

Declining and Aging Populations in Rural Japan: A Changing Environment

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## Abstract

The purpose of this study is to understand how the environment and well-being of rural Japan will be affected by depopulation and aging populations caused by low birth-rates and migration to urban areas. Rural abandonment will undoubtedly cause changes to local environments and there is a lack of studies in English aimed at understanding the environmental and wellbeing changes happening in Japan due to this change. To study this phenomenon, I designed and distributed a survey to residents of rural Japan designed to measure environmental concern, wellbeing, and perceived change in environment. I also reviewed existing studies from other countries about the effects of rural abandonment and the causes of Japan's depopulation. I found that, while the effects of rural abandonment are not fully understood, the known negative changes are not beyond mitigation efforts. It is by no means clear cut whether depopulation and urbanization result in net positive or negative changes; this paper adds to the discussion of how to deal with these issues and recommends further discussion about the local versus global implications of changing populations.

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## Preface

Clouds hang low in the sky above my apartment block, threatening rain but unlikely to deliver. It is six in the morning, long before I would normally be up. We gather outside the convenience store across the street from campus, and trek our way from there. Even in the middle of no-where, Japan's paved roads are plentiful and it is an easy walk away from the small campus to nearby plots of farmland, the families that tend them, and hills thick with trees and underbrush.

Having grown up in America, the countryside to me means flat, endless, tan landscapes with no human life for hours at a time. But even in the most backcountry areas of Japan there are few areas with no farms and houses. And between the heavy rains and temperate climate every hillside and plain is a brilliant emerald. I had chosen to spend my study abroad in a remote prefecture because I knew it would be easier to make friends at a smaller school. What I hadn't anticipated was finding the nature and culture of the countryside so compelling.

This cloudy Sunday we were out picking *sansai* (mountain vegetables): stalks of large leafed butterbur, long and leafy *mizo*, and dandelions. My friend pointed out how to distinguish the native Japanese dandelions (an absence of small downwards pointing leaves at the base of the flower) but in the end, we were only able to find a couple, the hills overrun with the common dandelion. We washed, salted, and fried our spoils in light *tempura* batter and ate them with warm noodles and broth.

The idea for this thesis came to me during a four-month long study abroad program in Northern rural Japan. The school I was studying at is situated in the Western part of Akita prefecture, an area at the very north end of Japan's main island, Honshū. The school was at least an hour by bus away from Akita's capital; besides the university, there was a convenience store,

a single restaurant, and a ramen cart that would make it's rounds during the evenings. Everything beyond that for any walkable distance was just small households, villages, farms, and forest. However, there were no large swatches of wilderness in rural Japan that I saw during my time there. In Japan, it is impossible to escape human civilization the way it is in America, rural communities have woven themselves into the land and Japan's countryside is more of a mosaic than it is vast, homogenous wilderness.

It struck me that morning how beautiful and rich the countryside truly was, how much life there was. Unlike in America, where it has always been man versus the wild and we have carved out our existences into the landscape, the Japanese built their lives into the land, a patchwork of human and non, inseparable and almost indistinguishable. As the population shrinks and people migrate to the cities for the convenience and opportunity, these areas of human and nature coexistence also shrink.

Japan is facing a potential economic crisis due to the decrease in the labor force but it is also looking at a potential change in ecology and geography. The reason I took up this project is because I believe that as world populations begin to level out, and eventually decrease, countries like Japan will prove to be good case studies into the accompanying cultural and ecological transitions. As a project for the environmental studies department I am, of course, concerned with the environmental changes that are occurring due to this change in demographics. But humans and the environment are intrinsically related and I am also concerned with the societal impacts of this migration out of the country-side.

This project has been supported by many advisors, friends, and family. A great amount of thanks to my advisors for providing support and guidance during the process. And as well to those in Japan who took time to participate in this study as well as spread it to their contacts.

None of this would have come to fruition without all the assistance and encouragement I received.

## Introduction

Rural Japan is facing a problem similar to that in rural areas around the globe, particularly those in developing and developed countries. These rural towns and farms are experiencing massive depopulation, and the average age of the remaining inhabitants is increasing. While it is undoubtable that this trend is effecting social wellbeing, I am interested in its potential effects on ecosystem health and how that will in turn contribute to a change in wellbeing.

My intention with this study is to better understand how the environment is changing in these areas. While there may be many more studies concerning this topic in Japanese there are none to be found that have been written in or translated to English. Japan is not the only country with aging rural populations and land abandonment, I believe that an international scientific community benefits from knowledge of how this phenomenon plays out.

This may be of particular interest to European countries in the coming decades as Europe has a similar climate to Japan, consists of relatively small countries with large populations, and are seeing decreases in the rate of population growth. The effects on ecosystems, agriculture, quality of life, and culture during times of depopulation are not quite clear yet so studies in countries experiencing this phenomenon (e.g. Japan, Germany, much of Eastern Europe) could prove vital for a stable, global future.

In order to explore how these rural areas are being effected I administered an online survey to a subject population of adults residing in these small towns, asking questions that measured wellbeing as well as perceived environmental wellbeing. I will also be exploring studies from other areas of the world and discussing the potential positive and negative changes as well as actions that could be taken to maximize human and environmental wellbeing. My

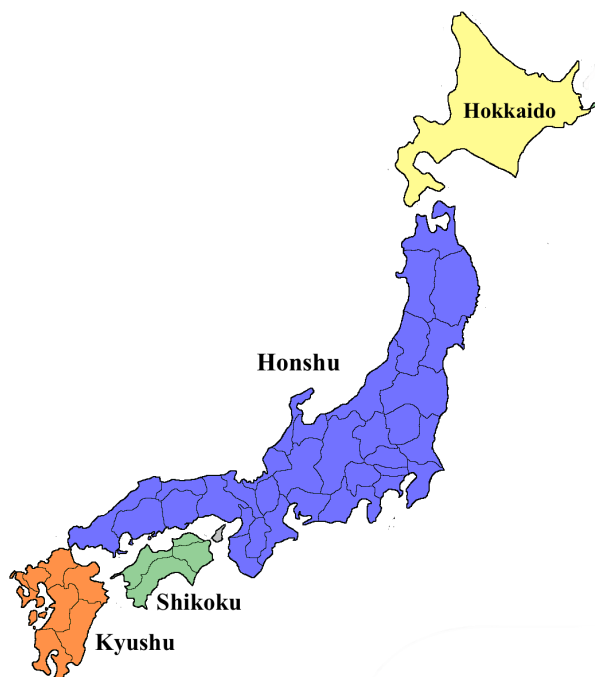


primary interest for this project is in how the changing population of rural Japan and the resulting change in landscape will affect ecosystems and in turn how that will change life for residents of Japan.

## Background and Literature Review

Japan is an island country that consists of four islands (Hokkaidō, Honshū, Shikoku, and Kyūshū) with many other smaller islands, mostly located in the South. Overall, Japan is slightly

*Figure 1 - Map of Japan by islands*



smaller than the state of California.

Of this landmass, only about 15% is available for agricultural usage, this is because the island is primarily covered by mountains and volcanoes and its rivers tend to be short and swift. Its climate is primarily temperate with the Southern islands being more tropical and the northern island of Hokkaidō being cooler. Ocean currents and winds also result in

different climates for the sides of the island facing the Pacific Ocean versus the Japan Sea: warm Pacific waters result in temperate climates whereas cold winds from over the Sea of Japan give the Western side intense, cold winters (Heinrich).

The rural mixed wilderness landscape of Japan is referred to by multiple terms in

Japanese; *chihō* (地方) is the word best used to describe provincial regions, it consists of the kanji for earth of land and the kanji for category. Another term used to refer to these areas is *satochi* (里地) meaning village land. However, in this paper I will also be using the term *satoyama* (里山), literally meaning mountain village, which is a term that has existed since the Edo period. While it has had many meanings over the years, it has come to refer to the secondary forest ecosystems where most of Japan's agriculture takes place and where many rural communities are situated.

In Japan, rural areas are very different from those of large countries like America. Even small villages have sizable populations and you can't drive far without passing through a village. These *satoyama* areas are important for their roles in "flood and water regulation, water purification, cultural services, and pollination" (Duraiappah, pg. 4). As for the term *satoyama*, I am referencing the definition as given by Indrawan et al.: "a holistic set of interlinked units, including settlements, rice paddies, agricultural fields, bamboo forests, woodlands, and grassland". This is a more modern definition, the term has in recent years become popular to describe the unique, harmonious, and sustainable relationship that many small villages have with their surrounding wilderness and forests. While there are many terms for these areas (such as *chiho*, *satochi*, etc.) the term *satoyama* has the strongest image of connection to and living with nature. I believe it is the best term to use in this study since I want to consider holistic socio-ecological systems and their functioning as a whole not just individually.

## Overview of Research

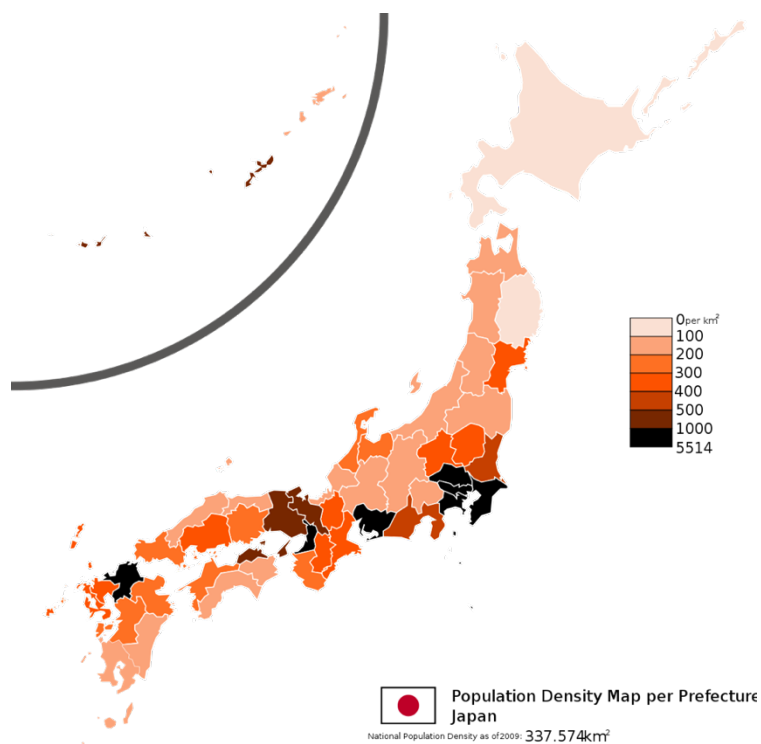
I expect that the results of this study will give insight to how depopulation and aging populations in rural Japan are effecting both the local environment and wellbeing as well as the

global environment. Japan is facing unique problems that are arising in many developed countries across the globe, problems that will likely affect developing countries before too long. I believe that the research conducted in this project will give directions to what environmental effects we should expect to see in the future of nations experience population decrease.

### Present Resources and Geography

Most of the island of Japan's landmass is coastline and mountainous areas. Many of the mountains that make up the raised center of Japan are active volcanoes, living inland is almost as dangerous as living on the coast. Because of the mountains, rivers are very steep and fast and flooding is a major concern. Since there are very few spots in Japan where large population

*Figure 2 - Map of Japan by prefecture density*



centers can be safely established Japan tends to have very high population density in those few areas that are best suited for residence.

It is difficult to decide where to draw the line between rural and urban, as far as I was able to find the Japanese government does not have an official number dictating what is rural or not. For purpose of

getting significant results for this paper I included all responses. Because many individuals in rural areas do not have access to internet or experience with online surveys it proved difficult to

get the responses I needed. While the survey was pushed as being for residents of rural areas (and thus a majority were from rural and semi-rural areas) I did not exclude respondents from high population density prefectures. I will go over where responses came from in the analysis section below. For the general thesis and this paper, I am only considering prefectures with an average population density less than 400 people per square kilometer. I decided on these numbers after consulting the U.S. Bureau of the Census which designates rural areas as having “population densities as high as 999 per square mile or as low as 1 person per square mile” (CRS Report). The conversions from square mile to kilometer were rough so converted numbers do not follow this rule exactly. It is difficult to try and apply the definition of a rural area a country so vastly different from Japan as the United States but I believe that these designations work well for the landscapes that this thesis is concerned with.

Japan’s geography makes it so that farming is a rather difficult endeavor. As can be seen

Figure 3 - Agricultural land utilization



in Figure 3, most of Japan is too heavily forested for agriculture and what little available land there is has to be used to its fullest extent. In general, Japanese farmers own very small amounts of land, on average less than two hectares (ha) (Maclachlan). This means that they have to put in more work and be more cautious to ensure that the land they do own is healthy and productive. In order to make similar profits to farms with more land,

farmers with small farms are put under stricter demands for labor and soil quality. Maintaining soil quality over decades is also a challenge with how intensive small farms often have to be. Figure 3 illustrates how much of Japan's farm land, especially in central and southern Japan, practices double cropping with paddy rice and wheat or barley. Double cropping allows farmers to get the yields from two crops in one year without increasing acreage but has to be done carefully to ensure that both crops are viable to sell.

With an increasingly competitive market due to international trade many local farmers are being forced out of the market. Farmers who choose to quit their occupation often abandon farms rather than repurpose or sell the land. In fact, "abandoned farmland grew between 1990 and 2010 from approximately 217,000 ha (approx. 536,000 acres) to 396,000 ha (979,000 acres), an area one and a half times the size of Metropolitan Tokyo" (Maclachlan, pg.449). In many of these cases it becomes impossible to track down the disappeared owners of this land, leaving previous farmland empty and without a chance to change hands. While it might seem counter-intuitive to leave land without attempting to sell it, due to the small and scattered nature of agricultural plots in Japan there is not much land desirable for large agro-businesses or other industries to buy up. With most farmers being very elderly, the hassle of going on the market to look for potential buyers outweighs any benefits. It's easier to just move in with children or into a retirement home.

This turn away from agriculture is rapidly changing the geography of rural areas of Japan and leading to changes in rural ecosystems that are likely going to negatively impact humans and animals alike for a time. While the land will eventually recover and become forest land this process will take a few hundred years and as terrain recovers it also has to stand up to Japan's extreme weather.

## Importance of Agricultural Areas

Small farms are of particular importance in maintaining ecosystem health in rural Japan. For this section I will be primarily referencing a study on the abandonment of agricultural areas in Europe. While it does not apply to Japan specifically the areas in consideration are at a similar latitude and have similar geographic conditions to most agricultural areas in Japan: they are located in mountainous areas and each farm is rather small. Global farm abandonment is often happening on small, mountainous farms like these that are easily overgrown and difficult to make large profits off of. Abandonment of farms can lead to shifts in the surrounding environment that are initially unfavorable to humans and overall ecosystem health. This study in particular found that “low-intensity farming, in the form of livestock rearing and traditional cultivation methods, has created semi-natural habitats that now support a wider range of species than might otherwise be found in purely ‘natural’ climax vegetation” (MacDonald, pg. 48). Human agriculture has been a part of many of these ecosystems for centuries. While an exact date is unclear, intensive rice farming in Japan is estimated to have begun somewhere in the Yayoi period, around 850 BCE (Crawford, pg. S335), with signs of smaller agricultural endeavors appearing as far back as 7050-6750 BCE during the Jomon period (Crawford, pg. S333). Most Japanese farms are, unlike industrial farms that cover landscapes with a single species of crop, integrated with local ecosystems. While Japan could transition to relying almost entirely on imports for agriculture it would no doubt lead to an uncertain (possibly negative) change in these rural ecosystems and biomes.

Abandonment of farms is also shown to be correlated with soil degradation in forested mountain areas. This in turn leads to greater risks for mud slides, avalanches, etc. (MacDonald)

which can lead to costly damages for remaining villages and towns. While in the long run these areas are likely to become more stable due to returning forest cover, this process takes a long time. In the meantime, this leaves areas in rural Japan with increasingly unpredictable summer monsoons as well as frequent earthquakes and tsunamis, at a high risk for disaster and destruction of land as well as a decrease in ecosystem services.

It is also important for Japan to have viable farm land and citizens who know how to properly care for those fields. Increasingly Japan has seen a decrease in their food self-sufficiency. The cause for this is primarily globalization, which has significantly changed the diets of Japanese citizens. While in Japan I was greatly surprised by the abundance and low prices on meat products. In the past Japan relied on rice, fish, and vegetables, all of which they could supply without needing to import too much food. However, for many reasons this diet is fading out of popularity with each generation. The proportion of rice in Japanese daily diets decreased “from 48.3% in... to only 23.4% [in 2014]” (Assmann, 2010) due to the introduction of wheat and red meat by the U.S. The seas are being over fished and polluted, putting Japan’s main source of protein in jeopardy. It is also more fashionable to eat Western food and it is not feasible to raise enough livestock on Japan’s relatively small island to affordably provide food for citizens who are demanding red meats. In 2016 Japan’s caloric self-sufficiency rate fell to 38%, the lowest it’s been since a serious rice shortage in 1993. Japan has taken to relying on imports for much of their food, they are even very reliant of soy which is a staple in Japanese food. While this trend is sustainable for the nation at the moment, it will become an issue if they become any less reliant or if economic/global tensions make it harder to import food.

Effects of Aging Populations

Japan has struggled with a rapidly aging population consistently since the late twentieth century. However, there were particularly severe cases of rural depopulation in the time between the 1960s and 1980s as Japan experienced rapid economic growth. With a high demand for urban, industrial jobs young people moved in vast waves from the countryside to city centers, most of which are located in Central Japan, from the Kantō to the Kansai area. This migration left areas across Japan that were traditionally more agricultural with much smaller populations and further contributed to the aging populations in these areas. The move also resulted in a baby boomer generation in urban areas causing a rare case in which you can find rapidly aging populations within urban Japan as well as rural Japan (Shiode).

One serious concern of this trend is for the aging of farmer populations. As discussed previously, Japan's farmlands help to make mitigate against disasters caused by monsoons, earthquakes, etc. and are important in order for land to survive after natural disasters. According to data from 2010 whereas those aged 65 or older made up 23% of Japan's overall population, 61.6% of commercial farmers were 65 and older. This percentage is nearly double the percentage in 1990. While the average Japanese farmer generally owns and works rather small areas of land it is still concerning to consider how quickly this demographic is aging. What is particularly scary is the fact that "74% of farmers age 65 to 69 are working the land with little to no help, and the corresponding figures for the 70-74 and 75-and-over age groups are 66% and 50%, respectively" (Maclachlan, pg.447). This means that many of these farms lack successors who can take over the land once the current farmer is no longer able to work it. As discussed previously, it takes hard work and time to be able to make profit off of these small plots of land and many young people feel that they can achieve better quality of lives by moving to more populated areas. Since it takes time to learn how to properly manage these farms (even more so



due to their limited land) this often means that farms with no successor will be abandoned after the current farmer becomes unable to work. This also spells badly for the future of Japan's food self-sufficiency.

## Methods

For this project, I administered an online survey hosted on the site Qualtrics, which was distributed to adults living in rural areas of Japan. The survey is a mix of qualitative and quantitative questions and asked about the wellbeing of the participant as well as perceived environmental wellbeing.

## Participants

The demographic I am targeting was rather hard to reach due to the remoteness, language barrier, lack of internet access, and age of the target population. In order to reach this group, I sent the survey to various contacts in Japan from my time studying abroad and from those I met at my home university. They then also put links for the survey onto social media and spread it to friends, family, coworkers, etc. Unfortunately, due to the difficulty in reaching this population, the results are heavily skewed towards a younger generation and I ended up having to include participants from larger towns and denser prefectures in order to have any sort of significant analysis. These are addressed in my analysis but is important to keep in mind as the results of the survey are considered.

## Procedure

Participants taking the survey did so online. After following the link, the first part of the survey they saw was a consent form detailing the purpose, estimated time, and risks/benefits of the survey as well as contact information in case they had any concerns or questions. In order to proceed to the questions, they had to agree to this consent form.

The survey begins with demographic questions meant to capture basic information about the respondent. These are important to help understand how well the population of respondents reflected the population of the area I was surveying. They also allow for me to look for correlation between demographics and matters of wellbeing and environmental concern. The next block of questions asks about the area where participants live and how long they have lived there in order to better understand the area. In this section I added questions regarding the participants opinion on the best part of the town they reside in as well as what aspect they think is in most need of change.

The next question blocks are more subjective. There is a question asking about the importance to the respondent of societal, environmental, economic, etc. issues in comparison to one another. After that is a series of questions asking about perceived change in various ecosystem and environmental indicators (plants, animals, bugs, weather, etc.) since childhood/first moving to the area. If they answer that there is a perceived difference they will be prompted to elaborate. These questions are meant to help me gauge environmental concern as well as health in these areas.

The next block of questions is meant to assess whether the respondents feel they are being negatively affected by changes in environment and society. Finally, I use the Cantril ladder to gauge current perceived satisfaction with life, perceived satisfaction in five years, and level of

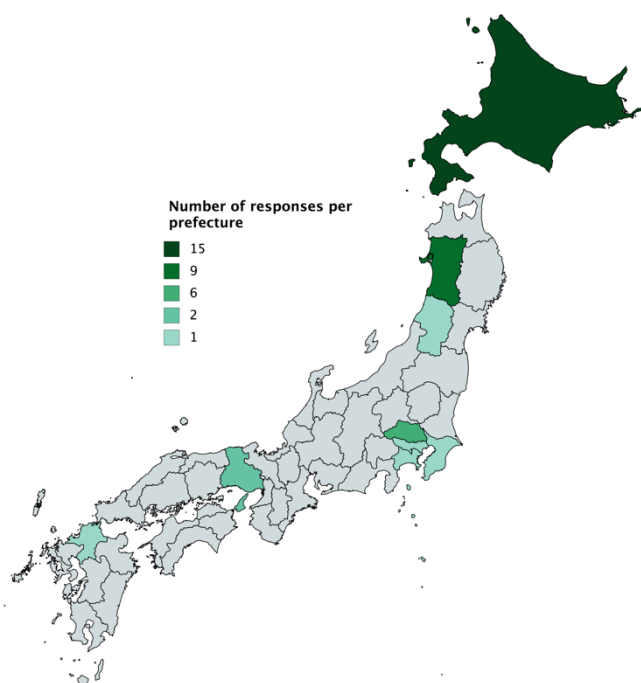
ideal life. These sets of questions were meant to understand the societal aspects of this change I was looking at.

The survey as well as the translated Japanese version that participants saw are located in the appendix in full. Due to difference in language and culture, the questions were not translated word for word but rather in such a way as to maintain the intent of the question. I will discuss any important distinctions between the translated version and English for the questions used in analysis when explaining results below.

## Analyses and Results

Due to the difficulty of reaching the target population via internet I was not able to receive enough responses to get data that could be used reliably to make strong quantitative analyses. However, there were enough responses to get a rough idea of the issues I was looking at and I ended up with interesting qualitative data.

Figure 4 - Distribution of responses



### Demographics

The responses I received were a bit skewed from the actual demographics of rural Japan. The largest difference is in average age, the population of rural communities tend to be older individuals, however this survey was completely conducted online making it hard to access for older residents. Many don't have access to internet in their homes or

experience taking online surveys, they are also less likely to be on social media where my survey was spread primarily. The average age of respondents to the survey was 28 years old with a range from 19 to 56 years. This is far below the average age of Japan (about 47 years), let alone the average age of the rural areas I wanted to survey. The lack of internet access in rural areas, along with the limitations of my contacts resulted in this large skew between the population and my survey population. For all analysis, this gap will be kept in mind and addressed.

As for location of respondents, a majority came from Akita prefecture and Hokkaido (24 respondents) as I have the most contacts in these two areas. I ended up including respondents from all prefectures even though the focus of the study was on rural areas due to the limited number of responses. This meant I ended up with a few respondents from urban areas like Chiba, Tokyo, and Saitama. A majority of responses, about 70 percent, were from cities with population densities around 400-500 people per km<sup>2</sup>. Because Japan is so densely populated the only areas with very low density tend not to have good access to internet, specifically farming households which I believe are an integral part of understanding the current transition and it's social and environmental effects.

### Benefits and Challenges of Residence Area

Early on in the survey I ask questions regarding the respondent's current residence and what they believe are the greatest benefits and challenges of the areas they reside in. I coded the

responses to understand general categories of motivations to move to/stay in the area they are residing. After reading through all the responses for the first of these two questions, I broke them down into the four sections above. I found that the largest benefit listed were natural amenities, as seen in Table 1. This included anything from access to nature, lack of natural disasters,

*Table 1 - What are the greatest benefits of living here?*

	<b>Frequency</b>	<b>Valid Percent</b>
<i>Natural Amenities</i>	17	45.9
<i>Social Capital</i>	5	13.5
<i>Convenience / Economic Capital</i>	12	32.4
<i>Peacefulness</i>	3	8.1
<i>Total</i>	37	100

climate, etc. Since I was primarily surveying individuals in rural areas it is no surprise that they greatly valued the environment they are

situated. However, as mentioned previously, I did not filter out responses from more urban areas and I believe this accounts for a large amount of the responses that fall under convenience and economic capital. Responses in this category included good infrastructure, access to places like malls, and the ease of reaching both urban and rural areas. Many people cited the best part of their current residence as being “not a large city and not countryside”, it seems that many of my respondents enjoy access to the conveniences of a large city but do not want to live in the center of someplace like Tōkyō or Ōsaka.

I also wanted to understand what, if any, drawbacks or challenges respondents felt they faced in the area they lived in. This question had to be worded a bit differently in Japanese. The translation officially used was more along the lines of “what point do you think most needs to be changed about the area you live”. Looking at Table 2 below, you can see that most respondents

Table 2 - What are the greatest challenges of living here?

	Frequency	Valid Percent
<i>Depopulation</i>	3	9.7
<i>Safety</i>	6	19.4
<i>Convenience</i>	11	35.5
<i>Migration</i>	4	12.9
<i>Quality of Life</i>	4	12.9
<i>Nothing</i>	3	9.7
<i>Total</i>	31	100

felt that the convenience of where they lived was the most in need of change. Many respondents addressed the lack of good infrastructure and public transportation as the hardest part of living

where they do. While Americans are used to driving and most families have several cars, Japanese people rely much more heavily on public transportation and find that having to drive all the time is inconvenient (high prices for parking, vehicle maintenance, bad road conditions, etc.). Japan can rely this heavily on public transportation because it is such a small country and most areas of interest are within close distance to each other. For those who have lived in large cities, the country side with its relatively sparse network of buses and trains can seem inconvenient.

Closest to convenience was safety, which I found rather surprising since Japan is known for low crime rates. The word that came up often was 治安 (*chian*) which literally means public order or public safety. While the strongest connotation of this is crime it appears that it can also refer to natural disasters which might have ties into the resistance and resilience of these areas. There are also fears of North Korea which is very geographically close to Japan and in the process of testing missiles, as well as a fear of crimes committed by foreigners. Another reason

that the fear of crimes may be so high is because local news stations in Japan report all crimes and accidents regardless of where they occurred. Since an individual in southern Japan is hearing about all the murders happening in central and northern Japan, as well as in their area, it gives the impression that life is more dangerous than it is in reality.

Many of the complaints about migration to urban areas are that it decreases the amount of appealing industries and stores in an area, which only encourages more to leave and less to come back. I will address more in the recommendations section how this can be leveraged to also increase the amount of youth living in rural areas and operating farms.

### Environmental Concern

I am also interested in levels of environmental concern; one of the ways I measured this was by having respondents rank issues in order of importance to them on a scale of 1 to 4, with 1 being the most important and 4 being the least. When averaged I found that by far the least

*Table 3 - Ranking of environmental concern*

<b>Rank</b>	<b>Frequency</b>	<b>Valid Percent</b>
1	2	5.9
2	10	29.4
3	19	55.9
4	3	8.8
<i>Total</i>	34	100

important issue of these four seemed to be economic health while the most important was family health. There may be a bias in the respondents towards environmental health simply because the nature of the survey is environmentally related. I did my best to mitigate this by putting the questions about perceived changes in environment

after this block of questions. As you can see in Table 3, environmental health was most frequently ranked as being the third most important concern, although a large amount of people also ranked it as their second highest concern. Very few ranked it first, Japan's environment for

the most part is very health and there doesn't seem to be much need for concern of its immediate degradation so it's not particularly surprising that it does not dominate the concerns of most people. Another trend I found is that income has a negative correlation ( $r = -.28$ ,  $p = .11$ ) with the ranking of environmental concern. This is an interesting relationship since I would expect those with lower incomes to rank economic health higher. The relationship may imply that those with low incomes are being more significantly affected by any changes that are happening in the environment.

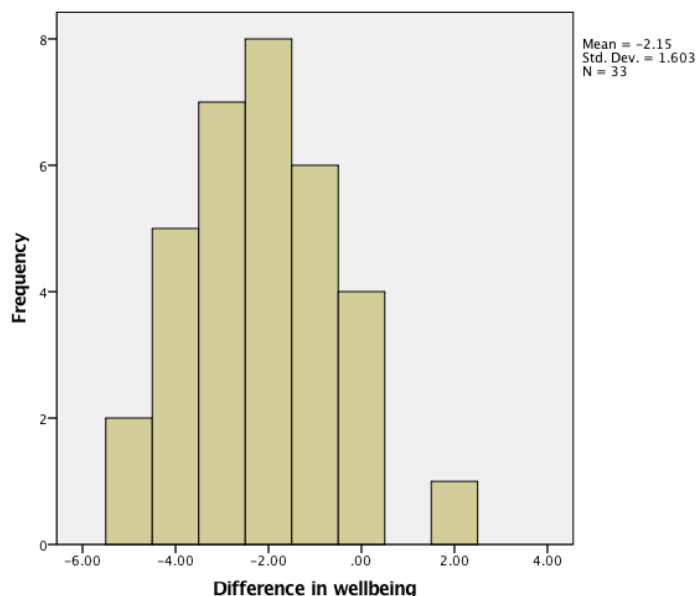
The other way I measured environmental concern was by the amount of changes respondents perceived in their environment. This set of questions asked about what changes participants noticed in various aspects of their local environment (climate, bugs, plant life, etc.) and if they had noticed any changes prompted them to identify what exactly they had noticed. I will cover the actual perceived changes later in this section, but I used the total amount of changes marked by each respondent to determine that this level of environmental concern was significantly correlated with age. Age and perceived change have a positive correlation ( $r = .58$ ,  $p < .01$ ) which is not terribly surprising since the older respondents had generally been living in their current town for longer and thus had more of a time span over which to notice changes. Whether this increase in changes perceived can be correlated to environmental concern is unclear but older respondents were undoubtedly more tuned in to the environment changes around them than the younger generation.



## Wellbeing of Respondents

I am also concerned with the wellbeing of respondents since it can strongly factor into decisions to stay in hometowns or move to larger cities. Younger people also see the prosperity

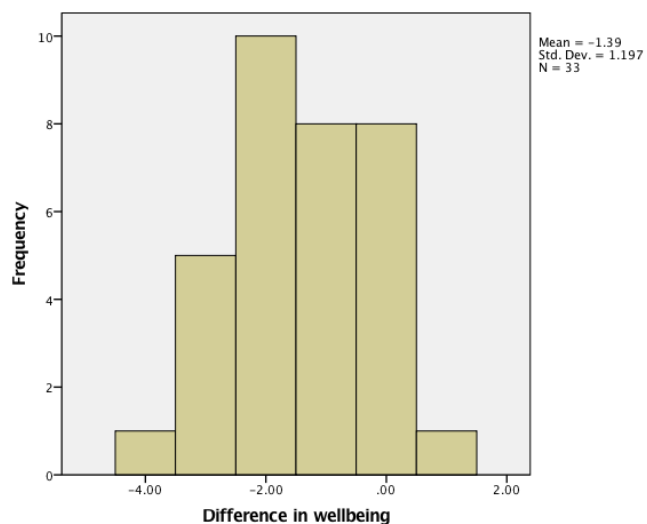
Figure 5 - Difference between current and ideal wellbeing



and/or suffering of older generations and base their plans off of what they've observed to work and not work, if young generations perceive that older generations in rural areas are unhappy they may be more likely to choose to leave for larger cities. For this analysis, I calculated how far off respondents were from their ideal life score on a Cantril

ladder for the present and in 5 years. Most people seemed to be off from their ideal by about 2 steps, both for present and ideal. The farthest downwards from ideal was by 5 steps and the

Figure 6 - Difference between 5 year and ideal wellbeing



highest was 2 above ideal (see Figures 5 and 6, those at .00 are at their ideal lives, below their ideal is negative and above is positive). As can be seen, most respondents were about 2 steps down from their ideal life in both their current and 5-year wellbeing estimates. This implies a rather good quality of life with the belief that there is still room to improve. I then

ran a regression test between the difference of current to ideal well-being and age of the

Table 4 - Correlations between wellbeing and age

Wellbeing vs Age	Correlation	Significance
<i>Now</i>	0.292	0.118
<i>5 years</i>	-0.188	0.319

respondents. The results showed a relationship that was sufficiently significant for the amount of data I had and a positive correlation between age and well-being ( $r = .29$ ,  $p = .12$ ) implying that, in general, older individuals in these areas were more satisfied with their life than younger people. This relationship makes sense since most young people (in the case of this survey, under 25 years) are still reliant on parents or struggling to make a living. Conversely, it seems that the projected wellbeing in 5 years was slightly lower as age increased, though the results of this analysis were less significant than the first ( $r = -.19$ ,  $p = .32$ ). This also matches expectations since more complications are expected with age and the older you get the less you expect to be able to improve in the near future.

### Environmental Wellbeing

Finally, I wanted to know specifically what types of changes respondents were noticing in their environment. I calculated the percentage of respondents who provided examples of changes they'd noticed for each category and within each category I found the most common trend that respondents had noticed in their environment. If you look at Table 5 you can see that by far the aspect that respondents most noticed change in is the climate (weather and seasons). To the right of the summaries of what changes I found is the percentage of how accurate this summary is for the total responses I got in each category. For agricultural plants the general consensus was that there were less fields and more residential areas now. As for wild plants, there were not enough respondents who noticed a change for there to be any trend. Observations about wild animals mostly noted that they were appearing more in human spaces than before, a

Table 5 - Summary of perceived changes

<b>Type</b>	<b>Percent change perceived</b>	<b>Summary of changes (percent accurate)</b>
<i>Crop plants</i>	14%	Less agricultural fields (60%)
<i>Wild plants</i>	6%	No trend (NA)
<i>Wild animals</i>	27%	Wild animals appear more around humans (75%)
<i>Bugs</i>	23%	Less bugs than in past (38%)
<i>Climate</i>	49%	It is generally hotter (53%)

lot of respondents noticed this with bears in particular. A few respondents also felt that some animals were appearing less, such as particular birds and the Japanese serow. There was a trend of respondents noticing that they did not see as many bugs as before although for many respondents they saw some species of bugs disappearing while other species increased and one respondent had seen a cockroach in Hokkaidō, generally cockroaches aren't seen in northern Japan since they prefer warmer weather but they've begun migrating north. The final category was climate, a lot of respondents thought that summers were getting hotter and longer and that winters were less cold and snowy. However, 35% found that winters were actually getting a lot colder and a lot of respondents seemed to think that temperatures and weather were getting more extreme overall. Since Japan has such a variable climate depending on where you are on the island it doesn't surprise me that there was so much variety in the climate changes that people observed.

## Discussion

As Japan's birthrate continues to decline, the country faces two increasing trends that it must deal with. The trend of depopulation, accompanied by an aging population, and the trend of urbanization. Many young people feel that there are little to no opportunities to be found in the countryside and increasingly kids are moving to cities and abroad. The reasons behind Japan's decreasing birthrate are various and complex, and urbanization is a trend that has been happening since the industrial revolution all across the globe. Japan's future and the future of the world is changing very rapidly and I hope to use the study I conducted for this thesis, as well as outside sources and my own reasoning, to make suggestions for how Japan and countries like it should act and how they should carry out whatever it is they decide is most fitting.

### Revitalization versus urbanization

Japan is already concerned with revitalization of rural areas, one method of revitalization that is popular in much of Asia is referred to as "One Village One Product" or OVOP for short. It is a method of revitalization that pushes villages to use their natural resources to create and brand one product or attraction that becomes their specialty. If the town can collectively make money off of that product, especially if it can draw in tourism, that revenue can prevent residents from losing their livelihoods and homes. Local governments sustain from helping these projects through subsidies in the fear that it will conversely hinder them on the path to self-reliance (Fujimoto). It is clearly important to the Japanese people to revitalize rural areas, and much research and effort has gone into how best to keep the economies of these areas afloat.

However, there is still the issue of the populations of these villages aging out. A healthy economy is important to attract young people; I believe that one of the reasons economy was

ranked so consistently low among respondents is because the economy in Japan is fairly stable at the moment and thus it is not a large concern. That means that at this point, where rural economies are beginning to stabilize, there needs to be a campaign to encourage migration back to the countryside by appealing to concerns other than economic conditions. Since the consistently highest ranked concern was family health and safety (which generally includes the individual and close friends), campaigns to capitalize on the relative safety of rural areas may prove to be important. Crime rate per capita is significantly less in rural areas than in high population prefectures like Ōsaka and Tokyo, more property can be bought for much cheaper, the air is cleaner, and neighborhoods tend to be more stable and close knit.

The selling points for large cities are the job opportunities and connection to global communities. Another way to help revitalize urban areas could be through programs to increase immigration in rural communities. There is a global interest in moving to Japan among younger generations but because of language and cultural barriers as well as prejudice against foreigners it is difficult to move there. By setting up immigration programs for those committed to working in agriculture Japan could raise the population of youth in rural areas while increasing its self sufficiency in regard to food. There is, to my knowledge, some similar programs set up but these are generally short-term programs that allow young people to stay for about one year. More long-term immigration programs would be much more difficult to implement but if Japan believes strongly that a revitalization of rural areas is important this is one way to do so even with a low birthrate.

On the other hand, there are benefits to encouraging urbanization. From a global environmental perspective, this is likely the best option, focusing populations into a few cities means that pollution becomes more point-source and easier to mitigate, it also decreases the need

for repetitive infrastructure and car use. Economically it makes sense to divide land into separate uses in concentric circles with businesses at the center, residential areas around that, then recreational areas, agriculture, and finally wilderness. This is shown by the bid-rent curve, generally keeping populations in one area is economically and environmentally more efficient and sustainable. That being said, there are always individuals who don't enjoy living in urban or suburban areas and prefer rural life so programs would also be necessary to encourage migration in the case of wanting to move towards urbanization.

The first steps of this would involve planning out the infrastructure of growing cities (especially capital cities in rural prefectures that still have room to grow). This could be done by tracking expected population decrease/increase for the foreseeable future and planning cities and suburban areas around how much space would be expected for businesses and residences in the center. Around that area viable farmland should be identified and programs to relocate any farmers who are interested should work to help them move and start up farms on the new land. Without good planning the centers of these areas could quickly overflow onto new cropland, raising the price of land for farmers and leading to more sprawl than is efficient. Since the Kanto and Kansai areas are both so crowded already these programs could be most effective on existing but smaller cities in less dense prefectures.

If Japan's citizens and government decided that this was the route to pursue there would also be a necessity to identify potential hazards due to loss of farmland. As discussed in the literature review, the potential hazards include soil degradation, flooding, and reduction in biodiversity. Efforts should be made pre-emptively to mitigate against landslides and floods or to relocate people in high risk areas. Potentially endangered species and their effects on the

environment should also be identified and if necessary programs to save important species should be implemented.

### Depopulation: mitigation versus adaptation

Aside from the issue of how the population is distributed, there is the issue of Japan's current trend in low birth-rates and a decreasing and aging population. Here I will discuss some of the known and theorized reasons behind this decrease, whether Japan should be working on bringing the birth-rate up or focusing on adapting to the change in population, and potential ways they could go about either of those options.

Unlike the issue of emigration faced by Eastern European countries, Japan's depopulation is due primarily to a low fertility rate. In 2010, only 1.4 births were recorded per woman; in order to keep a population stable in a developed country like Japan, a fertility rate of about 2.1 births per woman is necessary. One of the reasons behind this decrease is that Japan's baby boomer population came around during a period that allowed women more control over their fertility and many women chose careers over children. Due to the working climate in Japan women are often forced to choose between children and keeping their jobs. Businesses in Japan expect long hours and a lot of overtime from their workers so one parent generally has to agree to stay at home. There are also still a lot of women's equality issues present in Japan, and quite a few women feel they do not want to give in to the pressure to be a good, stay-at-home mom providing children because it is what is expected (Reasons for Japan's). While countries like France have managed to turn around low birthrates, the social issues behind the issue make it difficult to solve with policy alone.

Whether this declining population is good or bad is still up for debate. Since it is very recent that developed nations have seen this long-term decrease in fertility the long-term implications are still unclear. While the aging out of the population looks bad for the economy in the coming years (too many baby boomers to support and too few of the younger generation to support them), there are certainly upsides to the trend. For one, Japan is already very overcrowded, in large cities like Tōkyō the price of housing is astronomical. Furthermore, the less people to less resources are necessary to support them. Considering long-term effects, it may be best to only work on maintaining populations to better the quality of life and environment in Japan. However, if the current fertility rate is sustained long-term it could lead to a dangerous decrease in population so programs to slow down the aging of the population could be very helpful if implemented properly.

The two best solutions would be to bolster the population by either finding ways to increase the birth rate or increase immigration. However, both of these solutions would be very difficult to make work. For starters, even with laws restricting work hours, providing financial support for families, etc. the problem of workplace misogyny or hierarchal pressure for overtime won't disappear. It is expected in companies that you do not leave before your boss does, even if all your work is done for the day. And the prevalent issue of denying married women promotions or jobs is not one easily fixed by policy. A social change and change in work structure is necessary in Japan to raise the birth rate high enough to maintain a stable population. On the other hand, encouraging immigration would also be difficult to make a reality. Due to Japan's long history as a closed nation it has very low diversity and a high, unconscious wariness of foreigners. Unfortunately, there is not much data about how many Japanese citizens are not ethnically Japanese since Japan only collects nationality data in their census not ethnicity.



However, about 99% of the population is Japanese citizens and speak Japanese as a first language (Lie), giving us a pretty good indication that not a lot of foreigners are immigrating to Japan later in life. The difficulty of implementing either of these two possible solutions to depopulation does not speak well for a quick turn around on the issue.

I believe that the best solution for this issue is to adopt short-term programs to deal with the approaching economic issues. On the heels of this there needs to be programs implemented to help change the societal causes that are pushing the low birth-rate so as not encounter future crises. The biggest concern right now is how to support the large amounts of older citizens retiring without an equal working population. As I do not have any specific knowledge of the economics that go into this issue I cannot make specific policy recommendations but many countries with baby boomer generations are currently facing similar issues and it would prove wise to keep an eye on how various nations effectively work around the problem.

The following long-term project should focus on decreasing the hour requirements for Japanese businesses. This could help a myriad of issues (including Japan's high suicide rate) but it would likely allow for parents to continue their careers while raising a family. Women's rights also need to be addresses, it is likely that women will be reluctant about starting families so long as they feel that it is a role they are being shunted into rather than choosing of their own volition.

## Recommendations

While many of the issues Japan is facing are complicated, with no clear indication as to the correct course of action, I strongly believe that there are some actions that would greatly benefit the environment and overall well-being. Humans have long been an integral part of natural ecosystems and removing ourselves from them would clearly disturb the balance. Japan

has a wealth of resources and gorgeous natural land that could be damaged or forgotten because of rural abandonment. For the sake of the local environment I believe that a revival of agriculture, with a consideration for how to best cultivate the land, could be very beneficial to Japan's environment.

Since natural disasters are already a large worry for Japanese people an emphasis on the potential negative effects of urbanization (such as soil degradation in abandoned rural land) in news or schools could help catch people's attention and get them concerned about the issue. Counteracting soil degradation could also help to make rural cities safer from natural disaster; a positive feedback loop between small farm resurgence to help supply rural cities with food and make the environment safer and movement from overgrown cities (like Tōkyō) to rural cities due to the increase in safety and convenience would be ideal. There is already a start for positive messages about rural areas through the OVOP movement, appeals to young adults who are under a lot of stress and pressure that life in rural areas is more laid-back and fulfilling could be very successful. In rural areas, they may be able to make more profound and tangible differences than they ever could working an office job.

As for the issue of abandoned farm land, discussed in the present resources and geography section, I would recommend that Japan establish a sort of land trust that identifies farmers with a high potential to abandon their land and contacts them about selling or donating the land to the organization if and when they decide they don't want it any more. This takes complications out of finding buyers on the end of older farmers and helps ensure that the land is either put towards conservation land or future generations of farmers.

Since farms are restricted to such small areas it is undoubtedly difficult to make a living off of farming. One way to make it so that people can make enough money to live a full life is to

invigorate industry in rural towns. Using the bid-rent model it could be beneficial to plan mid-sized towns with business centers (shopping malls, hospitals, restaurants, etc.), housing and suburbs around that, and agricultural land on the outside. Residents could run farms as well as work in the town; a current trend among young college educated Americans is a return to farming supplemented by another job. More and more young college graduates are beginning to feel disconnected from the work they do and find satisfaction in being able to work land and sell food. Curriculum to increase knowledge about farm work, the benefits and methods, in universities could help inspire a young generation of Japanese people to return to agriculture and a system of small, self-sustained communities.

Preventative costs can be minimized through the above-mentioned programs for the government to acquire land from retiring farmers, which could be leased to young farmers at a low cost along with basic education and resources on farming the land. Especially with Japan's issue of strict and demanding industry this option may be greatly appealing to young adults who feel trapped, depressed, or anxious due to the societal structure. In turn, it may also help to bolster the birth rate since there may be less pressure and stigma put on women when the subject of children is brought up. Overall, I think that small, self-contained and sustained communities could benefit biodiversity and ecosystems, soil health, food reliance, and a health well-distributed population.

## Conclusion

In this paper, I examined the unique cultural and environmental issues that affect why depopulation in Japan is occurring and how it is manifesting in changes to environmental and social wellbeing. While there have been studies on rural farm abandonment in areas with similar

geography, Japan is facing its own unique environmental issues. The variety of natural disasters that Japan is subject to make the potential changes due to rural depopulation riskier.

Japan has a very strong relationship and appreciation of nature, which I believe can be leveraged in the goal of rural revitalization. However, the overall depopulation issue faced by the country is rooted in a culture that pushes long work hours and is still very backwards in its treatment of women. In the case of aging populations and migration from rural areas, I believe that a follow up study involving in-person interviews and a stronger focus on small communities and farmers would help to draw more specific conclusions about the current transition. A survey of changing ecology and soil structure would also be very useful. The issue of Japan's low birth-rates is a complicated one and, while relevant to the topic of this paper, a full-on study of the causes and potential solutions are out of the scope of what this thesis is interested in. For further study on either of these issues I also recommend collaboration with researchers in Japan and a review of Japanese literature.

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## Appendix

### Survey Questions

1. Consent form
2. How old are you?
3. What is your religious affiliation?
4. What is your gender?
5. What is your ethnicity? Select all that apply.
6. What is the highest level of school you have completed or the highest degree you have received?
7. How many people are living or staying at this address?
8. Information about income is very important to understand. Would you please give your best guess? Please indicate the answer that includes your entire household income in (previous year) before taxes.
9. What town, prefecture do you reside in?
10. Is this your hometown?

*Skip To: Q12 If Is this your hometown? = Yes*



11. At what age did you move here?
12. Do you work with your land for money (e.g. farming)?
13. Do you work with your land as a hobby (e.g. gardening)?
14. Are you the head of the household?
15. What are the greatest benefits of living here?
16. What are the greatest challenges of living here?
17. Please rank the following issues in order of importance to you. 1 is the most important 4 is the least important.
18. Societal health
19. Environmental health
20. Economic health
21. Individual/Family health
22. Have you noticed any significant changes in crop plants since you were a child / moved here?

*Display This Question:*

*If Have you noticed any significant changes in crop plants since you were a child / moved here? = Yes*

23. If yes please clarify.
  24. Have you noticed any significant changes in wild plants since you were a child / moved here?
- Display This Question:*
- If Have you noticed any significant changes in wild plants since you were a child / moved here? = Yes*
25. If yes please clarify.
  26. Have you noticed any significant changes in wild animals since you were a child / moved here?

*Display This Question:*

*If Have you noticed any significant changes in wild animals since you were a child / moved here? = Yes*

27. If yes please clarify.
28. Have you noticed any significant changes in bugs since you were a child / moved here?

*Display This Question:*

*If Have you noticed any significant changes in bugs since you were a child / moved here? = Yes*

29. If yes please clarify.
30. Have you noticed any significant changes in the seasons and weather since you were a child / moved here?

*Display This Question:*

*If Have you noticed any significant changes in the seasons and weather since you were a child / move... = Yes*

31. If yes please clarify.
32. Has the aging population in your community made your household's lives more difficult?
33. Has out-migration of people from your community to urban areas made your household's lives more difficult?
34. Has international trade made your household's lives more difficult?
35. Has climate change made your household's lives more difficult?
36. Assume that this ladder represents your life, the top rung represents the best possible life for you while the bottom rung represents the worst possible rung.



37. Currently, where do you think you stand on the ladder?
38. Where on the ladder do you think you will stand in 5 years?
39. If you had an ideal life which rung of the ladder would you be on?

## Translated Survey Questions

Q2 年齢

Q3 信仰

Q4 性別

Q5 国系をお教えてください。

Q6 最終学歴

Q7 同居の総人数（同じ家屋・住所地に住む人すべての合計人数）

Q8 世帯の去年の年収（所得税を引く前）は以下のどのカテゴリーに当てはまりますか。（年収についての情報は、この研究の分析にとっても重要になります。できるだけ、ご回答、お願いします。）

Q9 現在、どの市町村にお住まいですか。

Q10 先の質問でお答えの市 町村はあなたの出身地ですか。

はい (1)

いいえ (2)

*Skip To: Q12 If 先の質問でお答えの市町村はあなたの出身地ですか。 = はい*

Q11 現在お住まいの場所にいつ引っ越されましたか。

Q12 農家や山林业などを営んでいますか。

Q13 趣味でガーデニングなどをしてしていますか。

Q14 世帯主ですか。

Q15 今お住まいの市町村の一番いいところを教えてください。

Q16 今お住まいの市町村の一番改善すべきと思われる点を教えてください。

Q17 次の項目を、大切だと思う順に並べてください。1が「一番大切なもの」で、4が「一番大切ではない」を意味します。

Q18 地域の安全（例えば治安や差別問題など）

Q19 環境衛生

Q20 経済発展

Q21 家族の安全

Q22 子供の時、もしくはこの土地に引っ越された時と比べて、地域の作物の変化に何か気づいたことがありますか。

*Display This Question:*

If 子供の時、もしくはこの土地に引っ越された時と比べて、地域の作物の変化に何か気づいたことがありますか。... = はい

Q23 「はい」とお答えくださった方、その「変化」についてご説明ください。

Q24 子供の時、もしくはこの土地に引っ越された時と比べて、野生植物の変化に何か気づいたことがありますか。

*Display This Question:*

If 子供の時、もしくはこの土地に引っ越された時と比べて、野生植物の変化に何か気づいたことがありますか。... = はい

Q25 「はい」とお答えくださった方、その「変化」についてご説明ください。

Q26 子供の時、もしくはこの土地に引っ越された時と比べて、野生の動物の変化に何か気づいたことがありますか。

*Display This Question:*

If 子供の時、もしくはこの土地に引っ越された時と比べて、野生の動物の変化に何か気づいたことがありますか。... = はい

Q27 「はい」とお答えくださった方、その「変化」についてご説明ください。

Q28 子供の時、もしくはこの土地に引っ越された時と比べて、昆虫の変化に何か気づいたことがありますか。

*Display This Question:*

If 子供の時、もしくはこの土地に引っ越された時と比べて、昆虫の変化に何か気づいたことがありますか。... = はい

Q29 「はい」とお答えくださった方、その「変化」についてご説明ください。

Q30 子供の時、もしくはこの土地に引っ越された時と比べて、季節や天候の変化に何か気づいたことがありますか。

*Display This Question:*

If 子供の時、もしくはこの土地に引っ越された時と比べて、季節や天候の変化に何か気づいたことがありますか。... = はい

Q31 「はい」とお答えくださった方、その「変化」についてご説明ください。

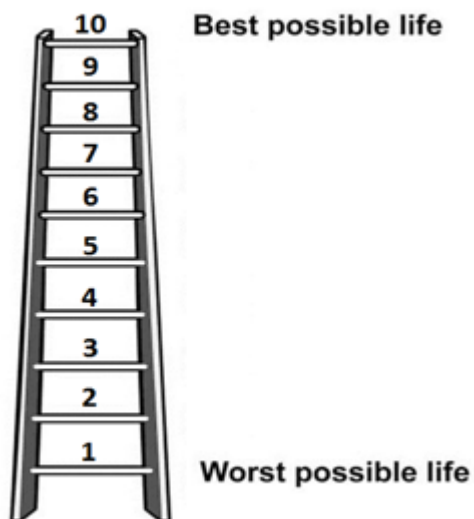
Q32 地域の少子高齢化の問題が、（回答者自身の）生活を以前より難しくしていると思われませんか。

Q33 人口の都会への流出のせいで、（回答者自身の）生活を以前より難しくしていると思われませんか。

Q34 家庭の生活は国際貿易のせいでより苦しくなりましたか。

Q35 地球温暖化のせいで、（回答者自身の）生活を以前より難しくしていると思われませんか。

Q36 このはしごはあなたの人生です。一番上が最良の人生で、一番下が最悪の人生です。



Q37 現在、あなたの人生はこのはしごのどこに位置していると思われませんか。

Q38 5年後、にあなたの人生は、このはしごのどこに位置していると思われませんか。

Q39 あなたの理想な人生は、このはしごのどこにあるべきだと思われませんか。