.714	.143	.001	.108	.174	.387	.004	.378	.383	.250	.708	.678	.000		.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.024	.000	.161	.519
	N	426	430	433	424	439	438	433	437	438	436	433	434	434	433	433	411	442	434	417	442	439	437	441	440	440	426	429	430	430	429	430

I have access to clean rivers close to where I live	Pearson Correlation	-.010	-.005	.068	-.050	.047	.073	.168**	.045	.021	.034	.077	-.012	-.119**	-.044	-.015	.116*	.196**	1	.262**	.185**	.195**	.196**	.120**	.155**	.122**	.070	.149**	.070	.136**	.065	.013
	Sig. (2-tailed)	.823	.909	.119	.256	.282	.093	.000	.296	.623	.436	.079	.786	.006	.307	.729	.016	.000		.000	.000	.000	.000	.005	.000	.005	.109	.001	.107	.002	.134	.772
	N	515	523	532	517	536	535	526	536	537	534	528	531	531	532	530	433	434	541	509	539	537	534	540	538	538	523	526	528	527	527	528
I am satisfied with the work	Pearson Correlation	.045	.091*	.042	-.057	.047	.147**	.197**	.040	.018	.165**	.039	.070	.006	.030	.043	.158**	.189**	.262**	1	.189**	.154**	.225**	.189**	.154**	.114**	.178**	.214**	.055	.199**	.157**	.069
my local governors are doing	Sig. (2-tailed)	.322	.042	.348	.204	.285	.001	.000	.360	.687	.000	.380	.115	.886	.498	.326	.001	.000	.000		.000	.000	.000	.000	.000	.010	.000	.000	.214	.000	.000	.118
	N	496	503	511	502	516	516	508	516	516	513	511	512	514	514	513	425	417	509	518	517	515	512	517	516	517	514	515	516	516	515	517
I live in a nice house	Pearson Correlation	-.014	.074	.133**	.027	.082	.151**	.078	.083	.115**	.175**	.113**	.137**	.115**	.071	.066	.213**	.317**	.185**	.189**	1	.498**	.274**	.410**	.366**	.319**	.169**	.331**	.132**	.169**	.076	.104*
	Sig. (2-tailed)	.744	.086	.002	.536	.056	.000	.070	.052	.007	.000	.009	.001	.007	.100	.128	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	.000	.002	.000	.080	.016
	N	526	534	541	527	546	545	536	546	547	544	539	541	541	542	540	442	442	539	517	551	548	544	550	548	548	533	536	538	536	536	539
I have a strong and positive relationship with my family	Pearson Correlation	.068	.071	.130**	.055	.140**	.319**	.161**	.114**	.136**	.169**	.054	.081	.029	.060	.050	.322**	.393**	.195**	.154**	.498**	1	.385**	.382**	.488**	.349**	.114**	.166**	.127**	.101*	.133**	.139**
	Sig. (2-tailed)	.118	.100	.002	.209	.001	.000	.000	.008	.001	.000	.211	.061	.508	.162	.247	.000	.000	.000	.000	.000		.000	.000	.000	.000	.008	.000	.003	.019	.002	.001
	N	523	531	539	525	544	543	535	544	545	542	537	539	539	540	538	440	439	537	515	548	549	544	549	547	546	531	534	536	534	534	537
I am a very religious person	Pearson Correlation	.090*	.071	.207**	-.035	.105*	.191**	.707**	.062	.216**	.151**	.160**	.155**	.035	.169**	.248**	.186**	.210**	.196**	.225**	.274**	.385**	1	.226**	.281**	.333**	.112*	.148**	.081	.146**	.162**	.106*
	Sig. (2-tailed)	.041	.103	.000	.430	.015	.000	.000	.153	.000	.000	.000	.000	.417	.000	.000	.000	.000	.000	.000	.000	.000		.000	.000	.000	.010	.001	.062	.001	.000	.014
	N	520	528	536	522	541	540	534	541	542	539	533	536	536	537	535	437	437	534	512	544	544	546	546	543	543	528	531	534	532	532	533
I am in very good health	Pearson Correlation	.050	.118**	.162**	-.048	.128**	.103*	.080	.191**	.197**	.253**	.104*	.118**	.061	.075	.030	.240**	.324**	.120**	.189**	.410**	.382**	.226**	1	.551**	.401**	.205**	.301**	.110*	.181**	.202**	.219**
	Sig. (2-tailed)	.253	.006	.000	.273	.003	.016	.063	.000	.000	.000	.016	.006	.156	.080	.482	.000	.000	.005	.000	.000	.000	.000		.000	.000	.000	.000	.010	.000	.000	.000
	N	526	534	542	528	547	546	538	547	548	545	539	542	542	543	541	442	441	540	517	550	549	546	552	549	549	534	537	539	537	537	539
My immediate family	Pearson Correlation	.033	.083	.084	-.122**	.063	.186**	.134**	.107*	.156**	.151**	.016	.058	.004	.027	.042	.264**	.395**	.155**	.154**	.366**	.485**	.281**	.551**	1	.418**	.130**	.243**	.102*	.117**	.172**	.137**

is in very good health	Sig. (2-tailed)	.455	.055	.050	.005	.144	.000	.002	.012	.000	.000	.704	.177	.920	.530	.325	.000	.000	.000	.000	.000	.000	.000	.000	.000		.000	.003	.000	.019	.007	.000	.001
	N	524	532	540	526	545	544	535	545	546	543	537	540	540	541	539	441	440	538	516	548	547	543	549	550	547	532	535	537	535	535	537	
I am a very active person	Pearson Correlation	.028	.170**	.175**	.010	.110**	.112**	.194**	.130**	.403**	.185**	.139**	.229**	.086*	.196**	.196**	.271**	.340**	.122**	.114**	.319**	.349**	.333**	.401**	.418**	1	.248**	.293**	.273**	.252**	.289**	.199**	
	Sig. (2-tailed)	.522	.000	.000	.816	.010	.009	.000	.002	.000	.000	.001	.000	.045	.000	.000	.000	.000	.005	.010	.000	.000	.000	.000	.000		.000	.000	.000	.000	.000	.000	
	N	524	532	540	527	545	544	535	545	546	543	537	540	540	541	539	441	440	538	517	548	546	543	549	547	550	533	536	537	535	535	537	
I have enough friends to hang out with	Pearson Correlation	.061	.010	.054	.017	.024	.059	.031	.039	.091*	.376**	.042	.139**	.089*	.059	.049	.195**	.189**	.070	.178**	.169**	.114**	.112*	.205**	.130**	.248**	1	.277**	.288**	.205**	.146**	.117**	
	Sig. (2-tailed)	.170	.825	.212	.704	.585	.177	.486	.373	.036	.000	.338	.001	.039	.178	.258	.000	.000	.109	.000	.000	.008	.010	.000	.003	.000		.000	.000	.000	.001	.007	
	N	512	519	528	515	532	532	523	533	533	530	526	528	530	531	529	437	426	523	514	533	531	528	534	532	533	535	533	534	532	532	534	
I feel very save where I live	Pearson Correlation	.126**	.086*	.163**	.066	.099*	.198**	.127**	.083	.163**	.222**	.138**	.110*	.050	.127**	.174**	.238**	.216**	.149**	.214**	.331**	.166**	.148**	.301**	.243**	.293**	.277**	1	.251**	.220**	.187**	.131**	
	Sig. (2-tailed)	.004	.049	.000	.136	.022	.000	.004	.055	.000	.000	.001	.012	.252	.003	.000	.000	.000	.001	.000	.000	.000	.001	.000	.000	.000	.000		.000	.000	.000	.002	
	N	514	522	530	517	534	535	526	535	536	533	529	530	532	533	531	440	429	526	515	536	534	531	537	535	536	533	538	537	535	535	537	
I enjoy doing activities outdoors	Pearson Correlation	.017	.013	.097*	.149**	.046	.051	.022	.122**	.221**	.160**	.029	.297**	.102*	.235**	.159**	.095*	.109*	.070	.055	.132**	.127**	.081	.110*	.102*	.273**	.288**	.251**	1	.176**	.337**	.186**	
	Sig. (2-tailed)	.694	.759	.025	.001	.289	.235	.618	.005	.000	.000	.502	.000	.019	.000	.000	.047	.024	.107	.214	.002	.003	.062	.010	.019	.000	.000	.000		.000	.000	.000	
	N	516	524	532	519	536	537	528	537	538	535	530	532	534	535	533	441	430	528	516	538	536	534	539	537	537	534	537	540	538	538	539	
I usually have enough time to relax	Pearson Correlation	-.016	.083	.064	-.070	.037	.078	.066	.085*	.130**	.191**	.116**	.086*	.082	.100*	.108*	.179**	.188**	.136**	.199**	.169**	.101*	.146**	.181**	.117**	.252**	.205**	.220**	.176**	1	.237**	.139**	
	Sig. (2-tailed)	.721	.059	.139	.111	.392	.070	.129	.048	.003	.000	.008	.047	.060	.020	.013	.000	.000	.002	.000	.000	.019	.001	.000	.007	.000	.000	.000	.000		.000	.001	
	N	514	522	530	518	535	536	527	535	536	533	529	531	533	533	532	439	430	527	516	536	534	532	537	535	535	532	535	538	538	536	537	
I enjoy spending time in contact with nature	Pearson Correlation	.115**	.045	.260**	.057	.113**	.066	.097*	.204**	.183**	.112**	.130**	.291**	.120**	.401**	.339**	.149**	.068	.065	.157**	.076	.133**	.162**	.202**	.172**	.289**	.146**	.187**	.337**	.237**	1	.315**	
	Sig. (2-tailed)	.009	.302	.000	.197	.009	.126	.027	.000	.000	.010	.003	.000	.006	.000	.000	.002	.161	.134	.000	.080	.002	.000	.000	.000	.000	.001	.000	.000	.000		.000	

	N	514	522	530	517	534	535	527	535	536	533	528	530	532	533	531	440	429	527	515	536	534	532	537	535	535	532	535	538	536	538	537
I think is important to conserve the environment	Pearson Correlation	.086	.016	.214**	.083	.187**	.099*	.067	.160**	.142**	.131**	.128**	.216**	.119**	.244**	.250**	.138**	.031	.013	.069	.104*	.139**	.106*	.219**	.137**	.199**	.117**	.131**	.186**	.139**	.315**	1
	Sig. (2-tailed)	.051	.709	.000	.057	.000	.022	.122	.000	.001	.002	.003	.000	.006	.000	.000	.004	.519	.772	.118	.016	.001	.014	.000	.001	.000	.007	.002	.000	.001	.000	
	N	516	524	532	519	536	537	528	537	538	535	531	532	534	535	533	441	430	528	517	539	537	533	539	537	537	534	537	539	537	537	540

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table B49. Costa Rica: Correlations: frequency variables

Correlations

		Frequency of spending time with immediate family	Frequency of participating in religious activities	Frequency of spending time exercising	Frequency of spending time with friends	Frequency of spending time doing outdoors activities	Frequency of spending time relaxing	Frequency of spending time in contact with nature	Frequency of spending time doing something for the environment
Frequency of spending time with immediate family	Pearson Correlation	1	.138**	.061	.082	.066	.072	.073	.051
	Sig. (2-tailed)		.001	.156	.059	.125	.094	.092	.244
	N	541	528	539	531	536	536	536	516
Frequency of participating in religious activities	Pearson Correlation	.138**	1	.202**	.033	.151**	.106*	.216**	.211**
	Sig. (2-tailed)	.001		.000	.453	.000	.014	.000	.000
	N	528	540	538	520	536	535	536	518
Frequency of spending	Pearson Correlation	.061	.202**	1	.293**	.577**	.469**	.506**	.335**

time exercising	Sig. (2-tailed)	.156	.000		.000	.000	.000	.000	.000
	N	539	538	551	531	546	546	546	526
Frequency of spending time with friends	Pearson Correlation	.082	.033	.293**	1	.352**	.266**	.233**	.157**
	Sig. (2-tailed)	.059	.453	.000		.000	.000	.000	.000
	N	531	520	531	533	529	528	528	509
Frequency of spending time doing outdoors activities	Pearson Correlation	.066	.151**	.577**	.352**	1	.579**	.562**	.316**
	Sig. (2-tailed)	.125	.000	.000	.000		.000	.000	.000
	N	536	536	546	529	548	545	544	523
Frequency of spending time relaxing	Pearson Correlation	.072	.106*	.469**	.266**	.579**	1	.619**	.331**
	Sig. (2-tailed)	.094	.014	.000	.000	.000		.000	.000
	N	536	535	546	528	545	548	543	524
Frequency of spending time in contact with nature	Pearson Correlation	.073	.216**	.506**	.233**	.562**	.619**	1	.500**
	Sig. (2-tailed)	.092	.000	.000	.000	.000	.000		.000
	N	536	536	546	528	544	543	548	525
Frequency of spending time doing something for the environment	Pearson Correlation	.051	.211**	.335**	.157**	.316**	.331**	.500**	1
	Sig. (2-tailed)	.244	.000	.000	.000	.000	.000	.000	
	N	516	518	526	509	523	524	525	528

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table B50. Costa Rica: Correlations: 'other' objective indicators

		Age	Age squared	Male	Dummy for couple (casado y union libre)	Recalculated number of kids at home, when blank = 0	Level of education in years	Average income recalculated with retired = 0	PaidEmployed	Roomspperson	Dummy variable for rural	Presence of beaches	Presence of Protected Areas
Age	Pearson Correlation	1	.983**	.135**	.325**	-.101*	-.213**	.123**	.042	.290**	.028	.157**	.079
	Sig. (2-tailed)		0.000	.002	.000	.019	.000	.006	.331	.000	.520	.000	.067
	N	547	547	521	547	547	545	504	547	539	544	545	545
Age squared	Pearson Correlation	.983**	1	.143**	.273**	-.123**	-.229**	.082	-.040	.285**	.051	.164**	.079
	Sig. (2-tailed)	0.000		.001	.000	.004	.000	.064	.347	.000	.237	.000	.066
	N	547	547	521	547	547	545	504	547	539	544	545	545
Male	Pearson Correlation	.135**	.143**	1	-.021	-.078	-.023	.131**	.139**	.120**	-.083	-.106*	-.090*
	Sig. (2-tailed)	.002	.001		.639	.077	.596	.004	.002	.006	.058	.015	.040
	N	521	521	524	521	521	519	480	521	513	523	524	524
Dummy for couple (casado y union libre)	Pearson Correlation	.325**	.273**	-.021	1	.127**	-.033	.165**	.139**	-.078	.033	.116**	.191**
	Sig. (2-tailed)	.000	.000	.639		.003	.443	.000	.001	.069	.436	.007	.000
	N	547	547	521	547	547	545	504	547	539	544	545	545
Recalculated number of	Pearson Correlation	-.101*	-.123**	-.078	.127**	1	-.216**	-.069	-.050	-.413**	.170**	.150**	.117**

		Age	Age squared	Male	Dummy for couple (casado y union libre)	Recalculated number of kids at home, when blank = 0	Level of education in years	Average income recalculated with retired = 0	PaidEmployed	Roomspperson	Dummy variable for rural	Presence of beaches	Presence of Protected Areas
kids at home, when blank = 0	Sig. (2-tailed)	.019	.004	.077	.003		.000	.120	.244	.000	.000	.000	.006
	N	547	547	521	547	547	545	504	547	539	544	545	545
Level of education in years	Pearson Correlation	-.213**	-.229**	-.023	-.033	-.216**	1	.393**	.161**	.129**	-.306**	-.314**	-.168**
	Sig. (2-tailed)	.000	.000	.596	.443	.000		.000	.000	.003	.000	.000	.000
	N	545	545	519	545	545	545	502	545	537	542	543	543
Average income recalculated with retired = 0	Pearson Correlation	.123**	.082	.131**	.165**	-.069	.393**	1	.362**	.082	-.196**	-.109*	-.083
	Sig. (2-tailed)	.006	.064	.004	.000	.120	.000		.000	.068	.000	.015	.064
	N	504	504	480	504	504	502	504	504	499	501	502	502
PaidEmployed	Pearson Correlation	.042	-.040	.139**	.139**	-.050	.161**	.362**	1	-.013	-.103*	.000	.039
	Sig. (2-tailed)	.331	.347	.002	.001	.244	.000	.000		.757	.016	.998	.361
	N	547	547	521	547	547	545	504	547	539	544	545	545
Roomspperson	Pearson Correlation	.290**	.285**	.120**	-.078	-.413**	.129**	.082	-.013	1	-.215**	-.142**	-.072
	Sig. (2-tailed)	.000	.000	.006	.069	.000	.003	.068	.757		.000	.001	.096
	N	539	539	513	539	539	537	499	539	539	536	537	537
Dummy variable for rural	Pearson Correlation	.028	.051	-.083	.033	.170**	-.306**	-.196**	-.103*	-.215**	1	.604**	.454**
	Sig. (2-tailed)	.520	.237	.058	.436	.000	.000	.000	.016	.000		.000	.000
	N	544	544	523	544	544	542	501	544	536	548	548	548

		Age	Age squared	Male	Dummy for couple (casado y union libre)	Recalculated number of kids at home, when blank = 0	Level of education in years	Average income recalculated with retired = 0	PaidEmployed	Roomspperson	Dummy variable for rural	Presence of beaches	Presence of Protected Areas
Presence of beaches	Pearson Correlation	.157**	.164**	-.106*	.116**	.150**	-.314**	-.109*	.000	-.142**	.604**	1	.470**
	Sig. (2-tailed)	.000	.000	.015	.007	.000	.000	.015	.998	.001	.000		.000
	N	545	545	524	545	545	543	502	545	537	548	549	549
Presence of Protected Areas	Pearson Correlation	.079	.079	-.090*	.191**	.117**	-.168**	-.083	.039	-.072	.454**	.470**	1
	Sig. (2-tailed)	.067	.066	.040	.000	.006	.000	.064	.361	.096	.000	.000	
	N	545	545	524	545	545	543	502	545	537	548	549	549

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table B51. Costa Rica: Results all models

Domain	Factors	Variables	All		A		B		C		D	
			Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise
			Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)	
		(Constant)	**2.689** **	**3.331** ***	**3.174**	**1.142**	**1.633**	**3.288** ***	**8.492**	**4.873** ***	**9.350** *	**8.431** ***
			1.215	*0.556*	*4.027*	*1.686*	*1.503*	*0.669*	*7.517*	*0.806*	*5.282*	*1.185*
Social	**Friends**	LN Satisfied with friends	**0.242**	**0.464** *	**0.911**		**0.244**	**0.733** **	**0.003**		**0.135**	
			0.328	*0.256*	*1.210*		*0.405*	*0.305*	*1.216*		*1.095*	
		Objective										
	Religion	LN days spent doing religious activities	**0.061**		**0.475** **		**0.007**		**0.301**		**0.239**	
			0.077		*0.210*		*0.096*		*0.329*		*0.265*	
		Objective (others)										
	Age	Age	**0.014** *	**0.026** ***	**0.010**	**0.028** **	**0.016**	**0.026** ***	**0.014**		**0.022**	
			0.008	*0.007*	*0.022*	*0.013*	*0.011*	*0.009*	*0.023*		*0.020*	
	Children	Number of children	**-0.079**		**0.297**		**-0.128**		**-0.523**		**-0.566** *	
			0.091		*0.254*		*0.126*		*0.348*		*0.290*	

Domain	Factors	Variables	All		A		B		C		D	
			Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise
			Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)	
Economic		***Subjective***										
	Income	LN Satisfied with money	**0.464** *0.282*	**0.521** ** *0.250*	**-0.310** *0.871*		**-0.102** *0.351*		**1.721** *1.069*		**2.105** ** *0.926*	
	House	LN Satisfied with house	**1.095** *** *0.326*	**1.205** *** *0.281*	**-0.460** *1.102*		**1.178** *** *0.465*	**1.181** *** *0.382*	**1.705** * *0.907*	**2.178** *** *0.562*	**1.854** ** *0.789*	**1.967** *** *0.518*
		Objective (others)										
	Income	LN average income	**0.035** *0.024*		**0.102** * *0.061*		**0.072** ** *0.032*	**0.062** ** *0.027*	**-0.103** *0.093*		**-0.086** *0.074*	
Health	**Family health**	***Subjective*** LN Satisfied with family health	**0.087** *0.467*		**5.425** ** *2.260*	**3.057** *** *1.079*	**-0.407** *0.687*		**0.152** *0.997*		**-0.081** *0.897*	
	Relaxing	LN Satisfied with relaxing time	**-0.102** *0.273*		**-0.383** *0.576*		**0.237** *0.360*		**-1.048** *1.564*		**-0.924** *1.289*	
Environment		***Objective***										
		Subjective										
	Outdoors	LN Satisfied with outdoor activities	**-0.512**		**0.066**		**-0.312**		**-4.193**		**-2.727**	**-2.119** ***

Domain	Factors	Variables	All		A		B		C		D	
			Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise
			Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)	
			0.347		***0.846***		***0.456***		***2.862***		***1.777***	***0.741***
		Objective										
	Interaction	LN days interaction with environment	**0.008**		**0.320** *	**0.250** **	**-0.038**		**0.308**		**0.303**	
			0.079		***0.188***	***0.111***	***0.101***		***0.569***		***0.480***	
		Objective (others)										
	Protected Areas	Dummy presence of protected areas	**0.128**								**1.146**	
			0.223								***1.037***	
	Rural	Dummy variable for rural	**0.124**									
			0.291									
		Number of observations:	**306**	**306**	**63**	**63**	**179**	**179**	**55**	**55**	**63**	**63**
		Adjusted R2:	**0.166**	**0.174**	**0.145**	**0.244**	**0.149**	**0.183**	**0.088**	**0.203**	**0.193**	**0.205**

Domain	Factors	Variables	All		A		B		C		D	
			Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise	Enter	Stepwise
			Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)		Unstandardized Coefficients (*Standard Error*)	
			1.568	*1.560*	*1.478*	*1.390*	*1.522*	*1.491*	*1.905*	*1.781*	*1.774*	*1.761*
		F:	**3.251**	**13.921**	**1.427**	**7.763**	**2.252**	**11.038**	**1.213**	**15.032**	**1.580**	**9.142**

Note: Significance at the 10% level is indicated by*, significance at the 5% level is indicated by** and significance at the 1% level is indicated by***

A. People that live in an urban area and have access to beaches and protected areas

B. People that live in an urban area and do not have access to beaches and protected areas

C. People that live in rural area and have access to beaches and protected areas

D. People that live in rural area and included a dummy variable of presence of protected areas in the regression

\

Table C1. Descriptive statistics

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Life satisfaction	123	6.000	-3.000	3.000	1.780	0.129	1.435	2.058
LN Life satisfaction	123	1.946	0.000	1.946	1.702	0.035	0.384	0.147
Ecological Health	126	5.000	-2.000	3.000	1.571	0.118	1.323	1.751
Relationships	123	12.000	-3.000	9.000	2.033	0.119	1.324	1.753
Control	125	6.000	-3.000	3.000	0.656	0.176	1.972	3.889
Satisfaction with income	115	6.000	-3.000	3.000	-0.748	0.184	1.973	3.892
Economic profits	79	10,093,797	-916,245	9,177,552	435,942	153,304	1,362,596	1,856,668,170,100
Not Owner	132	1.000	0.000	1.000	0.538	0.044	0.500	0.250
Midpoint years managed	131	47.000	3.000	50.000	21.103	1.203	13.765	189.484
More than 50% freehold	133	1.000	0.000	1.000	0.459	0.043	0.500	0.250
Diversified	126	1.000	0.000	1.000	0.167	0.033	0.374	0.140
Beef Cattle	121	1.000	0.000	1.000	0.777	0.038	0.418	0.175
University Degree	125	1.000	0.000	1.000	0.248	0.039	0.434	0.188

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Area	137	1,534,999	5	1,535,004	111,919	18,446	215,903	46,614,241,941
Watercourse	137	1.000	0.000	1.000	0.527	0.041	0.501	0.251
Rainfall 2013	136	3,535.5	60.5	3,596.0	769.1	54.3	633.5	401,317.6
Rainfall 2012	136	4,153.9	301.4	4,455.3	1,127.2	56.3	656.9	431,480.3
Chromosol soil type	137	1.000	0.000	1.000	0.106	0.021	0.255	0.065
Dermosol soil type	137	1.000	0.000	1.000	0.045	0.014	0.169	0.029
Ferrosol soil type	137	1.020	0.000	1.020	0.135	0.026	0.313	0.098
Hydrosol soil type	137	0.910	0.000	0.910	0.007	0.006	0.076	0.006
Kandosol soil type	137	1.000	0.000	1.000	0.238	0.030	0.359	0.129
Rudosol soil type	137	0.690	0.000	0.690	0.025	0.007	0.085	0.007
Sodosol soil type	137	1.000	0.000	1.000	0.049	0.013	0.160	0.025
Tenosol soil type	137	1.000	0.000	1.000	0.176	0.025	0.305	0.093
Vertosol soil type	137	1.000	0.000	1.000	0.208	0.030	0.362	0.131
Forests and woodlands	137	1.010	0.000	1.010	0.581	0.034	0.417	0.174
Grasslands	137	1.000	0.000	1.000	0.130	0.022	0.267	0.071

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
Cleared vegetation	137	1.010	0.000	1.010	0.235	0.030	0.369	0.136
Naturally bare land	137	0.190	0.000	0.190	0.001	0.001	0.016	0.000
Rainforests	137	0.950	0.000	0.950	0.038	0.013	0.163	0.027
Shrubland	137	0.410	0.000	0.410	0.009	0.004	0.051	0.003
Unclassified/unmodified native vegetation	137	0.090	0.000	0.090	0.003	0.001	0.013	0.000
Weeds Queensland	114	9.000	0.000	9.000	0.561	0.129	1.376	1.894
Weeds of national significance	114	3.000	0.000	3.000	0.114	0.043	0.456	0.208
Australian iconic species	114	18.000	0.000	18.000	3.325	0.403	4.302	18.504
# of listed threatened species	142	36.000	3.000	39.000	13.134	0.673	8.017	64.273
# of listed migratory species	142	36.000	7.000	43.000	9.641	0.332	3.960	15.679
No of endemic species	114	3.000	0.000	3.000	2.974	0.026	0.281	0.079
Pest animals	114	4.000	0.000	4.000	0.175	0.052	0.552	0.305
#of national heritage places	137	3.000	0.000	3.000	0.169	0.048	0.571	0.326
# of wetlands of national or international significance	137	2.000	0.000	2.000	0.148	0.032	0.376	0.141

	N	Range	Minimum	Maximum	Mean		Std. Deviation	Variance
	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Statistic
# of commonwealth, stat or territory reserves	137	7.000	0.000	7.000	0.373	0.094	1.121	1.257

6 References

Achor, S. (2010). *The happiness advantage: The seven principles of positive psychology that fuel success and performance at work.* New York: Crown Business.

Adams, V. M., Pressey, R. L., & Stoeckl, N. (2012). Estimating land and conservation management costs: The first step in designing a stewardship program for the Northern Territory. *Biological Conservation, 148*(1), 44-53. doi:http://dx.doi.org/10.1016/j.biocon.2012.01.064

Ambrey, C. L., & Fleming, C. M. (2011). Valuing scenic amenity using life satisfaction data. *Ecological Economics, 72*(0), 106-115. doi:http://dx.doi.org/10.1016/j.ecolecon.2011.09.011

Ambrey, C. L., & Fleming, C. M. (2012). Valuing Australia's protected areas: A life satisfaction approach. *New Zealand Economic Papers, 46*(3), 191-209. doi:10.1080/00779954.2012.697354

Ambrey, C. L., Fleming, C. M., & Chan, A. Y.-C. (2014). Estimating the cost of air pollution in South East Queensland: An application of the life satisfaction non-market valuation approach. *Ecological Economics, 97*(0), 172-181. doi:http://dx.doi.org/10.1016/j.ecolecon.2013.11.007

Arias, A. (2015). Understanding and managing compliance in the nature conservation context. *Journal of Environmental Management, 153*(0), 134-143. doi:http://dx.doi.org/10.1016/j.jenvman.2015.02.013

Ballas, D., & Tranmer, M. (2012). Happy People or Happy Places? A Multilevel Modeling Approach to the Analysis of Happiness and Well-Being. *International Regional Science Review, 35*(1), 70-102.

Barbour, B. (1954). How Nations See Each Other. by William Buchanan; Hadley CantrilReview by: Bernard Barbour *The Public Opinion Quarterly* (Vol. 18, pp. 106-108): Oxford University Press on behalf of the American Association for Public Opinion Research.

Barger, S. D., Donoho, C. J., & Wayment, H. A. (2009). The relative contributions of race/ethnicity, socioeconomic status, health, and social relationships to life satisfaction in the United States. *Quality of Life Research, 18*(2), 179-189.

Barnosky, A. D., Hadly, E. A., Bascompte, J., Berlow, E. L., Brown, J. H., Fortelius, M., . . . Smith, A. B. (2012). Approaching a state shift in Earth's biosphere. *Nature, 486*, 52+.

Barry, M., van Lente, E., Molcho, M., Morgan, K., McGee, H., Conroy, R., . . . Perry, I. (2009). SLAN 2007: Survey of Lifestyle, Attitudes and Nutrition in Ireland Mental Health and Social Well-being Report. *Psychology Reports*, 11.

Barton, J., & Pretty, J. (2010). What is the Best Dose of Nature and Green Exercise for Improving Mental Health? A Multi-Study Analysis. *Environmental Science & Technology, 44*(10), 3947-3955. doi:10.1021/es903183r

Blanchflower, D. G., & Oswald, A. J. (2004). Well-being over time in Britain and the USA. *Journal of Public Economics, 88*(7), 1359-1386.

Blanchflower, D. G., & Oswald, A. J. (2008). Is well-being U-shaped over the life cycle? *Social science & medicine, 66*(8), 1733-1749.

Boarini, R., Comola, M., Smith, C., Manchin, R., & De Keulenaer, F. (2012). *What makes for a better life?: The determinants of subjective well-being in OECD countries–Evidence from the Gallup World Poll*. Retrieved from

Brereton, F., Clinch, J. P., & Ferreira, S. (2008). Happiness, geography and the environment. *Ecological Economics, 65*(2), 386-396.

Brodt, S., Klonsky, K., & Tourte, L. (2006). Farmer goals and management styles: Implications for advancing biologically based agriculture. *Agricultural Systems, 89*(1), 90-105. doi:http://dx.doi.org/10.1016/j.agsy.2005.08.005

Buchanan, W., & Cantril, H. (1953). How Nations See Each Other (Urbana, Illinois: University of Illinois Press.

Camfield, L. (2004). Subjective measures of well-being in developing countries *Challenges for Quality of Life in the Contemporary World* (pp. 45-59): Springer.

Cantril, H. (1965). *The pattern of human concerns* (Vol. 4): Cambridge Univ Press.

Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: a meta-analysis. *Frontiers in Psychology, 5*. doi:10.3389/fpsyg.2014.00976

Carroll, N., Frijters, P., & Shields, M. A. (2009). Quantifying the costs of drought: new evidence from life satisfaction data. *Journal of Population Economics, 22*(2), 445-461. doi:http://dx.doi.org/10.1007/s00148-007-0174-3

Chen, S.-K., & Lin, S. J. (2014). The Latent Profiles of Life Domain Importance and Satisfaction in a Quality of Life Scale. *Social Indicators Research, 116*(2), 429-445. doi:10.1007/s11205-013-0309-8

Claassen, R., Duquette, E., & Horowitz, J. (2013). Additionality in agricultural conservation payment programs. *Journal of Soil and Water Conservation, 68*(3), 74A-78A.

Coasts, A. G. L. a. (2014). *Caring for our Country: outcomes 2008-2013*. Retrieved from Australia: viewed 27 August 2014, <http://nrmonline.nrm.gov.au/catalog/mql:1887>.

Cohen, Mark A. (2008). The Effect of Crime on Life Satisfaction. *The Journal of Legal Studies, 37*(S2), S325-S353. doi:10.1086/588220

Collins, J. F., & Cummins, T. (1996). *Agroclimatic atlas of Ireland: Working Group on Applied Agricultural Meteorology*. Ireland: University College Dublin, UCD.

Cortés, J., & Wehrtmann, I. S. (2009). Diversity of marine habitats of the Caribbean and Pacific of Costa Rica *Marine Biodiversity of Costa Rica, Central America* (pp. 1-45): Springer.

Costanza, R., Erickson, J., Fligger, K., Adams, A., Adams, C., Altschuler, B., . . . Williams, L. (2004). Estimates of the Genuine Progress Indicator (GPI) for Vermont, Chittenden County and Burlington, from 1950 to 2000. *Ecological Economics, 51*(1–2), 139-155. doi:http://dx.doi.org/10.1016/j.ecolecon.2004.04.009

Costanza, R., Kubiszewski, I., Giovannini, E., Lovins, H., McGlade, J., Pickett, K., . . . Wilkinson, R. (2014). Development: Time to leave GDP behind. *Nature, 505*(7483), 283-285.

Cox, K. (2012). Happiness and Unhappiness in the Developing World: Life Satisfaction Among Sex Workers, Dump-Dwellers, Urban Poor, and Rural Peasants in Nicaragua. *Journal of Happiness Studies, 13*(1), 103-128. doi:10.1007/s10902-011-9253-y

CRC, T. S. (2014). Tropical savannas: a unique region. Retrieved from http://savanna.org.au/all/

Cummins, R. (1998). The Second Approximation to an International Standard for Life Satisfaction. *Social Indicators Research, 43*(3), 307-334. doi:10.1023/A:1006831107052

Cummins, R. A. (1996). The Domains of Life Satisfaction: An Attempt to Order Chaos. *Social Indicators Research, 38*(3), 303-328. doi:10.2307/27522935

Cummins, R. A. (1997). Assessing quality of life. In R. I. Brown (Ed.), *Quality of life for people with disabilities: Models, research and practice* (Vol. 2, pp. 116-150). London: Nelson Thornes.

Cummins, R. A. (2000). Personal income and subjective well-being: A review. *Journal of Happiness Studies, 1*(2), 133-158.

Cummins, R. A., McCabe, M. P., Romeo, Y., Reid, S., & Waters, L. (1997). An Initial Evaluation of the Comprehensive Quality of Life Scale--Intellectual Disability. *International Journal of Disability, Development and Education, 44*(1), 7-19. doi:10.1080/0156655970440102

Dale, B. (1980). Subjective and objective social indicators in studies of regional social well-being. *Regional Studies, 14*(6), 503-515. doi:10.1080/09595238000185461

Davis, J. A., & Smith, T. W. (1991). *General social surveys, 1972-1991: Cumulative codebook*: National Opinion Research Center (NORC).

Davis, K., Schoen, C., Schoenbaum, S. C., Doty, M. M., Holmgren, A. L., Kriss, J. L., & Shea, K. K. (2007). Mirror, mirror on the wall: an international update on the comparative performance of American health care. *New York: The Commonwealth Fund, 59*.

Delgado, C., Matlon, P., & Reardon, T. (1992). Determinants and effects of income diversification amongst farm households in Burkina Faso. *Journal of Development Studies, 28*, 264+.

Di Tella, R., MacCulloch, R. J., & Oswald, A. J. (2003). The Macroeconomics of Happiness. *The Review of Economics and Statistics, 85*(4), 809-827. doi:10.2307/3211807

Dibden, J., Mautner, N., & Cocklin, C. (2005). Land Stewardship: Unearthing the Perspectives of Land Managers. *Australasian Journal of Environmental Management, 12*(4), 190-201. doi:10.1080/14486563.2005.10648650

Diener, E. (2000). Subjective well-being: The science of happiness and a proposal for a national index. *American psychologist, 55*(1), 34.

Diener, E. (2006). Guidelines for National Indicators of Subjective Well-Being and Ill-Being. *Journal of Happiness Studies, 7*(4), 397-404. doi:10.1007/s10902-006-9000-y

Diener, E. (2009). *The science of well-being: The collected works of Ed Diener* (Vol. 1): Springer.

Diener, E., & Biswas-Diener, R. (2002). Will Money Increase Subjective Well-Being? *Social Indicators Research, 57*(2), 119-169. doi:10.1023/A:1014411319119

Diener, E., & Biswas-Diener, R. (2011). *Happiness: Unlocking the mysteries of psychological wealth*: John Wiley & Sons.

Diener, E., & Diener, M. (2009). Cross-Cultural Correlates of Life Satisfaction and Self-Esteem. In E. Diener (Ed.), *Culture and Well-Being* (Vol. 38, pp. 71-91): Springer Netherlands.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment, 49*(1), 71-75. doi:10.1207/s15327752jpa4901_13

Diener, E., Inglehart, R., & Tay, L. (2013). Theory and Validity of Life Satisfaction Scales. *Social Indicators Research, 112*(3), 497-527. doi:10.1007/s11205-012-0076-y

Diener, E., & Seligman, M. E. P. (2004). Beyond Money: Toward an Economy of Well-Being. *Psychological Science in the Public Interest, 5*(1), 1-31. doi:10.2307/40062297

Diener, E., Suh, E. M., Lucas, R. E., & Smith, H. L. (1999). Subjective well-being: Three decades of progress. *Psychological bulletin, 125*(2), 276.

Dillman, D. A., Smyth, J. D., & Christian, L. M. (2014). *Internet, phone, mail, and mixed-mode surveys: the tailored design method*: John Wiley & Sons.

Dolan, P., & Peasgood, T. (2008). Measuring Well-Being for Public Policy: Preferences or Experiences? *The Journal of Legal Studies, 37*(S2), S5-S31. doi:10.1086/595676

Dolan, P., Peasgood, T., & White, M. (2008). Do we really know what makes us happy? A review of the economic literature on the factors associated with subjective well-being. *Journal of Economic Psychology, 29*(1), 94-122.

Easterlin, R. A. (1974). Does economic growth improve the human lot? Some empirical evidence. *Nations and households in economic growth, 89*.

Easterlin, R. A. (1995). Will raising the incomes of all increase the happiness of all? *Journal of Economic Behavior & Organization, 27*(1), 35-47. doi:http://dx.doi.org/10.1016/0167-2681(95)00003-B

Easterlin, R. A., Angelescu, L., & Zweig, J. S. (2011). The impact of modern economic growth on urban–Rural differences in subjective well-being. *World Development, 39*(12), 2187-2198.

Eger, R. J., & Maridal, J. H. (2015). A statistical meta-analysis of the wellbeing literature. *International Journal of Wellbeing, 5*(2).

EPA. (2005). *Water quality in Ireland 2001-2003* (1840951672). Retrieved from Wexford:

Farmar-Bowers, Q., & Lane, R. (2009). Understanding farmers' strategic decision-making processes and the implications for biodiversity conservation policy. *Journal of Environmental Management, 90*(2), 1135-1144. doi:http://dx.doi.org/10.1016/j.jenvman.2008.05.002

Fehr, E., & Falk, A. (2002). Psychological foundations of incentives. *European Economic Review, 46*(4–5), 687-724. doi:http://dx.doi.org/10.1016/S0014-2921(01)00208-2

Ferraro, P. J., & Kiss, A. (2002). Direct payments to conserve biodiversity. *Science, 298*(5599), 1718-1719.

Ferreira, S., & Moro, M. (2010). On the Use of Subjective Well-Being Data for Environmental Valuation. *Environmental and Resource Economics, 46*(3), 249-273. doi:10.1007/s10640-009-9339-8

Ferreira, S., & Moro, M. (2013). Income and preferences for the environment: evidence from subjective well-being data. *Environment and Planning A, 45*(3), 650-667.

Ferreira, S., Moro, M., & Clinch, J. P. (2006). Valuing the environment using the life-satisfaction approach.

Ferrer-i-Carbonell, A., & Frijters, P. (2004). How Important is Methodology for the estimates of the determinants of Happiness?*. *The Economic Journal, 114*(497), 641-659. doi:10.1111/j.1468-0297.2004.00235.x

Ferrer-i-Carbonell, A., & Gowdy, J. M. (2007). Environmental degradation and happiness. *Ecological Economics, 60*(3), 509-516.

Freeman III, M., Herriges, J. A., & Kling, C. L. (2013). *The Measurement of Environmental and Resource Values : Theory and Methods* Retrieved from http://jcu.eblib.com.au/patron/FullRecord.aspx?p=592546

Frey, B., Luechinger, S., & Stutzer, A. (2009). The life satisfaction approach to environmental valuation. *CESifo Working Paper Series No. 2836*.

Frey, B. S. (2008). *Happiness: A revolution in economics* (Vol. 1). Cambridge, Mass.: MIT Press.

Frey, B. S., & Stutzer, A. (1999). Measuring Preferences by Subjective Well-Being. *Journal of Institutional and Theoretical Economics (JITE) / Zeitschrift für die gesamte Staatswissenschaft, 155*(4), 755-778.

Frijters, P. (2000). Do individuals try to maximize general satisfaction? *Journal of Economic Psychology, 21*(3), 281-304. doi:http://dx.doi.org/10.1016/S0167-4870(00)00005-2

Frijters, P., Haisken-DeNew, J. P., & Shields, M. A. (2004). Money Does Matter! Evidence from Increasing Real Income and Life Satisfaction in East Germany Following Reunification. *The American Economic Review, 94*(3), 730-740. doi:10.2307/3592950

Frijters, P., & Van Praag, B. M. S. (1998). The Effects of Climate on Welfare and Well-Being in Russia. *Climatic Change, 39*(1), 61-81. doi:10.1023/A:1005347721963

Fuller, R. A., Irvine, K. N., Devine-Wright, P., Warren, P. H., & Gaston, K. J. (2007). Psychological benefits of greenspace increase with biodiversity. *Biology letters, 3*(4), 390-394. doi:http://dx.doi.org/10.1098/rsbl.2007.0149

Furnham, Adrian (1986). "Response bias, social desirability and dissimulation". Personality and Individual Differences. 7 (3): 385–400. doi:10.1016/0191-8869(86)90014-0

Gabriel, S. A., Mattey, J. P., & Wascher, W. L. (2003). Compensating differentials and evolution in the quality-of-life among US states. *Regional Science and Urban Economics, 33*(5), 619-649.

Gagné, M., & Deci, E. L. (2005). Self-determination theory and work motivation. *Journal of Organizational behavior, 26*(4), 331-362.

Gallup, G. H. (1976). Human Needs and Satisfactions A Global Survey. *Public Opinion Quarterly, 40*(4), 459-467.

Gneezy, U., Meier, S., & Rey-Biel, P. (2011). When and Why Incentives (Don't) Work to Modify Behavior. *The Journal of Economic Perspectives, 25*(4), 191-209. doi:10.2307/41337236

Gowdy, J. (2005). Toward a new welfare economics for sustainability. *Ecological Economics, 53*(2), 211-222. doi:http://dx.doi.org/10.1016/j.ecolecon.2004.08.007

Graham, C., & Pettinato, S. (2001). Happiness, Markets, and Democracy: Latin America in Comparative Perspective. *Journal of Happiness Studies, 2*(3), 237-268. doi:10.1023/A:1011860027447

Greiner, R., & Gregg, D. (2011). Farmers' intrinsic motivations, barriers to the adoption of conservation practices and effectiveness of policy instruments: Empirical evidence from northern Australia. *Land Use Policy, 28*(1), 257-265. doi:http://dx.doi.org/10.1016/j.landusepol.2010.06.006

Greiner, R., Patterson, L., & Miller, O. (2009). Motivations, risk perceptions and adoption of conservation practices by farmers. *Agricultural Systems, 99*(2–3), 86-104. doi:http://dx.doi.org/10.1016/j.agsy.2008.10.003

Group, I. W. (2006). Personal Wellbeing Index. In A. C. o. Q. o. Life (Ed.), (Vol. 4th edition). Melbourne: Deakin University.

Guven, C. (2007). *Reversing the Question. Does Happiness Affect Individual Economic Behavior? Evidence from Surveys from the Netherlands and Germany*. Retrieved from

Hartog, J., & Oosterbeek, H. (1998). Health, wealth and happiness: why pursue a higher education? *Economics of Education Review, 17*(3), 245-256. doi:http://dx.doi.org/10.1016/S0272-7757(97)00064-2

Helliwell, J. F. (2003). How's life? Combining individual and national variables to explain subjective well-being. *Economic Modelling, 20*(2), 331-360. doi:http://dx.doi.org/10.1016/S0264-9993(02)00057-3

Helliwell, J. F., Layard, R., & Sachs, J. (2013). *World Happiness Report 2013*. Retrieved from New York, USA.:

Hirata, J. (2011). *Happiness, Ethics and Economics*. Florence: Taylor and Francis.

Honey, M. (1999). *Ecotourism and sustainable development: Who owns paradise?* : Island Press.

Hsieh, C.-m. (2015). Domain Importance in Subjective Well-Being Measures. *Social Indicators Research*, 1-16. doi:10.1007/s11205-015-0977-7

Hurley, P. (2008). TAPM V4. User manual: CSIRO Marine and Atmospheric Research.

IMF, I. M. F. (2015). *World Economic Outlook (WEO): Adjusting to Lower Commodity Prices*. Retrieved from Washington (October):

INBIO, I. N. d. B. (2015). Biodiversity in Costa Rica. Retrieved from http://www2.inbio.ac.cr/en/biod/bio_biodiver.htm

Index, H. P. (2012). Happy Planet Index 2012 Report: A Global Index of Sustainable Well-Being. *NEF.(http://www. happyplanetindex. org/assets/happy-planetindex-report. pdf) haettu, 12*, 2015.

INEC, I. N. d. E. y. C. (2011). *COSTA RICA - X Censo Nacional de Población y VI de Vivienda., Censo 2011*. Retrieved from San José, Costa Rica: http://www.inec.go.cr/anda4/index.php/catalog/113

Inglehart, R. (1990). *Culture shift in advanced industrial society*: Princeton University Press.

Inglehart, R., Foa, R., Peterson, C., & Welzel, C. (2008). Development, freedom, and rising happiness: A global perspective (1981–2007). *Perspectives on psychological science, 3*(4), 264-285.

Jarvis, D., Stoeckl, N., & Liu, H.-B. (2016). The impact of economic, social and environmental factors on trip satisfaction and the likelihood of visitors returning. *Tourism Management, 52*(0), 1-18. doi:http://dx.doi.org/10.1016/j.tourman.2015.06.003

Kennard, M. (2010). *Identifying high conservation value aquatic ecosystems in northern Australia. Final Report for the Department of Environment, Water, Heritage and the Arts and the National Water Commission*. Retrieved from

Kirkcaldy, B., Furnham, A., & Veenhoven, R. (2005). 26 Health care and subjective well-being in nations. *Research companion to organizational health psychology*, 393.

Klineberg, S. L. (1967). *The Public Opinion Quarterly* (Vol. 31, pp. 511-512): Oxford University Press on behalf of the American Association for Public Opinion Research.

Knowler, D., & Bradshaw, B. (2007). Farmers' adoption of conservation agriculture: A review and synthesis of recent research. *Food Policy, 32*(1), 25-48. doi:http://dx.doi.org/10.1016/j.foodpol.2006.01.003

Kristoffersen, I. (2010). The Metrics of Subjective Wellbeing: Cardinality, Neutrality and Additivity*. *Economic Record, 86*(272), 98-123. doi:10.1111/j.1475-4932.2009.00598.x

Kubiszewski, I., Costanza, R., Franco, C., Lawn, P., Talberth, J., Jackson, T., & Aylmer, C. (2013). Beyond GDP: Measuring and achieving global genuine progress. *Ecological Economics, 93*(0), 57-68. doi:http://dx.doi.org/10.1016/j.ecolecon.2013.04.019

Lane, R. E. (2000). *The loss of happiness in market democracies*: Yale University Press.

Lelkes, O. (2006). Knowing what is good for you: Empirical analysis of personal preferences and the "objective good". *The Journal of Socio-Economics, 35*(2), 285-307.

Levinson, A. (2012). Valuing public goods using happiness data: The case of air quality. *Journal of Public Economics*.

Lin, B. B., Fuller, R. A., Bush, R., Gaston, K. J., & Shanahan, D. F. (2014). Opportunity or Orientation? Who Uses Urban Parks and Why. *PLoS ONE, 9*(1), e87422. doi:10.1371/journal.pone.0087422

Luechinger, S., & Raschky, P. A. (2009). Valuing flood disasters using the life satisfaction approach. *Journal of Public Economics, 93*(3–4), 620-633. doi:http://dx.doi.org/10.1016/j.jpubeco.2008.10.003

MacKerron, G., & Mourato, S. (2009). Life satisfaction and air quality in London. *Ecological Economics, 68*(5), 1441-1453.

MacKerron, G., & Mourato, S. (2013). Happiness is greater in natural environments. *Global Environmental Change*.

Maddison, D., & Rehdanz, K. (2011). The impact of climate on life satisfaction. *Ecological Economics, 70*(12), 2437-2445. doi:http://dx.doi.org/10.1016/j.ecolecon.2011.07.027

Margolis, R., & Myrskyl, M. (2011). A Global Perspective on Happiness and Fertility. *Population and Development Review, 37*(1), 29-56.

Margules, C. R., & Pressey, R. L. (2000). Systematic conservation planning. *Nature, 405*(6783), 243-253.

McCrea, R., Shyy, T.-K., & Stimson, R. (2014). Satisfied Residents in Different Types of Local Areas: Measuring What's Most Important. *Social Indicators Research, 118*(1), 87-101. doi:10.1007/s11205-013-0406-8

Mead, R., & Cummins, R. (2012). What makes us happy? Ten years of the Australian unity wellbeing index. from Australian Unity: Deakin University

Michalos, A. C., & Kahlke, P. M. (2010). Stability and Sensitivity in Perceived Quality of Life Measures: Some Panel Results. *Social Indicators Research, 98*(3), 403-434. doi:10.1007/s11205-009-9554-2

Milner-Gulland, E. J., McGregor, J. A., Agarwala, M., Atkinson, G., Bevan, P., Clements, T., . . . Wilkie, D. (2014). Accounting for the Impact of Conservation on Human Well-Being. *Conservation Biology, 28*(5), 1160-1166. doi:10.1111/cobi.12277

Moro, M., Brereton, F., Ferreira, S., & Clinch, J. P. (2008). Ranking quality of life using subjective well-being data. *Ecological Economics, 65*(3), 448-460. doi:http://dx.doi.org/10.1016/j.ecolecon.2008.01.003

National Research Council Panel on Measuring Subjective Well-Being in a Policy-Relevant Framework. (2012). The Subjective Well-Being Module of the American Time Use Survey: Assessment for Its Continuation. Washington (DC): National Academies Press (US).

Nisbet, E., Zelenski, J., & Murphy, S. (2011). Happiness is in our Nature: Exploring Nature Relatedness as a Contributor to Subjective Well-Being. *Journal of Happiness Studies, 12*(2), 303-322. doi:10.1007/s10902-010-9197-7

OECD. (2008). *Key Environmental Indicators*. Retrieved from Paris:

OECD. (2013). OECD Guidelines on Measuring Subjective Well-being: OECD Publishing.

Oishi, S., Diener, E. F., Lucas, R. E., & Suh, E. M. (1999). Cross-Cultural Variations in Predictors of Life Satisfaction: Perspectives from Needs and Values. *Personality and Social Psychology Bulletin, 25*(8), 980-990. doi:10.1177/01461672992511006

Oswald, A. J., & Wu, S. (2010). Objective Confirmation of Subjective Measures of Human Well-Being: Evidence from the U.S.A. *Science, 327*(5965), 576-579. doi:10.1126/science.1180606

Oswald, F., Wahl, H.-W., Mollenkopf, H., & Schilling, O. (2003). Housing and Life Satisfaction of Older Adults in Two Rural Regions in Germany. *Research on Aging, 25*(2), 122-143. doi:10.1177/0164027502250016

Pavot, W., Diener, E., Colvin, C. R., & Sandvik, E. (1991). Further Validation of the Satisfaction With Life Scale: Evidence for the Cross-Method Convergence of Well-Being Measures. *Journal of Personality Assessment, 57*(1), 149-161. doi:10.1207/s15327752jpa5701_17

Pearce, D. W., & Moran, D. (1994). *The economic value of biodiversity*: Earthscan.

Pelletier, L. G., Legault, L. R., & Tuson, K. M. (1996). The Environmental Satisfaction Scale: A Measure of Satisfaction with Local Environmental Conditions and Government Environmental Policies. *Environment and Behavior, 28*(1), 5-26. doi:10.1177/0013916596281001

Powdthavee, N. (2005). Unhappiness and Crime: Evidence from South Africa. *Economica, 72*(287), 531-547. doi:10.1111/j.0013-0427.2005.00429.x

Powdthavee, N. (2010). *The happiness equation: The surprising economics of our most valuable asset*: Icon Books.

Rehdanz, K., & Maddison, D. (2005). Climate and happiness. *Ecological Economics, 52*(1), 111-125. doi:http://dx.doi.org/10.1016/j.ecolecon.2004.06.015

Rietveld, C. A., Cesarini, D., Benjamin, D. J., Koellinger, P. D., De Neve, J.-E., Tiemeier, H., . . . Bartels, M. (2013). Molecular genetics and subjective well-being. *Proceedings of the National Academy of Sciences, 110*(24), 9692-9697. doi:10.1073/pnas.1222171110

Rohe, W. M., & Stegman, M. A. (1994). The Effects of Homeownership: on the Self-Esteem, Perceived Control and Life Satisfaction of Low-Income People. *Journal of the American Planning Association, 60*(2), 173-184. doi:10.1080/01944369408975571

Rojas, M. (2006a). Life satisfaction and satisfaction in domains of life: is it a simple relationship? *Journal of Happiness Studies, 7*(4), 467-497.

Rojas, M. (2006b). The utility of happiness research in economics. *Journal of Happiness Studies, 7*(4), 523-529.

Rojas, M., & Elizondo-Lara, M. (2012). SATISFACCIÓN DE VIDA EN COSTA RICA. *Latin American Research Review, 47*(1).

Rojas, M., & Veenhoven, R. (2013). Contentment and affect in the estimation of happiness. *Social Indicators Research, 110*(2), 415-431.

Russell, L. B., Hubley, A. M., Palepu, A., & Zumbo, B. D. (2006). Does Weighting Capture What's Important? Revisiting Subjective Importance Weighting with a Quality of Life Measure. *Social Indicators Research, 75*(1), 141-167.

Ryan, R. M., & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American psychologist, 55*(1), 68-78. doi:http://dx.doi.org/10.1037/0003-066X.55.1.68

Schneider, M. (1975). The quality of life in large American cities: Objective and subjective social indicators. *Social Indicators Research, 1*(4), 495-509.

SDRN. (2005). *Wellbeing Concepts and Challenges*. Retrieved from Sustainable Development Research Network:

Shanahan, D. F., Lin, B. B., Gaston, K. J., Bush, R., & Fuller, R. A. (2014). Socio-economic inequalities in access to nature on public and private lands: A case study from Brisbane, Australia. *Landscape and Urban Planning, 130*, 14-23. doi:http://dx.doi.org/10.1016/j.landurbplan.2014.06.005

Shanahan, D. F., Lin, B. B., Gaston, K. J., Bush, R., & Fuller, R. A. (2015). What is the role of trees and remnant vegetation in attracting people to urban parks? *Landscape Ecology, 30*(1), 153-165. doi:10.1007/s10980-014-0113-0

Shields, M. A., Price, S. W., & Wooden, M. (2009). Life Satisfaction and the Economic and Social Characteristics of Neighbourhoods. *Journal of Population Economics, 22*(2), 421-443.

Simons, K., Wike, R., & Oates, R. (2014). People in emerging markets catch Up to advanced economies in life satisfaction: Pew Research Center.

Stiglitz, J. E., Sen, A., & Fitoussi, J.-P. (2009). *Report by the commission on the measurement of economic performance and social progress*. Retrieved from

Stiglitz, J. E., Sen, A., & Fitoussi, J.-P. (2010). *Mismeasuring Our Lives : Why GDP Doesn't Add Up* Retrieved from http://jcu.eblib.com.au/patron/FullRecord.aspx?p=537946

Stoeckl, N., Chaiechi, T., Farr, M., Esparon, M., Larson, S., Jarvis, D., . . . Tran, L. T. (2015). *Improving the efficiency of biodiversity investment*. Retrieved from Charles Darwin University:

Tan, H. Z., Luo, Y. J., Wen, S. W., Liu, A. Z., Li, S. Q., Yang, T. B., & Sun, Z. Q. (2004). The Effect of a Disastrous Flood on the Quality of Life in Dongting Lake Area in China. *Asia-Pacific Journal of Public Health, 16*(2), 126-132. doi:10.1177/101053950401600209

Trauer, T., & MacKinnon, A. (2001). Why Are We Weighting? The Role of Importance Ratings in Quality of Life Measurement. *Quality of Life Research, 10*(7), 579-585.

UII. (2006). *Urbis Database*. Retrieved from Dublin:

Van Praag, B. M., Frijters, P., & Ferrer-i-Carbonell, A. (2003). The anatomy of subjective well-being. *Journal of Economic Behavior & Organization, 51*(1), 29-49.

Van Praag, B. M. S., & Baarsma, B. E. (2005). Using Happiness Surveys to Value Intangibles: The Case of Airport Noise. *The Economic Journal, 115*(500), 224-246. doi:10.2307/3590511

Veenhoven, R. (1991). Is happiness relative? *Social Indicators Research, 24*(1), 1-34.

Veenhoven, R. (1993). Happiness in nations': Subjective appreciation of life in 56 nations 1946-1992: Erasmus University Rotterdam

Veenhoven, R. (1999). Quality-of-Life in Individualistic Society: A Comparison of 43 Nations in the Early 1990's. *Social Indicators Research, 48*(2), 157-186. doi:10.2307/27522408

Veenhoven, R. (2000a). Freedom and happiness: A comparative study in forty-four nations in the early 1990s. In E. Diener & E. M. Suh (Eds.), *Culture and subjective well-being* (pp. 257-288). MIT press: Cambridge, MA USA.

Veenhoven, R. (2000b). Well-being in the welfare state: Level not higher, distribution not more equitable. *Journal of Comparative Policy Analysis: Research and Practice, 2*(1), 91-125.

Veenhoven, R. (2004). World Database of Happiness: Continuous register of research on subjective appreciation of life.

Veenhoven, R. (2005). Inequality Of Happiness in Nations. *Journal of Happiness Studies, 6*(4), 351-355. doi:10.1007/s10902-005-0003-x

Vemuri, A. W., Grove, J. M., Wilson, M. A., & Burch, W. R. (2009). A Tale of Two Scales: Evaluating the Relationship Among Life Satisfaction, Social Capital, Income, and the Natural Environment at Individual and Neighborhood Levels in Metropolitan Baltimore. *Environment and Behavior*. doi:10.1177/0013916509338551

Welsch, H. (2002). Preferences over Prosperity and Pollution: Environmental Valuation based on Happiness Surveys. *Kyklos, 55*(4), 473-494. doi:10.1111/1467-6435.00198

Welsch, H. (2006). Environment and happiness: Valuation of air pollution using life satisfaction data. *Ecological Economics, 58*(4), 801-813. doi:http://dx.doi.org/10.1016/j.ecolecon.2005.09.006

Welsch, H. (2007). Environmental welfare analysis: A life satisfaction approach. *Ecological Economics, 62*(3–4), 544-551. doi:http://dx.doi.org/10.1016/j.ecolecon.2006.07.017

Welsch, H. (2009). Implications of happiness research for environmental economics. *Ecological Economics, 68*(11), 2735-2742.

Welsch, H., & Kühling, J. (2009). USING HAPPINESS DATA FOR ENVIRONMENTAL VALUATION: ISSUES AND APPLICATIONS. *Journal of Economic Surveys, 23*(2), 385-406. doi:10.1111/j.1467-6419.2008.00566.x

White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013). Would You Be Happier Living in a Greener Urban Area? A Fixed-Effects Analysis of Panel Data. *Psychological Science, 24*(6), 920-928. doi:10.1177/0956797612464659

Wilson, K. A., Carwardine, J., & Possingham, H. P. (2009). Setting Conservation Priorities. *Annals of the New York Academy of Sciences, 1162*(1), 237-264. doi:10.1111/j.1749-6632.2009.04149.x

Wooden, M. (2001). The Household, Income and Labour Dynamics in Australia Survey and Quality of Life Measures. *Third Australian Conference on quality of Life. Deakin University*.

Wu, C.-H., & Yao, G. (2006). Do We Need to Weight Item Satisfaction by Item Importance? A Perspective from Locke's Range-Of-Affect Hypothesis. *Social Indicators Research, 79*(3), 485-502. doi:10.1007/s11205-005-5666-5

Wunder, S. (2007). The Efficiency of Payments for Environmental Services in Tropical Conservation. *Conservation Biology, 21*(1), 48-58. doi:10.1111/j.1523-1739.2006.00559.x