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Impacts of a Natural Disaster
on Well-being, Happiness
and Social Capital in
Two Nagis-affected Areas
in Myanmar

Impacts of a Natural Disaster on Well-being, Happiness and Social Capital in Two Nagis-affected Areas in Myanmar¹

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บทคัดย่อ

เนื่องจากการขาดแคลนข้อมูลก่อนและหลังเกิดเหตุภัยพิบัติในชุมชนเดียวกัน การศึกษานี้จึงพิจารณาเปรียบเทียบพื้นที่ศึกษาสองแห่งซึ่งได้รับผลกระทบจากพายุไซโคลนนาร์กีส โดยมีวัตถุประสงค์เพื่อสรุปผลกระทบของพายุไซโคลนนาร์กีสที่มีต่อสวัสดิภาพทางด้านกายภาพ รายได้ การจัดสรรรายได้ ความสุข และทุนทางสังคม ข้อมูลโดยรวมและลักษณะของครอบครัว เกษตรกรรรมขนาดเล็กจำนวนสามร้อยสองหลังคาเรือนซึ่งได้รับการรวบรวมหลังเกิดเหตุการณ์ภัยพิบัติดังกล่าวใช้สืบเสาะเจ็ดเดือน ถูกนำมาเปรียบเทียบกับเส้นความยากจนที่ได้จากการคำนวณมูลค่าความต้องการพื้นฐานขั้นต่ำของคนในการดำรงชีวิต คำนี้นี้ ของความเหลื่อมล้ำสัมพัทธ์รวมทั้งสภาวะ ความยากจน ระดับความยากจนที่ต้องได้รับความช่วยเหลือ ความรุนแรงของความยากจน และ ความต้องการความช่วยเหลืออย่างเร่งด่วนสำหรับความยากจนด้านอาหารในพื้นที่ศึกษาทั้งสองแห่ง ถูกนำมาใช้เป็นเกณฑ์วัดขอบเขตและการกระจายตัวของความยากจน สถิติทดสอบที่ เมตริกซ์ความ สัมพันธ์ระหว่างตัวแปรและการถดถอย ถูกใช้ในการทดสอบหาความแตกต่างที่ชัดเจนระหว่างพื้นที่ ที่ได้รับผลกระทบค่อนข้างน้อยและพื้นที่ที่ได้รับผลกระทบอย่างรุนแรง จะต้องมีการส่งข้อเสนอแนะ ให้กับส่วนท้องถิ่นและรัฐบาลแห่งชาติ องค์กรเอ็นจีโอและชุมชนที่ได้รับผลกระทบ ว่าจะสามารถลด ปัญหาความยากจนสัมบูรณ์อย่างไร และจะคาดการณ์ เตรียมการป้องกัน และลดผลกระทบที่เกิด จากภัยธรรมชาติทางด้านเศรษฐกิจและจิตใจอย่างไร

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ABSTRACT

In the absence of before-and-after data on the same community, the goal of this study is to infer, through contemporaneous comparisons of two study areas differentially affected by cyclone Nargis, the impacts of the cyclone on well-being, happiness and social capital. Profiles and characteristics of 302 small farm households using data collected 27 months after the catastrophe were compared against an exact poverty line developed through the Cost of Basic Needs Method. The Gini measure of relative inequality was used to measure the extent and distribution of poverty. T-tests, correlation matrices, and regressions were used test for the significance of differences between the slightly- and heavily-affected areas. Recommendations must be made to local and national governments, to NGOs, and to the affected communities themselves as to how to reduce absolute poverty; and to anticipate, protect against, and reduce the economic and mental impacts of natural disasters. State and local economic development officials should focus their efforts on encouraging education and retaining and attracting better educated residents. The resulting social capital will be the best gauge of the continued rehabilitation of the victims and the creation of individual and social resilience in case of any such event in the future.

Key words: natural disaster, Nargis, Irrawaddy delta, poverty, social capital, happiness

1. INTRODUCTION

Natural disasters cannot be prevented; but they can be anticipated, prepared for, and minimized in terms of their effects on human life, welfare and happiness. More than 296,800 people died in 373 natural disasters in 2010. In addition, about 208 million people were affected by the disasters. Many developed countries are using the early warning systems to save lives and reduce economic losses at all levels and but many people had been killed by natural disaster. Poor countries are much more dependent on natural resources as assets than rich countries. A link between natural resources, the environment and poverty is plausible. Every economic action can have some effect on the environment, and every environmental change can have an impact on the economy. Environmental change, particularly of local natural resources, can affect poverty through many pathways. In fact,

disasters are not killers. The main reason is poverty. This thesis focuses on one country in South East Asia that is particularly debilitated by the poverty epidemic. Myanmar is one of the lowest-income countries with GDP per capita rank of 182 out of 213 and a Human Development Index of 138 out of 182 countries in 2007. The total population of the country was 60 million in 2009. Agriculture is the most important sector of the national economy of Myanmar, contributing approximately 45 percent of the 2007 GDP. Myanmar remains a predominantly agrarian society with the mass of its population heavily dependent on agriculture and related activities. About 76 percent of the rural population is engaged in that sector. Moreover, the urban population is largely dependent on the agriculture sector. Agriculture income is therefore of pivotal importance since it has a direct bearing on all other socio-economic aspects of Myanmar. The economic growth of Myanmar has been dampened by some factors such as inadequate infrastructure, outdated and inappropriate production technology, environmental legislation, state price supports to unproductive sectors, and the lack of advanced skilled workers in the labor force.

According to the Agriculture Census in 1993, about 36 percent of total farming households owned less than three acres of land; these households can be presented as the "hardcore poor"⁵. The Asia Development Bank (2001a) found that Myanmar is trapped in abject poverty despite its rich resources base, and that the trend of poverty is steadily increasing over the last ten years. Published statistics are greatly understated. Myanmar and its people have intensity for poverty⁶. But the government's policies, its restrictions to travel, and control of information are the significant barriers for non-state actors.

1.1 IRRAWADDY DELTA

The Irrawaddy delta, a low-lying area along the Bay of Bengal has been called Myanmar's rice bowl. In that region, nearly everyone is employed through rice production or the fishing industry. Successful paddy output for a specified season determines not only the next paddy cultivation; it also leads to nonfarm opportunities for employees. At present, family farm income is low because of low farm productivity. Furthermore, primary products are marketed without value added at the household level creating very low profit margin to growers. Farm wages are barely enough to provide food, with little left over for clothing, school fees, shelters, supplies, or medicines. In this region, the situation of economics, livelihood, and quality of life have been degrading for the past decade.

⁵ A household is considered hardcore poor if its income is less than food poverty line.

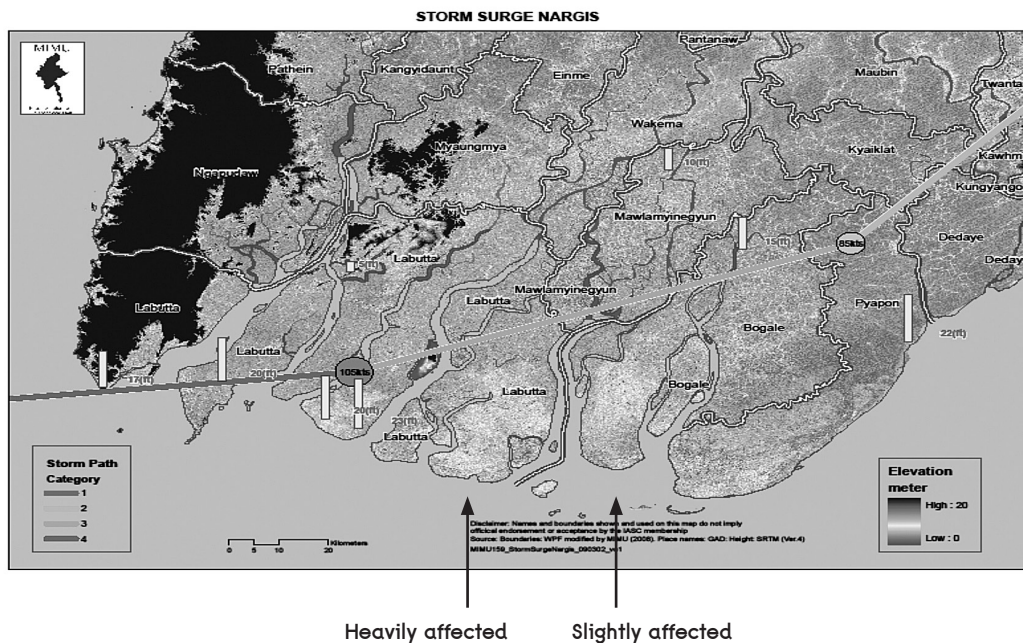
⁶ The intensity of poverty is the index combines both poverty and income inequality among the poor.

The delta is by no means one of the poorer parts of the country (29 percent of the population was poor in 2004-05, compared with 32 percent of the national poverty). However, development is relatively limited, and life can be harsh, in particular when crops fail. As agriculture is the driving force in the economy of the Irrawaddy delta, these uncertainties have a strongly impact on the income of households in other sectors. Overall in the Delta, 32 percent of the landless people work in agriculture as renters/sharecroppers, agriculture workers, or seasonal agriculture workers. This figure is well above the 26 percent national average. The other two-thirds work in other sectors including fisheries, salt production, trade and transportation. The landless are more likely to be poor in the Delta region than elsewhere: forty-four percent of the landless live below the government poverty line, compared with the 33 percent nationally. Of the "poor" in the Delta, 31 percent were landless, while the "very poor" were almost always landless at 85 percent.

1.2 CYCLONE NAGIS AND MYANMAR

In addition to these more generalized poverty challenges, the Irrawaddy delta area was also affected by the devastating Cyclone Nargis in 2008. The category 3 Cyclone Nargis struck Myanmar on 2 and 3 May 2008, making landfall in the Irrawaddy Division, approximately 250 km southwest of Yangon, and affecting more than 50 townships. With wind speeds of up to 200 km/h accompanied by heavy rain, the damage was most severe in the Delta region, where the effects of the extreme winds were compounded by a 12 foot (3.6 meter) storm surge. Nargis was the worst natural disaster in the history of Myanmar, and the most devastating cyclone to strike Asia since 1991. In the years following the natural disaster, the incidence of flooding and of unexpected pest and disease attacks has significantly reduced the yields and earnings from paddy related activities, putting the productivity of the country's "rice bowl" into question. Figure 1 mentioned the path of cyclone Nargis and the research areas of the slightly affected area, Pyapon and the heavily affected area, Bogalay.

Figure 1 Map of Cyclone Nargis Affected Areas



Source: MIMU _ Myanmar Information Management Unit www.themimu.info

1.3 OBJECTIVES OF THE STUDY

The overall goal of the study is to infer, using two study areas differently affected by hurricane Nargis, the impacts of the hurricane on physical well-being, income, income distribution, happiness and social networking; as well as to make policy recommendations for the alleviation of some of the worst effects of the hurricane. The word "infer" is used rather than "measure" because there was no baseline study of the heavily affected area Bogalay before Nargis hit. The slightly affected area Pyapon is therefore used as a counterfactual benchmark for the "before" situation. In order to achieve this overall goal, we have set the following specific objectives:

- I. To establish an accurate poverty line by means of the Cost of Basic Needs Method.
- II. To assess and compare the relative poverty conditions, using the Gini, Thiel, and Foster_Greer_Thorbecke coefficients, of small farm households in the two study areas.

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- III. To estimate, explain and test the significance of the levels of well-being (basic needs) access by respondents in both study areas.
 - IV. To make recommendations to local and national governments, to NGOs, and to the affected communities themselves as to how to reduce absolute poverty, and anticipate, protect against, and reduce the impacts on the well being of such natural disasters.

2. LITERATURE REVIEW ON THE IMPACTS OF DISASTERS

At present, the literature on the impact of climate change in Myanmar is limited. The researcher will examine the short and long run impact of natural disasters on economic growth by combining information from comparative case studies. The researcher found that large disasters have a negative effect on output for both the short and the long run. Large natural disasters such as earthquakes, tsunamis, hurricanes, and floods generate destruction upon impact: taking people's lives, injuring and rendering them homeless, and destroying property and public infrastructure. Some disasters that happened recently such as the Indian Ocean tsunami in 2004, Hurricane Katrina in 2005, and cyclone Nargis and the Sichuan earthquake in 2008 have received worldwide media coverage, and there is an increasing sense of awareness among the general public about the destructive nature of disasters. Most of the research in both the social and natural sciences has been concentrated to increasing our ability to predict disasters and prepare for them; though the economic research on natural disasters and their consequences is fairly limited.

Raschky (2008) states that socio-economic factors have been found to be the key determinants of a society's response to disasters. In his panel study for the period of 1984–2004, Raschky found that economic development (measured by GDP per capita) is an important factor in determining a society's vulnerability against natural hazards. He found that higher-income countries, in general, experience a lower death toll from natural disasters. Another very important factor also exists. Institutional factors such as the stability of the government, investment in climate and strong community understanding on the environment reduce the adverse effects of both, the death toll and the overall economic losses from natural disasters.

Horwich (2000) also argued that any economy's response to a natural disaster depends on its level of wealth. A wealthy or richer country can be a safer country. Since the demand for safety is positively correlated with money, a nation's per capita income is a good first approximation of the degree of safety it enjoys. Moreover, a rise in income will provide not only general safety but also protect from disasters (Horwich, 2000). Rasmussen (2004) also figured out that income and the number of persons affected by natural disasters is inversely correlated with each other. In his study the country with improvement income has the capacity to prevent the human cost of disasters as income levels increases.

In other research, Albala-Bertrand (1993) argues that the higher the level of development, the smaller both the number of deaths, injured, lost and the relative material losses of poverty and all other social capital. Income per capita and income equality, economic diversification and social inclusion, institutionalization and participation, education and health, choice and protection are included in the level of development. Kahn (2005) states that countries with higher per capita income experience disasters but suffer less death from similar events in poorer countries. However the richer countries have not much experience for natural disaster than poorer countries, they do less suffer and death and deprivation. Richer nations will have the rich capital to make investment to acquire such kind of events. Thus economic development can help to insure from the negative consequences of a natural disaster. Kahn (2005) argues that countries with better institutions, lower income inequality and higher levels of democracy experience fewer post disaster' problems. A study by Toya and Skidmore (2007) using time series data for some countries, researched several measures for social/economic infrastructure variables that included income, education, openness, financial development, and the size of the government as determinants of disaster recovery. The result showed that the economic development of those countries and economic losses from disasters are inversely related. Nations with higher levels of human capital are less vulnerable to disasters. Also, when the scope of the government is smaller and the strength is stronger, that country is associated with a lower disaster death toll.

In a recent study by Noy (2008), the research found that countries with higher educational attainment, better institutions, good governance, higher per capita income, high social capital and higher levels of government spending are better able to withstand the initial disaster shock and prevent further spillovers into the macro-economy.

Generally, the literature on macroeconomics distinguishes between short run effects (usually up to five years), and long run effects (anything beyond that horizon). Albala-Bertrand (1993) developed an analytical model of disaster occurrence and reaction for short run macroeconomic dynamics of natural disasters. Albala_Bertrand collected data on a set of disaster events: 28 disasters in 26 countries from 1960-1979. Based on before and after statistical data analysis, he found that GDP actually increases after the events. The more recent literature typically utilizes econometric techniques and finds different results. Raddatz (2007) studied the effects of external shocks on short run output dynamics in developing countries. He concludes that natural disasters have an adverse short-run impact on output dynamics. After that, Raddatz (2009) used a similar methodology to study the impact of various types of natural disasters on countries in different income groups. He collected data from 112 countries over the period 1975 to 2006. He figured out that the smaller and poorer states are more vulnerable, especially to climatic events, and that most of the output cost occurs during the year of the disaster. Loayza et al. (2009) and Fomby et. al. (2009) studied the economic impacts of disaster by type of events, distinguishing between droughts, floods, earthquakes, and storms and their impacts by economic sectors. They conclude that disasters affect economic growth but not always negatively and that the impact is different across disasters and economic sectors.

2.1 HYPOTHESES

In order to get the research objective , we shall test the following six hypotheses:

1. Current levels of net farm income and self-produced income in kind are adequate to supply 2100 calories and 95 grams of protein per day per adult equivalent to the majority of small scale farmers only in the slightly, but not the heavily, affected areas of the Irrawaddy Delta.
2. Relative poverty (as measured by the Gini and Thiel indices) is significantly higher in the heavily Nargis affected area than the slightly affected area.
3. Absolute poverty incidence is the same in both areas, but the depth and intensity of poverty are significantly higher in the heavily Nargis affected area.
4. The intensity of food poverty significantly increases with household size, total number of problems in farming, dependency ratio, age of household head, and the intensity of Nargis damage; and decreases with acres of farmland, total number of jobs in the

household, highest education of any household member, and the average no. of meals per household member for a day in the past seven days.

5. Around similar mean happiness levels in the two areas, there are much more severe cases of unhappiness, and hence a much worse distribution of happiness, in hard-hit Bogalay than in slightly-hit Pyapon.
6. The social capital of both types (bridging and bonding) in the Nargis heavily-affected area has increased significantly in comparison with the non-heavily affected area. This should give them higher protection from disaster in the future.

3. METHODS OF DATA COLLECTION AND ANALYSIS

The survey research underlying the present research was designed to investigate comparisons of the impacts of natural disaster on well-being, social capital and happiness level of differentially-affected Nargis areas. As such, it is more positive than normative. In this study a household is defined as a group of individuals residing together, pooling all or most of the income and resources, and basically sharing the same economic benefit from their livelihoods. The sample characteristics were examined from the data on whole households randomly selected in this study.

The researcher collected the secondary data in the Irrawaddy Division (Cyclone Nargis affected area). The major sources for secondary data were the Myanmar Agriculture Services (MAS), Settlement and Land Record Department (SLRD), Central Statistical Organization (CSO), United Nation Development Program (UNDP), Food and Agricultural Organization (FAO), World Food Program (WFP), United Nation Office for Coordination of Humanitarian Affair (UNOCHA), United Nations International Children's Emergency Fund (UNICEF), Groupe de recherche et d'échanges technologiques (GRET) and other non-governmental organizations. Secondary data of the township and village profile data, maps, annual progressive reports, project documents and research papers/reports were collected. The sources of data were both local and national.

After collecting secondary data from different sources to reveal the insights into the study area, the researcher selected the sample study sites based on the different levels of damage inflicted by cyclone Nargis. For selecting the respondents, the criterion was

Cyclone Nargis affected people who engaged in farming before Nargis and the small farmers who are holding under 5 acres (2 ha). Bogalay and Pyapon Townships were selected based on the different level of damages affected by Cyclone Nargis. Interviewees were comprised of village leaders and household heads of random selected villages. The random households were collected from villages from each township. To get the 150 households from each township, five villages from each township were chosen with the information of land ownership of the members of the community based organization.

Non-probability random sampling was used in each village because of the limitation of time frame and data availability. The opportunity for estimating the whole population or calculating with precision had to be forgone because sample size did not reflect the population size. The information collected was mainly concerned with the monetary expenditures but also with quantities relating to food items purchased or acquired for consumption.

For the main survey, enumerators who graduated from university and had experience with social survey activities were trained about the main objectives of the study and how to collect data. After training for the data collection, the team primarily conducted the survey in remote selected areas accessible only by waterway. Access to the disaster areas remains risky especially for outsiders who are not familiar with very wide, low-lying areas with small rivers and channels.

The calculation of the five measures of inequality and poverty to be reported in this article are as follows:

Gini Coefficient of income = $2 * \sum (i^{th} \text{ number of Sample Population} * \text{Per Capita Income}) / (\text{Total Income} * \text{Total Number of Sample Population}) - (\text{Total Number of Sample Population} + 1) / \text{Total Number of Sample Population}$

Foster_Greer_Thorbecke-Schoch measures of absolute poverty

$$FGT_{\alpha} = \frac{1}{N} \sum_{i=1}^H \left[\frac{z-y_i}{z} \right]^{\alpha}$$

Where

N = number of people in the sample population

H = number of poor people

-
- z = poverty line
 y_i = actual expenditure on food consumption per adult male equivalent
 α = 0, incidence of poverty, the Headcount ratio, or the fraction of the population which lives below the poverty line.
 α = 1, depth of poverty, how much government must give, on average, to each poor household to eradicate poverty.
 α = 2, intensity of poverty, the index combines both poverty and income inequality among the poor.
 α = 3, urgency of poverty, i.e., if we do not support them soon, they will likely starve.

The above formula was also adapted to measure the incidence, depth and intensity of unhappiness, where z = Likert scale of 1 to 5. Two different scales to measure subjective well-being (SWB) or happiness were used together to analyze the impacts, if any, of Cyclone Nargis on the level and components of happiness in the two areas. The first scale is the well-known Lyubomirsky scale (2008), which contains the four following questions:

1. I general, I consider myself a very happy person.
2. Compared to most of my peers, I consider myself happier.
3. Some people are generally very happy. They enjoy life regardless of what is going on, getting the most out of everything. To what extent does this characterization describe you?
4. Some people are generally not very happy. Although they are not depressed, they never seem as happy as they might be. To what extent does this characterization describe you?

The second scale in this research is called the Chiang Mai (University) scale, because it was developed by the researcher under the guidance of her professors at Chiang Mai University's Faculty of Economics. It includes 28 questions taken or adapted from various sources, including the author's own field experience and the Oxford Happiness Survey (Hills, P., & Argyle, M, 2002).

Both descriptive and inferential statistical methods are used in the data analysis of the current thesis. Lorenz curves are used to explain the income distribution in these study areas. Analytical tools are extended in the calculation of Gini coefficients and Foster-Greer-Thorbecke indices because of the poverty head count index, the poverty gap and the intensity of poverty for the research area.

An independent sample t test was conducted by village, wealth status, Nargis affected status, gender and so on. The test was used to determine whether or not the mean values were significantly different between groups. Comparisons of means also give the researcher further opportunity to study the nature of two Nargis affected areas comparing similarities and differences.

For the correlation matrix analysis, each category of variables was subdivided into a set of specific nominal, ordinal and cardinal indicators in order to choose the most significant for hypothesis testing. Correlation matrices help find out the possibility of multicollinearity and highly associated variables in the hypotheses equations. It also indicates the direction of the relationship between variables and can help to identify the most suitable variable for our regression equations.

Linear regression analysis was used for the hypotheses testing. The situation of the two different areas was determined by the other socio-economic factors, the Nargis affected status. Linear regressions were estimated using SPSS 17 to discover the most significant relationship between happiness and other socio-economic factors.

The questionnaire for this study was designed to inquire about the socio-economic situation, the use of economic infrastructures, social capital and happiness level of the research areas. The time frame of household interviews was set up to last between forty-five minutes to one hour.

4. EMPIRICAL RESULTS

4.1 POVERTY LINE AND ABSOLUTE POVERTY

The Food Poverty Line is defined as the amount of money required to purchase the minimum food requirements of the each adult male equivalent in a given household. In the case study of the Nargis affected areas, the food poverty line estimated by the Cost of Basic Needs method refers to the subsistence minimum food energy requirement of 2100 calories per person per day plus other essential goods (FOSTER et al., 1984; Ravallion, 1998). The Cost of Basic Needs method was applied in constructing the poverty line for the two Nargis affected areas. The lowest quartile's food consumption was used as a reference for food consumption in order to avoid the underestimation of poverty. Using

the FAO calorie conversion table from 1985, each food quantity was converted and then scaled up by 1.13 to reach the recommended intake of 2100 kcal per person per day. The food poverty line was estimated at 920 Kyats per person per day by multiplying the food quantities by average food prices. The population of the research area relies principally upon rice to get their required energy. They take less in other food items. They prefer to eat fish, which are produced and readily available in the study area.

Table 1 Food Composition and Respective Food Poverty Line in the Study Area

Items	Food Quantities of Ref. Household x 1.13 (gm/person/day)	Received Average Calorie (kcl/person/day)	Average Food Expenditure (Kyat/person/ day)	Calorie Contribution	
				From Survey	FAO Recommended
Rice	482	1701	200	81	45
Cooking Oil	40	3	100	0.1	10
Meat and Fish	50	120	100	6.7	20
Eggs	0.05	3	100	0.1	n.a
Pulses	50	74	100	2.6	5
Vegetables	185	50	100	2.4	5
Spices	59	32	40	1.5	n.a
Sugar	25	86	30	4.1	n.a
Beverage	4.32	12	100	0.6	n.a
Other foods	17	19	50	0.9	15
Total		2100	920	100	100

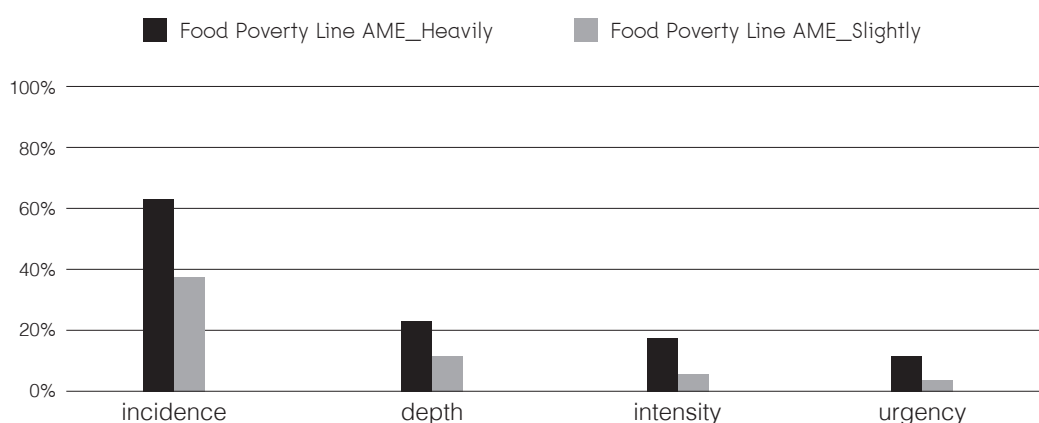
Source: Adapted and Modified from Gender and Rural Poverty in Myanmar and field survey August, 2010

After estimating the poverty line, the non food poverty line can be estimated as follows:
Non Food Poverty Line = Food Poverty Line $(1 - \alpha)$.

Therefore, Non Food Poverty Line = 920 Kyats $(1 - 0.81) = 174.8$ Kyats ≈ 175 Kyats. Hence, the absolute poverty line is $920 + 175 = 1095$ Kyats. The market exchange rate was 995 Kyats per 1 US\$ when survey was conducted. At the time of writing, in January 2011, the exchange rate is now 850 Kyats per 1 US\$. That poverty line is converted to US\$ in current price in 2010, it is equal to US\$ 1.1. This value is very close the commonly used international standard of 1.25 \$ per day.

The 920 Kyats poverty line is applicable for the Irrawaddy Delta area, as a household in rural area faces relatively modest food prices. The researcher used the food poverty line for the calculation of the incidence, depth, intensity and urgency of poverty. Even with these caveats, there is clear destination between the two study areas in terms of the degree and severity of poverty.

Figure 2 Food Poverty Line for the Two Nargis Affected Areas



AME= Adult Male Equivalent ratio

We therefore "accept" (fail to reject) hypothesis 1, to the effect that "Current levels of net farm income and self-produced income in kind are adequate to supply 2100 calories and 95 grams of protein per day per adult equivalent to the majority of small scale farmers only in the slightly, but not heavily, affected areas of the Irrawaddy Delta."

We must however reject hypothesis number 2, which states that "Absolute poverty is the same in both areas, but the depth, intensity, and urgency of poverty are significantly higher in the heavily Nargis affected area." In fact, all Foster_Greer_Thorbecke-Schoch measures of poverty (incidence, depth, intensity and urgency) are far worse in the heavily affected area, Bogalay than in the slightly affected area, Pyapon.

4.2 RELATIVE POVERTY OF THE TWO NARGIS AFFECTED AREAS

Table 2 summarizes the various measures of absolute and relative poverty for the two study areas.

Table 2 Levels of relative and absolute poverty in the two study areas

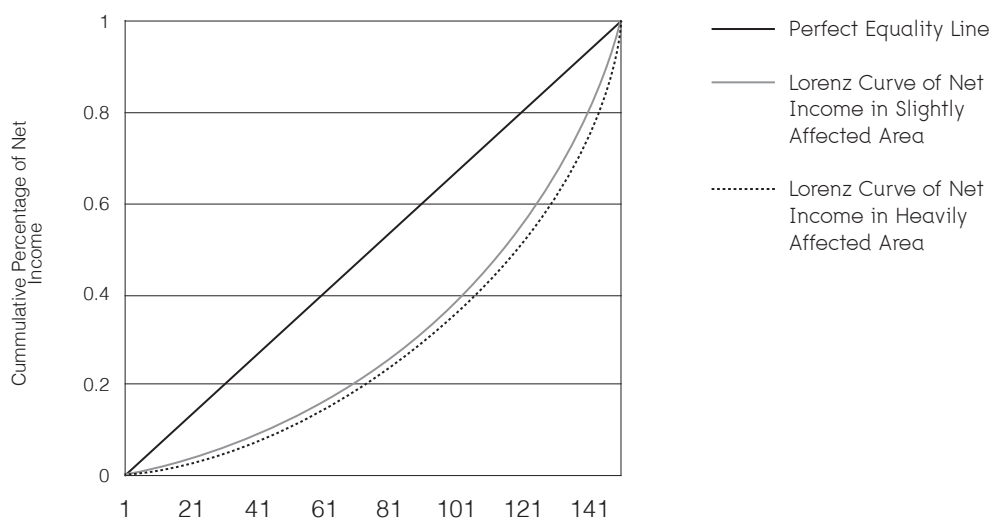
Nargis Areas	Slightly Affected Area (Pyapon)	Heavily Affected Area (Bogalay)
Gini	0.40	0.45
Theil Index	0.25	0.38
Incidence	39%	67%
Depth	16%	32%
Intensity	8%	20%
Urgency	5%	17%

Source: Author's calculation

There is a very little difference in the Lorenz curves of net income per capita. The result is confirmed by the calculation of Gini coefficients, which show that the heavily affected area has higher inequality in income. The Gini coefficient of Pyapon Township, the slightly affected area, is 0.4 and Gini coefficient of Bogalay Township, the heavily affected area, is 0.45. This signifies that Bogalay has a somewhat more intense level of income inequality. The Theil Index of the slightly affected area, Pyapon is, however much lower (0.25) than that of the heavily affected area, Bogalay (0.38).

Figure 3 shows that the Lorenz curve of the income in both areas is almost the same at the origin is almost the same at the origin thus illustrating that the income distribution among the poor is virtually the same in both areas. At the higher classes, however, the Lorenz curve of heavily affected area, Bogalay is steeper than the slightly affected area, Pyapon. We therefore fail to reject the hypothesis number 3, which states that "Relative poverty (as measured by Gini and Theil indices) is significantly higher in the Nargis heavily affected area". Both the Gini and Theil measures of inequality are significantly higher in the heavily affected area, Bogalay.

Figure 3 Comparative Lorenz Curve of the Net Income Per Capita



4.3 INTENSITY OF FOOD POVERTY

Living the in strongly affected area, Bogalay, as well as other factors (Table 3) strongly determine the intensity of food poverty. For example, the household size is strongly significant. The higher the household size, the higher the intensity of food poverty. The intensity of food poverty is also correlated with the adult male equivalent ratio. Acres of farm land are one of the prominent factors influencing the intensity of food poverty. The more they own the land for farming, the lower the probability of food insufficiency. As the research focuses on the agriculture of small farmers, the intensity of food poverty is directly and highly correlated with the lack of arable land.

We therefore cannot reject hypothesis 4, which states that "The intensity of food poverty significantly increases with household size, total number of problems in farming, dependency ratio, age of household head, and the intensity of Nargis damage; and the decreases with acres of farmland, total number of jobs in the household, highest education of any household member, and the average number of daily meals per household member over the previous week ."

Table 3 Regression to explain the Intensity of Food Poverty

Intensity of Food Poverty	Unstandardized Coefficients		Standardized Coefficients	t-statistic	Sig.
	B	Std. Error	Beta		
Household Size	.039	.008	.680	4.643	.000
Acres of Farm Land	-.056	.009	-.749	-6.025	.000
Total number of problems in farming	-.018	.008	-.162	-2.240	.026
Total No of Job jobs in HH	-.055	.019	-.383	-2.908	.004
Highest education of any household member	-.011	.004	-.331	-2.661	.008
Dependency Ratio	.025	.010	.195	2.536	.012
Average no. of meals per household member for a day in the past 7 days	.081	.017	.852	4.644	.000
Age of household head	.002	.001	.373	2.615	.009
%Income from casual jobs	-.314	.103	-.159	-3.055	.002
Nargis affected status	.059	.023	.158	2.530	.012
Adjusted R square	0.460				

Source: Author's calculation

4.4 ABSOLUTE UNHAPPINESS AND RELATIVE HAPPINESS IN TWO AREAS

The average levels of overall happiness, as well as happiness in each of the five key components, may mask significant incidence of absolute unhappiness and inequality in the distribution of happiness within a population. Table 4 reports the application of the Foster-Greer-Thorbecke-Schoch measures of absolute unhappiness, as well as the quintile ratio and Gini coefficients of the distribution of happiness. Results are reported for the combined sample of 298 respondents, as well as for the separate samples of 148 respondents in Pyapon and 150 respondents in Bogalay.

Table 4 Absolute unhappiness and the distribution of relative happiness in two areas

	Absolute unhappiness				Relative happiness	
	Incidence	Depth	Intensity	Urgency	Quintile ratio	Gini coeffic.
CMU SWB score						
Combined sample	35.90%	0.0008	0.0003	0.0001	1.38	0.062
Pyapon	37.20%	0.0015	0.0005	0.0002	1.39	0.063
Bogalay	34.70%	0.0015	0.0005	0.0002	1.36	0.056
Physical happiness score						
Combined sample	35.90%	0.0018	0.0012	0.001	1.76	0.119
Pyapon	37.80%	0.0036	0.0026	0.0024	1.78	0.128
Bogalay	34.00%	0.0035	0.0022	0.0016	1.74	0.125
Emotional happiness score						
Combined sample	38.60%	0.0017	0.0011	0.0009	1.65	0.108
Pyapon	39.20%	0.0034	0.0023	0.0018	1.67	0.119
Bogalay	38.00%	0.0033	0.0023	0.002	1.64	0.111
Social happiness score						
Combined sample	37.60%	0.0017	0.0012	0.0011	1.83	0.129
Pyapon	39.90%	0.0038	0.0029	0.003	1.86	0.139
Bogalay	35.30%	0.0031	0.0018	0.0013	1.8	0.134
Mental happiness score						
Combined sample	34.60%	0.0013	0.0007	0.0004	1.54	0.093
Pyapon	29.10%	0.0023	0.001	0.0006	1.5	0.099
Bogalay	40.00%	0.0029	0.0016	0.0011	1.52	0.099
Spiritual happiness score						
Combined sample	24.80%	0.0009	0.0004	0.0002	1.49	0.088
Pyapon	23.00%	0.0018	0.0007	0.0004	1.48	0.095
Bogalay	26.70%	0.0019	0.0007	0.0003	1.49	0.096

Source: Author's calculation

The first clear conclusion from the table is that there is extremely little difference between the two study areas for either the incidence of unhappiness or the distribution of overall happiness. The differences would probably not be significant if appropriate statistical tests were available, except in the case of the incidence, depth, intensity, and urgency of mental unhappiness in Bogalay, for the reasons stated above. This single exception does not prevent us from clearly rejecting hypothesis 5, to the effect that, "Around similar mean happiness levels in the two areas, there are much more severe cases unhappiness, and hence a much worse distribution of happiness, in hard-affected Bogalay than in slightly-affected Pyapon."

4.5 SOCIAL CAPITAL

Nargis affected status has no significant effect upon happiness. But this is not the case with social capital, which has a positive impact on happiness roughly equal to meditation at the temple. In the sustainable livelihood context, social capital is taken to mean the forms of mutual social assistance upon which people draw. These include networks such as play groups, men's groups (kar la thar in Burmese), caste, membership in more formalized groups such as women's associations, and religious groups. These social networks can provide an informal safety net during difficult times and play a pivotal role in helping people access resources urgently needed after a disaster. One of the most significant characteristics of resilient communities is the extent to which they work together towards a common aim, a function of their social cohesion. Groups that are homogeneous in terms of class, ethnicity, livelihood or wealth are more likely to cooperate in building resilience to disaster.

Indeed, one would expect that there would be an increase in joy as people banded together to help each other rebuild their lives after the cyclone. This is, as we have seen, an example of "bonding." We would also expect that the villagers would be assisted by new NGOs and other organizations from outside with whom they had had little or no contact in the past. This is an example of "bridging." Where these positive conditions exist, they can offset the social unhappiness noted above from how aid is delivered, as noted above in our discussion of social (un)happiness.

Thus, social capital does have a positive influence on happiness. The following portrait emerges of the population today: In heavily-affected Bogalay, people feel discriminated against less often.⁷ They are more religious, going to temple and praying more frequently than the people in Pyapon (but not significantly more than before Nargis)⁸. They also have been living longer together in Bogalay significantly longer, and have been confronted by a more fearsome external menace. So one would logically expect their levels of social and bonding capital to be distinctly higher than in Pyapon. Table 5 shows the exact opposite. The people of Bogalay have significantly lower scores for overall social capital and bonding capital within the community. Bridging capital with the outside world and organizations is also less, but not significantly so. While trustworthiness is higher within

⁷ The overwhelming reason for discrimination in both townships is the same: poverty!

⁸ Indeed, there is no significant increase in temple-going, prayer, or meditation as a result of the cyclone in either township.

the community in Bogalay, people from different backgrounds get on less well together. Presumably because of the loss of family members, people in Bogalay have fewer people to ask for help when they are ill or financially strapped, resorting to strangers or NGOs (bridging) more often than the spouse or close family members (bonding). People in Bogalay also get together in discussion-action groups less; when they do, they are more involved in NGO-type bridging than local bonding groups.

We are thus in a position to clearly reject hypothesis 6. Although the people of heavily-affected, Bogalay trust each other more and are more active religiously, overall social and bonding capital are significantly lower. Bridging capital is also, lower, though not significantly so, because (a) people from differing backgrounds do not get along and (b) in the absence of close relatives; distant neighbors are presumably put upon to help in sickness and financial distress. Meanwhile, opportunities for compensation for the lack of social capital by building bonding capital, such as participating in local discussion-action groups, are not taken up as frequently as in Pyapon Township, the slightly affected area.

Table 5 Tests of Means and Variances of Overall, Bonding, and Bridging Capital Scores¹ by Nargis-Affected Areas

	Nargis affected status	N	Mean	Boga- lay- Pyapon	Std. Devia- tion	Coeff varia'n	Sig. diff. in variance ²	t-sta- tistic	Sig. diff. in mean ³
Social capital score	heavily	150	0.7866	-0.013	0.04827	6%	0.033	-2.059	0.04
	slightly	148	0.7992		0.05742	7%			
Bridging social capital score	heavily	150	0.2539	-0.008	0.05927	23%	0	-0.94	0.348
	slightly	148	0.2616		0.08019	31%			
Bonding social capital score	heavily	150	0.5633	-0.03	0.0818	15%	0.016	-2.753	0.006
	slightly	148	0.5933		0.105	18%			
How long have you live in this area? (in- creasing category, all other variables have been standardized to between 0 and 1)	heavily	147	6.94	0.162	0.315	5%	0	2.539	0.012
	slightly	148	6.78		0.708	10%			
Satisfaction of the neighborhood as place to live (very satisfied=5, fairly sat- isfied=4, neutral=3, slightly dissatisfied=2, very is satisfied =1, don't know =0)	heavily	150	0.796	0.001	0.18314	23%	0.039	0.062	0.95
	slightly	148	0.7946		0.20463	26%			

Table 5 Tests of Means and Variances of Overall, Bonding, and Bridging Capital Scores¹ by Nargis-Affected Areas (Continue)

	Nargis affected status	N	Mean	Boga- lay- Pyapon	Std. Devia- tion	Coeff varia'n	Sig. diff. in variance ²	t-sta- tistic	Sig. diff. in mean ³
Sense of community spirit (people help each other=3, go own way =2, mixture =1, don't know=0)	heavily slightly	150 148	0.9489 0.9279	0.021	0.17157 0.19261	18% 21%	0.064	0.992	0.322
Trustworthiness in neighborhood (most people =4, some can be trusted=3, a few can be trusted=1, no one is trust worthy =1, just moved here =0, don't know =0)	heavily slightly	150 148	0.9617 0.9155	0.046	0.11119 0.16638	12% 18%	0	2.81	0.005
People from different backgrounds get on well together (definitely agree=6, tend to agree=5, tend to disagree=4, definitely disagree=3, don't know=2, too few people in neighborhood =1, all same backgrounds =0)	heavily slightly	40 61	0.76 0.86	-0.095	0.119 0.095	16% 11%	0.019	-4.261	0.00
Cause of discrimination (race=1, religion=2, gender=3, economic=4, health=5, social =6)	heavily slightly	58 78	0.67 0.68	-0.011	0.031 0.078	5% 11%	0.007	-1.102	0.273
If you are ill in bed, seek BRIDGING help (3 =colleague, 2=voluntary or other org)	heavily slightly	150 148	0.0025 0.0025	0	0.03062 0.03082	1225% 1217%	0.985	-0.009	0.992
If you are ill in bed, seek BONDING help (8=spouse, 7=other family, 6=relative, 5=friends, 4=neighbor)	heavily slightly	150 148	0.7 0.7998	-0.1	0.23575 0.19384	34% 24%	0.83	-3.99	0.00
If you are in financial straits for survival, seek BRIDGING help (work colleague=4, voluntary or other org.=3, other =2)	heavily slightly	150 148	0.1104 0.1059	0.005	0.0675 0.09813	61% 93%	0.001	0.462	0.644

Table 5 Tests of Means and Variances of Overall, Bonding, and Bridging Capital Scores¹ by Nargis-Affected Areas (Continue)

	Nargis affected status	N	Mean	Boga- lay- Pyapon	Std. Devia- tion	Coeff varia'n	Sig. diff. in variance ²	t-sta- tistic	Sig. diff. in mean ³
If you are in financial straits for survival, seek BONDING help (husband/wife/part- ner=9, other hh mem- ber=8, relatives=7, friends=6, neigh- bor=5)	heavily	150	0.0741	-0.09	0.23655	319%	0	-2.867	0.004
	slightly	148	0.1644		0.30297	184%			
During last year, par- ticipated in a BRIDG- ING discussion-ac- tion group (2=NGO, 1=GONGO)	heavily	150	0.0838	-0.007	0.10093	120%	0.001	-0.538	0.591
	slightly	148	0.0907		0.12033	133%			
During last year, par- ticipated in BOND- ING discussion- ac- tion group (7=others, 6=religious,5= sports, 4=social, 3=self-help)	heavily	150	0.1743	-0.107	0.30647	176%	0	-2.803	0.005
	slightly	148	0.2809		0.3485	124%			
Sought BRIDGING help for commu- nity problems from (2=GONGO,3=NGO)	heavily	150	0.0767	0.021	0.15403	201%	0.025	1.247	0.214
	slightly	148	0.0552		0.14337	260%			
Seek BONDING help for community prob- lems from (1=local au- thorized org,4=selfhelp group, 5=social club,6=others)	heavily	150	0.1078	-0.023	0.24739	230%	0.188	-0.797	0.426
	slightly	148	0.1306		0.24785	190%			
Increase in trips to temple per month af- ter Nargis	heavily	150	0.36	0.306	3.10937	864%	0.018	1.179	0.24
	slightly	148	0.0541		0.6576	1217%			
Increase in prayer times per month after Nargis	heavily	150	-0.2	-0.132	2.44949	-1225%	0.21	-0.624	0.533
	slightly	148	-0.0676		0.82199	-1217%			

5. CONCLUSION

In conclusion, the comparison between these two areas has demonstrated that -- although the basic needs and economic possibilities for residents from the heavily affected area are insufficient and harder than in the slightly affected area -- Bogalay inhabitants are still happy under the poverty line and trying their best for their future. Actually, even without the cyclone Nargis, chronic poverty has always reigned in the Delta area. Even when a household enjoys food sufficiency, there are many difficulties in meeting other basic needs. When the small farm household confronts crop failure or sinks into debt due to high interest rates or lack of productive capital, they must sell their lands plot by plot to and gradually become a landless household. That is why they are facing food insufficiency even though they are farmers. The most frequently employed coping strategies are to eat lower quality food or to borrow money for food.

6. RECOMMENDATION

Recommendations must be made to local and national governments, to NGOs, and to the affected communities themselves as to how to reduce absolute poverty; and to anticipate, protect against, and reduce the impacts of such natural disasters. Since the two study areas differ substantially, and the determinants of income per capita are not the simple opposites of the determinants of the intensity of food poverty, policy implications must be carefully targeted both geographically and in terms of the dimension of well-being. The government and non-governmental organizations should put into place new credit or loan programs to help farmers in reestablishing their livelihoods. Support could also be provided to strengthening local seed production, community-based storage, and capacity of support service providers including extension and financial services

Since human capital has a powerful impact on economic performance, state and local economic development officials should focus their efforts on encouraging education and retaining and attracting better educated residents. The resulting social capital will be the best gauge of the continued rehabilitation of the victims and the creation of individual and social resilience in case of any such event in the future.

This study has already contributed insights into the objective and subjective well being of the post disaster situation. Further study should be conducted using panel data on the affected area. That research should focus on the livelihood context and the development process for the farming households. One of its major objectives should be to determine the possibilities for faming and agriculture-related activities.

Much more work on coordination among researchers and between researchers and key disaster response decision-makers is also needed to realize the full potential of post-disaster mental health research.

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