

**COMPENSATION VALUATION FOR THE  
RESETTLEMENT OF THE INDIGENOUS  
COMMUNITIES IN BAKUN HYDROELECTRIC DAM,  
SARAWAK, MALAYSIA**

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**DOCTOR OF PHILOSOPHY  
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INDIGENOUS COMMUNITIES IN BAKUN HYDROELECTRIC DAM,  
SARAWAK, MALAYSIA**

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**Thesis submitted to  
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In Fullfillment of the Requirements for the Degree of Doctor of Philosophy**



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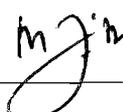
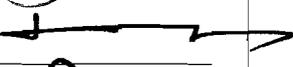
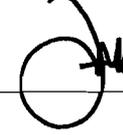
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Tandatangan

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## ABSTRACT

Compensation for indigenous communities as a result of development projects has been a controversial subject. The elements of rights, entitlements, freedom and justice are often difficult to value and left out in the compensation processes. Most of the compensation packages given to the indigenous communities are in-use values and non-use values are often ignored. The non-use values which include environmental, social and cultural values are very difficult to determine and often not compensated by government. These non-use values are more important compared with use values to the indigenous communities. In this study, a sample of 379 settlers in Sungai Asap Resettlement Scheme relocated as a result of the Bakun Hydroelectric Dam Project in Malaysia is surveyed to estimate the satisfaction with compensation as perceived by the settlers. The data was collected from September 2012 to December 2012. Logistic regressions models were used to identify the components of valuation of displacement cost that affect the settlers' satisfaction with compensation. The study of compensation valuation can result in better policies for compensating people affected by large projects. These policies will incorporate aspects of welfare more effectively thus increasing legitimacy for agencies involved in the relocation of communities. The findings showed that gaps in land compensation (differences in expected compensation and actual compensation paid out by state authorities) can result in dissatisfaction towards compensation. Besides that, environmental value (non-use value) perceived by the settlers is found to be significant in affecting probability of dissatisfaction towards compensation. The most important finding is that the lack of freedom and rights of settlers to participate in resettlement processes bring about dissatisfaction towards compensation. This has policy implication for government initiatives on compensation. An institutional avenue to consult and discuss the compensation figures with the settlers should be present to ensure agreeable compensation.

**Keywords:** compensation valuation, hydroelectric dam, use values, non-use values, freedom and rights

## ABSTRAK

Pampasan yang diberikan kepada komuniti yang dipindahkan akibat daripada projek pembangunan menjadi isu yang kontroversi. Unsur-unsur kebebasan dan hak asasi adalah susah dinilai dan diketepikan semasa proses pampasan dilakukan. Kebanyakan pakej pampasan yang diberikan kepada komuniti orang asli adalah dalam nilai pasaran, manakala nilai bukan pasaran sering tidak diambil kira. Nilai bukan pasaran seperti nilai alam semulajadi, nilai soesial dan nilai budaya sering diketepikan semasa proses pampasan. Berbanding dengan nilai pasaran, nilai bukan pasaran ini adalah lebih penting kepada komuniti orang asli. Dalam kajian ini seramai 379 sampel komuniti yang terpaksa berpindah ke kawasan Perpindahan Sungai Asap disoal selidik untuk mengganggu tahap kepuasan terhadap pampasan yang dinilai oleh komuniti tersebut akibat daripada Projek Empangan Hidroelektrik Bakun di Malaysia. Data dikutip dari bulan September hingga Disember 2012. Model-model regresi logit telah digunakan untuk mengenalpasti komponen penilaian kos yang mempengaruhi kepuasan komuniti yang dipindahkan ke penempatan baru. Hasil kajian penting untuk polisi yang lebih baik bagi membayar pampasan yang lebih menyeluruh untuk meningkatkan kebajikan komuniti yang dipindahkan. Hasil kajian menunjukkan bahawa nilai jurang dalam pampasan tanah (hasil ditolak pampasan yang diharap oleh komuniti yang dipindahkan dan pampasan yang diberi oleh pihak berkuasa) boleh menyebabkan ketidakpuasan komuniti terhadap pampasan. Selain itu, kekurangan nilai alam semulajadi (nilai bukan pasaran) juga boleh menyebabkan ketidakpuasan komuniti terhadap pampasan. Sumbangan yang paling utama daripada hasil kajian mendapati bahawa tidak ada kebebasan dan hak asasi komuniti yang terlibat untuk memberikan pandangan dan suara semasa proses perpindahan dan pampasan menyebabkan ketidakpuasan komuniti terhadap pampasan. Hal ini memerlukan pihak berkuasa untuk merancang dan menyediakan institusi bagi membincangkan nilai pasaran dan nilai bukan pasaran dengan komuniti yang dipindahkan untuk mencapai persetujuan dalam pampasan.

**Kata kunci:** penilaian pampasan, empangan hidroelektrik, nilai pasaran, nilai bukan pasaran, kebebasan dan hak asasi

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## **ABBREVIATIONS**

<b>WCD</b>	World Commission on Dams
<b>VIF</b>	Variance Inflation Factor
<b>MNL</b>	Multinomial Logit Model
<b>OLS</b>	Ordinary Least Square
<b>WTP</b>	Willingness to Pay
<b>WTA</b>	Willingness to Accept

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## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background**

Bakun hydroelectric dam project has raised much controversy among the local residents and non-governmental organization when it was first proposed in early 1980. The worries are whether the Bakun hydroelectric dam project can improve the welfare of the people of Sarawak and contribute to the development of Malaysia. The resettlement issue is of particular importance to the indigenous communities as they will experience changes in their welfare once the Bakun hydroelectric dam project is implemented.

The idea to build the Bakun hydroelectric dam was mooted by the then Prime Minister of Malaysia, Dato Seri Dr. Mahathir Mohamad with the objective to exploit the hydroelectric potential of the Sarawak river in order to supply cost-effective and clean hydroelectricity to Peninsular Malaysia and Sarawak and bring development to the indigenous people through more industrial development and employment. The Bakun project is part of "Electricity Master Plan for Sarawak" undertaken by Sarawak Electricity Supply Company (SESCO).

The Bakun hydroelectric dam is very important to Sarawak's economy and the Malaysian economy as a whole as it can generate 2400MW of power capacity. This can increase the economic growth of Sarawak and Malaysia. It is believed that Bakun hydroelectric dam project can also bring benefits such as irrigation and recreation and tourism. Malaysia faced power supply problems in the 1980's. The national grid then

began to experience serious shortages. Thus, the Bakun hydroelectric dam project is expected to reduce the shortage of power to transform Malaysia into an industrialized country.

However, several issues are at stake with regard to the Bakun hydroelectric dam project. The first issue is clearance of forested areas and relocation of the indigenous communities. Sarawak is the largest state in Malaysia and comprises of many different ethnic communities. The forests have to be cleared and the homes of the indigenous communities have to be relocated. The most important issue is whether the development of Bakun hydroelectric dam project can be undertaken without reducing the welfare of the indigenous people of Sarawak.

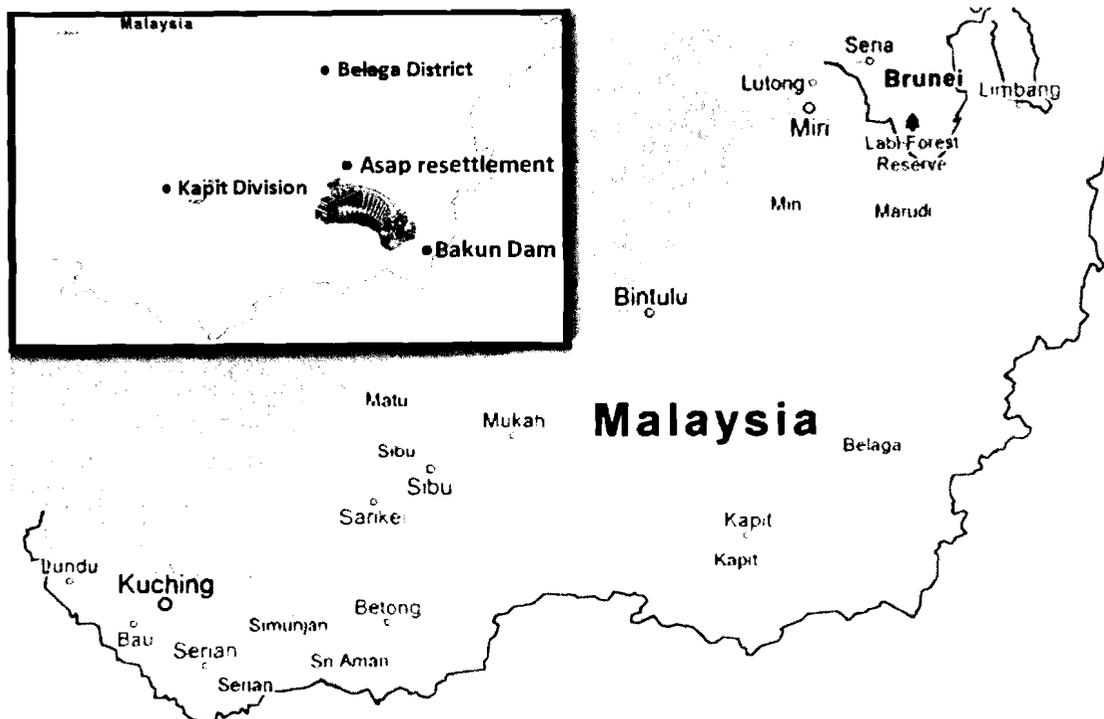


Figure 1.1  
*Location Map of Sungai Asap Resettlement Area*

Bakun hydroelectric dam was first proposed in 1980s to exploit the potential of Sarawak Rivers. It is the biggest hydroelectric dam project in Southeast Asia. It has eight giant turbines. Bakun hydroelectric dam project has an installed capacity of 2400 mrgawatts and expected to generate electricity for about 30-50 years. From Figure 1.1, the Bakun dam is built in the Belaga District of Sarawak. The dam is located on Balui River, 37km upstream of Belaga in Sarawak, Malaysia. The surface area of the lake of Bakun Hydroelectric Dam is 695 sq km, about the size of Republic of Singapore (Ling, 2011). The costs of the project were estimated to be RM 15 billion though many argued that the costs are between RM 25 to RM 30 billion. The current cost of the project is RM7.2 billion (Banji, 2011a). Bakun Hydroelectric dam project is owned by federal government but is managed by Sarawak Hidro Sdn Bhd- a unit under the Ministry of Finance (Sibon, 2011).

The dam is constructed by Malaysia China Hydro Joint Venture (MCHJV) consortium (joint venture between Sinohydro and Sime Engineering). According to the Sarawak Hidro Sdn Bhd CEO, Zulkifle Osman, the dam project adhered to all specifications stipulated in contract and complied with the international standards and procedures approved by Sarawak Hidro. Zulkifle Osman stated the Bakun dam was built after taking into consideration both economic and human factors.

### **Process of Relocation (Relocation Plan and Implementation)**

#### **People Relocated**

The Bakun project has relocated 10,000 people. They have to move to Sungai Asap. Sungai Asap resettlement area is about 30km from the Bakun hydroelectric dam (Banji, 2011b).

The indigenous population is about 48% of the total population in Sarawak. They are divided into different ethnic groups that comprise of Iban, Kelabit, Bidayuh, Kenyah, Kayan, Kelabit, Kajang, Ukit, Penan and others. Each ethnic group has their own culture and social structure. They also depend on the land for their food, resources and also as a spiritual home of their community. However, the development of the Bakun hydroelectric project in Sarawak will have severe impacts on the people of Sarawak, especially the indigenous people.

Table 1.1  
*Population Census of the Affected Communities in Year 1998*

Ethic Group	Longhouse- Settlement	Family	Population
Kenyah	4	1,024	4,708
Kayan	8	881	3,781
Lahanan/Kajang	1	138	535
Ukit	1	74	300
Penan	1	24	104
Total	15	2,141	9,428

Source: Local District Office, Sungai Asap (2001)

According to the final report of World Commission on Dams, the Bakun hydroelectric project will affect the indigenous communities because they have to be resettled (Gabungan, 1999). From Table 1.1, the affected communities are like Ukit, Kenyah, Lahanan and Penan communities. According to the statistics released by Local District Office, Sungai Asap, the population census of the affected communities of the Bakun Hydroelectric Dam in year 1998 is 9,428 people comprising of 2,141 families. There are basically five ethnic groups affected by the Bakun hydroelectric dam that are Kenyah, Kayan, Lahanan, Ukit, Penan. Out of these five ethnic groups, the indigenous population affected most is the Kenyah group of 4,708 people. This is followed by Kayan group of 3,781 people, Lahanan group with 535 people, Ukit group with 300 people and Penan group with 104 people. This shows that the number

of people affected by the Bakun hydroelectric dam project is large, affecting some 26.75% of the people in Belaga district in Sarawak.

Table 1.2  
*Total Population of Sungai Asap by Ethnic Group and Household in Year 2010*

Sub-District	Total population	Non other Bumiputera population (Malay, Iban Bidayuh, Melanau, Chinese, Indians, others and Non-Malaysian citizens)	Other Bumiputera population (Kenyah, Kayan, Kajang, Ukit, Penan)	Households
Sungai Asap	15,397	4,018	11,379	3,645

Source: Department of Statistics, Malaysia (2010)

From Table 1.2, the total population of other Bumiputera (Kenyah, Kayan, Kajang, Ukit, Penan) are 11,379 who are resettled at under Sungai Asap resettlement scheme at Sungai Asap sub-district, Belaga District. The other Bumiputera population has increased from 9,428 people in the year 1998 (the year the indigenous communities were affected by the Bakun hydroelectric dam project and had to be resettled) to 11,379 people in year 2010.

### **Relocation Practices**

The appointed leaders were requested to provide basic information on resettlement to the affected people. There were no discussion between the grassroots and the government. The relocation is a forced relocation. At the stage of planning and implementation of the resettlement, Bakun development committee was set up with the function to represent the indigenous communities as the only legitimate channel. The Bakun development committee was made up of the government appointees, local assemblymen, businessmen and government-appointed leaders.

However, the leaders were not elected from the indigenous communities (Gabungan, 1999).

### **Compensation**

Government did two things to arrive at the compensation figures. Firstly, the government surveyed the land and assets (including houses, crops, fruit trees, medicinal plants and burial sites) owned by the indigenous communities. Secondly, a valuation process was carried out. However, the compensation amount arrived at lacked transparency and this caused confusion. The details on how the compensation amount were arrived at were not given. Compensation amount varies among individual. According to report of World Commission on Dams, the compensation may be as low as nothing to as high as RM700,000 (opinion-based and not confirmed) (Gabungan, 1999).

Kenyah-Badeng ethnic group in Sungai Asap received three acres of land for compensation. None has received land title to claim the ownership of the 3 acres of land for agriculture purposes.

### **Controversies of Problems and Issues**

There are many controversies in terms of land and house compensation. Most of the indigenous communities claimed that the major portions of the land were not surveyed when giving compensation. The land needs to be surveyed before compensation to determine the value of land to the indigenous communities before giving compensation. Each type of land has different purposes. It represents the

cultural, spiritual and economic identity of the indigenous communities. For example, the Temuda represents the area of land around the longhouse that also includes the farmed land. Menoa, which is the area of land (forest) is used for the purpose of ancestral domain, hunting and gathering. Pulau is the area of land set aside for water catchment and material extracts for building. However, the compensation used by government only focus on the Temuda definition of land (Gabungan, 1999).

For house compensation in Bakun, indigenous communities were required to stay in the new house which costs RM52,000 (Gabungan, 1999). This caused dissatisfaction or decreasing utilities among the indigenous communities. The houses were also in bad condition, broken doors, shattered walls, leaking and stagnant drains and broken windows. The indigenous communities that moved to the new area were required to sign a long document stating the price of the house and loan for monies to be paid over 25 years. These add to the further dissatisfaction of the communities. Even the compensation paid for their old homes were much lower than the price of the new homes which costed RM52,000. The compensation was used to offset the purchase of new house and was not paid to the indigenous communities.

The increase costs also added burden to the indigenous communities. Costs such as electricity, water, food, housing and transport needed to be paid by the indigenous communities.

## **Income Stream Analysis (Comparisons of Sources of Income Before Relocation and After Relocation)**

### **Before Relocation**

The male indigenous communities did some fishing and hunting of wild pigs and deers on their own pieces of land, growing cash crops such as peppers, rice and vegetables. They could fish and obtain jungle products such as rattans and palm leaves. Besides that, they also harvested crops such as vegetables and fruits. Most of them are farmers, hunters and fishermen. Subsistence production and consumption was the main way of live for the communities.

### **After Relocation**

After the indigenous communities of Bakun were relocated, their access of land was reduced thus reducing their farming and hunting activities. Settlers have to rely more on the cash economy (Gabungan, 1999). They have to spend money to buy food, materials and incur higher transportation costs. There are often lack of jobs at new places. Due to insufficient land (3 acres of land and some are not fertile to plant crops) to do farming and hunting, the people have to work as hard labourers at oil palm plantations leased out to the oil palm companies. The wages is about RM8 to RM10 per day (Jehom, 2008)

Besides becoming labourers at oil palm plantations, some of the settlers become farmers and sell the vegetables. However, they found difficulties in marketing the products as proper marketing space was not provided for in the new

settlement. This resulted in the vegetables they produced being used mainly for their own consumption (Jehom, 2008).

## **1.2 Research Problem and Questions**

The report of the World Commission of Dams on resettlement of indigenous peoples in 1999 concluded that more than 80 percent of the resettled people from Batang Ai are worse off after the Batang Ai resettlement. Settlers complained about limited employment opportunities and inadequate provision of land for farming. The indigenous populations feel that they were short changed and they have lower welfare after resettlement brought by the large hydroelectric dam project. Latest reports of Bakun from Rosseau (1994), Thomson and Hui (2001), Jehom (2008) showed that indigenous population are not satisfied with the inadequate compensation for their loss of natural resources, social heritage and land, the forced payment for the acquisition of a new house and increased dependence on fertilizers to grow crops after being resettled. The Bakun settlers are thus deprived of their traditional land and culture and thus require compensation. The people also suffer from environmental problem such as pollution and deforestation (Sovacool and Valentine, 2011). Some of them feel that they were not compensated well. This becomes an issue or problem that need to be addressed carefully because the government's objectives of building the hydroelectric dam project was to bring development and to maximize the welfare of the people. Not all values were taken into account in the compensation made to the settlers.

Thus, there is a need to study the impact of the Bakun hydroelectric dam project on the socioeconomic development of the indigenous people and estimate the compensation acceptable to indigenous communities. This Bakun hydroelectric dam study presents us with a rare opportunity to conduct an in-depth study on how to improve our ability to measure compensation accurately. The hydroelectric dam not only can bring development to the Sarawak economy but should not worsen the welfare and development of the resettled indigenous people. Understanding what aspects of compensation that affect welfare can formulate better and more acceptable compensation policies. A theoretical framework for estimating the compensation level as a result of resettlement of indigenous people is developed to address the issue of compensation. In addition, this study will contribute to the knowledge on compensation measurement.

So, the purpose of the study is to estimate the indigenous communities satisfaction with compensation for relocation. The factors that influence the satisfaction level of indigenous communities with regard to the compensation received are examined by looking at the size of the gap between compensation received and expected compensation. Compensation gap arises when the expected compensation by the settlers is larger than the actual compensation given by the government. Compensation gap is calculated by expected compensation of settlers minus the actual compensation given by government. The key questions addressed in this study are:

- (1) Does the size of compensation gap affect the satisfaction from compensation received by the settlers?

- (2) Do use value variables affect the satisfaction from compensation received by settlers?
- (3) Do non-use value variables affect the satisfaction from compensation received by settlers?
- (4) Do socio-demographic variables affect the satisfaction from compensation received by settlers?
- (5) Do freedom and rights variables affect the satisfaction from compensation received by settlers?
- (6) Do use value variables affect the compensation gap?
- (7) Do non-use value variables affect the compensation gap?
- (8) Do socio-demographic variables affect the compensation gap?
- (9) Do freedom and rights variables affect the compensation gap?
- (10) Do use value variables affect the land compensation gap?
- (11) Do non-use value variables affect the land compensation gap?
- (12) Do socio-demographic variables affect the land compensation gap?
- (13) Do freedom and rights variables affect the land compensation gap?

The first five questions relate to Model 1, Satisfaction with Compensation. In this model, the independent variables are size of compensation gap, use value variables, non-use value variables, socio-demographic variables and freedom and rights variables. Questions six to nine relate to Model 2, Cash Compensation Gap, in which the independent variables are use value variables, non-use value variables, socio-demographic variables and freedom and rights variables. Questions ten to thirteen look at the issue of land where land is an important asset is tied up closely with the culture and life style of the settlers. These questions are related to Model 3,

land compensation gap, in which the independent variables are use value variables, non-use value variables, socio-demographic variables and freedom and rights variables. Land provides the indigenous people livelihood, forests for hunting ground and ancestral burial grounds (Sovacool and Valentine, 2011). Land is more than asset and livelihoods and should be given attention. There is a broader value of land that brings about a richer understanding of compensation. The three models mentioned above relate to the model estimated in this study and the results are presented in chapter five.

### **1.3 Research Objectives**

The objectives of this research can be casted in terms of the general and the specific objectives.

#### **1.3.1 General Objective**

The general objective of this research is to examine the factors that determine the satisfaction from compensation in the Bakun Hydroelectric project area. The compensation gap, use value variables, non-use value variables, socio-demographic variables, freedom and rights variables are perceived as important determinants of satisfaction from compensation received by settlers.

#### **1.3.2 Specific Objectives**

The specific objectives are expressed as follows:

- (1) To estimate the dependency of satisfaction from compensation received by settlers on the independent variables which are size of compensation gap, use value, non-use value, freedom and rights variables.

- (2) To estimate the dependency of compensation gap on the independent variables which are use value, non-use value, freedom and rights variables.
- (3) To estimate the dependency of land compensation gap on the independent variables which are use value, non-use value, freedom and rights variables.

#### **1.4 Significance of the Study**

There are serious problem with valuation of the benefit and costs of large development projects such as dams. The impacts often affect large group of people and significant conflicts arise between project authorities and project beneficiaries.

This study contributes to the knowledge by identifying the components of valuation of displacement cost that affect the level of satisfaction of settlers who are compensated as a result of relocation due to the large hydroelectric project. In previous studies of compensation, there is incomplete identification of the components of compensation that affect satisfaction and welfare of displaced people. Past studies (such as Agba, Akpanudoedehe & Ushie, 2010; Olawepo & Lawal, 2010; Hwang, Cao & Xi, 2011) have not adequately considered these aspects in explaining dissatisfaction with compensation.

The study of compensation valuation can result in policies that lead to more accurate compensation for communities affected by relocation. The compensation should commensurate the welfare loss that the dissatisfaction is minimized. This study aims at determining the factors that affect the dissatisfaction of settlers and thus can contribute in improving the compensation policy. The policies recommended in this study will incorporate aspects of welfare more effectively thus increasing

legitimacy for agencies involved in relocating of communities. If the communities accord high level of legitimacy to the resettlement agencies, the conflicts between communities and the institutions will be lower (Tyler, 1990).

Policies that attempt to account for the welfare of the people are often built on the economic model of social welfare. The social welfare function is defined as the sum of the utility of the members of that society for the production of different combination of goods. If the utility or welfare of the people are reduced as a result of the resettlement, government needs to compensate the indigenous communities in order to bring the utility of the communities to the original utility before resettlement. The difference or gap of the original utility before resettlement and the reduced utility after compensation is called the Hicksian compensation variation.

This study is important for the policy makers such as the government as they need to care for the benefits of the indigenous people. The government need to determine the appropriate compensation to offset the loss in welfare. This can improve the standards of livings of the indigenous people and reduce conflicts between the government and indigenous people arising from the large development project.

Research in this problem area will benefit the indigenous people and the people in Sarawak and Malaysia as a whole. The Bakun hydroelectric project is a big development project that covers the whole of Sarawak. The indigenous people will have greater concern from the government as the government's vision is to improve the standards of livings of the indigenous community. The government will provide

infrastructure such as roads and schools and increase job opportunities for the indigenous community. With this, the standards of livings of the indigenous community will improve and Sarawak and Malaysia will have a better chance of achieving high income economy by 2020.

### **1.5 Organization of the Thesis**

The thesis is organized as follows. Chapter 1 lays the background of the Bakun hydroelectric dam project in Sarawak. Chapter 2 reviews the basic concept of theory of welfare and the commons. The theory of risk of reconstruction will serve as the basis for the development of the theoretical model of the impact of hydroelectric dam on socioeconomic development of indigenous people. In chapter 3 the methodology used in measuring compensation based on the used values, non-use values and socio-demographic variables are detailed. The methodology encompasses the theoretical framework of the study, empirical model, measurement of variables, strategies for data collection and the survey instrument used, data analysis and pre-tests. The results obtained from the descriptive analysis are reported in Chapter 4. In chapter 5, the regression results are reported. In chapter 6, discussion of the results and policy implication of the study are presented. Last but not least, the summary of the research and limitation of the study is reported in chapter 7.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

The literature review will examine theories of compensation, the early theories of the impact of hydroelectric dam on the resettlement of communities as a result of development and valuation methods used in large scale projects. Hydroelectric dam projects often call for resettlement of the local communities. The report of World Commission on Dams estimated that worldwide, between 40-80 million people are displaced by dam projects (WCD, 2000).

Resettlement is a challenge and can create conflicts between governments and the local communities. Local communities may feel that they are not well treated after they are being resettled. They are not happy with the compensation provided to them after they are being resettled by the government for the big hydroelectric dam project. So, it is important to assess the methods to value the compensation provided to settlers for arriving at sound compensation policy. We need to know what the local communities consider valuable and what the government feels is important for the people.

The chapter consists of seven main sections. In the first section we examine the meaning and concept of utility. Utility is linked with compensation. The motive in compensation is to ensure there is no loss in the utility of the settlers required to relocate. The classical theory of compensation is discussed in section two. The modern welfare theory of compensation is taken up in the third section. In the fourth

section, a brief review of older theories related to the study of resettlement and impact of hydroelectric dams on the indigenous people is presented. In the fifth section, we discuss the theory of risk and reconstruction model that enables us to identify the eight important impacts of resettlement that is used as a basis for selecting the variables used in the conceptual framework for valuation. The theoretical model of valuation methods for use values and non-use values are examined in the sixth section. The literature on assessment of people's perception of value on displacement by using the variables from the theory of risk and reconstruction model is taken up in section seven. In the eighth section, we present some empirical studies of alternative valuation methods or approaches for valuing non-market values. Finally, we narrow our focus down to the valuation of compensation for the Bakun hydroelectric dam resettlement project.

## **2.2 Utility Theory**

Utility theory is used as the basis for analyzing compensation. Utility is defined as a property in an object which tends to produce benefit, advantage, pleasure, good and happiness (Warnock, 2003).

The history of utility can be dated back to the literature by Jeremy Bentham (1748-1832), an English philosopher in the early eighteenth century. Nineteenth century economists W. Stanley Jevons, Leon Walras, and Alfred Marshall said that utility is measurable. Every consumer is assumed to be able to assign the amount of degree of utility on every commodity or combination of commodities and this is termed as cardinal utility. However, Pareto replaced the concept of utility with the concept of scale of preference. For example, given two sets of goods, the consumer

will prefer the higher utility compare to lower utility, this is referred to as a scale of preference.

Indifference curve takes the concept of scale of preference. On the indifference curve, any utility along the same line of indifference curve would be of the same values. As the indifference curve goes up, the utility goes up as well and vice versa (Lancaster, 1998).

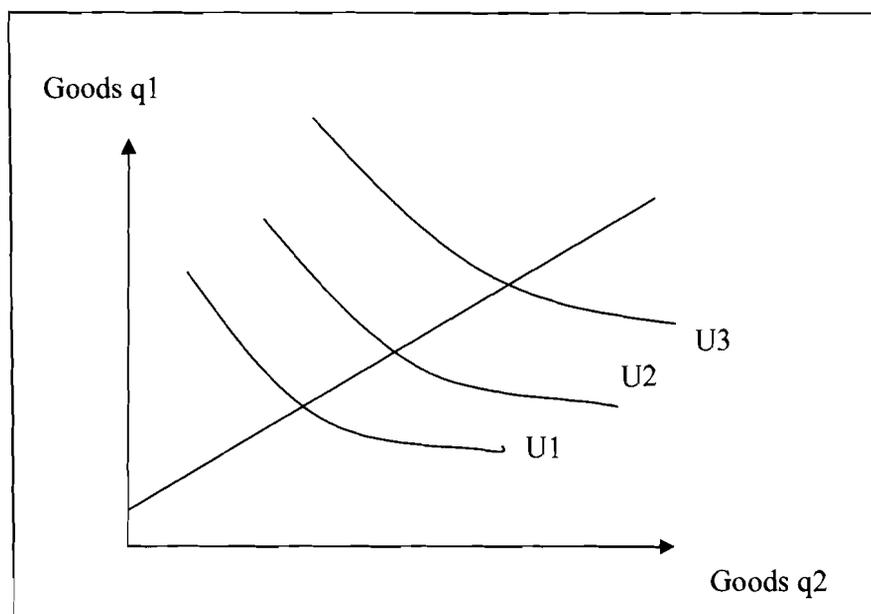


Figure 2.1  
*Indifference Curve*

### **Axioms of Choice**

Axioms of choice are important because it leads to the construction of utility functions and choice systems (Deaton & Muellbauer, 1980). The idea of axioms of choice is rationality. Axioms of choice are defined as the acceptance which is equivalent to the existence of the utility function. In other words, this means that utility function must satisfy the requirements of axioms of choice for utility functions

to exist and to ensure rational decision making. Utility comes from the consumption and preferences of the bundles of goods.

There are 6 axioms of choice to be discussed: (1) reflexivity (2) completeness (3) transitivity (4) continuity (5) non-satiation (6) convexity. (Deaton & Muellbauer, 1980). Not all of these axioms of utility are equally important. There are a few symbols in axioms of choice. For example, the symbol  $\geq$  is used to mean “at least as good as” whereas superscripts on vectors,  $q^1$  will be used to distinguish different complete vectors. Therefore, if  $q^1 \geq q^2$ , the vector or bundle of goods  $q^1$  is at least as much as  $q^2$ . The symbol  $\geq$  is called the preference relation. In the next paragraph, the 6 axioms of choice will be discussed in detail.

- Axiom 1: Reflexivity. For any bundle  $q$ ,  $q \geq q$ .
- Axiom 2: Completeness.
- Axiom 3: Transitivity and consistency
- Axiom 4: Continuity.
- Axiom 5: Nonsatiation.
- Axiom 6: Convexity.

The simple case of the consumer purchase behavior is only based on two commodities that are good X and good Y. Utility function is defined with reference to consumption during a period of time (Henderson & Quandt, 1980). The level of satisfaction consumed of the goods depends on length of period the consumer consume the combination of goods.

Therefore, the ordinal utility function is :

$$U = f(q_1, q_2)$$

However, there are other factors such as freedom and capabilities that will go into the utility function. Freedom is the ability to have a 'quality of life' (Sen, 1999). Freedom is needed to enhance the ability to help individual to be social effective. Freedom encompasses fulfilling material and spiritual needs. Capabilities focus on what a person is able to do to have a good life. Deprivation of capabilities will lead to poverty.

### **Utility Maximization**

A rational consumer will maximize his or her utility. He or she will purchase the combination of  $q_1$  and  $q_2$  to maximize his level of satisfaction. However, the income or resources that he has is limited. Therefore, the consumer's budget constraint is:

$$y^0 = p_1q_1 + p_2q_2$$

where,

$y^0$  = fixed income  
 $p_1$  = price of product 1  
 $p_2$  = price of product 2  
 $q_1$  = quantity of product 1  
 $q_2$  = quantity of product 2

### **Marshallian Demand Function**

Marshallian Demand Function or sometimes called the ordinary demand function reflects the quantity of a commodity the consumer will buy based on his

income and also commodity prices. It can be derived from the analysis of utility maximization. Thus, it is important to know utility maximization.

There is a difference between Marshallian Demand function and Hicksian Demand function. Marshallian demand function is also called Marshallian uncompensated demand function which is defined on price and outlay whereas Hicksian demand function is a compensated demand function which is defined on price and the utility. (Deaton & Muellbauer, 1980). Hicksian demand function is the relevant demand function for determining welfare and compensation estimation.

Utility theory is used as a basis for measuring welfare changes. In this study, the utility of the settlers reflect the changes of welfare after resettlement.

### **2.3 Classical Theory of Compensation**

#### **The Kaldor-Hicks Compensation Test**

In 1939, Nicolas Kaldor and John Hicks devised the compensation test. In this compensation test, there are two policies namely policy 1 and policy 2. In order for people to choose policy 2 instead of policy 1, the loser needs to be better off by hypothetically compensating by the gainers and everyone gets better off by moving from policy 1 to policy 2. Policy 2 is preferred to policy 1 if there is Pareto improvement. Pareto improvement is discussed in the next paragraph. Kaldor and Hicks (1939) proposed this welfare criterion that has been called the potential Pareto-improvement criterion or the potential compensation test. This is illustrated using Figure 2.2 below to show the Kaldor-Hicks welfare criterion

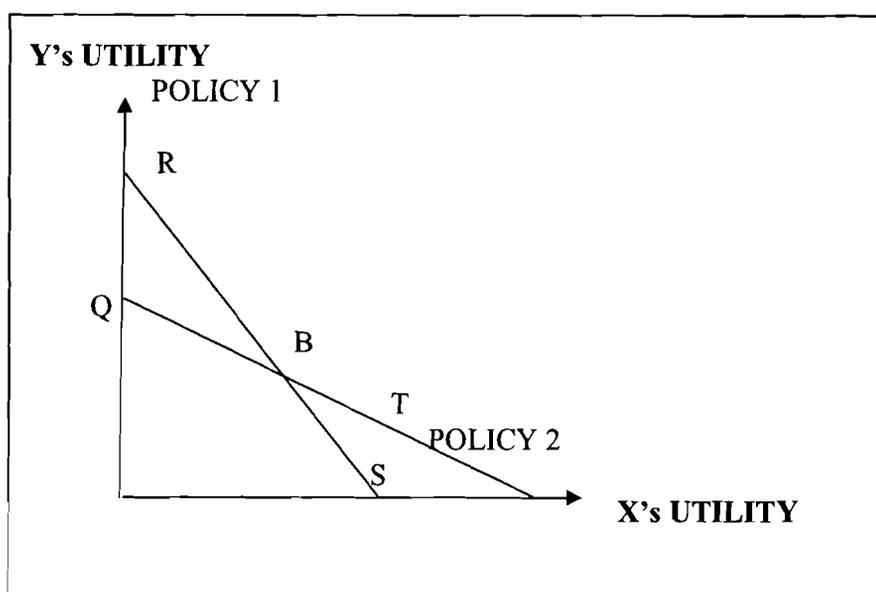


Figure 2.2  
Kaldor-Hicks Welfare Criterion

In this Figure 2.2, there are two policy options that are policy 1 and policy 2. Both the lines S and T represent the Hicksian demand curve for utility level (maximum feasible utility combinations). Suppose that in policy 1, the X gets S utility and Y gets 0 utility at point S. In policy 2, X gets 0 utility and Y gets Q utility at point Q. According to Kaldor Hicks compensation test, policy 2 is preferred than policy 1 because both X and Y can be better off. This is shown at point T where Y hypothetically compensates X by moving down to T and X would also be moving up to point T where the compensation needs not take place. Both X and Y would choose policy 2. In this figure, it also shows that those who have benefit would compensate the one who has not benefit so that no one is worse off and this is called Pareto superior.

However, there are still some limitations of this model in carrying out compensation. Firstly, the losers do not need to be compensated in actual condition. This has been a controversial issue and has been criticized by Just, Hueth & Schmitz

(1982) because it is possible to make a large group of people worse off and only small group of people better off without the actual payment of compensation.

It is irrational to make people better off without the actual payment of compensation. In the case of resettlement, the displaced communities have been compensated by the state authorities according to market value though the compensations are undervalued and not enough. The concept of welfare of the communities is only restricted or limited to the economic values such as market value of land and house value when government are dealing with compensation. Market-price-based evaluations are often used in valuation of compensation and opportunities of people to express valuations are not taken into account for compensation. We discuss some of the elements in the modern theory of welfares that are useful in valuation and compensation in the next section.

#### **2.4 Modern Theories of Welfare and Valuation (Amartya Sen and John Rawls)Valuation Approach in Benefit and Cost Analysis**

However, the concept of welfare is not limited to the utility of individual in terms of economic values. The welfare concept involves a broader definition that incorporates some of the elements of non-use values. Elements like justice and redistributive social policies are important in measurement of individual welfare levels (see eg. Elster and Roemer, 1991). Understanding these elements is very important in valuation and giving compensation. These elements are often ignored in the valuation of welfare by the displacement communities.

There are a few welfare economists such as Amartya Sen and John Rawls who mentioned that some elements are important in doing valuation and giving compensation. These elements of liberty and freedom by Amartya Sen and rights and entitlements are often left out by the state authorities during the process of valuation and giving compensation. This can create conflicts or disagreements between policymakers (state authorities) and the displaced communities. In this section, we discuss in-depth about each elements.

The compensation principles need to be based on valuation of the loss of the communities. Valuation of the loss can be done through benefits and cost analysis. Amartya Sen, an Indian economist who is the Nobel Prize winner in Economics Sciences stated that the current benefits and cost analysis approach often do valuation entirely on an analogy with the market mechanism in his article 'The Discipline of Cost and Benefit Analysis (2000)'. He argued that the demand of the individual is not taken into account in the procedure of market valuation. This makes the compensation not comprehensive. Thus, he suggested the use of social choice approach to capture the human loss in doing valuation. He also discussed elements like capabilities; freedom and liberty as important aspects in valuation and compensation. These elements in modern theories of compensation should not be ignored. These are discussed in the next paragraph.

#### **2.4.1 Freedom of Choice, Liberty and Welfare**

Freedom of choice is very important in economic valuation. It is linked with the evaluation of welfare of the people. If the communities or people do not possess freedom, the welfare will drop as a result of them. Thus, valuation and compensation

must take into account the element of freedom of choice. Freedom of choice is highlighted in Sen's book of collective choice and social welfare.

In Sen (1988)'s article of Freedom of Choice, he highlighted the concepts of freedom and why it so important for freedom? He postulated that values must serve as means of pursuing the aim of freedom. The forced displaced communities in big development project particularly in dam project often did not have freedom of choice. The instrumental role of freedom often is not taken into account by the state authorities for the valuation of compensation. This leads to a reduction in the welfare of the communities. The valuation and compensation processes are not so effective as a result of this. Displaced communities often look at the aspects of freedom to do things and access to the resources and properties to do valuation of the welfare.

There is a welfare loss if communities are forced to resettle in a new place. Problem arises when communities are forced to leave because this is not their choice to live at a new place. Communities have land, houses, access to resources like jungle resources and can have the freedom to move around the environment. The development project that caused displacement of communities will take away their freedom of choice. This will result in a loss of welfare. State authorities do not often take into account the freedom of choice in valuation of compensation. This can often create conflicts of interests.

For example, in most cases of resettlement due to hydroelectric dam, the individuals have freedom to get better resource allocation such as fruits, jungle products, vegetables before resettlement. The communities also have freedom to

move around and how to get the resources they want. After resettlement, the communities lose all the freedoms in the new environment and the element of freedom is viewed as an important aspect in valuation of welfare and communities hope the valuation and compensation by state authorities should taken consideration of freedom.

Sen (1988) stated that ‘The existence of instrumental relevance (i.e., the value of things as means to other ends) does not entail denial of intrinsic importance as well (i.e., their value as ends on their own right)’. In other words, the people must not be denied of their freedom to choose what they want in their standard of livings. In the development case, the communities must have the freedom to choose what their activities are in their lives. For example, they must have the freedom of access to the jungle resources and freedom of not being resettled. If the freedom to choose had been taken away, then there will be problem of deprivation.

The freedom of choice is important to the individual itself. If they possess the freedom of choice to choose in their lives, this would generate higher utility compared to if they do not possess freedom of choice. Freedom of choice can lead to better resource allocation as stated in Lange Lerner models of socialist pricing in socialist literature. The settlers who have to be resettled do not have freedom of choice to choose the place they want to live and get better resources allocation. Thus, they cannot allocate the resources effectively. This may be due to several reasons. The first reason is that they do not have access to the resources before they resettled such as jungle resources and lands for them to collect fruits and forest products. This lacks of access to resources makes them cannot sell the fruits and jungle products to earn

livelihoods income. The welfare will reduce as a result of that. This often ignored by state authorities in doing valuation. The second reason is that they do not have freedom to move around the environment after being resettled because they do not know how to move around and obtain the things they want in their new place. For example, if they want to do cultural activities, they do not know where the place for them to do cultural activities at the new environment. They may have to take times to adapt to the new environment. This is not their wish. This freedom of choice should be taken into account by state authorities when doing valuation.

There are two ways of freedom can be viewed that are positive freedom and negative freedom (Sen, 1988). Sen (1988) mentioned that negative 'view' of freedom focus on absence of the class of restraints that one person may exercise over another, or the state exercise over individual whereas positive 'view' of freedom concentrate on what a person can do to achieve something. Resettlement in Bakun hydroelectric dam project is interfered by the state and is viewed as negative 'view' of freedom. The state authorities forced the communities to be resettled to another place. The communities feel restraint and are being interfered by the state authorities and the communities may actually lose the freedom. This makes the communities feel deprived of the freedom.

However, the compensation by state authorities does not include the element of freedom. Sen (1988) also mentioned that freedom not only limited to commodities and income given but has a broader prospect that covers the elements of functioning and capabilities in his article Freedom of Choice.

#### **2.4.2 Capabilities Approach**

Amartya Sen's Capabilities approach is useful element for evaluation of individual welfare. There are two concepts in capabilities approach that are functionings and capabilities. Sen (2003) defines the functionings as achievement of a person and comprises of individual's activities and state of being. The valuation for doing compensation by the state authorities must take into account the concept of functionings. For example, the communities need to be in good health, moving freely whenever they want to, possess their own shelters and the opportunity of being educated after being resettled.

Beside, Sen (2003) also state that capability is derived idea that reflects what the potential achievement of the people and this involves the person interest to choose the lives they want. The individual welfare of each person is decided by their own. The communities should have their rights to choose the lives they want. The communities may like to stay in a place where they can achieve the potential achievement such as having different facilities and using the abilities to work for their livelihood. For example, in the case of Bakun hydroelectric dam which cause displacement of communities, the communities shall have the freedom and capability for hunting and collecting wild fruits to earn a better life after resettlement. The process of doing valuation of compensation shall not ignore these aspects.

These capabilities approach that comprises the elements of functionings and capabilities can provide a guideline of doing the framework of valuation and compensation. The objective is to increase the welfare or at least maintain the welfare

of the communities. Proper valuation of compensation needs to be carried out for the benefits of the communities.

### **2.4.3 Legal Entitlement**

The negative 'view' of freedom as discussed earlier has linkage with another element that is the rights that the communities have. The rights to have the lands, rights to move around, right to stay or choose the activities they want to do are important element in the valuation of the communities. One popular theory to explain the justice and rights is Robert Nozick's entitlement theory of justice. Under this theory, everyone has their own rights and there is no person or authorities that can restrain their rights.

Legal entitlement is important in valuation for compensation (Sen, 1988). For example, in the case of Bakun hydroelectric dam which resettles about 10,000 people from the home, the legal entitlement or rights to native customary lands is important. The communities use the lands to plant crops and do cultural activities to maintain the livelihoods of the families. Besides that, the native customary lands are important as a burial ground for the ancestors and communities feel free to move around and do anything on the lands. These lands are the rights of the communities. The resettlement processes due to the development projects would affect the welfare of the communities. The compensation shall reflect the valuation of legal entitlement or rights of communities. The communities shall not be deprived of the rights that they have on the resources, lands and environment.

The rights as being mentioned by Sen (1999) in his book *Development of Freedom* also includes political and civil rights. The example of political and civil rights is liberty to participate in public discussion as mentioned by Sen (1999). This is important because communities need to have a say in the resettlement processes. The communities should be given the rights to participate in any activities of resettlement. The communities should have political and civil rights to voice out their views. Their views need to be taken into account in doing valuation for compensation. In many cases of resettlement around the world, the communities roles of political and civil rights have been ignored by the state authorities in doing valuation for compensation. When there is development that induce displacement of the communities, human rights of communities should be prioritized in doing valuation for compensation by the state authorities so that this would not cause social deprivation, poverty and inequality among the communities.

Beside, another aspect viewed by Sen as entitlement is the food security. The food security may loss and become insecure after being resettled. The communities may have access and entitled to resources around them such as river, land, trees and gardens before resettlement. The communities can move freely to use these resources to produce food. However, these resources may be gone if they are resettled and compensated with a new environment with infertile land, no trees to plant fruits and others. This leads to the welfare loss in communities and become valuation problem for compensation.

#### **2.4.4 Social Exclusion**

Sen (2000) mentioned about the concept of social exclusion. Resettlement due to big development project often causes social exclusion. The logics behind it is that when communities are resettled in a new area, the skills they possess such as hunting for animals and collecting fruits in jungle to maintain livelihood will loss. This often results in social exclusion in job markets. This means that the communities will be unemployed in the new environment because their skills they possessed before this cannot be used in new environment. Thus, this unemployment will cause poverty, loss of freedom, psychological harm and misery (Sen, 2000). This social exclusion is also related to Sen's capabilities approach. Social exclusion can reduce welfare of the people and must be accounted for when state authorities are doing compensation valuation.

#### **2.4.5 Justice (John Rawl's Theory of Justice)**

John Rawl's stated justice shall be included as the basis for giving compensation and not just utility alone in his Theory of Justice in year 1971. Rawl (1971) pointed out that "Goods are welfaristically understood as happiness, pleasure or preference and utility (happiness and pleasure) are too subjective for giving compensation at the bar of justice". In doing valuation for compensation, the state authorities shall consider the element of justice and not just utility in terms of income. This would affect the life prospects of the communities and people if it is unjust in the compensation valuation. Every person shall have the rights and justice. In most cases of development that induce displacement in Asia countries, every society of subgroups are not taken into consideration in compensation process. Social justice

and liberties are often left out. This leads to unjust and unsatisfactory among the communities.

In Rawls (1971) Theory of Justice, social goods are defined as rights and liberties, income and wealth, opportunities and power and social bases of self-respect. In the case of compensation, the state authorities must make sure that every person in the communities shall possess the rights to think and participate in any decision-making process involving valuation of compensation. Beside, the communities shall be given chance to work and have proper occupation and free to move around the environment and own the resources. Self-respect is also important in which the communities realize that they are in their highest-order interests and have self-confidence in whatever they do and not just giving compensations according to market-value of tangible goods and focusing on the basis of utility of tangible goods in dealing with valuation of compensation. The broad definitions of social goods in the presence of justice are much more important in valuation of compensation.

#### **2.4.6 Synthesis of the Theories of Compensation**

The valuation of welfare by communities may include the elements of rights, justice, entitlement and freedom. Welfare can be seen as more comprehensive meanings. It is not just the concept of utility what is used mostly by traditional welfare theory. It has a broader range of meanings which include the elements of justice, rights and entitlement. If this welfare compensation does not include these elements, then the communities' welfare will be reduced. This may bring in negative consequences to the country and an example is provided in the next paragraph to discuss the issue of loss of rights and its consequences.

A good example of loss of rights is found in the Sardar Sarovar dam project in India. This project showed conflicts of interest between the local communities and the government which resulted in the funds for constructing the large dam development project being halted. This article is highlighted in Dwivedi (1999). The reasons of conflicts are the displacement costs being neglected in the project appraisals for doing valuation and giving compensation. Beck (1992) highlighted that the cultural norms and the legal frameworks are important components in the valuation of compensation by the communities. This cultural norms and legal framework are often neglected by the state authorities in giving compensation. The rights to land, properties, schools, education have been left out and ignored by state authorities. State authorities do not compensate the local communities enough. This induces and creates conflicts of interests.

The resettlement case especially, the state authorities are not allowed to take away the communities' rights of having lands, rights to move around and right to stay choose the activities they want to do. If the state has taken their rights away by forcing the communities to leave the place and move to a new place, then the compensation must account for the rights and freedom the communities have.

## **2.5 Early Studies of Resettlement Impact**

The literature of resettlement issue can be traced back to late 1960's on Chambers (1969) work. Chambers (1969) identified a three stages model in the evolution of land settlement schemes in Africa. Chambers (1969) focused on the voluntary settlement and did not touch on involuntary resettlement. He studied the land settlement scheme in Africa. The purpose of the settlement was to tackle the

erosion and over-population of refugees that occurred by bringing the unoccupied land into cultivation for agriculture. Before the resettlement for the purpose of irrigation in Lower Tana Basin in Kenya, the people were promised by the government that they would have 250,000 acres under crops and substantial population. Thus, the people agreed to move and this is termed as voluntary settlement. However, the benefits of the settlement project in terms of population absorption are subjected to many imponderable. For example, the economic returns of the settlers are hard to predict, subject as they are water supplies (with irrigation), crop varieties, mixes, pests and managerial policies, fiscal policies and marketing arrangements.

Later, Nelson (1973) confirmed the pattern in a synthesis of many experiences with new land settlements in Latin America. He also used the 3 stages general model of evolution and his work also focused on voluntary settlement. His study dealt with the exploits of forest covered with land in humid, tropical forests in Latin America but not in the case of development of hydroelectric dam project. This study led to exposition of benefit and cost analysis and its application to development project.

A more advance model was then postulated in the 1980's by Scudder and Colson (1982) diachronic framework. Scudder and Colson (1982) extended the model to 4 stages to explain the evolution of land settlement scheme in voluntary settlement. The 4 stages were recruitment stage, transition stage, development stage and incorporation or handing over stage to show how the majority of the resettlers can expect to behave during a successful resettlement process. The process started with the first stage which was recruitment stage is deal with who is going to be resettled,

planning with their removal, rehabilitation and development. The second stage which is transition stage that is the behavior of majority tends to be risk averse and living standards can expect to drop. The third stage is the stage where it deals with the process of community and economic development, during which risk-taking occur and many resettlers are able to enjoy improvement in standards of livings. This confirmed that there is a possibility for successful resettlement process. The fourth stage is handing over and incorporation occurs. The handing over of institutional responsibility and assets to the resettlers will take place here. Scudder and Colson (1982) work was on voluntary resettlement process at first. Later, they felt involuntary resettlement process is also an important element. However, their work on involuntary resettlement is not comprehensive to the extent that they focused only to those involuntary relocations that succeed and move through all the 4 stages.

None of these models incorporate the issue of impoverishment and also these models could not predict the cumulative impacts of displacement which had been debated heavily by Brenchin, West and associates (1991). Thus, studies on improved models were carried. Finally, a better model known as the impoverishment risk and reconstruction model was formulated by Cernea (1997). Cernea formulated the model in a series of studies (Cernea 1990, 1995, 1996, 1998 & 1999). This model was more comprehensive and able to capture the involuntary resettlement impact which will be discussed further. Many studies of involuntary resettlement of hydroelectric dam project development used the Involuntary Risk and Reconstruction (IRR) model to identify the socioeconomic impacts on resettlements caused by hydroelectric dam project. This IRR model provides a basis for valuation and ensures that adequate compensation to be given to the settlers.

## **2.6 Theory of Risk and Reconstruction (Theory of Resettlement Impacts)**

The first piece of work that developed a theoretical framework for explaining the risks of resettlement was that by Cernea (1997). He used an impoverishment risks and livelihood reconstruction framework to explain the risks of displaced indigenous people as a result of hydroelectric dam project. He argued that displacement or resettlement due to big hydroelectric dam project would lead to loss of land, loss of job, loss of housing, marginalized, increase death and diseases, insecure in food, loss of access to resources and loss of social network. The theoretical framework for this study adapts the Cernea's (1997) risk and reconstruction theory to explain the socioeconomic impacts or consequences of the hydroelectric dam project on the displacement of people.

There are eight displacement risks in the risks and reconstruction model by Cernea (1997). The risk and reconstruction model is used by project planners as a tool to anticipate and beware of the common displacement risks and also bring back the life of displacement after relocation. As the hydroelectric project will usually lead to displacement of the residents around the area, there is a certain economic risks of relocation. Many of the literatures will use the risks and reconstruction model by Cernea (1997). The theory was based eight aspects of risks as a result of displacements.

- (1) Landlessness
- (2) Joblessness
- (3) Homelessness
- (4) Marginalization

- (5) Increased morbidity and mortality
- (6) Food insecurity
- (7) Loss of access to common property resources
- (8) Social disarticulation

These eight variables are the social, culture and economic impacts brought by the resettlement of the indigenous communities. It has become the basis of identifying the impacts in many literatures that studied the social and economic impacts brought by the resettlement. These variables can be useful to construct the compensation value in conceptual framework. The definition and concepts of every variable are being discussed below.

### **2.6.1 Landlessness**

To build the hydroelectric dam, lands from the indigenous people in the area are required. This would lead to removal of land or expropriation of the land owned by the indigenous people for development. The displaced indigenous communities would lose both natural and man-made capital as the land is used by the communities for productive systems, commercial activities and livelihoods.

The land is a natural resources and use for generating income and employment for the indigenous people. The indigenous people may use the land for plantation and cultivation of crops.

### **2.6.2 Joblessness**

Job may be defined as the employment either in urban or rural. The people may be employed in enterprises, services or agriculture sector.

The displaced people as a result of hydroelectric dam project will lose their job. Those previously employed may lose employment in three ways. Workers will lose job in urban areas. Besides that, the labourers that work in rural areas may lose access to work on the land owned by the others and lose the use of assets under property regimes. It is hard especially for the rural indigenous people to find work in urban areas. Loss of jobs will lead to lose of wages from employment.

### **2.6.3 Homelessness**

Displacement of the residents due to hydroelectric dam project may lead to the loss of shelters for those resettlers. Things become worsen when the family's individual home will result in alienation and deprived of the status. Government who wants to build the hydroelectric dam project initiate the compulsory villagization schemes, the people may be forced to resettle in other places and experience homelessness. (De Wet, 1995)

### **2.6.4 Marginalization**

Marginalization happens where families lose the economic power and the spiral on “downward mobility” path. This happens especially to middle income family or households who suffer from downsize of their businesses or slip below the

poverty threshold. However, the middle income family does not suffer from landlessness. The resettled people cannot adapt to the new environment and they cannot use the skills that they had acquired earlier. Their human capital skills to generate productivity become inactive or obsolete because they are treated as “strangers”. Thus, the resettled people loss confidence in the society and their social status will drop. This is known as economic marginalization. Economic marginalization is often accompanied by the social and psychological marginalization.

#### **2.6.5 Food Insecurity**

There is a relationship between the development of the hydroelectric dam and food insecurity. When development of hydroelectric dam takes place, it will lead to inadequate resettlements. When this happens, the availability of food crops will fall. The resettled people will not get enough food to eat and suffers from hunger and undernourishments.

#### **2.6.6 Increase in Morbidity and Mortality**

Massive displacement can reduce the health levels among big displaced population. The population may suffer from social stress and psychological trauma. They may even suffer from diseases due to the unsafe water supply and sewerage systems. This happen especially to the small children and elder people.

### **2.6.7 Loss of Access to Common Property**

The displaced communities will suffer the loss of access to common property. The common property assets are lands, pastures, water bodies, burial grounds, quarries and others. When displaced communities lose the access to common property, they will suffer from deterioration of income and livelihood levels. However, the loss of access to common property will be compensated by the government through public services.

### **2.6.8 Social Disarticulation**

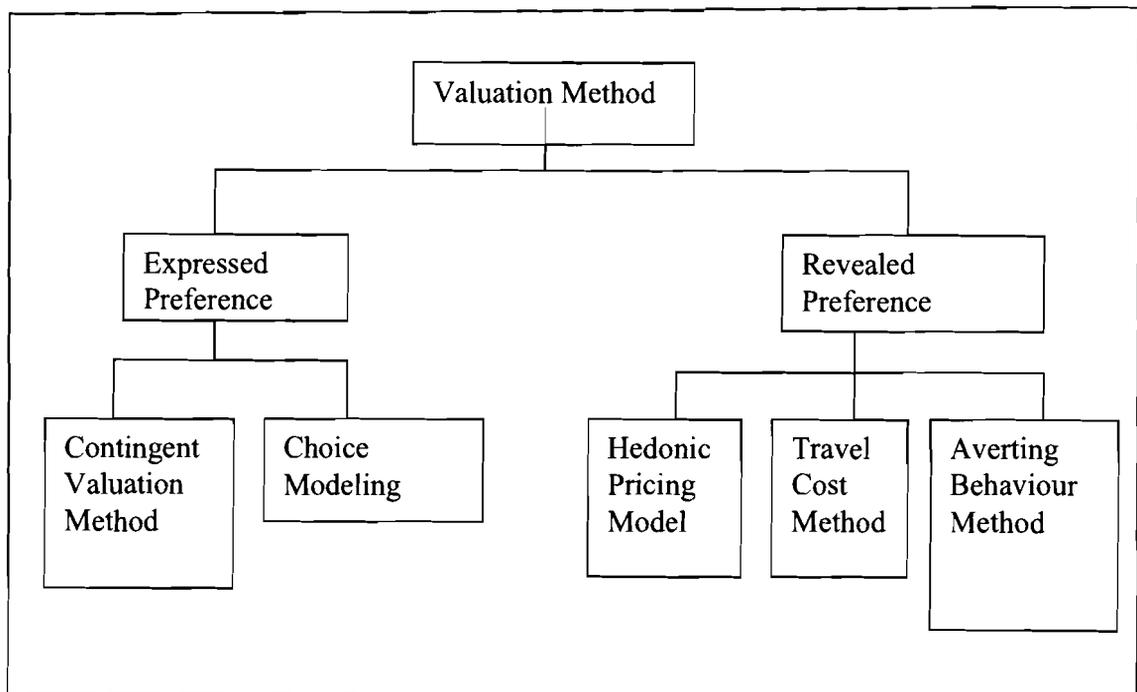
The hydroelectric dam project will lead to dismantle of the social organization and interpersonal ties. The loss of valuable “social capital” comprises of physical capital, natural capital and human capital. This is a serious problem and has long term consequences and is hard to be compensated.

The strength of this risk and reconstruction model is that it outlines several major adverse effects of displacement reflecting the fact that displaced people lose natural capital, man-made capital, human capital and social capital (Cernea 1995: 201). The risk and reconstruction model by Cernea (1990) is promoted to project planner as a tool to anticipate and preempt common displacement risks, and restore the life of the displaced after relocation. The people who are negatively affected should be properly compensated (Cernea, 1991).

In summary, the five theories namely utility theory, Kaldor-Hicks compensation theory, Sen's Freedom and Capabilities Theory, Rawls's Theory of Justice and Cernea's Impoverished Risk and Reconstruction Theory are related to the compensation amount and changes in welfare of the communities in this study. The Impoverished Risk and Reconstruction Theory by Cernea suggests the determinants in affecting welfare loss are landless, homeless, social disarticulation, loss of access to common property. These determinants in affecting welfare of the communities are used in the conceptual model of this study.

## **2.7 Theoretical Model of Valuation Methods**

The previous theories has showed the suggested the impacts of resettlements that affect the welfare of indigenous communities in this study. However, the valuation of displacement cost in the resettlement and compensation study is not explored in the previous theories. This section shows the theoretical model of valuation methods used in measuring use values and non-use values.



Source: Garrod & Willis, 1999

Figure 2.3

*Valuation Methods for Measuring Use Values and Non-Use Values*

Figure 2.3 shows that there are two types of valuation methods. One is called the expressed preference method and the other one is called the revealed preference method. The expressed preference method is divided into two namely the contingent valuation method and choice modeling whereas the revealed preference method is divided into three categories that are hedonic pricing model, travel cost method and averting behavior method. All these valuation methods are based on the demand curve.

### 2.7.1 Theory of Revealed Preference

Revealed preference theory is based on demand of goods. This theory of individual choice is arrived from Samuelson (1938) idea of deducing properties of demand from simple and direct axiom of behavior. Revealed preference technique is

one type of the demand curve approaches. The concept of revealed preference method is by examining the purchase of related goods in the private market (Garrod and Willis, 1999) It is widely use to value environmental goods.

### **2.7.2 Three Methods of Revealed Preference**

The first method is hedonic pricing model. Hedonic pricing model derives from consumer theory (Lancaster, 1966). It relies on the proposition that the utility of the individual to consume a good depends on the attributes of the goods. It is widely used in housing. It applies the concept of willingness to pay to express the level of utility the consumer place on the goods.

The second method is the travel cost method. This method uses the cost of travel to a non-price recreational site to measure the benefits obtain of going to the site. The benefits of going to the site are expressed by asking the number of times visit to the site.

The third method is averting behaviour method. Averting behavior method tries to deduce a monetary value for an environmental externality by observing preparation of the people to incur the costs to avoid negative effects. For example, by moving to an area with less air pollution at a greater distance from their place of work thus incurring additional transportation costs in terms of time and money (Garrod and Willis, 1999).

### **2.7.3 Theory of Expressed Preference**

This techniques is also used to derive a demand curve that is based on the concept to avoid to find the complementary good (travel or housing), or a substitute good (compensating wages). It is often used to value non-market goods. The idea is to estimate the implicit value of the consumers place on non-market goods (Garrod and Willis, 1999). There are basically two types of expressed preference methods for valuation. The first type is contingent valuation method and the second type is the choice modeling or choice experiment method.

### **2.7.4 Theory of Contingent Valuation**

The theoretical underpinning of the contingent valuation methods is the consumer behavior theory. The basis of truth of consumer behavior theory is the rationality of consumer. Consumer is assumed to maximize the utility (satisfaction) from the consumption of alternative of goods that he or she is aware of. Consumer must be capable of evaluating the possible alternatives of goods.

Contingent valuation method is a tool that can be used to state the non-market value by using hypothetical situation (Garrod and Willis, 1999). “For example, the contingent valuation method can be used to estimate the non-use values of the public goods such as wilderness and landscape preservation, biodiversity, preserving historical artifacts, monuments and the characters of old towns and villages” (Garrod and Willis, 1999). This is the advantage of using contingent valuation.

Contingent valuation survey can be used to measure both “willingness-to pay” and “willingness-to-accept”. The controversial issue in doing contingent valuation survey is whether to use “willingness-to-pay” or “willingness-to-accept”. To answer this question, it depends on which the Hicksian consumer surplus that measures what the researcher that wants to get (Mitchell and Carson, 1990). The property rights framework can be used to determine the choices between WTA and WTP. This is discussed in the next paragraph.

### **Property Rights Framework**

Property rights framework is very important in explaining the way to choose either WTA or WTP. If the individual owns the property rights, the willingness to accept (WTA) is suitable because it signifies the minimum amount of compensation the individual is willing to accept to forgone the goods and restore the original utility before the good is being deprived of. In contrast, willingness to pay (WTP) is used if the individual does not own the property rights. This is because this implies that the individual is willing to pay to obtain the rights of owning the good.

It should be similar between WTP and WTA in magnitude for most of the goods which are the close substitutes. However, there are differences in WTP and WTA.

### **Reasons of Disparities Between WTA and WTP**

However, there are a few studies which found out that the willingness-to-accept (WTA) is larger than the willingness-to-pay (WTP). For instance, see Hoehn

and Randall (1983, 1985 and 1987), Cummings, Brookshire and Schulze (1986), Gregory and Bishop (1986). The few explanations or reasons are:

(1) WTA measures might be faulty.

WTA is based on ownership of the rights of the goods. Normally, values will be sold higher if the person holds the rights of the good. Thus, the value of WTA is higher than WTP.

(2) Respondents might behave strategically

Respondent might not have motivational incentive to request or demand of the minimum compensation of the loss of good and the answers given might not be truth and large. However, the consumers would think rationally before formulating WTP bids because they have to consider the income constraint and budget constraint.

(3) Rejection of the WTA Property right

People might give high WTA values because they want to get high compensation of rejecting the property rights implied by the willingness-to-accept format.

(4) The cautious consumer hypothesis

The conditions of willingness to accept are certainty, risk neutrality. Therefore, the amount of compensation to accept is high. In contrast, the value to pay is low because the condition of consumer is uncertain about to pay more and risk-averse. (Hoehn & Randall, 1983, 1985, 1987).

### (5) Prospect theory

The prospect theory (Kahneman and Tversky, 1979) explains the hypothesis of willingness to accept is more than willingness to pay. It predicts that higher value of compensation is demanded (Gregory, 1986) because the value function is steeper for the loss of assets than for the gains. If the person loss the asset, he or she will demand more compensation compare with the person pay to gain the access of asset.

### **Steps of Doing Contingent Valuation**

According to Hanley and Spash (1993), there are a few stages to set up the contingent valuation study.

1. The first step is to set the hypothetical market.
2. The second step is to make sure respondents present a believable bid vehicle
3. The third stage is to obtain the WTP or WTA amount
4. The fourth stage is to estimate the mean and median WTP
5. The fifth stage is to aggregate the WTP or WTA amount.
6. The sixth stage is to assess the validity of the Contingent Valuation exercise

### **2.7.5 Discrete Choice Experiment**

Another method in the expressed preference method is the discrete choice experiment. In discrete choice experiment, individuals need to make decision involving trade-offs between the sum of money and the changes of the environment (Garrod & Willis, 1999). Respondents usually need to rank or choose a number of alternative options that is distinguished by the level of various attributes of the goods.

These choices from the individuals are used to construct and compute the willingness to pay for the changes in the quality of goods. The example is it can be used to evaluate the changes of the environment.

### **2.7.6 Conclusion of the Methods of Valuation**

The above discussion of the theory and the explanations of the use of the different valuation methods are important. The review of the valuation methods can help to understand the current methods of valuation available.

However, this study is designed to construct the compensation amount which is agreeable by indigenous communities based on the use values and non-use values among the indigenous people. The stated preference methods such as contingent valuation method and discrete choice experiment cannot be used in this study because this study has no hypothetical situation. The indigenous communities had been resettled to a new place and it is a real situation. This is against the assumption of stated preference methods which is the situation is hypothetical.

The revealed preference methods of travel cost method and hedonic pricing model also are not relevant to be used in this study. Travel cost method is more relevant in recreational economics which use the travel cost to construct the consumer surplus and demand curve. This study does not relate to recreational economics and does not need travel cost to construct consumer surplus and demand curve. The hedonic pricing model is also not suitable because it is used when the price of the house is known. In this case, the compensation value is our focus.

## **2.8 Assessment of People's Perception of Value on Displacement (Empirical Studies)**

There were studies (Olawepo and Lawal, 2010; Hwang, Cao and Xi, 2010) that adopted the Impoverishment Risk and Reconstruction (IRR) model as a guideline to identify the socioeconomic impacts faced by the displaced communities. This provides a basis for the giving compensation to the displaced communities. Different analysis was conducted by different studies. The studies can be grouped into African countries, Asia countries and the results of the studies are being discussed below.

### **2.8.1 Africa**

The study of Olawepo and Lawal (2010) examined the spatial patterns of socio-economic and rural change in post resettlement of the people in Jebba Dam in Nigeria. The aim of the resettlement project as valued is to bring social infrastructures development to improve standards of livings. They identified twenty-two variables to measure the rural and socio-economic changes with strict association of resettlement schemes. They used random sampling technique method in data collection process in which about 30 % of heads household involve in the resettlement scheme among the total 2245 household heads. Questionnaires were distributed to the 679 heads of households to value the people's perception of the project. This involves visit to the affected villages for a period of 4 months. Besides that, the secondary source of published information on Jebba resettlement issues was utilized. Simple tabulation, cross tabulation and factor analysis were used to explain the findings and the pattern differentiation of rural and socio-economic change on the landscape. The results showed that there were disparities of impacts of the resettled people in their new locations because some have advantages in accessibility of public

goods and services based on their new locations such as improvement opportunities in fishing and employment access roads while others are relatively disadvantaged. It suggested that the government should maintain the welfare provision through local governments to make sure that the relocated people enjoy sustainable development in the process of building hydroelectric dam project.

Another study of resettlement in African nation is by Agba, Akpanudoedehe and Ushie (2010). Agba, Akpanudoedehe and Ushie (2010) examined the socio-economic and cultural impact of resettlement on the economic activities of Bakassi people which are fishing, farming and trading across the Cross River State in Nigeria. The socio-economic variables included the occupation, accommodation and social networking activities and the cultural variable was cultural practices of the Bakassi people. The data was collected using the technique of purposive sampling and questionnaires. The target population is 516 respondents purposively selected from 172 houses from the affected people in Bakassi resettlement site in Ekpri Ikang and was distributed with questionnaires to value the perception of the indigenous population. The methods of analyzing the data were Pearson Product Moment Correlation to test the correlation between resettlement and occupation, accommodation and cultural practices. The results showed that the dislocated indigenous population could not carry out their occupation and this led to farming systems destroyed. Besides that, the indigenous population did not have accommodation, affected settlement layout and social networking among families were scattered as a result of the resettlement. These are the negative socioeconomic impact as a result of resettlement from hydroelectric project. On the culture side, the relocated population could not carry out their traditional worship practice. These

negative impacts became a problem to the relocated population. Thus, there is a need to find a solution to the problem. Recommendations had been made by Agba, Akpanudoedehe and Ushie (2010). They recommended that adequate accommodation should be provided for the Bakassi people, adequate compensation should be given to the affected persons (AP), basic social infrastructures such as markets, water, electricities should be provided to the resettled population, skills should be given to train the resettled people of which their occupations were disrupted. Finally, the affected people should participate in the resettlement programme decision-making process. This can contribute to the policy making to improve the standards of livings and the socioeconomic improvements as well as cultural improvements.

### **2.8.2 Asia**

Another study related to the impact of involuntary migration in Three Gorges Dam in China also has been done by Hwang, Cao and Xi (2010). In China, there is problem about the dam causing landslides along the river's bank and increase pollution in its tributaries. Resettlement seems to be a must in order to prevent landslides along the river's banks and increased pollution its tributaries and newly formed reservoir. So, this study forms a basis point of answering the questions about how the huge hydroelectric project that might affect the lives of the displacement of more than 1 million Chinese that are forced to relocate. Hwang, Cao and Xi (2010) intend to extend the scope of study by examining impact of involuntary migration in the Three Gorges Dam both pre- and post-migration as many of the research done before focus on pre-migration surveys and were considerably smaller. They focused on social, economic and mental and physical health impact based on six out of the

eight displacement risk model included in Cernea's (1997) risk and reconstruction model. Hwang, Cao and Xi (2010) measured and valued the impacts of involuntary migration on the people by using prospective panel study involving two waves of interviews spaced 3 years apart and employed the quasi-experimental design (Campbell & Stanley, 1966) to measure impact of the TGP on the involuntary migrants. This pre and post approach used in this study to measure the project-induced displacement impact can be very accurate as compare to retrospective measure. Retrospective measures are often inaccurate not only because they depend on recalls, but also because those recalls are often contaminated by ex post-facto justifications (Campbell and Stanley, 1966). To measure and value the economic impacts, 12 economic indicators are identified such as measures of income, employment, debts, possession of household appliances that reflect high standard of livings, housing condition. To measure the social wellbeing impacts, the social index of Lin et al. (1999) perceived routine social support scale and several items was employed. Hwang, Cao and Xi (2010) employed the data collection technique consists of two parts. Demographic details of the sample households are also included. The first part is the pre-migration survey sample conducted in late 2002 and early 2003 which consists of 975 designated migrants and 555 non-migrants that are recruited from five communities randomly selected from the Wanxian Relocation and Development Region (WRDR). The second part is post-migration survey conducted in early 2006 which consists of 350 non-migrants, 286 designated migrants who had not yet moved at the time of second survey, 420 designated migrants who had moved. The results showed that the measurable impacts of the Three Gorges Dam were negative such as the displaced have experienced decline in income and increase in debt. These negative impacts on displaced people are important aspect in policy-

making which it sharpens the awareness of unintended consequences of well-reasoned human projects and weaken justifications for future projects. As a whole, this study of Three Gorges Dam is very useful because it focus on socioeconomic impact caused by resettlement which is very similar to our study. The results of Three Gorges Dam by Hwang, Cao and Xi (2010) showed that the displaced only enjoyed relative gain in housing quality but suffered in increase in debt and decline in income, less accessible to essentials such as schooling, visiting with relatives and shopping, deterioration in social support and rapport with neighbours.

The Three Gorges Dam in China not only can affect the relocated people in terms of economic and social but also in terms of depression. This was documented by the study of Xi and Hwang (2011). Xi and Hwang (2011) identify the problem of depression among the relocated people caused by the Three Gorges Hydroelectric Dam. Xi and Hwang (2011) examine the association between problem of depression and the relocated people caused by Three Gorges Dam. The method of analysis is sensitivity analysis by regressing a dummy variable, indicating whether a respondent captured in wave 1 was missed in wave 2, on five social demographic variables (gender, age, urban/rural residence, education and household income) measured at time 1 using the logistic model. The data collection method is using panel study involving a pre-migration and post-migration survey which is spaced 3 years apart. The data collection technique consists of two parts. The first part is the pre-migration survey sample conducted in late 2002 and early 2003 which consists of 975 designated migrants and 555 non-migrants that are recruited from five communities randomly selected from the Wanxian Relocation and Development Region (WRDR). The second part is post-migration survey conducted in early 2006 which consists of

350 non-migrants, 286 designated migrants who had not yet moved at the time of second survey, 420 designated migrants who had moved. Control variable is needed in this study because there are other factors which might affect depression problem. The findings of the study shows that undeliverable promises caused by the Three Gorges Hydroelectric Dam project can backfire and further aggravate the harm inflicted on the displaced that is increase in proportion of depression. It is suggested a sound coping strategy is needed to minimize the harm caused by the displacement on the mental being and informing the resettlers of the negative outcomes associated with the project (Cernea, 1997).

A related study of Vietnam by Cao Thi (2003) also found that there are negative impacts of in the displaced local community and the environment. The built of dam could result in resettlement of thousands of people and change their lifestyle including the risks on the resettled people. Cao Thi (2003) examined the social impacts from hydroelectric dam development and resettlement related aspects of how to stabilize the life of people affected by the dam project in Vietnam. The case study analysis was employed. Systematic analysis and comparison of the key aspects in resettlement process was used. The data was collected through documentation and interview. The cases of hydropower dam are Hoa Binh hydropower project and Yali hydropower project. The two projects in different periods in Vietnam were analyzed in order to provide useful lessons regarding the overall resettlement history in Vietnam. The results showed that there are positive impacts and negative impacts found in resettlement of Hoa Binh dam. The positive impacts are the reservoir can provide new navigational transport medium and constituted potential resources for fishing and tourism, new occupation for people, increase supplementary source of

income from fishing, The negative impacts suffered by the displaced people for the first 10 year period due to construction of Hoa Binh dam were most household lack of food 3-6 months/year, reduction of income, high rate of children drop out of school, poor healthcare condition, heavy deforestation for cultivation, low rate of clean water access, most household lack of cultivated land, irrigation, high rate of household in poverty. However the next 10-year period which starts from 1992-2002, the condition was improving. The government decided to reduce poverty and improve the standards of livings among the resettled people. Budget was invested to improve agricultural production, forestation and basic infrastructures. In Yali hydropower project, the resettlement had brought improvement in the standards of livings of the displaced people because of careful consideration. The benefits brought by the resettlement were improvement in infrastructure, improvement in accommodation. However, there were still problems such as reduction of food and reduction of income as a result of resettlement. In conclusion, it is suggested that high-level policies should be revised towards sustainability and implementation of hydroelectric dam project should follow strict procedure and full participation of the both affected and the host people. Beside that, social cost, environmental cost and resettlement should be taken into account to ensure sustainable economic development. Aspects like compensation, stability of people and land issues should be considered and solved in related to resettlement.

Souksavath and Nakayama (2013) also documented the resettlers faced occupation changes, increase in average family income, limited land for rice cultivation, number of livestock has decreased due to limited land, sufficient irrigation water, average fisheries yield increases significantly, improved education

facilities and better public health facilities in Laos' Nam Theun 2 hydropower project. However, dissatisfaction comes from insufficient land compensated to the resettlers for rice cultivation. They also felt difficulties in maintaining good culture and traditional relationships living with new settlers because of limited land. Household interviews from 17 villages were conducted from 15 to 25 December 2010. The livelihoods of the resettlers cannot be sustained as a result of insufficient land resources given. This shows land is important for the economic livelihood of the resettlers that depends on agriculture for subsistence living. Overall, the settlers feel satisfied because the public infrastructures had improved.

There are mixtures of satisfaction level faced by the settlers that relocated as a result of Kotmale Dam in Sri Lanka. Manatunge and Takesada (2013) interviewed 437 households at the resettlement site and found out that settlers relocated by Kotmale Dam expressed satisfaction with the increase and stable income level because of having access to land titles. Harsh climate conditions and conflicts between human and wildlife after being resettled resulted in dissatisfaction with the resettlement place. From this study, it is observed that compensation in legal land title and adequate job opportunities are extremely important for rebuilding community livelihood and reduce dissatisfaction with compensation. A longer-term benefits generated by the compensation can offset the short-term loss of settlers and increase satisfaction with compensation. Benefits like good public infrastructures including good irrigation water, accessible to school and health facilities, off-farm income sources and institutional support can contribute to the satisfaction of the settlers.

In the case of Indonesia, the largest country in Southeast Asia, Karimi and Taifur (2013) assessed the present living conditions of the settlers using comparison of the best-performing village and worst-performing village at Kota Panjang Resettlement Village. The settlers were relocated as a result of Kota Panjang dam construction. The interview sessions with 50 household from each of the two villages were conducted in December 2010. Land ownership, new home, cash compensation, good location, education for children, good public infrastructure (electricity, clean water supply and health service contribute to the success of resettlement and increase the satisfaction of settlers.

Another examination of the long-term effects of dam construction on settlers in Indonesia, the case of the Saguling Dam studied by Sunardi, Gunawan, Manatunge and Pratiwi (2013) revealed that inequality in employment opportunities and occupation level changes and loss of job lead to dissatisfaction. Besides that, many settlers do not have equal access to public facilities such as community halls, common toilets and football fields which leads to welfare losses and socio-economic change. Many settlers expressed a preference to live near to the vicinity of the dam to prevent culture losses and to continue the practice of their customs. This showed the settlers have strong attachment to the environment, nature and land. It is also found out that good education facilities for children, close social ties with relatives are the key to success for resettlement project.

Another study of dam case in Indonesia, the Bili-Bili dam was carried out by Yoshida, Agnes, Solle and Jayadi (2013) to assess the effect of Bili-Bili dam on the living conditions of the affected communities. They interviewed 53 returnees from

Manuju settlement and 48 returnees from Luwu settlement. The returnees are those who returned to the vicinity of the dam reservoir. The results supported the notion that the settlers have strong attachment to their environment, nature and land. They found out that the 101 settlers would return to their original home vicinity of the dam and used the cash compensation obtained during participation in Transmigration Programme (TP) to buy the land near to their original home. However, the resettlement cases are quite successful because 70% are satisfied with the compensation given to live the life they want including the freedom to move back to their own original home (freedom to live), improved living conditions and improved infrastructure.

There is also some problem faced in compensation and resettlement in developed country like Japan. Matsumoto, Mizuno and Onagi (2013) pointed out that the settlers in Kusaki Dam and Sameura Dam in Japan felt that livelihood rehabilitation programme had not been fully implemented. Thus, adequate compensations like rehabilitation of livelihood, house and bridge construction are needed to be given to compensate negative physical impacts. The negative physical impacts would lead to dissatisfaction with the compensation project and resettlement project. Lesson learnt is the negotiation processes of flexible financial and non-financial compensation that involved all stakeholders (include developers and active participation of settlers) are crucial to the success of community livelihood sustainability and bond rebuilding. A certain redevelopment plan for public compensation and allowance for public negotiation are needed in the planning process of compensation and resettlement for future policy. Public investments in infrastructure, policy consideration for long-term effects of individual such as

geographical environment and strong economic foundation can reduce dissatisfaction of settlers.

The studies above show the assessment of peoples' perception of value on displacement. Many previous studies also show the assessment of socioeconomic impacts of resettlement by indigenous communities. However, they did not value the loss in satisfaction of the settlers. In most of the studies reviewed above, the authors describe the issues related to resettlement dissatisfaction by the settlers but they did not suggest a compensation method to value the loss as a basis for solving the problem. There is thus a significant gap in the research in this area of compensation for settlers forced to relocate as a result of development projects such as dams.

## **2.9 Valuation in Other Sectors**

Resettlement can affect the communities in terms of social and cultural impacts. However, these social and cultural values which are classified as non-market values are hard to measure and often being ignored in the valuation process for compensation. In this section, valuation methods used around the world to value the non-market values in other sectors are examined. There was alternate valuation methods used to estimate non-market values in other sectors such as health service, nursing and environmental services around the world. In common, it was divided into two methods that were stated preference methods and revealed preference methods. Stated preference methods were like contingent valuation method, discrete choice experiment approach whereas revealed preference methods were like travel cost method and hedonic pricing model.

### **2.9.1 Contingent Valuation Method**

Contingent valuation method was used to estimate the values of different services. It has been mostly used to elicit people's willingness to pay (WTP) for changes in non-market goods and establish the benefits. Below were some of the studies done throughout the world.

In the case of health sector, Borghi and Jan (2008) used the willingness-to-pay in contingent valuation method to measure the value of broader benefits of women's group programme to improve the maternal and newborn health in rural Nepal. The variables being valued by the women's group members, women's of non-group members and men were the health benefits and non-health benefits. The ordinary least squares model was used to estimate the willingness to pay among women's group members, female non-members and men. The results showed that individuals were willing to pay for non-health benefits and there were difference between valuation by women's group members and women's non-group members. This empirical example showed that the difference in valuation among women belonging to groups and non-groups. This is due to group members have more information and knowledge after undergone health program and have time to do think and do preferences whereas non-group women values reflect moral satisfaction rather than actual value of good. This implies that additional information of a program can help changing the value. The results also showed that values of men were higher than women due to higher income than woman. This implies that income may affect the valuation results.

In the case of environmental goods, Howley, Hynes and O'Donoghyne (2010) explored the individual preferences by using willingness to pay to value environmental goods. The estimation of valuation of benefits was divided into two groups namely personal benefits and group benefits. The estimation was based on WTP is the function of income, education, environmental attributes, environmental importance for society, living in the countryside and siblings in the farming. The results showed that income and education has significant and positive effect on willingness to pay for the conservation of traditional rural landscape. Individuals who have siblings are likely to pay more to conserve the landscape. From this article, it showed that the valuation may differ among people in terms of income and education level.

Ojeda, Mayer and Solomon (2008) used the contingent valuation survey on 40 neighbourhoods to estimate the economic values of environmental services provided by the restored stream flows in the water-scarce Yaqui River Delta in Mexico. The surveying on customers regarding willingness-to-pay (WTP) on existing and potential environmental attributes in hypothetical and constructed market was constructed. Water bill was the payment vehicle. The variables were socio-demographic variables and attitudes regarding environment. The results from statistical test suggest that income and education, age, occupation, bid amount and information about environmental issue have significant influence on WTP. This shows that value is not a stable thing. The value can differ according to the income, education level, age group.

Afroz and Masud (2011) used the contingent valuation approach to estimate the willingness to pay of the household to improve waste collection system in Kuala Lumpur, Malaysia. The method used to examine the factors affecting willingness to pay was Binary Choice Modeling (Logit Model). The dependent variable was household willingness to pay for improved waste management and designed as dichotomous dummy whereas the independent variables were age, number of family members, education, income and conscious about solid waste. The results showed that age, income, education and concern about conscious about waste management have significant positive relationship with the willingness to pay. This reflects that age, income, education and conscious about solid waste can affect the valuation results.

Asafu-Adjaye and Tapsuwan (2008) used the Dichotomous Choice Contingent Valuation Method (DCCVM) or referendum questionnaire to elicit the respondents' willingness to pay in valuing the economic benefits of scuba diving. Logistic model was used to estimate the quantitative choice model. The dependent variable was willingness to pay the proposed fees whereas the independent variables were annual income of the individual diver after tax and expenses, bid offer and socio-economic characteristics (income, gender, age and level of education). The results showed that the socio-economic variables and income affect the values of estimated WTP.

Five of the contingent valuation method studies about valuation are in environmental and health and they stated that the socio-demographic variables such as differences in income, education level and age among different group of people may show different valuation results. This shows that these socio-demographic variables

are significant in affecting valuation results. There are some advantages and disadvantages of the contingent valuation methods. One of the disadvantages is that the respondents have misunderstood or did not know the meaning of the hypothetical questions (Shavell, 1993). Beside, the respondents were not able to estimate the hypothetical questions and these may result in wrong valuation. The advantages are contingent valuation is able to estimate the hypothetical questions with non-market or non-use value and it also is useful for public decision making.

### **2.9.2 Discrete Choice Experiment Approach**

McIntosh and Ryan (2002) used the discrete choice experiments method to derive the welfare estimates for the provision of elective surgery in health care sector from a random sample of 1000 adults living on the Isle of Wight. Compensation variation was estimated through marginal rate of substitution preference for the attributes like location, waiting time and costs among the adults randomly selected on Isle of Wight. The implications of adherence to continuity and transitivity were explored. The results showed that location, cost and waiting time can all negatively significant influence patients' preferences, hence utility. If the full model is used which is 'usable' and discontinuous preferences, location shows positive significant suggesting location with shorter waiting time at mainland is preferred.

Herbild, Bech and Gyrd-Hansen (2009) used the discrete choice experiment to estimate the willingness to pay (monetary use value) for pharmacogenetic testing in the treatment of depression in Denmark. The value of the good (in this case is the pharmacogenetic test) was determined by the magnitude of the health attributes.

Respondents were faced with hypothetical choices between treatment scenarios that differ in terms of specified field attributes and attribute levels. Respondents were forced to make trade-offs and the relative weighting of the attributes can become the basis of derivation of compensation variation measure that conforms with demand theory. Utility function is regressed against the price attribute, effect-attributes (number of changes in antidepressant and time with dosage adjustments, interaction between time attribute and probability and interaction between number of changes in antidepressant products and probability). The results showed that decreasing utility as price increase, utility associated with decreases in number of antidepressant changes or reduction in time with dosage adjustments. Using subgroup analyses, the results also showed that differences in preferences across income but no evidence of heterogeneity in preference structures because of personal experience of antidepressant medication, knowledge of disease, sex, age and education.

The advantage is estimation of the preferences and information that are difficult to reveal because of the behaviour of the actual choice is controlled in a certain way. It is the same with contingent valuation except it used the price variable to estimate the preferences of individual (willingness to pay). The disadvantage is that the discrete choice model's observed preference may not signify the actual behavior.

### **2.9.3 Travel Cost Method**

Rolfe and Prayaga (2007) estimated the values for recreational fishing benefits at freshwater dams in Queensland. They used the travel cost methods to estimate the

separate consumer surpluses associated with two key subgroups of recreational anglers namely frequent and occasional anglers. The dependent variable was the visit rates and the independent variables were, travel costs, trip costs, fishing costs, distance travelled, days spent fishing, length of holiday and number of people in groups. The results showed that recreational values vary between different groups of anglers across sites. Travel cost and income were significant in explaining visit rate whereas the other independent variables were not significant in explaining the visit rates.

Shuib (2011) used the travel cost method to derive the demand curve for outdoor recreational resources. In the derived demand curve, the value outdoor recreation activities can be estimated using the concept of consumer surplus. This value is important for allocating resources. The travel cost model account for the time travel, effect of income, effect of price related goods, quality of resources and the socio-demographic factors. The visitation rate per capita (dependent variable) is regressed against the monetary cost of travel, income of users, attractive index of other sites, gross family income of visitors and costs travel to other sites. The results showed that visitation rate per capita showed negative relationship with monetary cost of travel, attractive index of other sites and positive related with income of users, gross family income of visitors and cost travel to other sites. Consumer surplus for all visitors then can be obtained from demand function which is RM553.03 million. This consumer surplus (value) represents the economic benefits for the sites.

The travel cost method is one approach of the revealed preference. The advantage was that it clearly reflected the observed behavior of the consumers since

the consumers really used the products and invest time and money for the products. However, the disadvantage is that some values like non-market values were very hard to quantified using the travel cost method.

#### **2.9.4 Hedonic Pricing Model**

Bohlen and Lewis (2009) used hedonic property value to provide insight into how property owners value the Penobscot River and its associated facilities. Hedonic valuation method offer the way of measuring impacts of environmental attributes on property values. The variables were real property transaction, socio-economic characteristics and environmental amenities (open space) and environmental disamenities (air and water pollution, risks from superfund site). The results showed that structural characteristics of the houses such as additional room and age of house has significant effect on property values and there was significant positive relationship of distance between house and Penobscot River and property prices.

The advantage of hedonic pricing model is that it is low cost evaluation because there was already market price or value for the property and researcher does not need to prepare additional information to the respondents to reveal the preferences. The disadvantage is that there is limited information about the values that can be obtained because hedonic pricing model is part of revealed preference method which cannot reveal the non-use or non-market value. Besides that, the disadvantage of hedonic pricing model is that some variables like choice sets, attributes of options and individual characteristics cannot be controlled compare to contingent valuation

method which can control or design the choice sets, attributes of options and individual characteristics before asking the respondents.

### **2.9.5 Synthesis of the Methods of Valuation**

The above valuation methods were used in different sectors such as health, tourism and recreational activities and environment. The common valuation methods used in sectors are like, contingent valuation method used in health economics environment economics, transportation economics, the discrete choice experiment used in health economics, travel cost method used in recreational activities and tourism and hedonic pricing for valuing property sector. All these articles discuss on how to obtain the value which is very similar to this study which stresses on how to obtain value of indigenous communities regarding the hydroelectric project. However, some questions can arise as to whether similar methods that apply tourism, recreational activities and environment can also be applied to the context of obtaining value for the hydroelectric projects. What methods are more appropriate in the case of valuation of the compensation to settlers due to the big hydroelectric power project is the key issue here.

Beside, the values of different groups are very difficult to compare among groups of people as value is not a stable thing. People are making decisions that all the values are the same in every group of people. The outcomes of values can be different and changes according to the different group of people in terms of education and income, example in the case of Howley, Hynes and O'Donoghyne (2010). The challenge arise how the government or state authorities can adjust the true value for

compensation given the difference groups of people in the resettlement of hydroelectric project.

Drawing from all the methods of valuation provided above that are contingent valuation method, discrete choice experiment, travel cost method and hedonic pricing model, this study provides a direct measurement of compensation value by eliciting the indigenous communities assessment of the use values and non-use values in a post-resettlement study.

## **2.10 Valuation in Bakun Hydroelectric Dam**

Valuation of compensation of Bakun hydroelectric dam was done by government. According to Gabungan (1999), the state authorities maximized the profitability of land by exploiting it for commercial purposes and this created internal conflict with indigenous communities. The state authorities consistently backed the companies and contractors against the indigenous communities even when there was clear incursion on indigenous land and destruction to indigenous property and culture. The state authorities often viewed and valued the indigenous land use as “unproductive” that indigenous attitudes were “barrier to development” and that indigenous communities must be brought into the” mainstream of development”.

State authorities utilized the appointed leaders within the indigenous communities at Bakun area to translate the little information given, control grievances and ensure compliance (Gabungan, 1999). The compensation paid to the indigenous communities such as homes and infrastructures were without any adequate support

mechanism provided to indigenous communities to help them understand the consequences of being moved into monetized economy and importance of financial planning. Land allocated to the new site was inadequate in both quantity and quality. It was not valued in social and cultural aspects. Compensation of money paid for their old homes was not to be paid to the indigenous communities but was used to offset their new compulsory house purchase. We will discuss the problems arise in the valuation of use values (lands, jungle resources, aspects of economic value and non-market value in details.

## **2.10.1 Problems in the Valuation of Use Values**

### **2.10.1.1 Land Values**

There are serious controversies regarding the hydroelectric project from 3 aspects. The main controversy that mainly raised by non-governmental organizations (NGO) such as Aliran is regarding the people's right especially the rights of local communities around the Belaga district. The rights of local communities to be displaced regarding land, forest, culture are often raised by the NGOs. Land is considered as important by the local communities because they used the land for food, resources and spiritual home and it is their culture.

Bakun hydroelectric dam project would induce displacement of the people especially local community. This would lead to local community losing their property rights on land. They considered the land as their own property rights because they have been living in the lands for so many years. These local indigenous communities are like the Kenyah, Kayan, Penan and other ethnics which had been relocated by force. The government asked them to leave their own lands and moved

to a new place which was called the Sungai Asap Resettlement Scheme. Protests and critics come as a result of this. Local communities value land as an important aspect and is part of their life. Beside, local communities also look in to aspects of forest as forest provide the indigenous communities food, medicine, building and site ancestral grounds (Gabungan, 1999). Government should look into the aspect of land and property rights to give them adequate of compensation on land issues.

It was documented in the report of Gabungan (1999) on how government side dealing with the land and property rights. According to Gabungan (1999), the government maximized the profitability of land by exploiting it for commercial purposes and this created internal conflict with indigenous communities. The state authorities consistently backed the companies and contractors against the indigenous communities even when there was clear incursion on indigenous land and destruction to indigenous property and culture. The state authorities often viewed and valued the indigenous land use as “unproductive” that indigenous attitudes were “barrier to development” and that indigenous communities must be brought into the” mainstream of development”.

From a report of Jehom (2008), it showed that all the households claimed that major portions of their land were not being reviewed. This becomes an issue when doing compensation. The issue is how government gets the value for compensation and what approach the government used to value the land. This lands and rights of the indigenous communities had on the lands must be properly valued because the native lands were owned by the indigenous communities. As stated by Hooker (1999),

“we have to be careful as to what we mean by law, native, adat and especially land and land rights.” The land rights were stated in the Native Customary Land Rights.

The household interviewed by Jehom (2008) showed that “Compensation for land was calculated based on the how much land was supposed to be flooded by the water from Bakun dam and not based on how much lands owned by households.” The compensation was divided among the whole community. Jehom (2008) also stated in his doctoral dissertation report that the ambiguous understanding of land rights made it difficult to estimate the lands and farmlands for compensation. Beside, the absence of reliable landmarks, boundaries and community land mapping comfounded made it difficult to calculate value of land. The problems of disputes arised because Kenyah-Badeng did not discuss before making land claims and did not understand the evaluation of the claims were evaluated as communal land and not by individual claims due to absence of individual land title. Many of the indigenous communities did not know administration of ancestral land via adat system and they simply claim the lands. Thus, this results in disputes of overlapping of land between two persons.

State authorities utilized the appointed leaders within the indigenous communities at Bakun area to translate the little information given, control grievances and ensure compliance (Gabungan, 1999). The compensation paid to the indigenous communities such as homes and infrastructures were without any adequate support mechanism provided to indigenous communities to help them understand the consequences of being moved into monetized economy and importance of financial planning. Land allocated to the new site was inadequate in both quantity and quality. It was not valued in social and cultural aspects. Compensation of money paid for

their old homes was not to be paid to the indigenous communities but was used to offset their new compulsory house purchase.

It seemed like the state authorities used the marketable approach to value the compensation for land. It was mainly used for the commercial purposes and did not consider the impacts to the local communities. The valuation method is not clear as the approach to value the land from local communities was not emphasized.

#### **2.10.1.2 Compensation for Jungle Resources**

According to Jehom (2008) report of the surveys, the compensation regarding the fruit tree which is a jungle resources were done by surveyors on behalf of the government. The problem arised when the surveyors did not check the land or farm that had underwent 'alteration' by having a 'spot check' by the local communities. Surveyors only listed the type and number of fruit trees in the process of doing compensation and do not determine borders between people's land. This may due to problems of local leaders and lack of experience of the surveyors. The most important thing is that households' opinions were not consulted. This becomes a problem of demarcation of land territories for planting trees causing the indigenous communities to fight for their right.

In the report submitted to State Planning Unit in 1994, Rousseau (1994) stated that in identifying the government's decision on compensation, the government seldom invited them to express their view on compensation. The meetings were conducted in English which was barely understood by the indigenous communities.

The indigenous communities had no platform to express the views and problems. In fact, the opinions of the indigenous communities are very important in decision making regarding compensation. It is their rights to express the view regarding compensation. The indigenous communities are also protected under the indigenous and Tribal Peoples Convention, 1989 (No.169) of International Labour Organization. The value of compensation must involve the views of indigenous communities.

In the perspective of the indigenous people, the jungle is where the income derived from. Jungle provides them with vegetables and resources. The indigenous communities can sell the vegetables and earn income to increase livelihoods. According to the report of which interviewed one of the Kayan indigenous people, the indigenous communities have the jungle resources as their own income generation and it is important to them. The rice, fish, meat and vegetables are all free. The indigenous communities have gained access the natural resources. This means that compensation must also include the compensation for the loss of the income and loss of jungle resources. It is challenge to maintain the same utility they had after relocation.

#### **2.10.1.3 Compensation for House Ownership**

An important variable in compensation valuation is the house and housing condition. After being resettled, most communities feel that the housing conditions are worst as stated in the report of Jehom (2008). They have to pay for the new house for RM52,000 and the renovation of low quality. Certificate of fitness (COF) was not given to the communities moving in. This could reduce the utility of the indigenous

communities regarding the compensation of house given to them. The value of old house owned by the indigenous communities was told to compensate the new houses of the indigenous communities. However, the valuation on how government derived the figures of the old house was not known and not stated in the article.

#### **2.10.1.4 Non Participation of Indigenous Communities in Relocation Project**

Indigenous communities are often not involved in the decision-making of relocation project and compensation in Bakun hydroelectric project. According to the Gabungan (1999) report, the indigenous communities were often viewed as “barrier to development” by the state authorities. This becomes a problem in relocation because they are the ones who directly being affected by hydroelectric dam project. The participation of the displaced communities in decision-making is important so that they are empowered to shape the compensation packages in the way that fit their needs and demands. But this was not the case in Bakun.

#### **2.10.2 Non-market asset loss /non-use value loss (Social and cultural aspects)**

Controversies often come when there is debate on the non-market and non-physical assets loss on indigenous communities. Non-market losses and non-physical assets are like social loss and cultural loss. Social loss is like loss in community institutions, social networks and cultural loss are like weaken cultural identity. These non-market losses are very hard to be compensated because it has no value in the market. Mahalia (1994) stated that it is very difficult to measure non-physical losses and non-market income loss. This can result in the failure of involuntary resettlement outcome because non-physical losses and non-market losses are not accounted for

compensation (Cernea, 2003). Indigenous communities can feel that the compensation given to them are undervalued and feel not satisfied with the compensation.

In the case of Bakun, the indigenous communities were being moved to a new environment in Sungai Asap resettlement scheme. Before resettlement, the indigenous communities have strong ties of neighborhoods with their friends and have strong social networks. After resettlement, the indigenous communities loss the strong ties of neighbourhoods with their friends. This makes them feel worse-off. However, this loss of social value is hard to be value and compensated because it is very subjective and very hard to measure. Many previous literatures did not touch on how to compensate the social value regarding relocation of the hydroelectric dam project. Thus, the question to how to account social and cultural value inside compensation is still unknown.

### **2.10.3 Synthesis of Valuation of Bakun**

As a whole, it seemed like the state authorities used the market approach to value the compensation for land, jungle resources and houses. Most of the valuations were done by engineers and project panels. It was mainly used for the commercial purposes. Engineers and project panels did not look into the aspects of resettlement in a theoretical consistency way. The theoretical consistency works are quite weak and there was no grounded theory to support the valuation and compensation. The valuation method is not clear as the approach to value the land from local communities was not emphasized. There is no concrete methodology to value the loss

suffered by the displaced indigenous communities. This leads to problem of undervalue the properties of the displaced indigenous people. Furthermore, the problem also arises due to no participation of indigenous communities in relocation project and determining the valuation of compensation and aspects of non-market or non-use values (social and cultural aspects) are not included in the compensation and did not consider the impacts to the local communities.

## **2.11 Conclusion**

From the review of literatures, we notice that there are economic, social and cultural impacts of resettlement for indigenous communities. The variables used to assess the economic impacts brought by the resettlement are income from crops, income from jungle resources, land, houses of the displaced communities. The social impact variables identified is social support (social disarticulation). There were mixed results which showed that the resettlement can bring positive and negative impacts on socioeconomic development of displaced communities. The impacts serve as a basis for government to value the project to provide better compensation so that the displaced communities are not worse off. The valuation problem arises because there is information asymmetry between the dominant group that is the government and the displaced local communities.

We can identify that there is a gap in the study of resettlement of people affected by hydroelectric dam development. Most of the articles are descriptive study by describing the case studies without giving empirical analysis. The valuation of the loss of benefits of people who have to be moved or resettled is still rudimentary or at the basic stage and the points of settlers are not considered. This study will fill this

gap by providing some empirical figures and using empirical analysis to value the hydroelectric projects. Furthermore, there are not many studies that are done in Malaysia and also Asia. This study will fill the gap by examining the empirical aspects of compensation to people affected by the Bakun hydroelectric dam. In particular, the approach for valuation of compensation for projects which includes the communities' assessment of gains and losses through their participation in the valuation process will add new information for arriving at the values. These values are thus expected to be less controversial and would be accepted by the majority of the people affected by the change arising from the project. The techniques of valuation will use the economic valuation approaches that have been developed more recently for valuing non use values.

Now, we need to look at the approach to close the gap in valuation by looking at valuation approach or method that will lead to scientific valuation. People are faced with relocation with large development projects like hydroelectric dam in Bakun. We now move forward to develop a method that can be agreeable by both government and indigenous communities which are the target of compensation.

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.1 Introduction**

This chapter provides the details of the methodology used in analyzing the socioeconomic impact of resettlement of the hydroelectric dam project and attempts to explain the differences in value arising between different groups of people over activities. The methodology encompasses the theoretical framework of this study as well as the procedures in data collection to answer research questions posed in Chapter One.

#### **3.2 Theoretical Framework**

The components of the theoretical framework of the study below reflect the key issues under treatment of this study of the hydroelectric dam. The study employs the Risks and Reconstruction model by Cernea (1997) as a basis to determine the resettlement impacts or the elements of values to arrive at a better compensation value. The elements of values can be classified into two categories. The first category is the use values which comprises of income from crops in cultivated lands, income from jungle resources, personal area of land, area of jungle land, houses and level of infrastructures investments. The second category is the non-use values that consist of environment quality value, social value, culture value and freedom and rights values. The reason for using risks and reconstruction model by Cernea (1997) as basis to determine the elements of values for the compensation study is there are not many models in studying compensation based on literatures. Cernea's model provides

comprehensive analysis on compensation on large development project. It explains use value and non-use variables resulted from resettlement.

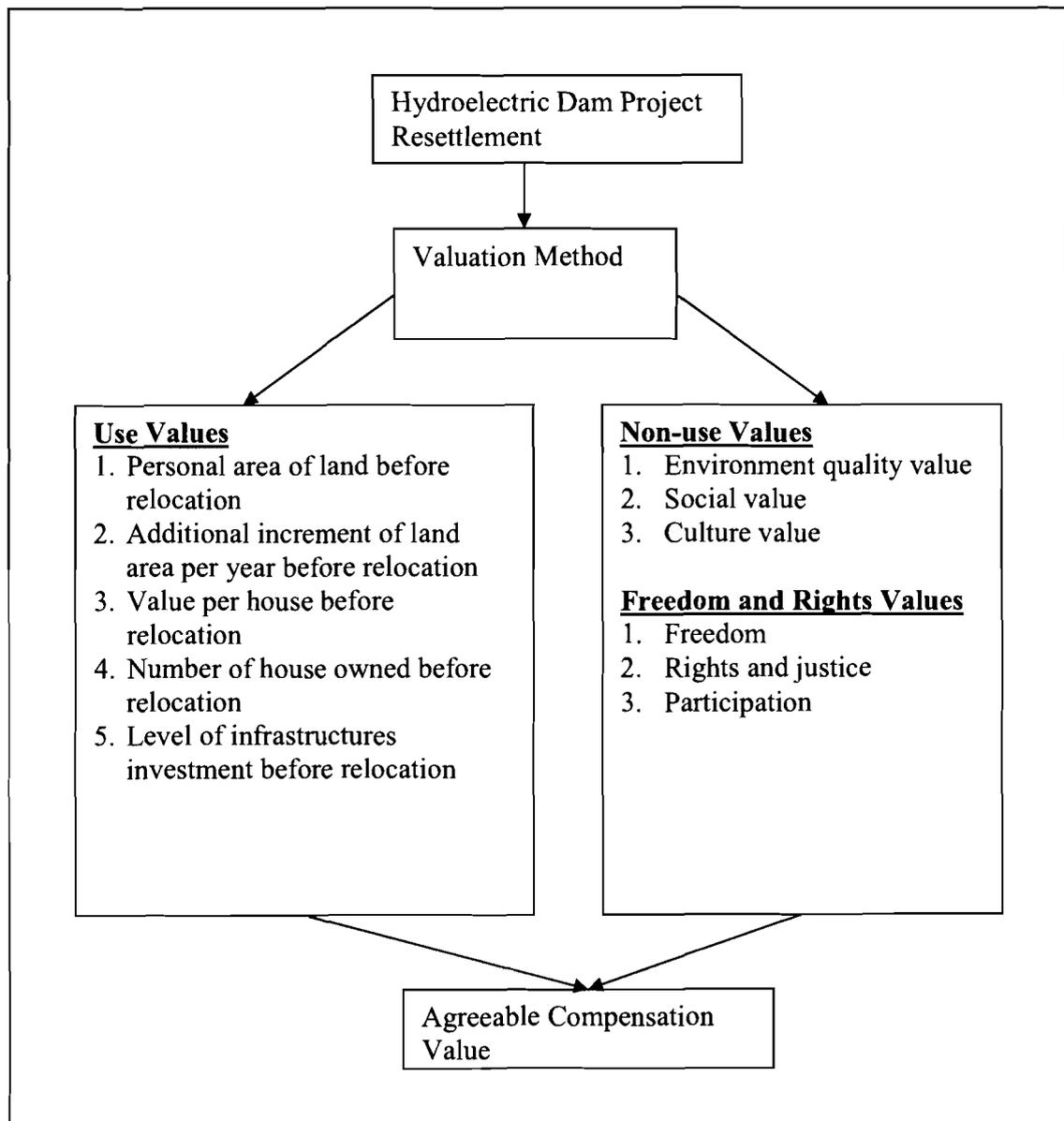


Figure 3.1  
*Conceptual Model for the Use Values and Non-use Values to Arrive at a Compensation Value*

Figure 3.1 shows the relationships between the variables of this study. The hydroelectric dam construction leads to resettlement. Resettlement has socioeconomic impact on the indigenous population. The conceptual model follows the Cernea (1997) risk and reconstruction model. However, this valuation method

incorporates the economics concepts of use value and non-use value elements into the study to arrive at a compensation value that is agreeable by both the government and local communities. The use values are personal area of land, additional increment of land per year, house and level of infrastructure investment while the non-use values are importance of environment quality value, importance of social value, importance of culture value, freedom, rights and justice and participation. Freedom and rights are important in determining compensation. Settlers must be free to express their views on compensation or free to participate in any compensation process so the gap of compensation can be reduced. Reducing compensation gap leads to improved welfare for the settlers. Thus, the agreeable compensation can be obtained. Amartya Sen indicated the lack of consideration to freedom and rights can lead to welfare loss in his capabilities and development framework discussed in his book (Sen, 1999).

### **3.3 Specification of Theoretical Model**

Economists generally measure utility framework. Utility theory is used as the basis for analyzing compensation. Utility is defined as a property in an object which tends to produce benefit, advantage, pleasure, good and happiness (Warnock, 2003).

The history of utility can be dated back to the literature by Jeremy Bentham (1748-1832), an English philosopher in the early eighteenth century. Jeremy Bentham define greatest happiness principle (utility) in his article “The Principles of Morals and Legislation”. Nineteenth century economists W. Stanley Jevons, Leon Walras, and Alfred Marshall said that utility is measurable. The measurement of utility is divided into two categories. The first category is cardinal utility and the second category is ordinal utility. In cardinal utility, every consumer is assumed to be

able to assign the amount of degree of utility on every commodity or combination of commodities. However, Pareto replaced the concept of utility with the concept of scale of preference. For example, given two sets of goods, the consumer will prefer the higher utility compare to lower utility, this is referred to as a scale of preference. This is termed as ordinal utility.

The background of the utility model of this study follows the Hicksian compensation variation utility model. Hicksian compensated demand function is the demand of consumers over a bundle of goods with fixed level of utility but minimize expenditure. When there is a change in the welfare due to policy, there is a change in the utility.

The individual settler's utility function (order-preserving transformation) before compensation and before resettlement depends on the use values and non-use value, and can be specified as follows:

$$\text{Utility} = U_j^0 [uv^0, nuv^0]$$

Where

$U_j^0$  = the original utility of individual before being resettled.

$uv^0$  = the utility from use values of individual.

$nuv^0$  = the utility from non-use values of individual.

The individual settler's utility function after compensation and after resettlement depends on the levels of use values and non-use values, and can be specified as follows:

$$\text{Utility} = U_j^1 [uv^1, nuv^1]$$

Where

$U_j^1$  = the utility after resettlement and compensation.

$uv^1$  = the utility of use values of the new location.

$nuv^1$  = the utility of non-use values of the new location.

### **Changes of the utility before and after compensation**

$$\Delta U_j = U_j^1 - U_j^0$$

Where

$\Delta U_j$  = the changes of utility after compensation.

$U_j^1$  = the new utility after resettlement and compensation.

$U_j^0$  = the original utility of individual before being resettled.

#### **3.3.1 Theory of Diminishing Marginal Utility (William Stanley Jevons)**

This study follows the theory of diminishing marginal utility. The resettlement of the indigenous people leads to the decrease in utility. Total utility decreases as a result of resettlement. The lost utility will be less than the utility before resettlement because the indigenous people have access to the use values (income from crops in cultivated lands and jungle resources, personal area of land, additional increment of land per year, house, level of infrastructures investment) and non-use values (environmental quality level the individual has, level of the individual's social standing and level of the individual's cultural standing) before resettlement and they may lost all the use values and non-use values after being resettled to a new place.

The formula for marginal utility is:

$$\text{Marginal Utility} = \frac{\text{change in Total Utility}}{\text{change in resettlement area}} = \frac{\Delta U_j}{\Delta r}$$

$$\frac{\partial U}{\partial r} \approx \frac{\Delta U}{\Delta r}$$

$$\frac{\partial^2 U}{\partial r^2} < 0 \text{ (Diminishing marginal utility)}$$

### 3.4 Empirical Model

An empirical model is used to explain the phenomenon of the resettlement of the Bakun hydroelectric dam project. In the model, hydroelectric dam project requires resettlement of the indigenous communities and this results in socioeconomic impact for the displaced indigenous population. The socioeconomic impacts can be measured in terms of values in the framework. These elements of values can be grouped into two broad categories that are use values and non-use values. The elements or the variables in the use values and non-use values are called the independent variables. These independent variables will affect the dependent variable which in this study is the satisfaction with compensation. The dependent and independent variables will be discussed in detail in the following paragraphs.

In this study, the theory of utility is employed as a basis to study the valuation of compensation for the resettlement of the indigenous communities in Bakun hydroelectric dam. The individual indigenous people utility's function depends on the social-demographic activities, the use values (personal area of land before relocation, additional increment of land area per year before relocation, value per house before relocation, number of house owned before relocation, level of infrastructure investments) and non-use values (environmental quality value, social value and culture value), freedom and rights variables. However, the utility cannot be measured

directly. Thus, the compensation variation approach is used to measure the change in utility.

Compensation variation is needed in order to maintain the utility of the individual or at least not making the individual worse off after the relocation. Thus, we must have a compensation response function to be measured. The compensation response function depends on non-use value, use-values, how much the person suffers environmental loss and loss due to socio-demographic changes. We develop the model from John Hicks compensation variation utility model.

In the present study, there are three empirical models. First, Logit Model (Satisfaction with Compensation); second, Ordered Logit Model (Compensation Gap) and third, Multinomial Logit Model (Land Compensation Gap).

### **3.4.1 Model 1: Satisfaction with Compensation (Logit Model)**

#### **3.4.1.1 Logit Regression Model**

Logit regression model is used because the dependent variable, satisfaction with compensation value consists only 2 categories that is satisfied and not satisfied (binary choice situations). This model is used to answer objective 1.

#### **Model Specification of Logistic Regression Model 1: Satisfaction with Compensation**

The general model of the functional form is the following:

### *YSATISFIED*

*= f(gap of the expected compensation and actual compensation, use values, non – use, freedom and rights values and socio – demographic variables*

Following the latent variable framework of Blanchflower and Oswald (2004) which assumed that for each household head and housewife separately, there is a latent variable which represents his or her underlying satisfaction towards the amount of compensation given by the government. This latent variable for satisfaction or dissatisfaction is associated with difference in the values between expected and actual compensation (gap variables), use values, non-use values, freedom and rights values and individual characteristics of the household heads and housewives which are obtained at survey ( $X_i$ ). Let  $y^*$  represents this latent variable and assume that  $y^*$  is a linear function of  $X_i$ , thus,

The general linear form for the econometric model is:

$$y^* = \beta X' + \varepsilon \quad (3.1)$$

Where,

$y^*$  = underlying satisfaction towards the amount of compensation given by the government (unobservable)  
 $X$  = independent variables (survey)

The model assumes that the reported satisfaction ( $y$ ) is related to the  $y^*$  (which is unobservable) with the answer of yes or no to the question regarding whether or not the individual is satisfied with the amount of compensation given by the government.

Then, the value of Y is observed as:

$$y = \begin{cases} 1 & \text{if } y^* > 0 \\ 0 & \text{if } y^* \leq 0 \end{cases} \quad (3.2)$$

Then using equation 3.1 with assumption that the error term in the latent equation is logistic distributed, the Single Bound Logit Model can be specified as follow:

$$\begin{aligned} \Pr(y=1 \mid X) &= \Pr(y^* > 0 \mid X) \\ &= \Pr(X\beta + \varepsilon > 0 \mid X) \\ &= \Pr(\varepsilon > -X\beta \mid X) \\ &= \Pr(\varepsilon < X\beta \mid X) \end{aligned}$$

The cdf of the error distribution is shown below:

$$\Pr(y = 1 \mid X) = F(X\beta) \quad (3.3)$$

F=logistic cdf for the Logit Model

$\Pr(y=1 \mid X)$  =probability of observing a satisfy event given X is the cumulative density

We need to use Maximum Likelihood estimation to obtain probability, thus we need the value of  $x_i$  and  $\beta$ . We need to define the probability of observing the value of y and the model is specified as follow:

$$P_i = \begin{cases} \Pr(y_i = 1 \mid x_i) & \text{if } y_i = 1 \text{ is observed} \\ 1 - \Pr(y_i = 1 \mid x_i) & \text{if } y_i = 0 \text{ is observed} \end{cases} \quad (3.4)$$

Likelihood equation is shown as below which shows if the observations are independent:

$$L(\beta \mid y, X) = \prod_{i=1}^N P_i \quad (3.5)$$

If we substitute the  $P_i$  into the function of  $L(\beta \mid y, X)$ , then we obtain:

$$L(\beta|y, X) = \prod_{y=1} \Pr (y_i = 1|x_i) \prod_{y=0} [1 - \Pr (y_i = 1|x_i)] \quad (3.6)$$

The area of cdf function is replacing the probability of observing value of  $y$  in likelihood function, then we obtain the following equation:

$$L(\beta|y, X) = \prod_{y=1} F(x_i\beta) \prod_{y=0} [1 - F(x_i\beta)] \quad (3.7)$$

The log is being incorporate to obtain the log likelihood equation:

$$\ln L(\beta|y, X) = \sum_{y=1} \ln F(x_i\beta) + \sum_{y=0} \ln [1 - F(x_i\beta)] \quad (3.8)$$

Where  $X$  is a matrix of variables which consists of:

**Gap variables**

$X_1$ = compensation gap from fruits (measured in RM)

$X_2$ = compensation gap from small farm and orchard (measured in RM)

$X_3$ = compensation gap from land (measured in area, acres).

$X_4$ = compensation gap from value of house (measured in RM).

$X_5$ = compensation gap from number of house (measured in units).

$X_6$ = gap from income excluding fruits (measured in RM).

**Use Values**

$X_7$ =personal area of land before relocation (measured in hectares).

$X_8$ =additional increment of land area per year before relocation (measured in hectares).

$X_9$ =value per house before relocation (measured in RM).

$X_{10}$ = number of houses owned before relocation (measured in units).

$X_{11}$ =level of infrastructure investments (roads, buildings, school and shop)(measured in 1=low, 2=medium, 3=high).

**Non-Use Values**

$X_{12}$ =environment (river, hills/mountains and forests) quality valuebefore relocation measured in 1=low, 2=medium and 3=high).

$X_{13}$ =social value before relocation (measured in 1=low, 2=medium and 3=high).

$X_{14}$ =culture value before relocation (measured in 1=low,2=medium and 3=high).

**Socio-demographic variables**

$X_{15}$ =gender

$X_{16}$ =marital status

$X_{17}$ =employment status

$X_{18}$ =job

$X_{19}$ =number of other family members working

$X_{20}$ =income

$X_{21}$ =religious affiliation

$X_{22}$ =level of education

X<sub>23</sub>=age  
X<sub>24</sub>=number of people in household  
X<sub>25</sub>=ethnicity  
X<sub>26</sub>=years of living in Bakun

***Freedom and rights variables (measured in rights, involvement in compensation process)***

X<sub>27</sub>=freedom to be consulted in compensation process (measured in Likert scale 1-5)  
X<sub>28</sub>= rights to be informed earlier in compensation process (measured in Likert scale1-5)  
X<sub>29</sub>= rights to involve in all compensation stages (measured in Likert scale1-5)  
X<sub>30</sub>= freedom to prepare for changes in resettlement to new settlement (measured in Likert scale1-5)  
X<sub>31</sub>= freedom of choice to reject or accept the compensation given (measured in Likert scale 1-5)  
X<sub>32</sub>= freedom of communities to be involved in resettlement process (measured in Likert scale1-5)  
X<sub>33</sub>= freedom of communities to be involved in compensation process (measured in Likert scale1-5)

For details of definition and measurement of these variables, please refer to Appendix 2.

### **3.4.1.2 Goodness of Fit Tests**

The tests of goodness of fit in logistic regression are likelihood ratio (LR) test, Wald test, Pseudo R<sup>2</sup> and hit-miss table (percentage correctly predicted).

Menard (1995:58) explained the steps of doing diagnostic of logistic regression. To do logistic regression, the assumptions of logistic regression must be fulfilled. There are a few important tests:

- i) Specification error
- ii) Multicollinearity
- iii) Heteroscedasticity

- iv) Classification Table for level of prediction.

### **3.4.1.3 Further Description on the Variables**

#### **Dependent Variable (Satisfaction with Compensation)**

The dependent variable in this research is the satisfaction with compensation. It is affected by the independent variables which are the gap variables, use values variables, non-use values variables, socio-demographic variables and freedom and rights variables. The satisfaction level from compensation is elicited from the indigenous communities based on what they think should be required to compensate for changes of welfare.

Involuntary resettlement or forced resettlement by the Bakun hydroelectric dam project authorities forced the indigenous communities to resettle at a new area known as Sungai Asap resettlement. From the report or interviews of Bakun, many of them are not happy with the compensation value given. From the report by Jehom (2008), the non-use values (non-market valuation approach) are not taken into account to arrive at the compensation value paid by the government to the communities. So, this research incorporates the non-use values and use values to arrive at a more comprehensive compensation value.

#### **Independent Variables (Gap Variables)**

Gap variables are divided into 6 variables namely compensation gap from fruits, compensation gap from small farm and orchard, compensation gap from land,

compensation gap from value of house, compensation gap from number of house and gap from income.

The first independent variable in Model 1 is the compensation gap from fruits. It is derived from the expected compensation amount from fruits (RM) minus actual compensation amount from fruits (RM). The actual compensation is the compensation received from the government. The expected compensation is the compensation that is expected by the communities to bring them to the original utility before relocation.

The second independent variable in the Model 1 is the gap of compensation from small farm and orchard. It is derived from expected compensation from small farm and orchard (RM) minus actual compensation from small farm and orchard (RM).

The third independent variable in Model 1 is the compensation gap from land. It is derived from the expected compensation from land (acres) minus actual compensation from land (acres) given by the government.

The fourth independent variable in Model 1 is the compensation gap from house (RM) per person. It is derived from the expected compensation from house (RM) minus actual compensation from house by government (RM).

The fifth independent variable in Model 1 is the compensation gap from number of house. It is derived from expected compensation from number of house

(unit) minus the actual compensation from number of house given by government (unit).

The sixth independent variable in Model 1 is the gap from income (RM). Gap of income derived from income after resettlement (RM) minus income before resettlement.

### **Independent Variables (Use Values)**

#### ***Personal Area of Land before Relocation***

Personal areas of lands in Bakun are referred to the lands owned by each individual of the indigenous communities and measured in hectare. The lands are also referred to the Native Customary Right (NCR) lands. The land can be used to grow crops, food and planting agriculture products.

#### ***Additional Increment of Land Area Per Year Before Relocation***

There is an additional increment of land area per year by the indigenous communities in Bakun. The land is used for planting crops. The indigenous communities can increase the size of the land from Native Customary Rights (NCR) land every year. The land area is measured in hectare.

### ***Value Per House Before Relocation***

House is an important variable to show the economic impact of resettlement under risk and reconstruction model by Cernea (1997). Houses are important as they provide shelters for the indigenous communities. In this study, the value per house before relocation is used as an independent variable and it is measured in Ringgit Malaysia (RM).

### ***Number of Houses Owned Before Relocation***

Some of the communities have several houses. Thus, number of houses before relocation is also used as an independent variable. The number of houses is measured in unit.

### ***Level of Infrastructure Investments***

Infrastructures referred to the houses, roads, building and schools that the indigenous communities possessed. The level of infrastructures investments are the investments done by the indigenous communities before resettlement in building the houses, roads, building and schools. This is an important aspect for doing compensation on economic value. After resettlement, there is a change in the level of infrastructures, state authorities need to give compensation according to the level of infrastructures investments to maintain the same level or improve the utility or welfare of indigenous communities before resettlement. It is measured by rating scale (1=Low, 2= Medium, 3=High).

## **Independent Variables (Non-use Values)**

### ***Environment Quality Value Before Relocation***

The environment is important aspect in the resettlement. The loss of environment benefits after relocation such as the loss of greenery environment. The beautiful scenery of virgin tropical forests had been cut down. The views of river and the mountains may loss after being resettled and these reduce the welfare of the indigenous communities. This is viewed as non-use value and it is hard to measure because the environmental quality being valued is not traded in the markets. The measurement of importance of environment quality to settlers can be done by asking the communities to rate the importance of environment (1=Less important, 2=Medium important and 3=Very important).

### ***Social Value Before Relocation***

The social impact variable of resettlement is the social disarticulation under risk and reconstruction model of Cernea (1997) which can be indicated by social adaptation. “Development induce resettlement can cause the social destruction because it uproots the displaced from familiar social environment and transplants them to a socially foreign host society” (Cernea, 1997; Scudder & Colson, 1982). The examples of social disarticulation are like dismantling the social organization and reduce interpersonal ties as a result of people scattered from their homes. Resettlement may leads to loss of social adaptation. Before resettlement, the people have strong neighbourhood relationships. But they do not have strong relationships with neighbours again after being resettled. The people may feel the loss of network

ties between the neighbours. The measurement of importance of environment quality to the settlers can be done by asking the communities to rate the importance of social value (1=Less important, 2=Medium important and 3=Very important).

### ***Culture Value Before Relocation***

The culture aspect in non-use value is important in the arriving a compensation value. Compensating culture loss like the spiritual loss is like a respect to the indigenous communities. The cultures of the people are also represented by it's the activities the indigenous communities can perform on land in Bakun, environment and natural resources. The land is used for burial grounds, ancestral and doing cultural activities. The culture identity is needed to be upheld. It is hard to measure the values of culture identity using economics use value. Therefore, it is identified as the non-use value. The measurement of importance of culture value to settlers can be done by asking the communities to rate the importance of culture (1=Less important, 2=Medium important and 3=Very important).

### **Independent Variables (Socio-demographic Variables)**

#### ***Gender***

Gender is divided into male and female in our study. The coding used is 1 for male and 2 for female.

### ***Marital Status***

The marital status is divided into 4 categories namely 1 for single, 2 for married, 3 for widow and 4 for others.

### ***Employment Status***

The employment status is classified into 5 categories namely 1 for unemployed, 2 for unable to work, 3 for full-time employed, 4 for part-time employed and 5 for self-employed.

### ***Job***

The job can be classified into 5 categories namely 1 for jungle resource collector, 2 for cash crop farmers, 3 for oil palm plantation labour, 4 for hunter and 5 for other job category.

### ***Number of Other Working Family Members***

Number of other working family members refers to the total family members that are working excluding the interviewee.

## ***Income***

Income is derived from income from crops in cultivated lands plus income from jungle resources.

Income from crops in cultivated lands is measured in the income value (RM) earned by selling the crops per month. Crops are like the paddy, peppers, vegetables and agriculture products that are cultivated. It is important as it can contribute to the increase of income of the indigenous communities through the cultivation of crops. It is an element of use values because of its direct benefits (income) earned by the indigenous communities.

The cultivated lands referred to the lands owned by the indigenous communities. Lands can be used to plant crops and do cultivation. It can be used as a productive system and doing commercial activities. Resettlement can lead to exploitation of lands for building of hydroelectric dam. The indigenous people have no land and this is called landlessness in the risk and reconstruction model of Cernea (1997). According to the previous interviews obtained from reports of Bakun hydroelectric dam project, lands can be used for food and it is a resource to the indigenous communities. This benefits directly involved from the use of lands is called the use value. This economic impact on cultivated lands is very important for the study because it can lead to reduction of income.

The income from jungle resources is measured by the income value earned from the selling of the jungle resources per month. Jungle resources are like the

forests woods, fruits and bamboos used directly from the indigenous communities. It is either used for self-consumption or sold at the market to earn income. The income sold can improve the livelihood of the people. Jungle resources are classified as use value because its benefits are obtained directly from the use of it. It is measured in Ringgit Malaysia (RM).

### ***Religious Affiliation***

Religious affiliation is the religion of the household head or housewife being interviewed. It can be classified into 3 categories namely 1 for Christian, 2 for Islam and 3 Other religious.

### ***Education Level***

Education level refers to the education of household head or housewife of household head being interviewed. The education level got ordered dimension and categorized under continuous variable. It ranges from no formal education to Postgraduate Degree Education.

### ***Age***

The age of household head or housewife can be classified as continuous variable which is measured in years.

### ***Number of People in Household***

Number of people in household is a continuous variable in which the size of the family of household head or housewife is measured.

### ***Ethnicity***

Ethnicity variable in this study is a categorical variable. It is divided into 3 categories namely 1 for Kenyah, 2 for Kayan, 3 for other ethnics.

### ***Years of Living in Bakun***

Years of living in Bakun refers to the time of the household head or housewife stayed at Bakun hydroelectric dam (the old settlement before the relocation). It is a continuous variable.

### **Independent Variables (Freedom and Rights Variables)**

There are seven freedom and rights variables in affecting the satisfaction level. The freedom and rights variables are highlighted in Sen (1999) Development as Freedom. The freedom and variables are freedom to be consulted in compensation process, rights to be informed earlier in compensation process, rights to involve in all compensation stages, freedom to prepare for changes in resettlement to new settlement, freedom of choice to reject or accept the compensation given, freedom of communities to be involved in the resettlement process and freedom of communities

to be involved in the compensation process. All these variables are measured using a Likert scale 1-5. 1 referred to no involvement and 5 having complete involvement.

### 3.4.2 Model 2: Compensation gap (Ordered Logit Model)

Ordered Logit Model is used because the dependent variable, gap of total compensation (RM) is a divided into 5 categories according and have ordered dimension. The independent variables consist more than one variable. This model is used to answer objective 2.

#### 3.4.2.1 Ordered Logit Model for Compensation Gap

The general model of the functional form of the gap of actual compensation and expected compensation:

*Compensation gap*

*= f (items and flows of benefits loses of use values, non – use values  
freedom and rights and socio – demographic variables*

The Latent variable model for the above ordered choice model is shown below:

$$y_i^* = x_i\beta + \varepsilon_i \quad (3.9)$$

Where

$y^*$  = the latent variable of compensation gap.

$\beta$  = column vector of coefficients

$x_i$  = the vector of the variables in use values, non-use values, freedom and rights variables and socio-demographic variables.

$\varepsilon$  = the error term.

The observed outcome ( $y$ ) is either in category of 1 (RM3000 to less than RM138000), 2 (RM138000 to less than RM231000), 3 (RM231000 to less than RM400000), 4 (RM400000 to less than RM512000) and 5 (RM512000 to RM784000). We need to specify the probabilities of observing value of  $y$  given  $x$ . The probability of obtaining value of  $y$  equal to 1 given  $x$  is based on if the latent variable  $y_i^*$  falls between cutoff points of from  $-\infty$  and  $\tau_1$ .

$$\Pr(y_i = 1|x_i) = \Pr(-\infty < y_i^* < \tau_1|x_i) \quad (3.10)$$

Substituting the  $y_i^*$  with the  $x_i\beta + \varepsilon_i$ , then we obtain:

$$\Pr(y_i = 1|x_i) = \Pr(\tau_0 \leq x_i\beta + \varepsilon_i < \tau_1|x_i) \quad (3.11)$$

To obtain the range of error term, we subtract the both sides of inequality with  $x_i\beta$ ,

$$\Pr(y_i = 1|x_i) = \Pr(\tau_0 - x_i\beta \leq \varepsilon_i < \tau_1 - x_i\beta|x_i) \quad (3.12)$$

The probability that a random variable,  $\varepsilon_i$  is between values can be calculated by the remains of cdf at one value subtracts by cdf at another value in these values.

$$\begin{aligned} \Pr(y_i = 1|x_i) &= \Pr(\varepsilon_i < \tau_1 - x_i\beta|x_i) - \Pr(\varepsilon_i < \tau_0 - x_i\beta|x_i) \\ &= F(\tau_1 - x_i\beta) - F(\tau_0 - x_i\beta) \end{aligned} \quad (3.13)$$

We can generalized the equation to obtain the probability of  $y$  equals other value given  $x$  by replacing  $y_i = 1$  with  $y_i = m$ . Thus, we obtain:

$$\Pr(y_i = m|x_i) = F(\tau_m - x_i\beta) - F(\tau_{m-1} - x_i\beta) \quad (3.14)$$

We present the probability with four observed outcomes as below in ordered logit model:

$$\Pr(y_i = 1|x_i) = \Phi(\tau_1 - \alpha - \beta x_i)$$

$$\Pr(y_i = 2|x_i) = \Phi(\tau_2 - \alpha - \beta x_i) - \Phi(\tau_1 - \alpha - \beta x_i)$$

$$\Pr(y_i = 3|x_i) = \Phi(\tau_3 - \alpha - \beta x_i) - \Phi(\tau_2 - \alpha - \beta x_i)$$

$$\Pr(y_i = 4|x_i) = \Phi(\tau_4 - \alpha - \beta x_i) - \Phi(\tau_3 - \alpha - \beta x_i)$$

$$\Pr(y=5) = 1 - \Phi(\tau_4 - \alpha - \beta x_i)$$

Now, we proceed to likelihood estimation to obtain the values of  $x_i, \beta$  to obtain the probability of the observed outcomes. We specify the probability of a generalized value of  $m$  given the condition  $x_i, \beta, \tau$  in equation (3.15) below:

$$\Pr(y_i = m | x_i, \beta, \tau) = F(\tau_m - x_i\beta) - F(\tau_{m-1} - x_i\beta) \quad (3.15)$$

The likelihood equation (3.18) below can be obtained if the observations are independent from each other:

$$L(\beta, \tau | y, X) = \prod_{i=1}^N p_i \quad (3.16)$$

We can merge equation (3.15) into equation (3.16) to obtain:

$$\begin{aligned} L(\beta, \tau | y, X) &= \prod_{j=1}^J \prod_{y_i=j} \Pr(y_i = j | x_i, \beta, \tau) \\ &= \prod_{j=1}^J \prod_{y_i=j} [F(\tau_j - x_i\beta) - F(\tau_{j-1} - x_i\beta)] \end{aligned} \quad (3.17)$$

The log likelihood function can be obtained if the log is added into the likelihood function:

$$\ln L(\beta, \tau | y, X) = \sum_{j=1}^J \sum_{y_i=j} \ln [F(\tau_j - x_i\beta) - F(\tau_{j-1} - x_i\beta)] \quad (3.18)$$

### 3.4.2.2 Goodness of Fit Tests

Goodness of fit tests are also undertaken before the regression analysis is performed. The objective is to check the data fit the model or not. The steps of goodness of fit for Model 2: Compensation gap are similar to Model 1 as mentioned earlier.

### **3.4.2.3 Further Description on the Variables**

#### **Dependent variable (Compensation gap)**

The first dependent variable in Model 2 is the compensation gap. It is derived from the expected compensation amount minus the actual compensation minus. The expected compensation is the compensation that is expected by the communities to bring them to the original utility before resettled. The actual compensation is the compensation received from the government.

#### **Independent Variables**

The independent variables are use value (personal area of land before relocation, additional increment of land area per year before relocation, value per house before relocation, number of house owned before relocation, level of infrastructure investments before relocation), non-use value (environment quality value, social value and culture value), socio-demographic variables (gender, marital status, employment status, jobs, number of other working family members, income, religious affiliation, level of education, age, number of people in household, ethnicity and years of living in Bakun) and freedom and rights variables (freedom to be consulted in compensation process, rights to be informed earlier in compensation process, rights to involve in all compensation stages, freedom to prepare for changes in resettlement to new settlement, freedom of choice to reject or accept compensation given, freedom of communities to be involved in the resettlement process). All the definitions of independent variables have been discussed in Model 1.

## **Measurement of Compensation**

The methodology that is used to estimate the compensation value is the direct method. The compensation value is estimated directly from use-values and non-use values obtained from the indigenous communities. Every value of the use-values and non-use values is used to compute and empirically tested against the compensation value. The value of gap of compensation in model 2 is also estimated directly from the use values and non-use values. These variables of use values, non-use values, freedom and rights are important to estimate the gap of compensation of which the gap is calculated by the difference between the expected value of compensation and actual value of compensation eliciting directly from the indigenous communities.

### **3.4.3 Model 3: Land Compensation Gap (Multinomial Logit Model)**

Multinomial Logit Model is used because the dependent variable, land compensation gap (RM) is a divided into 5 categories. However, the ordered dimension of the categories are not significant, thus Multinomial Logit is used. The model is used to answer objective 3.

#### **3.4.3.1 Regression Model for Land Compensation Gap**

The general model of the functional form of the land compensation gap (expected land compensation by settlers minus actual land compensation given by state authorities):

*Land Compensation gap*

*= f (items and flows of benefits loses of use values, item and flows of benefits loses of non – use values, socio – demographic variables and freedom and rights variables*

The multiple choice model is shown with a latent variable model as below:

$$y_i^* = x_i\beta + \varepsilon_i \quad (3.19)$$

Where,

$y_i^*$  = considered the latent variable of land compensation gap.

$\beta$  = column vector of structural coefficients with first element being intercept  $\beta_0$ .

$x_i$  = the vector of the variables in use values, non-use values, freedom and rights variables and socio-demographic variables.

$\varepsilon$  = the error term.

This study observes the outcome (y) in the following five categories: 1(0 to less than 7 acres), 2 (7 acres to less than 12 acres), 3 (12 acres to less than 27 acres), 4 (27 acres to less than 37 acres), 5 (37 acres to 197 acres).

This study includes exponential function in the probability model of multinomial logit model to ensure the probabilities are non-negative values. Then, the exponential function is divided with the sum of exponential function to make the probabilities sum equal to 1 and equation (3.20) is obtained:

$$\Pr(y_i = m|x_i) = \frac{\exp(x_i\beta_m)}{\sum_{j=1}^J \exp(x_i\beta_j)} \quad (3.20)$$

For identification purpose, one of the  $\beta$ 's is constrained to be equal to zero. Then, we obtain:

$$\Pr(y_i = m|x_i) = \frac{\exp(x_i\beta_m)}{\sum_{j=1}^J \exp(x_i\beta_j)} \quad \text{where } \beta_1 = 0 \quad (3.21)$$

For the case of  $y_i = 1$ , the probability model can be shown as follow:

$$\Pr(y_i = 1|x_i) = \frac{1}{1 + \sum_{j=2}^J \exp(x_i \beta_j)} \quad (3.22)$$

For the case of  $y_i = m$  and  $m \neq 1$ , then the probability model is written as follow:

$$\Pr(y_i = m|x_i) = \frac{\exp(x_i \beta_m)}{1 + \sum_{j=2}^J \exp(x_i \beta_j)} \quad \text{for } m > 1 \quad (3.23)$$

Next, we need to estimate Maximum Likelihood function to obtain the  $\beta$ , the likelihood equation can be written as follow if all the observations are independent,

$$L(\beta_2, \dots, \beta_j | y, X) = \prod_{i=1}^N p_i \quad (3.24)$$

Then, the probability equation can be put on the right side of the likelihood equation to replace  $p_i$ :

$$L(\beta_2, \dots, \beta_j | y, X) = \prod_{m=1}^J \prod_{y_i=m} \frac{\exp(x_i \beta_m)}{\sum_{j=1}^J \exp(x_i \beta_j)} \quad (3.25)$$

### 3.4.3.2 Goodness of Fit Tests

Goodness of fit tests are also undertaken before the regression analysis is performed. The objective is to check the data fit the model or not. The steps of goodness of fit for model 2: Compensation gap are similar to Model 1 as mentioned earlier.

### 3.4.3.3. Further Description on the Variables

#### Dependent Variable (Land Compensation Gap)

The first dependent variable in Model 3 is the land compensation gap. It is derived from the expected land compensation amount minus the actual land compensation. The expected compensation is the compensation that is expected by

the communities to bring them to the original utility before resettled. The actual compensation is the compensation received from the government.

### **Independent Variables**

The independent variables are use value (personal area of land before relocation, additional increment of land area per year before relocation, value per house before relocation, number of house owned before relocation, level of infrastructure investments before relocation), non-use value (environment quality value, social value and culture value), socio-demographic variables (gender, marital status, employment status, jobs, number of other working family members, income, religious affiliation, level of education, age, number of people in household, ethnicity and years of living in Bakun) and freedom and rights variables (freedom to be consulted in compensation process, rights to be informed earlier in compensation process, rights to involve in all compensation stages, freedom to prepare for changes n resettlement to new settlement, freedom of choice to reject or accept compensation given, freedom of communities to be involved in the resettlement process). All the definitions of independent variables have been discussed in model 1.

## **3.5 Data Collection Strategies and Survey Instruments**

### **3.5.1 Study Area**

The study area is the Sungai Asap resettlement scheme (place where people displaced from the Bakun hydroelectric dam). Bakun hydroelectric dam is located in Balui River (the upper part of Rejang River), 37 kilometres from Belaga, Bintulu and is fed by three main tributaries, the Murum River, Linau River and the Bahau River.

The project has displaced 10000 people, including many semi-nomadic people Penan tribes people. The indigenous communities near Bakun area are resettled at Sungai Asap resettlement scheme. The collection of the data will focus on the area of Sungai Asap resettlement scheme.

#### **(a) Background Information of Sungai Asap Resettlement Scheme**

The Sungai Asap resettlement scheme was established in year 1998 to accommodate the 10000 people from 15 longhouses. The people have to be relocated from their original villages in the Balui River and make way for the Bakun hydroelectric dam project.

Sungai Asap is a sub-district located in the Belaga district, about 37km beyond and up river of Balui is the Bakun hydroelectric dam. A Sarawak administrative officer is in-charges of the Sungai Asap sub-district. The little town of Belaga is situated at the confluence of Belaga River and Balui River.

In mid-1999, all the 15 longhouses near Bakun hydroelectric dam had moved to Sungai Asap resettlement scheme. Currently, Sungai Asap consists of five different ethnic groups which are the Kayan, Kenyah, Ukit, Penan Talun and Kajang. There were 9428 inhabitants or 1639 households in Sungai Asap by year 1998 and with many births (no written documents except health records at the Sungai Asap Clinic). The sample of study is stratified according to the number of households in the each longhouse (stratum) according to the data of local district office in year 2001.

Data in year 2001 released by Department of Statistics, Malaysia was used to calculate the sample for the households.

Table 3.1  
*Ethnic Groups Resettle at Sungai Asap 1998*

No	Ethnic Group	Population
1	Kenyah	4708
2	Kayan	3781
3	Kajang	535
4	Ukit	300
5	Penan	104
Total		9428

Source: Local District Office, Sungai Asap (2001)

The sample size of the different ethnic groups is based on the actual ethnic groups resettled at Sungai Asap in year 1998.

Table 3.2  
*The Population Composition at Sungai Asap in 1998*

No.	Longhouse /Villages	Head of Longhouse	Date of relocation	Total Households	Total inhabitants
1	Uma Ukit	Bawa Paran	15.09.1998	51	300
2	Uma Lesong	Huvat Laing	18.09.1998	128	646
3	Uma Daro	Liah Japi	11.11.1998	115	468
4	Uma Belor	Saging Bit	17.11.1998	101	429
5	Uma Badang	Nyaban Kulleh	23.11.1998	197	1559
6	Uma Nyaving	Tajang Laing	22.12.1998	87	445
7	Uma Kelap	Batang Langat	02.03.1998	103	477
8	Uma Kulit	Gun Imang	05.04.1998	209	1274
9	Uma Bakah	Palan Bisau	12.04.1998	223	1398
10	Uma Balui	Lating Abun	19.04.1998	84	414
	Ukap				
11	Uma Bawang	Duren Lihan	18.05.1998	69	453
12	Uma Balui Liko	May Legiew	26.05.1998	68	348
13	Uma Penan	Migu Magui	14.06.1998	20	104
	Talun				
14	Uma Lahanan	Lajang Nyipa	16.06.1998	89	535
15	Uma Juman	Musa Talik	28.07.1998	95	578
Total				1639	9428

Source: Local District Office, Sungai Asap (2001)

Table 3.3

*Total Population by Ethnic Group and Household, Sub-district and State, Malaysia 2010*

Sub-District	Total population	Non other Bumiputera population (Malay, Iban Bidayuh, Melanau, Chinese, Indians, others and Non-Malaysian citizens)	Other Bumiputera population (Kenyah, Kayan, Kajang, Ukit, Penan)	Households
Sungai Asap	15397	4018	11379	3645

Source: Department of Statistics, Malaysia

### 3.5.2 Data Collection Strategies

The data for this study was collected using primary and secondary sources. Data on the socio-demographic variables, amount of compensation received in Ringgit Malaysia, actual compensation for each listed item, expected amount of compensation, expected amount of compensation of each item and satisfaction level towards compensation given were collected through face to face interview. Besides that, data of amount of values before resettlement for each element in use values (Income from crops in cultivated lands and jungle resources, personal area of land, additional increment of land per year, house, level of infrastructures investment), non-use values (environmental quality value, social value and culture value) and freedom of choice to be involved in the compensation process were also collected from face-to-face interviews with the indigenous communities. The questionnaire used in this study (Appendix 1) was developed over the period of three months. The original questionnaire was in English version and was translated to Malay language version during the interview. Before the actual interview is undertaken, pre-testing was conducted. The objective was to examine the understandability of households. The post-migration survey study was undertaken in year 2012.

Secondary data was collected from newspapers, literature studies (review) of published materials and reports, other relevant journals. Visits to the statistic offices and district offices in Sungai Asap, Belaga area to collect more detailed data was required and performed. Examples of the data collected are the number of population household in Sungai Asap resettlement and the number of longhouses resettled.

### **3.6 Sampling Technique**

The unit of the analysis in this study was households resettled in the Sungai Asap resettlement area. The sample was chosen on the basis of a purposive sampling procedure. Purposive sampling is confined to obtaining information from specific type of people because they are the only ones who have the information (Sekaran & Bougie, 2009). In this study, the face to face interview with the household heads or housewives could only be carried out for those who were available during the interview session. Data of total population households at every longhouse at Sungai Asap sub-district in year 1998 was obtained from Local District Office, Sungai Asap. The population at Sungai Asap in year 1998 shows that the population households are 1639. According to Sekaran & Bougie (2009), the appropriate sample size for population households of 1639 was about 313. However, 379 sample households were obtained during the interview session for this study.

Let

n = sample

N = population

$379 / 1639 = 23\%$  is the proportion of the population interviewed from this study

Housewives were also selected for the interviews. The sample size of housewives was 178. The purpose of asking housewives was to get the views of women about the valuation so that the valuation considers the gender perspective on compensation. As a whole, the total sample in this study was 379 (201 household heads plus 178 housewives).

### **3.7 Pre-testing Questionnaires**

Pre-testing questionnaires was carried out on a small sample of population that consists of 10 household heads and housewives randomly selected at Sungai Asap sub-district of which the indigenous communities are resettled before carry on to test the 379 sample in Sungai Asap sub-district. The main objective of the pre-testing questionnaires was to see whether the respondents can understand the questionnaires. After the pre-testing questionnaires, the changes are made to sequence the questions and the wordings to enable the respondents to understand easier. This can enable construct validity in which the items of questions in the questionnaires are clearly stated.

### **3.8 Survey Instrument**

The standardized questionnaire was developed over the period of three months during which it is tested and retested on the household heads and the housewives in Sungai Asap resettlement scheme area. Same questionnaires were given to household heads and housewives. The questionnaire for the household heads and housewives to fill is organized as follows:

Section A: Settlers socio-demographic characteristics: gender, marital status, working status, job, income, religion affiliation, level of education, age, and number of people in the households, ethnics and years of living in Bakun.

Section B: The amount of compensation received, the satisfaction level towards compensation by government, the actual compensation for each items given, the expected amount of compensation and expectation for the compensation items.

Section C: Amount of values in elements of use values (Income from crops in cultivated lands and income from jungle resources before relocation, personal area of land before relocation, additional increment of land per year before relocation, level of infrastructures quality before relocation and non-use values (importance of environmental quality value, importance of social value and importance of culture value).

Section D: Freedom of choices involvement in compensation process was asked to know the rights and freedom of people in compensation process. If the indigenous people have more choices, the welfare will increase. If the indigenous people have less choice in the compensation process, the welfare will decrease. This may affect the dissatisfaction towards given compensation.

### **3.9 Measurement of the Variables**

In this study, we examine compensation by looking at the change in the use and non use values that the individual experiences as a result of the relocation. There are two types of respondents that are household heads and housewives. The same questionnaire is used for the two types of respondents' namely household heads and housewives.

Firstly, the household heads and housewives need to fill the socio-demographic details such as the gender, age, marital status, working status, job, income, religious affiliation, education level, numbers of people in the household, ethnicity and years living in Bakun in section A.

In section B, the respondents will be asked whether government give them the compensation and state the compensation they got. Based on the given amount of compensation, respondents will have to answer whether they are satisfied or not with the reported compensation amount. The satisfaction level towards the reported compensation (dependent variable) is measured using binary choice/ dichotomous answers of yes/no. The respondents have to state the actual compensation for each item. After that, the respondents will be asked to give their expected value of compensation and fill in the expected compensation for each item.

The amounts of values for the independent variables (use values and non-use values) will be asked in section C so that the independent variables can be tested against the dependent variable (satisfaction level towards the compensation given). The values of all the use-values (Income from crops in cultivated lands and jungle resources, personal area of land, additional increment of land per year, house, level of

infrastructures investment) and non-use values (importance of environmental quality value, importance of social value and importance of culture value) will be asked. These are found in section C.

To know whether aspects of freedom and rights were accounted for in the compensation process, the respondents are requested to answer the questions of freedom of choices in the compensation processes by ranking the freedom of choices and give a value to Likert scale (point 1 to point 5). Point 1 represents the respondents are not given the freedom to participate in compensation process. As the point move up from point 1 to point 5, the freedom to participate in compensation process will be higher. Point 5 represents the respondents are very well given the freedom to participate in the compensation process. The freedom of choices can affect the satisfaction towards the compensation given. If the respondents are given more choices, the welfare is expected to be higher. However if the respondents are given less choices, the welfare is expected to be lower. These are found in section D.

### **3.10 Data Analysis**

The data analysis is divided into descriptive, profile and regression. Descriptive analysis on socio-demographic variables, gap variables, use value variables, non-use value variables are discussed. The regression analysis on the 3 models (Model 1: Satisfaction with Compensation, Model 2: Compensation Gap and Model 3: Land Compensation Gap) and the diagnostic tests are also discussed

### **3.10.1 Descriptive Analysis**

Descriptive statistics is used to show the characteristics of the sample (De Vaus, 2002). It also helps to simplify the data into frequency table that consists of frequency, percentage form and probability (Rani, 2004:76; Mason & Lind, 1990:27). The results of mean, minimum value, maximum value and standard deviation values are presented in descriptive analysis. The purpose of doing mean is to find the average values of the sample. Key variables such as gap in land compensation, personal land area before relocation, importance of environmental quality before relocation, freedom and rights variables are presented.

### **3.11 Regression Analysis**

Regression is a statistical procedure for establishing the relationship between two or more variables. The Logit regression is used to analyze the relationship between the dependent variable (satisfied or not to the compensation value) and the independent variables (the socio-demographic variables, use values (use values (Income from crops in cultivated lands and jungle resources before relocation, personal area of land before relocation, additional increment of land area per year before relocation, house value before relocation, number of house before relocation and level of infrastructures investment), non-use values (environmental quality value, social value and culture value) and freedom and rights variables in the compensation response function.

### **3.12 Chapter Summary**

This chapter describes the methodology used to generate the theoretical framework, conceptual model and empirical model, data collection strategies, sampling technique and methods of analysis to answer the research questions provided. The next chapter will provide descriptive statistics of the data used in the study.

## **CHAPTER FOUR**

### **DESCRIPTIVE AND PROFILE ANALYSIS**

#### **4.1 Introduction**

This chapter presents the descriptive analysis for the continuous variables and dummy variables. In descriptive analysis, the mean, standard deviation, minimum and maximum values are reported. The objectives of descriptive analysis are to get better understanding of the data and to detect any obvious errors in the data before it is used for regression analysis.

Profile analysis is also performed and reported in this chapter. The objective of doing profile analysis is to check whether there are significant difference between dependent variable (satisfaction with compensation) and independent variables (the socio-demographic variables, gap variables, use values variables (income from crops in cultivated lands and jungle resources before relocation, personal area of land before relocation, additional increment of land area per year before relocation, house value before relocation, number of houses before relocation and level of infrastructures investment) and non-use values variables (environmental quality value, social value and culture value).

#### **4.2 Descriptive Statistics of Continuous/ Discrete Variables**

The results of descriptive statistics can be divided into socio-demographic variables, gap variables and freedom and right variables.

## Socio-demographic Variables

Table 4.1  
*Descriptive Statistics for Continuous Variables*

<b>Variables</b>	<b>Mean</b>	<b>Standard Deviation</b>	<b>Min</b>	<b>Max</b>
1. Number of Other Members working	0.92	1.48	0.000	10
2. Monthly income before resettlement	645.52	773.53	0	8000
3. Monthly income after resettlement	470.90	534.07	0	5000
4. Age of respondent	50.67	13.29	21	90
5. Number of family members	6.77	3.65	1	22
6. Years of living in Bakun	35.96	13.28	1	76
7. Income from crops (RM)	511.13	520.84	0	3000
8. Income from jungle resources (RM)	325	381.93	0	3000
9. Personal land area (hectare)	69.20	89.09	0	700
10. Additional increment of land area per year before relocation (hectare)	10.47	28.33	0.000	300
11. Number of houses before Relocation	1.02	0.14	1.000	2
12. Value per house before relocation (RM)	26107.70	15261.41	0	70000

From the Table 4.1, the mean age of respondents is 51 years old. The respondents have average family members of seven persons and number of others working members of one. The average monthly income before resettlement is RM645.51 and the average monthly income after resettlement is RM470.90.

## Gap Variables

Table 4.2  
*Descriptive Statistics for Gap Variables*

	<b>Mean</b>	<b>Standard Deviation</b>	<b>Min</b>	<b>Max</b>
1. Gap of total compensation in cash (RM)	323,818.70	176,412.16	3,000	784,000
2. Gap in land compensation (acre)	19.65	24.50	0	197
3. Gap in value of house compensation (RM)	38,203.44	22,871.85	0	100,000
4. Gap in number of houses compensated	0.96	1.57	0	10
5. Gap in value of small farm (RM)	131,156.20	91,253.36	0	500,000
6. Gap in value of orchard (RM)	93,309.23	67,824.46	0	300,000
7. Gap in value of fruits (RM)	60,446.69	38,068.99	0	150,000
8. Gap in income per individual (RM)	-173.96	-656.35	-4000	4,000
9. Gap in value of small farm and orchard (RM)	224,465.47	1.44	0	660,000
10. Gap in total compensation (Recategory)	3.00	1.41	1	5

In term of gaps as shown in Table 4.2, the average gap of total compensation in cash (RM) is RM323,818.70. This means that the amount of compensation given by the government is not similar to amount of compensation expected by the indigenous communities. Gap of compensation is the amount of compensation expected by the settlers minus the actual compensation given by the government. The average gap in compensation of small farm, orchard and fruits are RM131,156.20, RM93,309.23 and RM60446 respectively. The average gap in compensation of house in term of cash is RM38,203.44 and average gap in number of house compensated is one. Finally, the average gap in land compensation is 19.646 acres.

## Freedom and rights variables

Table 4.3

*Descriptive Statistics for Freedom and Rights Variables*

	<b>Mean</b>	<b>Standard Deviation</b>	<b>Min</b>	<b>Max</b>
1. Freedom to be consulted during compensation process	1.21	0.55	1	5
2. Rights to be informed earlier during compensation process	1.97	0.91	1	5
3. Rights to involve in all stages of compensation	2.10	0.89	1	5
4. Freedom to prepare for changes in resettlement	2.42	1.05	1	5
5. Freedom of given choice to accept or reject final compensation	1.49	0.84	1	5
6. Freedom of community involvement in resettlement process	2.56	1.18	1	5
7. Freedom of community involvement in compensation process	1.99	0.96	1	5

From the Table 4.3, on average, the figures indicate that freedom and rights variables are not very high that is below 2.5. This implies that the settlers do not have high level of freedom and rights to participate in the compensation and resettlement process by the state authorities.

### 4.3 Descriptive Statistics of Dummy/Categorical Variables

The descriptive statistics of dummy or categorical variables can be divided into gender and marital status, employment status and jobs, education, ethnics, religious, use value variables and non-use value variables.

## Gender and Marital Status

Table 4.4  
*Descriptive Statistics for Gender and Marital Status*

	<b>Groups</b>	<b>Valid Percentage (%)</b>
1. Gender	Male	53
	Female	47
2. Marital Status	Single	1.8
	Married	87.1
	Widow	11.1

From the Table 4.4, the sample has balance representative of gender with male (53%) and female (47%). The sample is dominated by married respondent (87.1%).

## Employment Status and Jobs

Table 4.5  
*Descriptive Statistics for Employment Status and Jobs*

	<b>Groups</b>	<b>Valid Percentage (%)</b>
1. Employment status	Unemployed	14
	Unable to work	0.5
	Full-time employed	2.9
	Part-time employed	1.1
	Self-employed	81.5
2. Job	Jungle resource collector	4.6
	Cash crop farmer	87.8
	Labour at oil-palm plantation	2.4
	Hunter	1.5
	Others	3.7
3. Other members working	Yes	41.7
	No	58.3

From the Table 4.5, the majority of the sample is self-employed (81.5 percent) and mostly self-employed cash-crop farmer (87.8 percent).

## Education

Table 4.6  
*Descriptive Statistics for Education Status*

	<b>Groups</b>	<b>Valid Percentage (%)</b>
1. Education Status	No formal education	42
	Did not complete primary school	15.3
	Completed primary school	8.2
	Did not complete lower secondary school	6.1
	Completed lower secondary school	8.4
	Did not complete upper secondary school	3.4
	Completed upper secondary school	12.9
	STPM	1.3
	Certificate/ Diploma	1.8
	Bachelor	0.3
	Postgraduate	0.3

From the Table 4.6, most of them do not have formal education implying they have difficulties adapting to new environment. This may lead to settlers demanding higher compensation. 71.6 percent of the sample did not complete lower secondary school and even lower than did not complete lower secondary school status.

## Ethnic

Table 4.7  
*Descriptive Statistics for Ethnic*

	<b>Groups</b>	<b>Valid Percentage (%)</b>
1. Ethnic	Kenyah	31.7
	Kayan	57.3
	Kajang	3.2
	Ukit	5.8
	Penan	2.1

From the Table 4.7, majority of the respondents are Kayan (57.3%) and Kenyah (31.7%). Two ethnic groups (Kenyah and Kayan) dominate the population of the project area.

## Religious

Table 4.8  
*Descriptive Statistics for Religious*

	<b>Groups</b>	<b>Valid Percentage (%)</b>
1. Religious	No religion	0
	Christian	96.6
	Islam	1.1
	Bungan	2.4
	Buddhist	0
	Taoist	0
	Others	0

From the Table 4.8, Christian (96.6%) has the highest proportion in the sample whereas Islam has the lowest (1.1%).

## Use Values

Table 4.9  
*Descriptive Statistics for Use Values*

	<b>Groups</b>	<b>Valid Percentage (%)</b>
1. Infrastructure quality before relocation	Low	31.9
	Medium	43.8
	High	24.3

From the Table 4.9, there are mixed responses to the quality of infrastructure investments before relocation.

## Non-use values

Table 4.10

*Descriptive Statistics for Non-use Values*

	<b>Groups</b>	<b>Valid Percentage (%)</b>
1. Importance of environmental quality value before relocation	Less important	0.3
	Medium important	3.4
	Very important	96.3
2. Importance of social values before relocation	Less important	0.3
	Medium important	5.5
	Very important	94.2
3. Importance of culture value before relocation	Less important	1.6
	Medium important	98.2
	Very important	0.3

From the Table 4.10, majority of the sample perceive that environmental values before relocation are very important (96.3 percent) and social values before relocation are very important (94.2 percent). Besides that, 98.2 percent perceive culture value before relocation as medium important.

#### 4.4 Levels of Satisfaction with Regard to Continuous Variables

The continuous variables can be grouped into socio-demographic variables, use value variables, non-use value variables and freedom and rights variables. The profiling analysis is done to complement the regression analysis.

Table 4.11  
*Profiling for Continuous Variables*

<b><u>Profiling</u></b>				
<b><u>Continuous Variables</u></b>	<b>Dissatisfied Mean</b>	<b>Satisfied Mean</b>	<b>Difference (D-S)</b>	<b>p-value</b>
1. Number of other members working	0.876	1.812	-0.936	0.013
2. Age	50.000	45.000	5.000	0.099
3. Number of people in household	6.807	5.937	0.870	0.352
4. Years of living in Bakun	36.000	30.000	6.000	0.082
5. Gap of total compensation (RM)	331,378.200	152,12.500	179,065.700	0.000
6. Gap of land (acre)	20.243	6.106	14.137	0.024
7. Gap of house value(RM)	38,261.990	36,875.000	1,386.990	0.813
8. Gap of number of house	0.981	0.500	0.481	0.231
9. Gap of fruits (RM)	61,832.770	29,000.000	32,832.770	0.001
10. Personal land area before relocation	71.185	24.125	47.060	0.038
11. Additional increment of land area per year before relocation	10.561	8.312	2.249	0.757
12. Number of house before relocation	1.022	0.000	1.022	0.550
13. Value per house before relocation (RM)	26,151.010	25,125.000	1,026.010	0.793
14. Infrastructure quality before relocation	1.9394	1.5625	0.3769	0.048
15. Gap of income per individual	-182.727	25.000	-207.727	0.216
16. Gap of small farm and orchard	230,549.400	86,437.500	144,111.900	0.000
17. Income before relocation	835.386	853.125	-17.739	0.933

From the Table 4.11, significant continuous variables are selected. Those variables with p-value less than 0.10 are significant variables. The variables are number of other members in a family working, age, years living in Bakun dam, gap of total compensation (RM), gap of compensation in small farm and orchard (RM), gap of compensation in fruits (RM), gap of compensation in land (acres), personal land area before relocation, infrastructure quality before resettlement, environmental quality value.

There is a difference of gap in total compensation between the dissatisfied group and satisfied group. The difference of gap of total compensation between the

two groups is RM179,065.70. Dissatisfied group tends to have higher gap of compensation compared to the satisfied group. Gap in compensation of fruits is also important in affecting dissatisfaction. Dissatisfied group tends to have higher gap in compensation of fruits compared to the satisfied group. Those with more hectares of land tends have more dissatisfaction compared to those with less hectares of land.

For use value variables comparison, those who perceive their old settlement as of medium infrastructure quality level are more likely to be not satisfied (mean value =2). Those who perceive their old settlement as of low infrastructure quality level are more likely to be satisfied with the compensation given (mean value =1.56).

### **Freedom and Rights Variables**

Table 4.12  
*Profiling for Freedom and Rights Variables*

<b>Freedom and Rights Variables</b>	Dissatisfied Mean	Satisfied Mean	Difference (D-S)	p-value
1. Freedom to consult during compensation process	1.176	1.938	-0.762	0.000
2. Rights to be informed earlier for the compensation process	1.937	2.750	-0.813	0.000
3. Rights to involve in various stages of compensation	2.063	3.000	-0.937	0.000
4. Freedom to prepare changes in resettlement	2.402	2.938	-0.536	0.046
5. Freedom of given choice to accept or reject final compensation	1.488	1.500	-0.012	0.954
6. Freedom of community involvement in resettlement process	2.551	2.875	-0.324	0.282
7. Freedom of community involvement in compensation process	1.964	2.688	-0.724	0.003

From the Table 4.12, those with higher freedom in compensation and resettlement process have less dissatisfaction than those with less freedom. The freedoms that are significant in affecting satisfaction level are freedom to be consulted

during compensation process, rights to be informed earlier in compensation process, rights to involve in various stages of compensation and freedom of community involvement in compensation process. Those with higher freedoms in the significant freedom and rights variables mentioned have less dissatisfaction than those who possess less freedom.

#### 4.5 Level of Satisfaction with Regard to Categorical/Dummy Variables

Profiling of categorical or dummy variables are performed and the results are shown in table below.

##### Gender, Marital Status and Religious

Table 4.13

*Profiling for Gender, Marital Status and Religious*

<b>Classification Table</b>	Not Satisfied (%)	Satisfied (%)
<b><u>1. Dummy Gender</u></b>		
(a) Male	54	31.3
(b) Female	46	68.8
Chi-Square Test P-Value: 0.074		
<b><u>2. Dummy marital status</u></b>		
(a) Single	1.9	0
(b) Married	87.1	87.5
(c) Widowed	11	12.5
(d) Others		
Chi-Square Value: 0.844		
<b><u>3) Religious</u></b>		
(a) Christian	96.4	100
(b) Islam	1.1	0
(c) Bungan	2.5	0
Chi-Square Value: 0.743		

From the Table 4.13, for socio-demographic variables comparison, males are more likely to be dissatisfied with the compensation than female.

## Education Level

Table 4.14

*Profiling for Education Level*

<b>1) Education Level</b>	Not Satisfied (%)	Satisfied (%)
a) No formal education	42.4	31.3
b) Not finish primary school	15.4	12.5
c) Finish primary school	7.7	18.8
d) Not finish lower secondary school	6.3	0
e) Finish lower secondary school	8.5	6.3
f) Did not complete upper secondary school	3.3	6.3
g) Complete upper secondary school	12.7	18.8
h) STPM	1.4	0
i) Diploma/ Certificate	1.7	6.3
j) Bachelor	0.3	0
l) Pstgraduates	0.3	0
Chi-Square Value:		
0.742		

From the Table 4.14, the Chi-Square value of 0.742 indicates that there is no significant difference of settlers' dissatisfaction with compensation across education level.

## Ethnic

Table 4.15

*Profiling for Ethnic*

<b>1) Ethnic</b>	Not Satisfied (%)	Satisfied (%)
a) Kenyah	32.2	18.8
b) Kayan	59	18.8
c) Kajang	3.3	0
d) Ukit	3.9	50
e) Penan	1.7	12.5
f) Others	0	0
Chi-Square Value: 0.000		

From the Table 4.15, Kayan and Kenyah are more likely to be dissatisfied than other race and Ukit ethnic are more likely to be satisfied with compensation given.

## Employment status and jobs

Table 4.16

### *Profiling for Employment Status*

<b>1) Employment Status</b>	Not Satisfied (%)	Satisfied (%)
(a) Unemployed	13.5	25
(b) Unable to work	0.6	0
(c) Full-time employed	2.8	6.3
(d) Part-time employed	0.8	6.3
(e) Self-employed	82.4	62.5
	Chi-Square Value: 0.126	
<b>2) Jobs</b>		
(a) Jungle resource collector	4.8	0
(b) Cash crop farmer	87.9	83.3
(c) Labour at oil-palm plantation	2.2	8.3
(d) Hunter	1.3	8.3
(e) Others	3.8	0
	Chi-Square Value: 0.159	
<b>3) Other members working</b>		
(a) Yes	40.8	62.5
(b) No	59.2	37.5
	Chi-Square Value: 0.084	

From the Table 4.16, it shows that those who do not have other members working are more likely to be dissatisfied than those who have.

## Non-use values

Table 4.17

### *Profiling for Social Value and Culture Value*

<b>1) Social value</b>	Not Satisfied (%)	Satisfied (%)
a) Less important	0	6.3
b) Middle important	5.5	6.3
c) Very important	94.5	87.5
	Chi-Square Value: 0.000	
<b>2) Culture value</b>		
a) Less important	0	0
b) Middle important	1.7	0
c) Very important	98.3	100
	Chi-Square Value: 0.604	

From the Table 4.17, for non-use value variables comparison, those who feel environment value and the social value in the old settlement are very important are

more likely to be not satisfied with compensation given. However, those who feel environment value and social value are very important in the old settlement are also likely to be satisfied compared with others.

In short, those who are satisfied are females, households with high number of working members, Ukits and younger people. For those with higher acres of personal land in the old settlement, higher gap in total compensation of cash, higher gap in compensation of land (acres), higher gap in compensation of fruits (RM), higher gap in compensation of small farm and orchard (RM), who perceived low infrastructure quality in old settlement, who view environmental values and social values as very important in the old settlement, tends to be more dissatisfied with the compensation given.

## **CHAPTER FIVE**

### **REGRESSIONS ANALYSIS**

#### **5.1 Introduction**

This chapter provides the results to answer the research objectives of the study. Three models are presented in this chapter. The first model with dependent variable as satisfaction with compensation is analyzed using logistic regression whereas Model 2 with dependent variables of compensation gaps analyzed using ordered logistic regression. In Model 3, land compensation gap is analyzed using multinomial logistic regression. Diagnostic analysis of each model is also provided in this chapter.

#### **5.2 Model 1: Satisfaction with Compensation**

In Model 1, the dependant variable is satisfaction with compensation. The independent variables are gap variables, use-value variables, non-use value variables, socio-demographic variables and freedom and rights variables. Combination of all independent variables is called the full model.

##### **5.2.1 Full model (In Model 1)**

At first, the full model of satisfaction level is regressed using logistic regression. However, the iteration does not converge in logistic regression for full model. Maximum Likelihood estimation could not be estimated. Thus, separate model of gap variables, use-value variables, non-use value variables, socio-

demographic variables and freedom and rights variables have to be regressed against the satisfaction with compensation.

### 5.2.1.1 Regression of Model 1 with Gap Variables as Independent Variables

Satisfaction with compensation is first regressed against the gap variables which comprise gap in compensation of small farm and orchard, gap in compensation of fruits, gap in compensation of land, gap in compensation of house, gap in compensation of number of house and gap of income. Goodness of fit is presented first before estimation results are presented.

#### *Goodness of fit*

Table 5.1

#### *Model Summary of Model 1 with Gap Variables as Independent Variables*

Model	pseudo R <sup>2</sup>	Test statistic	p-value	(% Correctly Classified)
1. Overall fit	0.2310	30.63	0.0000	
2. Specification Error		0.31	0.7540	
3. Heteroscedasticity* (White)		48.29	0.0071	
4. Classification Table (Hit-Miss Table)				95.78%

Note:

\* This test is performed using the White test.

From Table 5.1 above, it is found that overall fit of the model is significant, with p-value of zero. The null hypothesis of the model does not fit the data is rejected. Hit-miss table predicts the data correctly by 95.78%. Thus, overall, this model fits the data well in this study.

The specification error test is also tested. The p-value of predicted  $\hat{y}_2$  is 0.754. This means that the null hypothesis of no specification error is not rejected.

Thus, there is no evidence of specification error of Model 1 with gap variables as independent variables.

Table 5.2  
*Multicollinearity: VIF of Model 1 with Gap Variables as Independent Variables*

Model	Collinearity Statistics
	VIF
Gap in fruits	2.15
Gap in small farm and orchard	2.09
Gap in land area	1.05
Gap in value per house (RM)	1.03
Gap in number of houses	1.03
Gap in income (RM)	1.02

Relating to multicollinearity, VIF test was performed. Table 5.2 shows that the maximum value of VIF is 2.15, which is less than 10. This shows that there is no evidence of serious multicollinearity problem in the model.

There is heteroscedasticity problem in the gap variables of Model 1. The p-value is 0.0071 thus resulting in rejection of the null hypothesis of no heteroscedasticity problem in the model. Studies using cross-section data often face the problem of heteroscedasticity. To minimize this problem, the model of this study is estimated using robust standard error.

As a whole, this Model 1 with gap variables as independent variables is a good model because it has a satisfactory level of goodness of fit for the data and does not violate the major classical assumptions. Thus, the model can be used. The next step is Logit estimation of satisfaction with compensation, using gap variables only and the results are presented below.

### Model 1 with Gap Variables as Independent Variables

The below Table 5.3 shows the regression results of Model 1: Satisfaction with compensation with the independent variables as gap variables.

Table 5.3  
*The Estimated Model 1 with Gap Variables as Independent Variables*

	B	z-stat	Sig
	Robust B	Robust z	Robust Sig
(Constant)	0.9914130	1.44	0.150
Gap in fruits	0.0000006	0.05	0.961
Gap in small farm and orchard	0.0000080 *	1.88	0.060
Gap in land	0.0989110**	2.48	0.013
Gap in value per house	-0.0000100	-1.02	0.306
Gap in number of houses	0.2794710	0.85	0.396
Gap of income	-0.0003290	-0.64	0.524
Restriction Test		Chi-square 2.15	p-value 0.708

Note:

Asterisks \*\*\*,\*\* and \* indicate significant at 1%, 5% and 10% level respectively.

Complementary log-log is performed but the results are similar to logistic regression (see Appendix 3).

Table 5.3 shows the estimated model of satisfaction with compensation using gap variables only. The coefficient of gap in compensation of small farm and orchard is significant at 10 percent level. The coefficient of gap in compensation of land is significant at 5 percent level. The others gap in compensation variables are found to be insignificant. This means that the gap inland compensation (acres) and gap in compensation of small farm and orchard (RM) are significant and have positive effect on probability of dissatisfaction towards compensation.

In short, reducing the gap inland compensation and gap in compensation of small farm and orchard (RM) will help reduce the probability of dissatisfaction. The results are consistent with expectations.

### **Restriction Tests (Test for Joint Significance)**

The restriction test is also performed to check whether insignificant gap variables jointly affect the dissatisfaction towards compensation. The p-value of chi-square of 0.708 suggests that the null hypotheses of all independent variables are insignificant in affecting satisfaction level towards compensation is not rejected. This implies that the independent variables (gap of compensation in fruits (RM), gap of compensation in house (RM), gap of compensation in number of houses and gap of compensation in income (RM) are indeed insignificant in affecting dissatisfaction towards compensation.

#### **5.2.1.2 Regression of Model 1 with Use Value Variables as Independent Variables**

Satisfaction level towards compensation is first regressed against the use value variables which comprises of personal land area before relocation, additional increment of land per year before relocation, value per house before relocation, number of houses before relocation and infrastructure quality before relocation. Goodness of fit is presented first before estimation results are presented.

*Goodness of fit*

Table 5.4

*Model Summary of Model 1: Satisfaction with Compensation; Use Value Variables*

Model	pseudo R <sup>2</sup>	Test statistic	p-value	(% Correctly Classified)
1. Overall fit	0.0774	10.20	0.0371	
2. Specification Error		-0.50	0.6180	
3. Heteroscedasticity* (White)		24.17	0.1896	
4. Classification Table (Hit-Miss Table)				95.69%

Note:

\* This test is performed using the White test.

From Table 5.4 above, it is found that overall fit of the estimated model is significant at 5 percent level, with p-value of 0.0371. The null hypothesis of the data does not fit the model is rejected. The hit-miss table 95.69% represents the model correctly predicted 95.69% of the data. Thus, overall, this model fits the data statistically.

The specification error test is also tested. The p-value of predicted  $\hat{y}_2$  is 0.618. This means that the null hypothesis of no specification error is not rejected. Thus, there is no specification error of Model 1 with use value variables as independent variables statistically,

There is no heteroscedasticity problem in Model 1 with use value as independent variables. The p-value is 0.1896 and this results in the non-rejection of the null hypothesis of no heteroscedasticity problem in the model.

As a whole, this Model 1 with use value variables as independent variables is a good model because it fulfills all the requirement of goodness of fit. Thus, the model can be used. The table below shows the estimation results of dissatisfaction towards compensation given using use value as independent variables.

Table 5.5

*Multicollinearity: VIF of Model 1: Satisfaction with Compensation; Use Value Variables*

Model	Collinearity Statistics VIF
Personal land area before relocation	1.12
Infrastructure quality before relocation	1.09
Additional increment of land area per year before relocation	1.06
Value per house before relocation	1.01
Number of house before relocation	1.00

Relating to multicollinearity, this study performs the VIF test. From Table 5.5, the maximum value of VIF is 1.12, which is less than 10. The VIF values of all use value variables are less than 10. This shows that there is no evidence of serious multicollinearity problem in the estimated model statistically.

**Model 1: Satisfaction with Compensation; Use Value Variables**

Table 5.6

*Coefficient of Robust Test in Model 1 with Use Value Variables as Independent Variables*

	B	z -stat	Sig
(Constant)	1.621837	2.05	0.041
Personal land	0.015087*	1.95	0.051
Additional increment of land area per year	-0.004089	-0.50	0.614
Value per house	-0.000002	-0.12	0.905
Infrastructure quality	0.555377	1.37	0.171
		Chi-square	p-value
Restriction Test		1.93	0.587

Note:

1. Number of house is dropped due to multicollinearity.
2. The variables of in use values are the values before relocation.
3. Asterisks \*\*\*,\*\* and \* indicate significant at 1%, 5% and 10% level respectively.
4. Complementary log-log is performed but the results are similar to logistic regression (refer to Appendix 4).

From Table 5.6, personal land before relocation is found to be significantly affecting dissatisfaction towards compensation given. Personal land before relocation positively affected dissatisfaction towards compensation. This implies that if the settlers have more land before relocation, they will be more dissatisfied. This may be due to the fact that land compensation gap will be larger if they have more land before relocation.

Restriction test of insignificant variables in use value variables model (p-value = 0.587) shows that there are jointly insignificant in affecting the dissatisfaction towards compensation.

### 5.2.1.3 Regression of Model 1 with Non-use Value Variables as Independent Variables

*Goodness of fit*

Table 5.7

*Model Summary of Model 1 with Non-use Value Variables as Independent Variables*

Model	pseudo R <sup>2</sup>	Test statistic	p-value	(% Correctly Classified)
1. Overall fit	0.1499	19.80	0.0001	
2. Specification Error		0.12	0.9020	
3. Heteroscedasticity*		16.97	0.0176	
4. Classification Table (Hit-Miss Table)				95.98%

Note:

\* This test is performed using the White test.

From Table 5.7 above, it is found that overall fit of the estimated model is significant at 1 percent level, with p-value of 0.0001. The null hypothesis of the model does not fit the data is rejected. The hit-miss table predicts the data correctly 95.98%. Thus, overall, this model fit into the data statistically.

The specification error test is also tested. The p-value of predicted  $\hat{y}_2$  is 0.902. This means that the null hypothesis of no specification error is not rejected. Thus, there is no specification error of Model 1 with non-use variables as independent variables statistically,

There is heteroscedasticity problem in Model 1 with non-use variables as independent variables. The p-value is 0.0176 and this value rejects the null hypothesis of no heteroscedasticity problem in the model. To counter this, the model of this study is estimated using robust standard error.

As a whole, this Model 1 with non-use value variables as independent variables is a good model because it fulfills all the requirement of goodness of fit. Thus, the model can be used for interpretation.

Table 5.8

*Multicollinearity: VIF of Model 1 with Non-use Value Variables as Independent Variables*

Model	Collinearity Statistics VIF
Dummy high for social value	1.28
Environmental quality value	1.18
Importance of culture value	1.13

From Table 5.8, there is no serious multicollinearity problem in non-use value variables. The maximum value of VIF is 1.28, which is less than 10. This shows that there is no evidence of serious multicollinearity problem in the estimated model statistically. Table 5.9 below shows the estimation results of dissatisfaction towards compensation given using non-use value as independent variables.

#### **Model 1 with Non-use Value Variables as Independent Variables**

Table 5.9

*Coefficient of Robust Test in Model 1 with non-use value variables as independent variables*

	B	z -stat	Sig
(Constant)	-5.452	-3.11	0.002
Environmental quality value	3.305***	4.66	0.000
Dummy high for social value	-1.016	-0.94	0.348
Restriction Test		Chi-square 0.88	p-value 0.348

Note:

1. Dummy medium for social value dropped due to multicollinearity.
2. Culture value is dropped due to multicollinearity.
3. Asterisks \*\*\*,\*\* and \* indicate significant at 1%, 5% and 10% level respectively.
4. Complementary log-log is performed but the results are similar to logistic regression (refer to Appendix 5).

From Table 5.9, only environmental quality before relocation is significantly affecting dissatisfaction towards compensation given. The environment quality value positively affected dissatisfaction towards compensation. This implies that if the environment value (trees, river and mountain) is high in current situation, the probability of dissatisfaction towards compensation becomes higher. This is consistent with expectations.

#### 5.2.1.4 Regression of Model 1 with Socio-demographic Variables as Independent Variables

##### *Goodness of fit*

Table 5.10

*Model Summary of Model 1 with Socio-demographic Variables as Independent Variables*

Model	pseudo R <sup>2</sup>	Test statistic	p-value	(% Correctly Classified)
1. Overall fit	0.4066	53.00	0.0000	
2. Specification Error		1.78	0.0750	
3. Heteroscedasticity*		214.45	0.0067	
4. Classification Table (Hit-Miss Table)				96.33%

Note:

\* This test is performed using the White test

From Table 5.10 above, it is found that overall fit of the model is significant at 1 percent level, with p-value of 0.0000. The null hypothesis of the model does not fit the data is rejected. The hit-miss table predicts the data correctly 96.33%. Thus, overall, this model fit into the data.

The specification error test is also tested. The p-value of predicted  $\hat{y}_2$  is 0.0750. This means that the null hypothesis of no specification error is not rejected at

5% significance level. Thus, there is no specification error of Model 1 with socio-demographic variables as independent variables.

There is heteroscedasticity problem in Model 1 with socio-demographic variables as independent variables. The p-value is 0.0067 and this value rejects the null hypothesis of no heteroscedasticity problem in the model. To counter this, the model of this study is estimated using robust standard error.

As a whole, this Model 1 with socio-demographic variables as independent variables is a good model because it fulfills all the requirement of goodness of fit. Thus, the model can be used.

Table 5.11

*Multicollinearity: VIF of Model 1 with Socio-demographic Variables as Independent Variables*

Model	Collinearity Statistics VIF
Age	56.58
Age2	44.75
Number of people in household	13.11
Number of people in Household2	12.67
Years living in Bakun	9.95
Dummy for widow	7.91
Dummy for married	7.75
Dummy for self-employed	7.65
Dummy for not working	7.24
Dummy for cashcrop	4.79
Dummy for Kayan	3.22
Dummy for Kenyah	3.04
Number of other members working	2.24
Dummy for family working	2.19
Dummy for other jobs	2.01
Dummy for labour	1.70
Dummy for Christian	1.62
Dummy for Islam	1.55
Education	1.47
Dummy for hunter	1.35
Dummy for female	1.35
Income	1.17

Note:

1. Age2 indicates age power of two.
2. Number of people in household2 indicates number of people in household power of two.

From Table 5.11, The VIF values for most of the socio-demographic variables are less than 10 implies that there is no multicollinearity problem. However, there are 4 independent variables which have VIF values of more than 10 namely age, age2, number of people in household and number of people in household2. Age and age2 have serious multicollinearity problem and cannot be avoided due to they are related to each other. Number of people in household and number of people in household2 also show serious multicollinearity problem because they are also belonging to same category.

### Model 1 with Socio-demographic Variables as Independent Variables

Table 5.12

*Coefficient of Robust Test in Model 1 with Socio-demographic Variables as Independent Variables*

	B	z-stat	Sig
(Constant)	39.722570	7.43	0.000
Dummy for female <sup>1</sup>	-1.225823*	-1.65	0.098
Dummy for married <sup>2</sup>	-16.592420***	-7.98	0.000
Dummy for widow <sup>2</sup>	-17.448600***	-9.75	0.000
Dummy for not working <sup>3</sup>	-15.364810***	-8.72	0.000
Dummy for self-employed <sup>3</sup>	0.711986	0.46	0.647
Dummy for cashcrop <sup>4</sup>	-15.628870***	-7.85	0.000
Dummy for labour <sup>4</sup>	-17.600850***	-10.94	0.000
Dummy for hunter <sup>4</sup>	-17.017600***	-7.38	0.000
Dummy for family working <sup>5</sup>	-0.231955	-0.27	0.790
Number of other members working	-0.351997*	-1.65	0.099
Income	-0.000474	-1.26	0.209
Education	-0.184209	-1.06	0.289
Age	-0.164637	-1.01	0.313
Number of people in household	-0.652578	-1.43	0.153
Dummy for Kenyah <sup>6</sup>	3.157432***	3.57	0.000
Dummy for Kayan <sup>6</sup>	4.314135***	4.77	0.000
Years living in Bakun	0.042380	0.92	0.356
Age2	0.001273	0.88	0.378
Number of people in household2	0.050914	1.55	0.122
	Chi-square	p-value	
Restriction Test	16.57	0.056	

Note:

1. The comparison group is male.
2. The comparison group is single status.
3. The comparison group is other employment which consists of unable to work, working full-time and working part-time.
4. The comparison group is jungle resource collector.
5. The comparison group is family members not working.
6. The comparison group is other ethnic which comprises of Kajang, Ukit and Penan.
7. Dummy for other jobs is dropped due to multicollinearity.
8. Dummy for Christian is dropped due to multicollinearity.
9. Dummy for Islam is dropped due to multicollinearity.
10. Complementary log-log (cloglog) is also performed on socio-demographic variables but the likelihood function cannot converge.
11. Asterisks \*\*\*,\*\* and \* indicate significant at 1%, 5% and 10% level respectively.

From Table 5.12, there are only 4 significant variables that are gender (dummy for female), marital status (dummy for married and dummy for widow), employment

status (dummy for not working and dummy for self-employed), job (dummy for cash crop farmer, dummy for labour and dummy for hunter), number of other members working and ethnicity (dummy for Kenyah and dummy for Kayan).

Female, as compared to male group, tends to lower the probability of dissatisfied towards compensation. Those who married, compare to the single status, can reduce the probability of dissatisfaction towards compensation given and those who are widowed, relative to single status also tends to reduce further the probability of dissatisfied compared to single status.

For those who are working, cash crop farmers tend to have lower probability of dissatisfied towards compensation as compared to jungle resource collectors. Both labourers and hunters also tend to have lower probability of dissatisfied towards compensation as compared to jungle resource collectors.

Different ethnic also affect probability of dissatisfaction towards compensation. Kenyah and Kayan tends to have higher probability of dissatisfaction towards compensation as compared to other ethnics (Kajang, Ukit and Penan).

#### **5.2.1.5 Regression of Model 1 with Freedom and Rights Variables as Independent Variables**

In this model, the dependent variable is satisfaction level and the independent variables are freedom and right variables. The goodness of fit is first performed and the results are presented in Table 5.13 and Table 5.14. The estimated model is presented in Table 5.15.

*Goodness of fit*

Table 5.13

*Model Summary of Model 1 with Freedom and Rights Variables as Independent Variables*

Model	pseudo R <sup>2</sup>	Test statistic	p-value	(% Correctly Classified)
1. Overall fit	0.2566	34.02	0.0000	
2. Specification Error		1.56	0.1190	
3. Heteroscedasticity*		69.07	0.0005	
4. Classification Table (Hit-Miss Table)				96.04%

Note:

\* This test is performed using the White test.

From Table 5.13 above, it is found that overall fit of the model is significant at 1 percent level, with p-value of 0.0000. The null hypothesis of the model does not fit the data is rejected. The hit-miss table predicts the data correctly 96.04%. Thus, overall, this model fit into the data.

The specification error test is also tested. The p-value of predicted  $\hat{y}_2$  is 0.1190. This means that the null hypothesis of no specification error is not rejected at 5% significance level. Thus, there is no specification error of Model 1 with freedom and rights variables as independent variables.

There is heteroscedasticity problem in Model 1 with freedom and rights variables as independent variables. The p-value is 0.0005 and this value rejects the null hypothesis of no heteroscedasticity problem in the model. To counter this, the model of this study is estimated using robust standard error.

As a whole, this Model 1 with freedom and rights variables as independent variables is a good model because it fulfills all the requirement of goodness of fit. Thus, the model can be used.

Table 5.14

*Multicollinearity: VIF of Model 1 with Freedom and Rights Variables as Independent Variables*

Model	Collinearity Statistics VIF
Freedom consulted	1.08
Rights to be informed	1.20
Rights to involve	1.21
Freedom to prepare change	1.07
Freedom of given choice to reject	1.11
Freedom of community involve resettlement	1.23
Freedom of community involve compensation	1.20

From Table 5.14, The VIF values for most of the freedom and rights variables are less than 10 imply that there is no multicollinearity problem.

### Model 1 with Freedom and Rights Variables as Independent Variables

Table 5.15

*Coefficient of Robust Test in Model 1 with Freedom and Rights Variables as Independent Variables*

	B	z-stat	Sig
(Constant)	9.362799	5.29	0.000
Freedom consulted	-0.862354***	-2.59	0.010
Rights to be informed	-0.659195*	-1.77	0.077
Rights to involve	-0.759311*	-1.76	0.078
Freedom to prepare change	-0.243608	-1.17	0.244
Freedom of given choice to reject	-0.242669	-0.65	0.516
Freedom of community involve resettlement	0.126700	0.58	0.564
Freedom of community involve compensation	-0.387361	-1.51	0.130
Restriction Test		Chi-square 2.81	p-value 0.590

Note:

1. Asterisks \*\*\*, \*\* and \* indicate significant at 1%, 5% and 10% level respectively.
2. Complementary log-log is performed but the results are similar to logistic regression except for Freedom to prepare change (refer to Appendix 7).

From Table 5.15, the coefficient of freedom to be consulted during compensation process is -0.862 and significant at 10 percent. The coefficient of rights to be informed earlier during compensation process is -0.659 and significant at 10 percent. The coefficient of rights to involve in all stages of compensation is -0.759 and significant at 10 percent. The others freedom variables are found to be insignificant.

This implies that giving more freedom for the settler to be consulted during compensation process, this will reduce the probability of dissatisfaction towards compensation. If the settler is informed earlier during compensation process, this will

reduce probability of dissatisfaction towards compensation. Finally if the settler is given more rights to involve in all stages of compensation, the probability of dissatisfaction towards compensation will be reduced.

### 5.2.2 Summary of Regression Results in Model 1: Satisfaction Level Towards Compensation

In this section, the summary of regression results in Model 1 is presented and compared it with the profiling results.

Table 5.16  
*Summary of Regression Results in Model 1 and Profiling Results*

	Gap	Use value	Non-use	Socio Demographic	Freedom and rights	Profiling <sup>3</sup>
<b><u>Gap</u></b>						
Fruits	+ve					(***)
Small farm (* and orchard	+ve (*)					
Land	+ve (**)					(**)
House value	-ve					
Number of house	+ve					
Income	-ve					
<b><u>Use Value</u></b>						
Personal land		+ ve(*)				(**)
Additional increment of land		- ve				
Price of 1 house		- ve				
Infrastructure quality		+ve				(**)
<b><u>Non-use</u></b>						
Environment quality value			+ve (***)			(***)
Dummy high for social			-ve			(***)

Table 5.16

*Summary of Regression Results in Model 1 and Profiling Results (Continued)*

	Gap	Use value	Non-use	Socio Demographic	Freedom and rights	Profiling
<b><u>Socio-</u></b>						
<b><u>Demographic</u></b>						
Dummy female				- ve(*)		(*)
Dummy married				- ve(***)		
Dummy widow				- (ve***)		
Dummy not working				- ve(***)		
Dummy for self-employed				+ ve		
Dummy cashcrop				- ve(***)		
Dummy labour				- ve(***)		
Dummy hunter				- ve(***)		
Dummy family working				- ve		(*)
Number other members working				- ve(*)		(**)
Income				- ve		
Education				- ve		
Age				- ve		(*)
Number people in household				- ve		
Dummy Kenyah				+ ve(***)		(***)
Dummy Kayan				+ ve(***)		(***)
Years living in Bakun				+ ve		(*)
<b><u>Freedom and</u></b>						
<b><u>Rights</u></b>						
Freedom consulted					- ve(***)	(***)
Freedom to be informed					- ve(*)	(***)
Freedom to involve					- ve(*)	(***)
Freedom to prepare change					- ve	(**)
Freedom of given choice to reject					- ve	
Freedom of community involve resettlement					+ ve	

Table 5.16

*Summary of Regression Results in Model 1 and Profiling Results (Continued)*

	Gap	Use value	Non-use	Socio Demographic	Freedom and rights	Profiling
<b><u>Freedom and Rights</u></b>						
Freedom of community involve compensation					+ ve	(***)

Note:

1. + ve and - ve indicate positive and negative relationships respectively.
2. Asterisks \*\*\*, \*\* and \* indicate significant at 1%, 5% and 10% level respectively.
3. Profiling results are obtained from Chapter 4.

### 5.3 Model 2: Compensation Gap

#### Full Model

#### Regression of full model of compensation gap

In Model 2, the dependent variable is compensation gap (RM). The dependent variable is a continuous variable. Ordinary Least Square regression (OLS) is first performed. Then Ordered Logit estimation is performed. The results of OLS and ordered logit estimation of compensation gap model are presented in Table 5.17.

#### *Goodness of fit tests*

The goodness of fit for OLS regression of full model is performed. There is no specification error in the model, no serious multicollinearity problem between independent variables (except for the age variable and years of living in Bakun variable) and no heteroscedasticity (refer to Appendix 8). However, the distribution of error term is not normally distributed. This may due to the compensation gap variable is not normal in nature. Thus, some adjustments need to be undertaken to make the gap of total compensation to become normally distributed. The

compensation gap is recategorized into 5 categories. Every category has a weightage of 20 percent. The ordered logit regression model is used to analyze the compensation gap after recategorized.

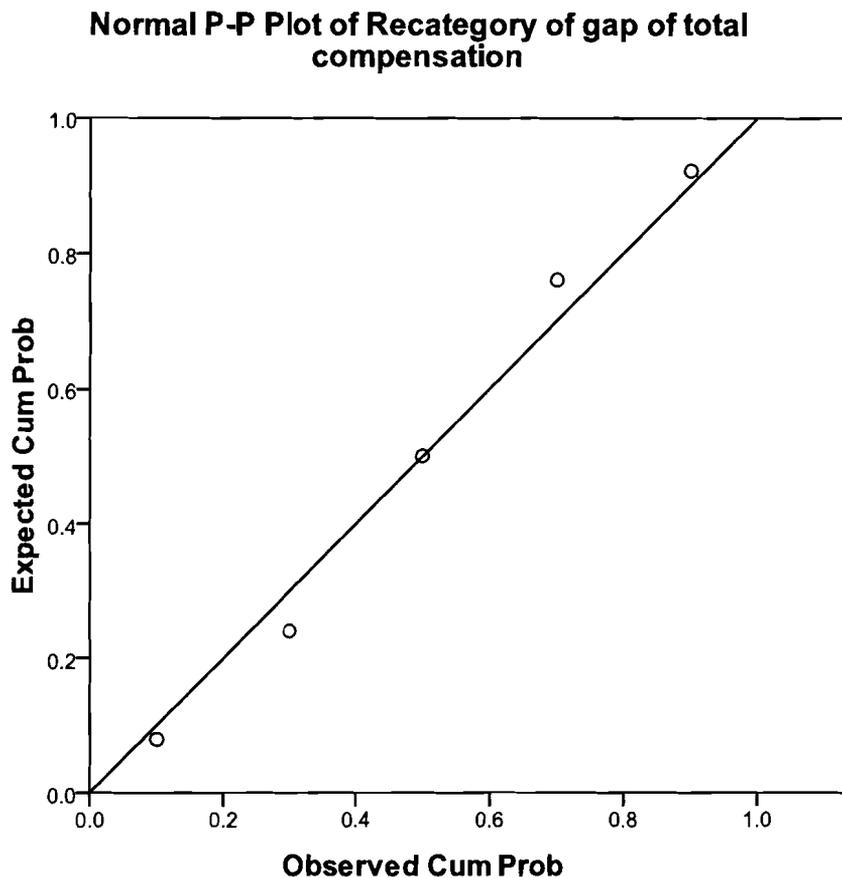


Figure 5.1  
*P-P Plot to Show the Normal Distribution After Compensation Gap is Recategorized*

The above diagram in Figure 5.1 shows that the distribution of compensation gap is normally distributed. The deviation of observe value from mean value is not big. In short, the goodness of fit tests shows that the estimated model is fit into the data statistically. Thus, interpretation and discussion will be presented in the following section.

*Goodness of fit*

Table 5.17

*Summary of Model 2: Compensation Gap*

Model	pseudo R <sup>2</sup>	Test statistic	p-value	(% Correctly Classified)
1. Overall fit	0.0844	101.34	0.0000	
2. Specification Error		0.44	0.6610	
3. Heteroscedasticity (White)		373.00	0.4757	
4. Classification Table (Hit-Miss Table)				38.94%

Note:

\* This test is performed using the White test.

From Table 5.17 above, it is found that overall fit of the estimated model is significant at 1 percent level, with p-value of 0.0000. The null hypothesis of the model does not fit into the data is rejected. The classification table or hit-miss table of 38.94% shows that the independent variables correctly classify 38.94% (more than 20%) of compensation gap. Thus, overall, this model fit into the data.

The specification error test is also tested. The p-value of predicted yhat2 is 0.6610. This means that the null hypothesis of no specification error is not rejected at 5% significance level. Thus, there is no specification error of Model 2: Compensation Gap .

There is no heteroscedasticity problem in Model 2: Compensation Gap. The p-value is 0.4757 and this value does not reject the null hypothesis of no heteroscedasticity problem in the model.

As a whole, this Model 2: Compensation Gap is a good model because it fulfills all the requirement of goodness of fit. Thus, the model can be used.

Table 5.18  
*Multicollinearity: VIF of Model 2: Compensation Gap*

Model	Collinearity Statistics VIF
Age	10.48
Years in Bakun	10.47
Dummy for self-employed	8.07
Dummy for widow	7.96
Dummy for married	7.56
Dummy for not working	7.45
Dummy for cash crop farmer	4.96
Dummy for Kenyah	4.12
Dummy for Kayan	4.10
Number of family members working	2.38
Dummy for family members working	2.35
Dummy for other jobs	2.03
Dummy for labour	1.75
Dummy for Christian	1.64
Education	1.61
Dummy for Islam	1.61
Rights to be informed	1.48
Freedom of community involve resettlement	1.45
Freedom of community involve compensation	1.44
Rights to involve in all stages of compensation	1.40
Dummy for hunter	1.40
Dummy for high social value	1.38
Dummy for female	1.38
Income	1.36
Level of Infrastructure Quality	1.36
Personal land area before relocation	1.36
Value per house before relocation	1.33
Environmental Value	1.30
Freedom of given choice to reject or accept compensation	1.30
Freedom of being consulted earlier in compensation	1.30
Culture value	1.28
Freedom to prepare changes in resettlement	1.27
Number of people in household	1.24
Additional land increment per year before relocation	1.21
Number of houses owned before relocation	1.12

From Table 5.18, most of the VIF values for all the independent variables are less than 10 implies that there is no serious multicollinearity problem. Only 2 variables that are age and years of living in Bakun have VIF values of more than 10. These cannot be avoided as both measurement units of age variable and years of living in Bakun variable are years.

### **OLS and Ordered Logit and Multinomial Logit of Full Compensation Gap Model and Interpretation**

The compensation gap model is estimated using OLS, ordered logit model and multinomial logit and the results are presented in Table 5.19.

Table 5.19

*OLS, Ordered Logit and Multinomial Logit Estimation of Compensation Gap*

Variables	OLS Estimated Coefficient (p-value)	Ordered Logit Estimated Coefficient (p-value)	Multinomial Logit Coefficient (p-value)
Constant	250742.4 (0.371)		7.935245 (0.998)
DFemale	-19351.31 (0.330)	-0.409934* (0.066)	-1.04277** (0.028)
DMarried	-36913.73 (0.594)	-1.202764 (0.108)	-17.75587 (0.987)
DWidow	-102439.2 (0.178)	-1.943717** (0.019)	-19.26037 (0.986)
DNotWorking	-138883.3** (0.037)	-2.389713*** (0.001)	-5.314388** (0.015)
DSelfEmployed	-95275.78 (0.124)	-2.110113 (0.004)***	-4.220163 (0.040)**
DCashcrop	-50802.97 (0.248)	-0.517106 (0.297)	-1.034814 (0.328)
DLabour	-166344.3 (0.033)**	-2.733582 (0.002)***	-6.140974 (0.008)***
DHunter	-21029.99 (0.810)	-0.5898893 (0.546)	-16.91002 (0.991)
DOtherJobs	-64626.47 (0.347)	-1.73109 (0.046)**	-0.812083 (0.672)
Dfamilywork	-34378.3 (0.191)	-0.4428 (0.125)	-1.203926 (0.071)*
NumberWork	262.4604 (0.976)	0.13416 (0.887)	-0.232746 (0.349)

Table 5.19

*OLS, Ordered Logit and Multinomial Logit Estimation of Compensation Gap (Continued)*

Variables	OLS Estimated Coefficient (p-value)	Ordered Logit Estimated Coefficient (p-value)	Multinomial Logit Coefficient (p-value)
Income	-0.251828 (0.983)	-0.0000519 (0.687)	-0.0000131 (0.662)
DChristian	-40675 (0.494)	-0.5231085 (0.428)	-18.85237 (0.983)
DIslam	26207.8 (0.802)	1.151543 (0.334)	-2.091732 (1.000)
Education	6995.577 (0.112)	0.0846668* (0.093)	0.070561 (0.502)
Age	1169.451 (0.570)	-0.0006507 (0.977)	-0.015509 (0.789)
NumberPeople In Family	-3290.694 (0.202)	-0.0331809 (0.244)	-0.018276 (0.771)
DKenyah	102677.4*** (0.006)	1.122954*** (0.009)	3.312932** (0.022)
DKayan	108308.6*** (0.002)	1.298305*** (0.002)	3.638057** (0.011)
Years in Bakun	-413.1596 (0.841)	-0.007271 (0.797)	10.48 (0.901)
Personal Land Area	278.026** (0.012)	0.003651*** (0.009)	0.0149257*** (0.001)
Additional increment land per year	29.20368 (0.929)	-0.000515 (0.883)	0.001313 (0.940)
Number of house	9529.732 (0.878)	0.245433 (0.717)	-14.30488 (0.991)
Price of 1 house	0.200804 (0.754)	0.000002 (0.783)	-0.000010 (0.530)
Infrastructure	32603.79** (0.014)	0.451512*** (0.003)	0.339915 (0.298)
Environment value	29014.01 (0.531)	0.332607 (0.510)	2.060653 (0.145)
DHigh3	-8519.729 (0.841)	-0.093629 (0.851)	-0.747157 (0.422)
Culture value	32527.26 (0.671)	0.324631 (0.696)	14.25082 (0.990)

Table 5.19

*OLS, Ordered Logit and Multinomial Logit Estimation of Compensation Gap (Continued)*

Variables	OLS Estimated Coefficient (p-value)	Ordered Logit Estimated Coefficient (p-value)	Multinomial Logit Coefficient (p-value)
Freedom Consult	- 651.1377 (0.970)	-0.32601 (0.861)	-0.223675 (0.677)
Rights to be Informed	-2999.983 (0.791)	-0.105511 (0.403)	-0.375114 (0.191)
Rights to involve	-6496.69 (0.564)	-0.001895 (0.488)	0.318703 (0.262)
Freedom to prepare change	-1179.857 (0.897)	0.0400527 (0.688)	-0.019571 (0.933)
Freedom of given choice to reject	-1494.519 (0.896)	-0.068797 (0.592)	-0.289098 (0.359)
Freedom of community reessettle	-27943.35*** (0.001)	-0.311924*** (0.001)	-0.972598** (0.000)
Freedom of community involve compensation	3554.662 (0.735)	-0.044911 (0.716)	0.263556 (0.310)
		<u>Estimated</u> <u>Coefficient</u>	<u>standard error</u>
/Cut1		-3.300396	3.362437
/Cut2		-2.121206	3.360542
/Cut3		-1.144963	3.362178
/Cut 4		-0.0075755	3.363183
			<u>t-statistics</u>
			-0.981549
			-0.631209
			-0.340542
			-0.002252

Note:

1. The values in parenthesis indicates p-values.

2. Asterisks \*, \*\* and \*\*\* indicate significant at 1%, 5% and 10% level respectively.

In Model 2, OLS regression is first performed. The results is reported in Table 5.19. However, the distribution of dependent variable, gap of total compensation is not normal. The gap of total compensation is then recategorized into category 1 to category 5. This is because by recategorizing the dependent variable into 5 categories will yield normal distribution. According to Long (1997), suggested that ordered logit regression model can be used to analyze the regression. In general, it appears the results of OLS and ordered logit regression have no substantial differences in terms of signs of estimated coefficients and significant level of t-test for each variables in Table 5.19.

In the estimated Ordered Logit Model, all the 4 cutoff points of 5 categories are insignificant because the t-statistics are less than 1.96 (5% significance level in T-critical table). Thus, Multinomial Logit regression Model is performed as well. It is found that the significant variables in multinomial logit are not similar with the Ordered Logit Model as shown in Table 5.19. The ordered logit model presents more significant variables than multinomial logit model. Thus in this study, Ordered Logit Model is used because of its richness in providing more significant variables in explaining the compensation gap model.

The analysis also highlights the variables who are found significant in the three estimated models (OLS, Ordered Logit and MNL Model). These significant variables are the robust variables which could be used as the based of policy implications.

The significant variables in compensation gap model using Ordered Logit analysis are gender (dummy for female), employment status (dummy not working and dummy for self-employed), types of job (dummy for labour), ethnic (dummy for Kenyah and dummy for Kayan), personal land area before relocation and freedom of communities to involve in resettlement process except marital status (dummy for widow), employment status (dummy for other jobs), family working status (dummy for other family members working) and infrastructure quality level before resettlement.

In general, female tends to have lower gap of compensation category compared to male. Those with widow status tend to have lower gap of compensation category than those who are single.

Employment status (dummy for not working) is significant in affecting gap of total compensation in the three estimated models (OLS regression model, Ordered Logit Model and Multinomial Logit Model) and the sign of coefficient does not differ regardless of types of regression model used. Employment status (dummy for not working) is considered robust.

Those who are not working tends to have lower gap of total compensation than other employment status. For those who are employed as labour tends to have lower gap of total compensation category compared to jungle resource collector. The job (dummy for labour) is also robust regardless of types of estimation model used because the signs of coefficients in three estimated model (OLS, Ordered Logit and MNL) are similar.

A self-employed person tends to have lower gap of compensation category compared to other employment status. Higher educated people tend to have higher gap of compensation category. This means higher educated people expects more compensation to be given by government.

Ethnic (dummy for Kenyah and dummy for Kayan) is important in affecting gap of total compensation. The estimation results are robust regardless of any estimation model (OLS, Ordered Logit Model and Multinomial Logit Model). Kenyah and Kayan tends to have higher gap of compensation category compared to other ethnics. Estimation results of personal land are also robust regardless of any estimation model used. Those who have higher personal land area before relocation have higher gap of compensation category.

Infrastructure quality before resettlement is significant in affecting gap of total compensation in OLS Model and Ordered Logit Model. Those who perceive higher infrastructure quality in old settlement would have higher gap of total compensation category.

Freedom is another important component in affecting gap of total compensation. If the indigenous communities are given more freedom to involve in resettlement process, it will reduce the gap of total compensation category.

## **Further Analysis**

Since land compensation gap is important in affecting dissatisfaction towards compensation as discussed earlier in Table 5-3, understanding factors affecting gap of compensation in land is useful for policy making. Thus, Model 3 on gap of compensation in land is performed and estimation results are presented as below.

### **5.4 Model 3: Land Compensation Gap**

In Model 3, the full model of land compensation gap is performed. The results of OLS of land compensation gap are presented in Table 5-20. However, it encounters non-normality problem and specification error. Although step to increase the power of variable and putting interactive variables inside the model has been performed, but the model 3 still faces non-normality problem and specification error.

Table 5.20  
*OLS Estimation of Land Compensation Gap*

Variables	OLS Estimated Coefficient	p-value
Constant	8.740053	0.829
DFemale	-1.098311	0.702
DMarried	-12.22253	0.223
DWidow	-5.976703	0.586
DNotWorking	-8.052482	0.402
DSelfEmployed	-7.303361	0.414
DCashcrop	5.582916	0.379
DLabour	-.0209322	0.999
DHunter	13.03926	0.304
DOtherJobs	-1.081430	0.913
Dfamilywork	1.254782	0.741
NumberWork	-1.761735	0.166
Income	0.000151	0.931
DChristian	5.947581	0.489
DIslam	4.845258	0.749
Education	-0.147629	0.817
Age	0.000277	0.999
NumberPeople In Family	0.279139	0.454
DKenyah	13.01669	0.015
DKayan	5.462789	0.275
Years in Bakun Personal Land Area	-0.133397	0.655
Additional increment land per year	0.060185***	0.000
Number of house	0.000074	0.999
Price of 1 house Infrastructure Environment Value	-1.290358	0.886
DHigh for Social Value	0.000067	0.471
Culture Value	-2.703570	0.158
Freedom Consult	9.985211	0.137
Rights to be Informed	-1.439732	0.897
	-1.337036	0.595
	-4.328189***	0.009

Table 5.20  
*OLS Estimation of Land Compensation Gap (Continued)*

Variables	OLS Estimated Coefficient	p-value
Rights to involve	1.998373	0.221
Freedom to prepare change	0.081584	0.950
Freedom of given choice to reject	1.596408	0.335
Freedom of community involve resettlement	0.883235	0.480
Freedom of community involve compensation	-1.229404	0.419

Note:

1. Asterisks \*\*\*,\*\* and \* indicate significant at 1%, 5% and 10% level respectively.

Next, the data is regrouped and recategorized into normal distribution to solve the problem of non-normality in OLS (Refer to Appendix 10). The land compensation gap is recategorized and histogram is performed to see the shape of the distribution of land compensation gap. The histogram of land compensation gap after regrouping is shown in Figure 5.2.

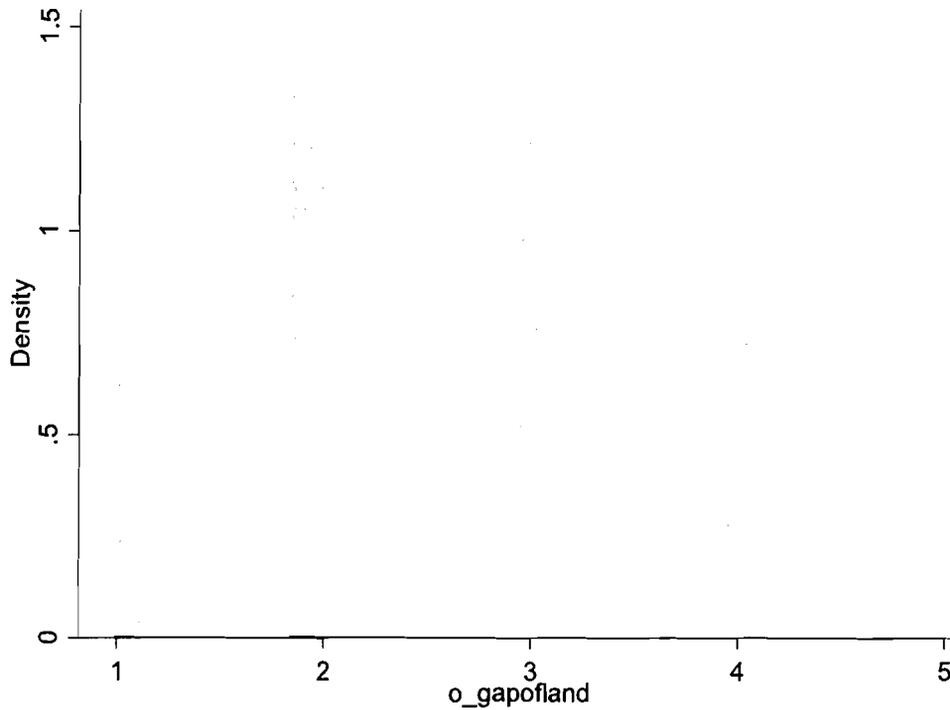


Figure 5.2  
*Histogram of land compensation gap after recategory*

After that, Ordered Logit of Land Compensation Gap Model is performed. However, the 3 cuts in parameter (boundary parameter) are not significant and only 1 cut in parameter is significant at 5% level. The ordered dimensions are not significant. For more information, refer to Appendix 11. This suggests this study to employ multinomial logit for estimating Land Compensation Gap Model.

Table 5.21 shows the results of Multinomial Logit (MNL) estimation for land compensation gap. In this study, we employ group 4: group 1 in Table 5-21 because it gives us more significant variables.

Table 5.21

*Multinomial Logit Estimation of Land Compensation Gap*

Variables	Group 2: Group 1 Estimated Coefficient (p-value)	Group 3: Group 1 Estimated Coefficient (p-value)	Group 4: Group 1 Estimated Coefficient (p-value)	Group 5: Group 1 Estimated Coefficient (p-value)
Constant	8.151719 (0.993)	-41.269850 (0.991)	-5.056754 (0.997)	5.870766 (0.995)
DFemale	0.019907 (0.962)	-0.179040 (0.686)	-0.105928 (0.829)	-0.354376 (0.511)
DMarried	-13.635260 (0.988)	-13.618530 (0.988)	-15.015010 (0.987)	-14.707280 (0.987)
DWidow	-13.380260 (0.988)	-12.791290 (0.989)	-15.992350 (0.986)	-13.189250 (0.988)
DNotWorking	0.022639 (0.986)	0.464827 (0.767)	-0.434843 (0.824)	-2.575195 (0.227)
DSelfEmployed	1.253583 (0.294)	1.081655 (0.479)	-0.297202 (0.875)	-2.408413 (0.218)
DCashcrop	-1.537446 (0.144)	-0.707090 (0.533)	-0.547545 (0.673)	0.463371 (0.759)
DLabour	-1.672976 (0.280)	-2.239090 (0.204)	-2.124753 (0.295)	-2.765000 (0.211)
DHunter	-1.415486 (0.416)	-15.478500 (0.491)	-15.156370 (0.992)	0.398649 (0.884)
DOtherJobs	0.129316 (0.931)	0.364609 (0.827)	-1.618418 (0.506)	-2.525025 (0.380)
Dfamilywork	-0.653662 (0.237)	-0.542254 (0.378)	-0.604869 (0.381)	0.144149 (0.849)
NumberWork	0.369232 (0.074)	0.146204 (0.534)	0.106865 (0.683)	-12.998600 (0.666)
Income	0.000039 (0.905)	0.000702 (0.026)**	0.000393 (0.266)	0.000130 (0.747)
DChristian	0.157917 (0.904)	0.106286 (0.938)	14.613840 (0.987)	0.313356 (0.854)
DIslam	0.000936 (1.000)	-14.714960 (0.989)	15.955810 (0.986)	-12.984070 (0.994)
Education	0.210859 (0.048)**	0.265465 (0.018)**	0.220959 (0.065)	0.147899 (0.270)
Age	0.016053 (0.691)	0.042748 (0.333)	0.008106 (0.881)	-0.003669 (0.952)
NumberPeople In Family	-0.040255 (0.428)	-0.002253 (0.968)	-0.023350 (0.716)	-0.018428 (0.786)

Table 5.21

*Multinomial Logit Estimation of Land Compensation Gap (Continued)*

Variables	Group 2: Group 1 Estimated Coefficient (p-value)	Group 3: Group 1 Estimated Coefficient (p-value)	Group 4: Group 1 Estimated Coefficient (p-value)	Group 5: Group 1 Estimated Coefficient (p-value)
DKenyah	1.350249 (0.054)*	1.681604 (0.028)**	3.588342 (0.009)***	3.023066 (0.029)**
DKayan	1.215498 (0.045)**	1.033552 (0.142)	3.372086 (0.009)***	1.942440 (0.147)
Years in Bakun	-0.016392 (0.682)	-0.032519 (0.470)	-0.009576 (0.862)	-0.007642 (0.902)
Personal Land Area	0.004874 (0.132)	0.003884 (0.262)	0.006768 (0.056)*	0.109681 (0.022)**
Additional increment land per year	-0.002503 (0.807)	0.015604 (0.117)	0.008825 (0.377)	0.005602 (0.660)
Number of house	-1.579459 (0.263)	-1.417602 (0.298)	0.613763 (0.607)	-0.703409 (0.956)
Price of 1 house	-0.000005 (0.733)	0.000008 (0.559)	0.000010 (0.539)	0.000001 (0.979)
Infrastructure	-0.092333 (0.742)	-0.319734 (0.299)	-0.702095 (0.031)**	-0.291224 (0.418)
Environment Value	1.183365 (0.152)	3.174667 (0.011)**	2.577308 (0.022)**	3.335089 (0.022)**
DHigh for Social Value	0.238935 (0.847)	-1.907532 (0.116)	-1.945894 (0.118)	-1.915569 (0.141)
Culture Value	0.172633 (0.903)	1.542457 (0.990)	-1.118148 (0.528)	-0.230074 (0.910)
Freedom Consult	0.057813 (0.853)	-0.086557 (0.823)	-0.200105 (0.668)	-0.181301 (0.724)

Table 5.21

*Multinomial Logit Estimation of Land Compensation Gap (Continued)*

Variables	Group 2: Group 1 Estimated Coefficient (p-value)	Group 3: Group 1 Estimated Coefficient (p-value)	Group 4: Group 1 Estimated Coefficient (p-value)	Group 5: Group 1 Estimated Coefficient (p-value)
Rights to be Informed	-0.035938 (0.878)	-0.599996 (0.022)**	-0.431275 (0.133)	-0.954621 (0.004)***
Rights to involve	0.451058 (0.051)*	0.206327 (0.427)	0.201843 (0.478)	0.742250 (0.014)**
Freedom to prepare change	0.135032 (0.489)	-0.022025 (0.917)	-0.119726 (0.594)	0.095206 (0.689)
Freedom of given choice to reject	0.086932 (0.760)	0.329651 (0.272)	0.662625 (0.031)**	0.525698 (0.123)
Freedom of community involve resettlement	0.242183 (0.160)	-0.202170 (0.316)	0.265049 (0.204)	0.240599 (0.283)
Freedom of Community involve compensation	-0.042545 (0.840)	0.125244 (0.600)	-0.308230 (0.235)	-0.197419 (0.474)

Note:

1. The values in parentheses indicate p-value.
2. Asterisks \*\*\*,\*\* and \* indicate significant at 1%, 5% and 10% level respectively.

From Table 5.21, there are seven variables that are significant in group 4: group 1 in Multinomial Logit estimation for land compensation gap. There are education, ethnicity (dummy for Kenyah and dummy for Kayan), personal land area before relocation, infrastructure investments before relocation, environmental quality value before relocation and freedom of choice to reject or accept the compensation given.

For socio-demographic variables, the probability for getting higher land compensation gap for those with higher educated is higher compared with those lower educated people. Compared with other ethnics, probability of Kenyah to get higher land compensation gap is higher. Compared with other ethnics, probability of Kayan to get higher land compensation gap is higher.

For use value variables, the probability for getting higher land compensation gap for those with higher personal area of land before relocation is higher compared with those who had lower personal area of land before relocation. The probability for getting higher land compensation gap for those who perceived higher infrastructure investments quality before relocation is lower than those who perceived lower infrastructure investments quality before relocation.

For non-use value variables, the probability for getting higher land compensation gap for those who perceived higher importance level of environmental quality value before relocation is higher compared with those who perceived lower importance level of environmental quality value.

For freedom and rights variables, the probability for getting higher land compensation gap for those with higher freedom of choice to reject or accept the compensation given is higher compared to those with lower freedom of choice to reject or accept the compensation given.

Table 5.22  
*Marginal Effect of Land Compensation Gap*

Variables	Predicted Outcome 1 (p-value)	Predicted Outcome 2 (p-value)	Predicted Outcome 3 (p-value)	Predicted Outcome 4 (p-value)	Predicted Outcome 5 (p-value)
DFemale	0.105108 (0.944)	0.042951 (0.868)	-0.021192 (0.958)	-0.003070 (0.982)	-0.029201 (0.952)
DMarried	0.485525 (0.985)	-0.071956 (0.996)	-0.031818 (0.996)	-0.227676 (0.967)	-0.154076 (0.969)
DWidow	0.9665303 (0.802)	-0.478697 (0.912)	-0.214844 (0.966)	-0.159448 (0.970)	-0.113542 (0.955)
DNotWorking	0.007303 (0.991)	0.033859 (0.988)	0.129267 (0.947)	-0.035428 (0.969)	-0.135001 (0.951)
DSelfEmployed	0.015169 (0.990)	0.371726 (0.913)	0.161758 (0.962)	-0.016434 (0.989)	-0.532220 (0.891)
DCashcrop	0.099754 (0.950)	-0.292307 (0.799)	0.458273 (0.966)	0.038181 (0.971)	0.129267 (0.952)
DLabour	0.380045 (0.875)	-0.115796 (0.968)	-0.123744 (0.962)	-0.058667 (0.971)	-0.081838 (0.954)
DHunter	0.211459 (0.943)	-0.143567 (0.959)	-0.238916 (0.954)	-0.123823 (0.959)	0.294848 (0.931)
DOtherJobs	0.006450 (0.992)	0.083497 (0.973)	0.104817 (0.949)	-0.090329 (0.970)	-0.104435 (0.953)
Dfamilywork	0.061906 (0.943)	-0.089974 (0.930)	-0.020450 (0.965)	-0.017292 (0.970)	0.065809 (0.948)
NumberWork	-0.025742 (0.950)	0.078369 (0.846)	-0.009354 (0.971)	-0.009174 (0.971)	-0.034099 (0.951)
Income	-0.000030 (0.945)	-0.000080 (0.931)	0.000101 (0.954)	0.000019 (0.976)	-0.000010 (0.974)
DChristian	-0.047514 (0.959)	-0.072700 (0.971)	-0.047009 (0.967)	0.167994 (0.960)	-0.000771 (0.999)
DIslam	-0.130558 (0.951)	-0.424499 (0.894)	-0.237548 (0.962)	0.910551 (0.768)	-0.117947 (0.894)
Education	-0.025418 (0.940)	0.009907 (0.976)	0.016230 (0.955)	0.003576 (0.976)	-0.004295 (0.960)
Age	-0.002232 (0.945)	-0.000211 (0.998)	0.005513 (0.956)	-0.000922 (0.972)	-0.002148 (0.948)
NumberPeople In Family	0.003059 (0.954)	-0.007724 (0.806)	0.004291 (0.956)	-0.000076 (0.996)	0.000450 (0.981)
DKenyah	-0.183859 (0.943)	-0.185985 (0.947)	-0.033595 (0.983)	0.260111 (0.960)	0.143329 (0.958)
DKayan	-0.188276 (0.941)	-0.032958 (0.991)	-0.051759 (0.974)	0.212161 (0.964)	0.060831 (0.961)
Years in Bakun	0.002146 (0.941)	-0.000218 (0.997)	-0.003496 (0.953)	0.000692 (0.971)	0.000878 (0.957)
Personal Land Area	-0.000657 (0.945)	-0.000005 (1.000)	-0.000206 (0.967)	0.000209 (0.968)	0.000649 (0.948)
Additional increment land per year	-0.000506 (0.956)	-0.002742 (0.883)	0.002494 (0.955)	0.000556 (0.974)	0.000649 (0.984)

Table 5.22  
*Marginal Effect of Land Compensation Gap (Continued)*

Variables	Predicted Outcome 1 (p-value)	Predicted Outcome 2 (p-value)	Predicted Outcome 3 (p-value)	Predicted Outcome 4 (p-value)	Predicted Outcome 5 (p-value)
Number of house	0.125771 (0.950)	-0.284329 (0.932)	-0.102184 (0.957)	0.169150 (0.967)	0.091592 (0.954)
Price of 1 house	-0.000001 (0.985)	-0.000002 (0.832)	0.000002 (0.957)	0.000001 (0.969)	-0.000000 (0.993)
Infrastructure	-0.029102 (0.941)	0.054095 (0.931)	-0.021903 (0.969)	-0.053250 (0.968)	-0.008044 (0.975)
Environment Value	-0.246195 (0.937)	-0.281080 (0.930)	0.284085 (0.956)	0.082478 (0.973)	0.160712 (0.957)
DHigh for Social Value	0.096670 (0.944)	0.349380 (0.846)	-0.215346 (0.950)	-0.120184 (0.971)	-0.110520 (0.966)
Culture Value	-0.428276 (0.989)	-1.316748 (0.989)	52.576469 (0.988)	-0.469621 (0.986)	-0.361825 (0.988)
Freedom Consult	0.004591 (0.961)	0.040302 (0.848)	-0.011051 (0.966)	-0.018180 (0.968)	-0.015663 (0.955)
Rights to be Informed	0.039238 (0.937)	0.111806 (0.869)	-0.065050 (0.957)	-0.015390 (0.975)	-0.070603 (0.953)
Rights to involve	-0.462209 (0.949)	0.047697 (0.922)	-0.028613 (0.960)	-0.015383 (0.971)	0.042520 (0.945)
Freedom to prepare change	-0.006974 (0.967)	0.036596 (0.831)	-0.015495 (0.961)	-0.018758 (0.968)	0.004631 (0.955)
Freedom of given choice to reject	-0.318458 (0.939)	-0.065388 (0.911)	0.019714 (0.969)	0.046705 (0.968)	0.030816 (0.956)
Freedom of community involve resettlement	-0.015981 (0.969)	0.054340 (0.937)	-0.067409 (0.954)	0.016053 (0.968)	0.012996 (0.957)
Freedom of community involve compensation	0.006354 (0.977)	0.001984 (0.977)	0.036235 (0.953)	-0.028585 (0.966)	-0.015988 (0.952)

Note:

1. The values in parentheses indicate p-value.

From the above marginal effect of independent variables on land compensation gap in Table 5.22, none of the independent variables (socio-demographic variables, use value variables, non-use value variables and freedom and rights variables) is individually significant in affecting the land compensation gap. Thus, this suggests that the effects of independent variables on land compensation gap may be relative effects (group-to-group comparisons) and this is tested using odds ratio.

Table 5.23  
*Odds Ratio Multinomial Logit Estimation of Land Compensation Gap*

Variables	(Group 2:1)	(Group 3:1)	(Group 4:1)	(Group 5:1)
DFemale	1.0201070 (0.962)	0.8360723 (0.686)	0.8994892 (0.829)	0.7016109 (0.511)
DMarried	0.0000012 (0.988)	0.0000012 (0.988)	0.0000003 (0.987)	0.0000004 (0.987)
DWidow	0.0000015 (0.988)	0.0000028 (0.989)	0.0000001 (0.986)	0.0000019 (0.988)
DNotWorking	1.0228970 (0.986)	1.5917390 (0.767)	0.6473662 (0.824)	0.0761390 (0.227)
DSelfEmployed	3.5028720 (0.294)	2.9495580 (0.479)	0.7428938 (0.875)	0.0899579 (0.218)
DCashcrop	0.2149294 (0.144)	0.4930772 (0.533)	0.5783679 (0.673)	1.5894240 (0.759)
DLabour	0.1876876 (0.280)	0.1065554 (0.204)	0.1194625 (0.295)	0.0629761 (0.211)
DHunter	0.2428076 (0.416)	0.0000002 (0.991)	0.0000003 (0.992)	1.4898100 (0.884)
DOtherJobs	1.13805 (0.931)	1.4399500 (0.827)	0.1982120 (0.009)***	0.0800563 (0.380)
Dfamilywork	0.5201377 (0.237)	0.5814362 (0.378)	0.5461459 (0.381)	1.1550560 (0.849)
NumberWork	1.4466230 (0.074)*	1.1574330 (0.543)	1.1127840 (0.683)	0.8781077 (0.666)
Income	1.0000390 (0.905)	1.0007020 (0.026)**	1.0003930 (0.266)	1.0001300 (0.747)
DChristian	1.1710690 (0.904)	1.1121400 (0.938)	2221824 (0.987)	1.3680080 (0.854)

Table 5.23

*Odds Ratio Multinomial Logit Estimation of Land Compensation Gap (Continued)*

Variables	(Group 2:1)	(Group 3:1)	(Group 4:1)	(Group 5:1)
DIslam	1.0009360 (1.000)	0.0000004 (0.989)	8501975 (0.986)	0.0000023 (0.994)
Education	1.2347380 (0.048)	1.3040370 (0.018)	1.2472720 (0.065)	1.1593960 (0.270)
Age	1.0161830 (0.691)	1.0436750 (0.333)	1.0081390 (0.881)	0.9963378 (0.952)
NumberPeople In Family	0.9605442 (0.428)	0.9977492 (0.968)	0.9769202 (0.716)	0.9817409 (0.786)
DKenyah	3.8583870 (0.054)*	5.3741710 (0.028)**	36.1740500 (0.009)***	20.5542100 (0.029)**
DKayan	3.3719730 (0.045)**	2.8110320 (0.142)	29.1392600 (0.009)***	6.9757540 (0.147)
Years in Bakun	0.9837421 (0.682)	0.9680038 (0.470)	0.9904694 (0.862)	0.9923868 (0.902)
Personal Land Area	1.0048850 (0.132)	1.0038920 (0.262)	1.0067910 (0.056)*	1.0110280 (0.002)***
Additional increment land per year	0.9975006 (0.807)	1.0157260 (0.117)	1.0088640 (0.377)	1.0115617 (0.660)
Number of house	0.2060866 (0.263)	0.2422944 (0.298)	1.8473700 (0.607)	0.9320760 (0.956)
Price of 1 house	0.9999956 (0.733)	1.0000080 (0.559)	1.0000100 (0.539)	1.0000000 (0.979)
Infrastructure	0.9118017 (0.742)	0.7263426 (0.299)	0.4955462 (0.031)**	0.7473481 (0.418)
Environment Value	3.2653450 (0.152)	23.9188600 (0.011)**	13.1616500 (0.022)**	28.0808800 (0.022)**

Table 5.23

*Odds Ratio Multinomial Logit Estimation of Land Compensation Gap (Continued)*

Variables	(Group 2:1)	(Group 3:1)	(Group 4:1)	(Group 5:1)
DHigh for Social Value	1.2698960 (0.847)	0.1484463 (0.116)	0.1428592 (0.118)	0.1472581 (0.141)
Culture Value	1.1884300 (0.903)	4998119 (0.990)	0.3268847 (0.528)	0.7944748 (0.910)
Freedom Consult	1.0595160 (0.853)	0.9170836 (0.823)	0.8186451 (0.668)	0.8341844 (0.724)
Rights to be Informed	0.9646997 (0.878)	0.5488137 (0.022)**	0.6496803 (0.133)	0.3849581 (0.004)***
Rights to involve	1.5699730 (0.051)*	1.2291550 (0.427)	1.2236560 (0.478)	2.1006570 (0.014)**
Freedom to prepare change	1.1445740 (0.489)	0.9782156 (0.917)	0.8871635 (0.590)	1.099886 (0.689)
Freedom of given choice to reject	1.090823 (0.760)	1.3904820 (0.272)	1.9398780 (0.031)**	1.691639 (0.123)
Freedom of community involve resettlement	1.2740270 (0.160)	0.8169559 (0.316)	1.3034950 (0.204)	1.272010 (0.283)
Freedom of community involve compensation	0.9583473 (0.840)	1.1334250 (0.600)	0.7347460 (0.235)	0.820846 (0.474)

Note:

1. the comparison group is group 1.
2. The values in parentheses indicate p-value.
3. Asterisks \*\*\*,\*\* and \* indicate significant at 1%, 5% and 10% level respectively.

The odds ratio is defined as  $\frac{\text{Prob } Y=4}{\text{Prob } Y=1}$ . In this study, the odd ratio is shown in column rrr which represents relative risk ratios in Table 5.23. The odd ratio is the ratio of probability of group 4 of land compensation gap and the probability of group 1 of land compensation gap.

From Table 5.23, there are eight variables that are significant namely jobs (dummy for other jobs), education, ethnics (dummy for Kenyah and dummy for Kayan), personal land area before relocation, infrastructure investment value before relocation, environment value before relocation and freedom of given choice to reject or accept compensation given.

For socio-demographic variables, the variables that significant are jobs (dummy for other jobs), education and ethnics (dummy for Kenyah and dummy for Kayan). Increasing 1 level of education, the odds of getting higher land compensation gap will increase by 1.24 times. In other words, the ratio of being in group 4 land compensation gap (higher land compensation gap) compared to group 1 land compensation gap (lower land compensation gap) is 1.24 times greater if there is a level of increase in education.

The odds of being in higher land compensation gap vs. lower land compensation gap is 80.20%  $[(0.198-1)*100]$  lower for other jobs compared to jungle resource collector, *ceteris paribus*. The odds probability of Kenyah getting higher land compensation gap is higher by 36.17 times as compared with other ethnics whereas the probability of Kayan getting higher land compensation gap is higher by 29.14 times as compared with other ethnics.

For use value variables, the variables that significant are personal land area before relocation and infrastructure investments value before relocation. Each additional increase in personal land area before relocation will lead to 0.68% (or = 1.006791) increase in the odd of getting higher land compensation gap vs. lower land

compensation gap. Each additional increase in infrastructure investments value before relocation will decrease the odd of getting higher land compensation gap by 51%  $[(1-0.49)*100]$ .

For non-use value variable, the variable that significant is environmental value. An increase in 1 additional unit of self-perceived environmental value (in a 3-point rating scale: less important, medium important and very important) before relocation will lead to 13.16 times increase in the odds of getting higher land compensation gap.

For freedom and rights variable, the variable that is significant is freedom of given choice to reject or accept compensation given. Each additional unit increase in freedom of given choice to reject or accept compensation given will lead to 94% (1.94 times) increase in the odd of getting higher land compensation gap.

## **5.5 The Monetary Values of Gaps in Compensation**

In this section, the total cash gaps (expected compensation of cash minus the actual compensation of cash) for the 14 villages located in Sungai Asap Resettlement Area are determined.

Table 5.24  
*Ringgit Values of Cash Gaps for 14 Villages at Sungai Asap Resettlement Area*

Village	Sample households	Average gap per households (RM)	Number of households in village	Total cash gaps (RM)
1	22	213,681.81	51	10,897,773
2	51	397,573.03	128	50,889,348
3	40	233,950.00	115	26,904,250
4	42	425,776.19	101	43,003,395
5	52	326,778.65	197	64,375,394
6	37	369,907.67	87	32,181,967
7	11	446,545.45	209	93,328,000
8	53	339,780.73	223	75,771,102
9	3	216,666.67	84	18,200,000
10	9	249,888.89	69	17,242,333
11	13	211,538.46	69	14,596,154
12	8	130,500.00	20	2,610,000
13	8	230,250.00	89	20,492,250
14	30	279,166.67	95	26,520,833
			Total cash gaps	497,012,799

From Table 5.24, the total cash gap (RM) for 14 villages is RM497 million. The calculation of total cash gap (RM) is based on 14 villages. The total cash gap of RM497 million is obtained from the sum of total cash gap for 14 villages. The total cash gap for each village is the multiplication of the average gap per household and the total number of households in every village. It is a huge figure in compensation gap. The significant value can have substantial effect on welfare of the settlers. The total cost of the dam project is RM7.2 billion (Banji, 2011a). The percentage of total cash gap compared to the total cost of Bakun dam is 6.90 percent. On average, it indicates that the villages were short changed thus affecting the welfare of settlers by an average of RM323,365.50 (RM497 millions divided by the number of population for 14 villagers) per household. This is a significant amount given the rural population involved. This estimated value of cash gap provides inputs to the state authorities to reduce the cash gap figures. By reducing the cash gap values, the

welfare of the settlers will increase and settlers' dissatisfaction towards the compensation given can be reduced.

## **5.6 Summary**

The key findings are summarized in relation to questions raised in theses in chapter 1. In summary, the results obtained show that size compensation gap, use-value variables, non-use value variables affect dissatisfaction indicated by model 1. The significant variables in affecting dissatisfaction with compensation are land compensation gap, environmental quality before relocation and freedom and rights variables.

The study reveals the results that can answer the 3 objectives of this study in the compensation and resettlement context. It provides important insight to what cause the dissatisfaction among the settlers and add to the understanding of the components of compensation that affect the welfare of the displaced people. It concludes that land (use value), environmental value (non-use value) can positively affect the dissatisfaction of settlers with the compensation in Model 1. Meanwhile, more freedom and rights (non-use values) given to settlers can reduce the level of dissatisfaction of settlers with the compensation in Model 1. It highlights to the policy maker the importance to examine the land (use value), environmental value and freedom and rights (non-use values) in the study of compensating the settlers affected by large project. It is concluded that the findings have significant impacts on the formulation on compensation policy in Malaysia.

In model 2 Compensation gap in cash, the results obtained show that the personal land area and infrastructure quality before relocation from use value are significant in affecting compensation gap. Higher infrastructure quality before relocation can lead to higher compensation gap. Less freedom of community involvement in resettlement process can increase the compensation gap in cash as indicated in Model 2.

In Model 3 land compensation gap, the results show that larger personal land area owned before relocation can increase land compensation gap from use value perspective. Higher infrastructure quality value before relocation can reduce land compensation gap. From non-use value perspective, higher environmental value before relocation and higher freedom of choice to reject or accept compensation gap can lead to larger land compensation gap as indicated by the results in Model 3.

## **CHAPTER SIX**

### **DISCUSSION AND POLICY IMPLICATIONS**

#### **6.1 Introduction**

In this chapter, the key objective is to propose strategies to reduce the dissatisfaction of settlers towards compensation and improve compensation packages. We first discuss the general compensation policy in Bakun project. After that, we discuss the implications of findings for policy that can be drawn from significant variables highlighted in regression results in chapter five. The variables that emerge as significant variables are used to formulate efficient and effective compensation programmes in resettlement projects in Bakun project.

#### **6.2 General Compensation Policy in Bakun Project**

In Bakun case in Sarawak, there is no dialogue and consultation regarding compensation and resettlement schemes between policy makers and settlers (Swain & Chee, 2004). Besides, there is no information of compensation revealed to the settlers for discussion. The only information revealed to the people is 70 percent of cash compensation in terms of loss of property and goods from previous home can only be obtained upon arrival for 2 weeks at new place (Sungai Asap resettlement area). There is no negotiation between state authorities and settlers regarding compensation amount.

Thus, there is weakness in compensation policy in Bakun project. Freedom and rights of communities to participate in all stages of compensation and resettlement are not found in compensation practices in the project.

Social value is very important to the settlers in Sungai Asap as indicated by the 94.2% of settlers. Good neighborhoods' ties are found before relocation and now their neighborhoods' ties are reduced due to settlers having to search for food and earn more income. This happened because there are limited resources (land, forests and river) after relocation. Our empirical results of cross tab between social value and satisfaction shows that there is significance difference between groups of settlers (based on ranking of social values) and have different satisfaction level and yet social value is not given much attention.

### **6.3 Implications of Findings for Policies**

#### **6.3.1 Land (Difference in Expected Compensation and Actual Compensation)**

From regression results, we find out that land is an important variable in affecting dissatisfaction towards compensation. Land has a big role to play in compensation. Land is used for cultivation for crops to earn living. Land is always undervalued. The average gap in land compensation per household is 19.65 acres as indicated by the descriptive statistics in chapter four. This leads to dissatisfaction towards compensation. This can be shown statistically from the regression results of model 1 which stated that land compensation gap (difference between expected land compensation minus actual land compensation) and personal land area before relocation are significant in affecting dissatisfaction towards compensation given.

In designing compensation practices for land, the compensation package for land should focus on giving more total land area that had been given up by settlers instead of focusing on fixed amount of land area for example 3 acres of land per household. Fertile land should be given to settlers to plant crops to earn incomes.

More land areas should be given to settlers because land is needed for settlers to do farming and cultivate crops. Without adequate land area, the settlers cannot maintain normal livelihood and suffer from poverty as well as reducing flexibility in cultivating various crops. Development is therefore reduced. For example in the case of Bakun, all settlers were given 3 acres of land irrespective of their initial land holdings. This appears to be a non equitable compensation approach when initial land holdings ranged from 0 to 700 acres per household.

There is a gap in land compensation. That means the state authorities still have not done enough to compensate for the land given up by the settlers. This increased the probability of dissatisfaction among settlers. The state authorities should look at some approaches for land compensation in different countries and try to adopt policies to reduce dissatisfaction. We provide Table 6-1 below to show the comparisons of land policies among countries.

Table 6.1

*Comparisons of Land Compensation Policies Among Countries*

Elements of land	Malaysia	England	Australia	India
1. Market value of land	No clear definition	The definition is listed in Section 5(2), Land Compensation Act 1961.	Many of states have defined the market value of land.	No clear definition of market value of land. It just stated that there is a need to value the land under Section 23, Land Acquisition Act 1984.
2. Home loss payment	No	Yes. It is listed under Section 29 to 33 Land Compensation Act UK (1973)	No. However, solatium (similar to home loss payment is paid).	No. However, solatium (similar to home loss payment is paid).
3. Orchard loss payment	No.	Yes. It is listed under Section 34 to 36 Land Compensation Act (1973)	No. However, solatium (similar to orchard loss payment is paid).	No. However, solatium (similar to orchard loss payment is paid).
4. Solatium	No.	No. Because home loss payment and orchard loss payment has been given.	Yes. It is listed under Section 241(9) Land Administrative Act Western Australia)	Yes. It is listed under Section 23(2) Land Acquisition Act India (1894)

## Note:

Home loss payment refers to extra payment to landowners that face difficulties to offset their homes (Rowan-Robinson & Brand, 1995, Leech, 1975).

Orchard loss payment refers to compensation to land owner to offset orchard to move to another piece of land (Rowan-Robinson & Brand, 1995).

Solatium refers to additional payment to landowners to sacrifice the land. The payment is paid according to certain percentage of market value of land with no add-on of disturbance cost (Sarkar, 1998).

### **6.3.2 Environment**

Environmental value perceived by the settlers (measured in a ranked scale of 1 to 3 measuring less important to very important) is also found to be significant in affecting probability of dissatisfaction towards compensation statistically. For example, 96.3 percent of settlers ranked the environmental quality as very important in the assessment of importance of environment before relocation. It is consistent with previous empirical literatures (Sungai Selangor Dam) which mentioned that environment is an important element in designing compensation packages and it is often left out in compensation package. Ignoring environment in the compensation package will cause dissatisfaction. Thus, new compensation package must include land and environment. State authorities should provide the settlers a good environment such as river, trees, forests and mountains beside land. The compensation must be able to capture what the settlers want to maintain and remain at the same level of utility before relocation. Forests provide a whole range of services such as hunting ground for the indigenous communities.

There is a need to move to better valuation methods to reflect actual values lost by the settlers forced to move or relocate. For future undertaking of compensation in environment, the suggestion by Asian Development Bank to use Contingent Valuation Method to value the environment for compensation policy may help in setting at better estimates of compensation value. Most developing countries do not account for environment loss in the valuation of compensation. The environmental impact assessment report for Bakun hydroelectric dam project is important to be used as guideline for giving compensation and not just for formality purposes.

### **6.3.3 Freedom and Rights**

Freedom and rights element as a component of liberty is important in building compensation policy for Bakun settlers. Lack of consultation and no public participation of the settlers in resettlement and compensation can cause serious problem in dissatisfaction (Swain & Chee, 2004). This is confirmed by the regression results of this study in model 1 which showed that if the settlers are given less freedom to be consulted in compensation process, less rights to be informed in compensation process and rights to involve in compensation process, then the probability of dissatisfaction towards compensation will increase. Settlers should be given freedom and rights to be consulted in compensation process to discuss the amount of compensation in an open discussion with the state authorities to arrive at agreeable compensation value. The key freedom and rights variables are freedom to be consulted, right to be informed, right to involve, freedom for preparation for changes, freedom of choice, freedom of community involvement in resettlement process and freedom of community involvement in compensation process. There should be an environment that exercises liberty which provides for freedom of expression and participation in the compensation process. This is reflected in the results; the variables significant in determining dissatisfaction with compensation are freedom to be consulted, rights to be informed, rights to involve and freedom for preparation for changes,

Institutional avenues to consult the opinion and discuss the compensation figures in terms of use values and non-market items that include non-use values (environment goods) should be present. Public participation of the settlers in the compensation packages is a must to ensure agreeable compensation. This is

highlighted in Cernea (2003) involuntary resettlement guidelines. Then, this should be channeled to the state authorities for policy making.

#### **6.4 Valuation Procedures in Malaysia**

There are many limitations in compensation and the results from the study implies that actual compensation given by state authorities do not meet the expectations of settlers. Some improvements are required. Authorities in charge of compensation responsibilities need to use more scientifically-based compensation methods. They should use the improved techniques of non-market valuation (the aspects of liberty, freedom, rights, environmental quality) such as contingent valuation method. The significant elements causing dissatisfaction are arising from non-market valuation. The significant variables in non-market valuation are environmental quality value before relocation (96.3% of settlers ranked the environmental quality value before relocation as very important), freedom to be consulted during compensation process (mean value of 1.208), rights to be informed earlier during compensation process (mean value of 1.971), rights to involve in all stages of compensation (mean value of 2.103) and freedom to prepare for changes in resettlement (mean value of 2.425).

Non-market valuation can be fully supported by state authorities. State authorities need to spend more effort on valuation and compensating on these non-market aspects. State authorities can hire experts in contingent valuation or non-market valuation methods and not just hiring experts on market valuation alone. Over the year 1990's and onwards, there are developments of non-market valuation techniques appearing in literature. These new non-market valuation techniques must

be tapped and used effectively by the state authorities to try to get the true value of non-market value such as environment.

## **6.5 Involvement of Multiple Agencies**

The findings of this study lend support for the involvement of multiple agencies during resettlement and compensation processes. In resettlement process of Bakun hydroelectric dam project, the land valuers and land evaluators were given the responsibility to evaluate the lands of the households.

The state authorities need to allow more involvement of multiple agencies or stakeholders in the resettlement and compensation processes. This enables more inputs and better inputs given to state authorities for policy making. The agencies that can be allowed to involve are forestry department, environment department, agriculture department to assist providing feedback or input and making suggestions to improve the compensation policy.

## **CHAPTER SEVEN**

### **CONCLUSION**

#### **7.1 Introduction**

In this chapter, the key findings are presented. Then, the significant variables in model 1, 2 and 3 are highlighted. This followed by a discussion of the limitations of the study and direction in which this research can be extended.

#### **7.2 Summary of Significant Variables in Model 1, 2 and 3**

In model 1: Satisfaction with compensation, the important significant use value variables are land compensation gap, small farm and orchard gap, personal area of land before relocation. The significant non-market or non-use variables in model 1 are environment value, freedom and rights variables. All these use value variables show positive effects on affecting satisfaction level. High levels of land compensation gap, high small farm and orchard gap value and higher perceived value of personal land before relocation leads to higher probability of dissatisfaction. In non-market or non-use variables, higher perceived value of environmental value leads to higher probability of dissatisfaction. Settlers that are given less freedom and rights to involve in all compensation stages demonstrate higher probability of dissatisfaction.

In model 2 Compensation gap, the important variables that lead to higher compensation gap can be divided into use value and non-use variables. In use value variables, the cause of higher compensation gap is due to higher personal land area before relocation. Higher Infrastructure values before relocation perceived by settlers can also lead to higher compensation gap. From non-use value or non-market values

perspective, less freedom of community involvement in resettlement process is significant in causing the compensation gap to be larger.

In model 3 Land compensation gap, higher personal land area before relocation can also cause probability of land compensation gap to be higher. Environmental values before relocation and freedom of choice to reject or accept compensation are significant variables from the non-use or non-market perspective. Environment (forests, river and mountains) value before relocation is important factor for settlers to value the land compensation. If settlers perceived higher environment value before relocation, the probability of land compensation gap is higher as well. Another aspect in non-use value is the freedom variable. If settlers are given more freedom of choice to reject or accept compensation, the amount of compensation negotiated with state authorities is higher, thus increasing the probability of land compensation gap. This is because if settlers are given more liberty, the settlers can demand higher compensation and state authorities might not agree to pay them the compensation demanded. Thus, the probability of land compensation gap increases.

### **7.3 Limitation of the Study**

The first limitation is the endogeneity issue. In this study, the dependent variable in model 1 is satisfaction with compensation, in this case there is tendency for respondents to say not satisfied with compensation since settlers want to get more compensation. However, this endogeneity issue does not actually affect our results in the sample because we use large samples in this study. Endogeneity issue is reduced by larger samples through balancing off effect between high compensation group and low compensation group.

The second limitation is the measurement limitation. Most of the variables in this study are ranking variables (environment value ranking 1 to 3, social value ranking 1 to 3) and in dummy variables (dummy Kenyah and dummy Kayan in ethnicity, dummy Christian and dummy Islam in religious affiliation). Thus, the regression results just indicate the range over the dummy variables.

#### **7.4 Future Research**

Future research should include more variables in the questionnaire to capture their effects on land compensation gap. The variables can be land quality, market price of land, fertility rate of land that may affect land compensation gap. This can affect the valuation of settlers on land compensation. These land quality and price information variables should be included in the valuation of compensation. Incorporating these information will lead to improve the land compensation policy.

For methodological limitation, numerical value variables should be put in order to capture the exact value for non-market variables instead of ranking the non-market variables (environmental values and social values). This enables us to measure the true gap among non-market values. Examples like what is the compensation value of environmental value and social value accepted by settlers should be asked. This enables measuring of the welfare drop in terms of non-market values and the amount to compensate the settlers to maintain same utility before relocation.

Contingent valuation method should be used to measure non-market valuation to arrive at a true value of measuring non-market value. Contingent valuation studies used in compensation issue are very limited. Questions like how much the settlers are

willing to accept to forgo environmental value should be asked. This enables the researcher to capture the environmental value in compensation valuation before relocation is done to arrive at more agreeable compensation amount. These approaches however involve careful development of data collection instrument and implementation of the survey instruments to obtain valid results.

## REFERENCES

- Agba, A.M.O., Akpanudoedehe, J.J. & Ushie, E.M. (2010). Socio-Economic and Cultural Impacts of Resettlement on Bakassi People of Cross River State, Nigeria. *Studies in Sociology of Science*, 1(2), 50-62.
- Afroz, R. & Masud, M.M. (2011). Using a contingent valuation approach for improved solid waste management facility: Evidence from Kuala Lumpur, Malaysia. *Waste Management*, 31, 800-808.
- Arrow, K.J., Solow, R., Portney, P.R., Lerner, E.E., Radner, R. & Schuman, H. (1993). 'Report of the National Oceanic and Atmospheric Administration (NOAA) Panel on Contingent Valuation'. *Federal Register*, 58(10), 4016-614.
- Asafu-Adjaye, J. & Tapsuwan, S. (2008). A contingent valuation study of scuba diving benefits: Case study in Mu Ko Similan Marine National Park, Thailand. *Tourism Management*, 29, 1122-1130.
- Banji, C. (2011, January 16). RM100m for Belaga: Prime Minister announces eight mammoth projects which will directly benefit some 28000 villagers. *The Sunday Post*, p.6.
- Banji, C. (2011, October 23). Subtle criticisms through poetry. *The Borneo Post*, p.1.
- Beck, U. (1992). *Risk Society: Toward a New Modernity*. London: Sage.
- Blanchflower, G.D. & Oswald, J.A. 2004. Well-being over time in Britain and USA. *Journal of Public Economics*, 88:1359-1386.
- Bohlen, C. & Lewis, L.Y. (2009). Examining the economic impacts of hydropower dams on property values using GIS. *Journal of Environmental Management*, 90(3), 258-269.
- Borghini, J. & Jan, S. (2008). Measuring the benefits of health promotion programmes: Application of contingent valuation method. *Health policy*, 87 (2), 235-248.

- Brenchin, S. R., West, P., Harmon, D. & Kutay, K.(1991). "Resident Peoples and Restricted Areas: A Framework for Inquiry." In West and Brenchin (eds.) *Resident Peoples and National Parks*, Arizona, Tucson: University of Arizona Press.
- Campbell, D. T. & Stanley, J. (1966). *Experimental and quasi-experimental designs for research*. Chicago: Rand McNally.
- Cao Thi, T.Y. (2003). *Towards Sustainability of Vietnam's large Dams – Resettlement in Hydropower Projects, Stockholm*. Retrieved December 20, 2011 from <http://www.infra.kth.se/bba/MASTER%20THESISSES/msc%20thesis%20cao.pdf>
- Cernea, M. M. (1990). *Poverty Risks from Population Displacement In Water Resources Development*, HIID Development Discussion Paper No. 355, Harvard University, Cambridge, MA.
- Cernea, M. M. (1991). *Putting People First: Sociological Variables in Development Projects*, 2<sup>nd</sup> edition. New York: Oxford University Press.
- Cernea, M. M. (1995). Understanding and Preventing Impoverishment from Displacement: Reflections on the State of Knowledge. Keynote Address, International Conference on Development Induced Displacement. University of Oxford, England. *Journal of Refugee Studies*. 8:3:245-264.
- Cernea, M.M. (1995). Understanding and preventing impoverishment from displacement: Reflections on the state of knowledge. *Journal of Refugee Studies*, 8(3), 245-264.
- Cernea, M. M. (1996). "Bridging the Research Divide: Studying Refugees and Development Oustees." In Tim Allen (ed.) *In Search of Cool Ground: War, Flight & Homecoming in Northeast Africa*, Boston: UNRISD.

- Cernea, M. M. (1997). The risks and reconstruction model for resettling displaced populations. *World Development*, 25 (10), 1569-1587.
- Cernea, M. M. (1998). "Impoverishment or Social Justice?" A Model for Planning Resettlement." In H.M. Mathur and D. Marsden, (eds.) *Development Projects and Impoverishment Risks: Resettling Project-Affected People in India*, Delhi: Oxford U.P.
- Cernea, M. M. (1999). "The Need for Economic Analysis of Resettlement: A Sociologist's View." In Michael M. Cernea (ed.) *The Economics of Involuntary Resettlement: Questions and Challenges*, Washington, DC: The World Bank.
- Cernea, M. (2003). *For a new economics of resettlement: A sociological critique of the compensation principle*. Washington, DC: World Bank.
- Chambers, R. (1969). *Settlement Schemes in Tropical Africa*. Routledge & Kegan Paul, London.
- Cummings, R. G., Brookshire, D. S. & Schulze, W. D. (1986). *Valuing Environmental Goods: A State of the Arts Assessment of the Contingent Method*. Totowa, NJ: Rowman and Allanheld.
- Deaton, A. & Muellbauer, J. (1980). *Economics and Consumer Behaviour*. Cambridge: Cambridge University Press.
- Department of Statistics, Malaysia (2010). *Population Distribution by Local Authority Areas and Mukims*. Kuala Lumpur: Department of Statistics, Malaysia.
- De Vaus, D. (2002). *Analyzing social science data*. Sage Publication.
- De Wet, C. (1995). *Moving Together, Drifting Apart*. Johannesburg: Witwatersrand U.P.

- Dwivedi, R. (1999). 'Displacement, Risks and Resistance: Local Perceptions and Actions in the Sardar Sarovar'. *Development and Change*, 30(1):43-78.
- Eliason, S. R. (1993). *Maximum likelihood estimation logic and practice*. Sage Publication Inc.
- Elster, J. & Roemer, J.E. (1991). Introduction. In Jon Elster and John E. Roemer, editors, *Interpersonal Comparison of Wellbeing*, pages 1-16. Cambridge University University Press, Cambridge, 1991.
- Gabungan (1999). The Resettlement of Indigenous People affected by the Bakun Hydroelectric Project, Sarawak, Malaysia. *World Commission on Dams Final Report*. Cape Town: World Commission on Dams.
- Garrod, G. & Willis, K. G. (1999). *Economic Valuation of the Environment: Methods and Case Studies*. UK: Edward Elgar.
- Gregory, R. & Bishop, R.C. (1986). "Willingness to Pay or Compensation Demanded." Paper presented at the Workshop on Integrating Psychology and Economics in Valuing Public Amenity Resources, Estes Park, Colo., May.
- Gregory, R. (1986). "Interpreting Measures of Economic Loss: Evidence from Contingent Valuation and Experimental Studies." *Journal of Environmental Economics and Management*, 13, 325-337.
- Gujarati, D. N. & Porter, D.C. (2009). *Basic econometrics*. New York: McGraw-Hill.
- Hanley, N. & Splash, C. L. (1993). *Cost-Benefit Analysis and the Environment*. UK: Edward Elgar, Hunts.
- Harrell, F.E.(2001). *Regression modeling strategies with applications to linear models, logistic regression, and survival analysis*. New York: Springer.
- Henderson, J. M. & Quandt, R. E. (1980). *Microeconomic theory: A mathematical approach*. Singapore, SG: McGraw-Hill International Editions.

- Herbild, L., Bech, M. & Gyrd-Hansen, D. (2009). Estimating the Danish Populations' Preferences for Pharmacogenetic Testing Using a Discrete Choice Experiment. The Case of Treating Depression. *Value in Health*, 12(4), 560-567.
- Hicks, J.R.(1939). "The Foundations of Welfare Economics."*Economic Journal*, 49, 696-712.
- Hoehn, J. P. & Randall, A. (1983). "*Incentives and Performance in Contingent Policy Valuation.*" Paper presented at the American Agricultural Economics Association summer meetings, Logan, Utah.
- Hoehn, J. P. & Randall, A. (1985). "*A Satisfactory Benefit Cost Indicator from Contingent Valuation.*" Staff Paper 85-4, Department of Agricultural Economics, Michigan State University.
- Hoehn, J. P. & Randall, A. (1987). "A Satisfactory Benefit Cost Indicator from Contingent Valuation." *Journal of Environmental Economics and Management*, 14 (3), 226-247.
- Hooker, M.B. (1999). A note on native land tenure in Sarawak (Research Notes), *Borneo Research Bulletin*. Retrieved March 13, 2012, from <http://www.highbeam.com>.
- Howley, P., Hynes, S. & O'Donoghue, C. (2010). The citizen versus consumer distinction: An exploration of individuals' preferences in contingent valuation studies. *Ecological Economics*, 69(7), 1524-1531.
- Hwang, S-S., Cao, Y. & Xi, J. (2010).The Short-Term Impact of Involuntary Migration in China's Three Gorges: A Prospective Study. *Social Indicator Research*, 101(1), 73-92.
- Jehom, W. J. (2008). *Development and displacement: Kenyah-Badeng in Bakun Resettlement Malaysia*. Bonn, Germany: Universität zu Bonn; 2008.

- Just, R. E., Hueth, D. L. & Schmitz, A. (1982). *Applied Welfare Economics and Public Policy*. Englewood Cliffs, N.J.: Prentice Hall.
- Kaldor, N. (1939). "Welfare Propositions in Economics and Interpersonal Comparisons of Utility," *Economic Journal*, 49, 549-552.
- Kahnemann, D. & Tversky, A. (1979). "Prospect Theory: An Analysis of Decision under Risk." *Econometrica*, 263-291.
- Karimi, S. & Taifur, W. D. (2013). Resettlement and development: a survey of two of Indonesia's Koto Panjang resettlement villages. *International Journal of Water Resources Development*, 29(1), 35-49.
- Lancaster, K.J. (1998). *Consumer Theory*. Northampton, M.A: Edward Elgar Publishing.
- Leach, W. A. (1975). *Disturbance on compulsory purchase*. London: The Estates Gazette.
- Lin, N. Y., Ye, X. & Ensel, W. M. (1999). Social support and depressed mood: A structural analysis. *Journal of Health and Social Behavior*, 40, 344-359.
- Ling, J. (2011, August 8). Bakun an eco-tourism goldmine. People in Sungai Asap resettlement area must work with SEB to tap its potential-Masing. *The Borneo Post*, p.1.
- Local District Office, Sungai Asap (2001). *The population composition at Sungai Asap in 2001* obtained from Development and displacement: Kenyah-Badeng in Bakun Resettlement Malaysia, Welyne Jeffrey Jehom Doctoral Dissertation (2008), 1-145.
- Long, J.S. (1997). *Regression Models for Categorical and Limited Dependent Variables*. SAGE Publications, Thousand Oaks, California.

- Mahalia, B. (1994) Letter from a tribal village. *Lokayan Bulletin*, 11.2(3): 157–158.  
Sept.–Dec 1994.
- Manatunge, J. & Takesada, N. (2013). Long-term perceptions of project affected-  
persons: a case study of the Kotmale Dam in Sri Lanka. *International Journal of  
Water Resources Development*, 29(1), 87-100.
- Mason, R. D. & Lind, D. A. (1990). *Statistical Techniques in Business and  
Economics*. (Ninth Edition). USA: Irwin.
- Matsumoto, K., Mizuno, Y. & Onagi, E. (2013). The long-term implications of  
compensation schemes for community rehabilitation: the Kusaki and Sameura  
dam projects in Japan. *International Journal of Water Resources Development*,  
29(1), 109-119.
- McIntosh, E. & Ryan, M. (2002). Using discrete choice experiments to derive  
welfare estimates for the provision of elective surgery: Implications of  
discontinuous preferences. *Journal of Economic Psychology*, 23 (3), 367-382.
- Menard, S. (1995). *Applied logistic regression analysis*. Sage University papers  
series.
- Mitchell, R. & Carson, R. (1989). *Using Surveys to Value Public Goods: The  
Contingent Valuation Method*. Washington, DC: Resources for the Future.
- Nelson, M. (1973). *Development of Tropical Lands: Policy Issues in Latin America*.  
Baltimore: Johns Hopkins U.P.
- Ojeda, M., Mayer, A. & Solomon, B. (2008). Economic valuation of environmental  
services sustained by water flows in the Yaqui River Delta. *Journal of Ecological  
Economics*, 65: 155-166.

- Olawepo, R. A. & Lawal, M. O. (2010). Post Resettlement Pattern of Socio-economic Change and Rural Development in Jebba Villages, Nigeria. *Journal of Sustainable Development in Africa*, 12(6), 162-176.
- Rani, H.O. (2004). *Economic and Business Research For Malaysian Students*. Tanjong Malim, Malaysia: Universiti Pendidikan Sultan Idris (UPSI).
- Rawls, J. (1971). *A Theory of Justice*. Cambridge, Massachusetts: The Belknap Press of Harvard University Press.
- Rolfe, J. & Prayaga, P. (2007). Estimating values for recreational fishing at freshwater dams in Queensland. *The Australian Journal of Agriculture and Resource Economics*, 51, 157-174.
- Rosseau, J. (1994). Review of socio-economic studies and preliminary recommendations for the resettlement of the Kayan and Lahanan of the Upper Balui. (Kuching: Report Submitted to the State Planning Unit, Jabatan Ketua Menteri, Sarawak, September 27).
- Rowan-Robinson, J. & Brand, C.M. (1995). *Compulsory purchase and compensation*. London: Sweet & Maxwell.
- Russell, R. R. & Wilkinson, M. (1979). *Microeconomics: A synthesis of modern and neoclassical theory*. New York, NY: John Wiley & Sons, Inc.
- Sarkar, P. K. (1998). *Law of land acquisition of land in India*. Delhi: Eastern Law House.
- Scudder, T. & Colson, E. (1982). "From Welfare To Development: A Conceptual Framework for the Analysis of Dislocated People." In Hansen A. and A. Oliver-Smith (eds.) *Involuntary Migration and Resettlement*. CO, Boulder: Westview Press.

- Samuelson, P. (1938). A Note on the Pure Theory of Consumers' Behaviour. *Economica*, 5, 61-71.
- Sekaran, U. & Bougie, R. (2009). *Research Methods for Business: A Skill Building Approach*. United Kingdom: John Wiley & Sons Ltd.
- Sen, A. (2000). The Discipline of Cost and Benefit Analysis. *The Journal of Legal Studies*, 29(2), 931-952.
- Sen, A. (1988). Freedom of choice: Concept and content. *European Economic Review*, 32, 269-294.
- Sen, A. (1999). *Development as Freedom*. New York, NY: Anchor Books, A Division of Random House.
- Sen, A. (2000). *Social exclusion: Concept, application and scrutiny*. Social Development Papers No. 1, Office of Environmental and Social Development, Asian Development Bank, June 2000.
- Sen, A. (2003). Development as Capability Expansion. In Sakiko Fukuda-Parr and A.K.Shiva Kumar, editors, *Readings in Human Development, Concepts, Measures and Policies for a Development Paradigm*, p. 3-16. Oxford University Press.
- Shavell, S.(1993). Contingent Valuation Of The Nonuse Value Of Natural Resource: Implications For Public Policy and The Liability System, in Jerry A. Hausman (ed.) *Contingent Valuation: A Critical Assessment (Contributions to Economic Analysis, Volume 220)*, Emerald Group Publishing Limited, p.371-388.
- Shuib, A. (2011). *Value of Outdoor Recreation*. FEB Working Paper Series, No. 1102, University Malaysia Sarawak (UNIMAS), Malaysia.
- Sibon, P. (2011, August 2). Bakun set to go commercial this Saturday. *The Borneo Post*, p. 5.

- Souksavath, B. & Nakayama, M. (2013). Reconstruction of the livelihood of resettlers from the Nam Theun 2 hydropower projects in Laos. *International Journal of Water Resources Development*, 29(1), 71-86.
- Sovacool, B. K. & Valentine, S. V. (2011). Bending bamboo: Restructuring rural electrification in Sarawak, Malaysia. *Energy for Sustainable Development*, 15, 240-253.
- Sunardi, Gunawan, B., Manatunge, J. & Pratiwi, F. D. (2013). Livelihood status of resettlers affected by the Saguling Dam project, 25 years after inundation. *International Journal of Water Resources Development*, 29(1), 25-34.
- Swain, A & Chee, A.M. (2004). Political Structure and Dam Conflicts: Comparing Cases in Southeast Asia. In: World Water Council, editor. *Proceedings of the Workshop on Water and Politics: Understanding the Role of Politics in Water Management*. Paris, France: World Water Council.
- Swainson, L. & McGregor, A. (2008). Compensating for development: Orang Asli experiences of Malaysia's Sungai Selangor dam. *Asia Pacific Viewpoint*, 49(2), 155-167.
- Thompson, H. & Hui, S. (2001). *Bakun Dam Lurches Forward*. World Rivers Review. June.
- Tyler, T. R. (1990). *Why People Obey the Law*. Princeton and Oxford: Princeton University Press.
- Warnock, M. (2003). *Utilitarianism and on Liberty*. Malden, MA: Blackwell.
- WCD (2000). *Dams and development : A new framework for decision-making* (The report of the world commission on dams, 2000 edition). Retrieved December 26, 2011 from [www.unep.org/dams/WCD/report/WCD\\_DAMS%20report.pdf](http://www.unep.org/dams/WCD/report/WCD_DAMS%20report.pdf)

Xi, J. & Hwang, S-S (2011). Unmet expectations and symptoms of depression among Three Gorges Project resettlers. *Social Science Research*, 40 (1), 245-256.

Yoshida, H., Agnes, R. D., Solle, M. & Jayadi, M. (2013). A long-term evaluation of families affected by the Bili-Bili Dam development resettlement project in South Sulawesi, Indonesia. *International Journal of Water Resources Development*, 29(1), 50-58.