Regional Development for a Disastrous Country

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Regional Development for a Disastrous Country

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Abstract – *The purpose of this paper is to explore the relationship between social and economic factors on the economic loss and number of victims of natural disaster occurring in Indonesia using a pooled data from 2004 to 2008 of all provinces. This study found income as measured by GDRP per capita have negative impact on the number of deaths as well as in the number of houses destroyed. It also suggests that the impact of natural disasters can be lowered by enhancing not only economic development but also human development. Therefore, regional development should consider both of developments in order to reduce the impact of natural disasters. Other important finding of this study is the positive impact of government expenditure on the disaster impact related to the number of deaths. It means that large local government expenditure will not guarantee the regions in reducing the impact of natural disasters. The positive impact of government size on the disaster impact is an interesting topic for a further study that may be related to other issue such corruption in the distribution of aid regarding disasters. The study also suggests that further research may use other appropriate indicator of human development in estimating the benefit of human quality in reducing the impact of natural disaster.*

Key words: regional development, natural disaster, Indonesia

JEL Classification: O1, R1, Q54

INTRODUCTION

Indonesia is one of the disastrous countries in the world. *The Annual Disaster Statistical Review 2008* shows that the top ranking of disaster occurrence in several years were occupied by Indonesia, together with China, the United States, Philippines, and India (RODRIQUEZ *et al* 2009). EM-DAT summarized there are 390 disaster events in Indonesia during 1900-2010 that killed almost 240,000 people and the country suffered economic losses of about $24 billions.[1] One government report said that total economic loss (direct and indirect losses) caused by seven big disasters during 2004-2007 are about 3.1 percent of gross domestic product of Indonesia in 2007 or 15.8 percent of central government budget in 2007.[2] Meanwhile, according to the Indonesian Disaster Data and Information – National Management Disaster Agency (DIBI-BNPB), there were about 6,000 disaster events since 1997-2008. Those events include from climate change to social conflicts.

The statistic indicates that disasters are important issues that should be considered as a serious concern as they affect the development in Indonesia, including the regional level. The goal of this study is to explore the issue by analyzing the relationship between regional development and the disaster impacts. The general hypothesis used in this study shows that as the level of regional development increase, the impacts of disaster decrease. It means that the concern of this study is the impact of regional development on the impact of disasters but not the opposite relationship. This study will focuses only on natural disasters in 2004-2008.

A brief discussion on the interconnection between disasters and development framework is discussed on the next section. Data sources, empirical results and conclusion are presented in order.

DISASTERS AND DEVELOPMENT

From "dis-astro" to development concern

There was an evolution in putting natural disaster as a concern of development based on the actors and the main issues (UNDP 2004: 18). Up to 1970s, an idea that natural disasters were more than just an act of God was emphasized. The word "disaster" historically comes from astrology ***dis+astro*** or "bad star" and then it is beyond of human responsibilities (FREUDENBURG *et al* 2008). In this phase, natural disasters were understood synonymously with natural events such as earthquakes, volcanic eruptions, and cyclones. The consequence of this view was the magnitude of natural disaster was considered as a function of the magnitude of hazards.

Beginning in 1970s, technical professionals, such as engineers and architects, expressed concerns that those natural hazards had varying impacts on different kind of

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[1] This statistic is included epidemic disasters. By definition, in order for a disaster to be entered into the EM-DAT: The OFDA/CRED International Disaster Database at least one of the following criteria has to be fulfilled: (1) 10 or more people reported killed, (2) 100 people reported affected, (3) a call for international assistance, (4) declaration of a state of emergency. See: http://www.emdat.be/result-country-profile.

[2] It included bird flu or avian influenza (2004-2005) and the Lapindo hot mud at Sidoarjo (since May 2006).

structures, such as buildings. Then, improving the quality of building foundations, for example was important in reducing disaster risks. However, costs were the main problems in this ideal solution. During the next decades, this concern then was shared by social sciences and humanities researchers. They argued that the capacity of people to absorb the impact and recover from losses and damaged was also important besides the resistance of a structure, in determining the impacts of natural disasters. By the end of 1990s, the emerged perspective was that all development activities had the potential to increase or reduce risks of natural disasters.

UNDP (2004) also contributes in explaining deeply the complex interactions between disaster and development (Table 1). The table shows that disaster can limit development both in economic and social. However, development may cause or reduce disaster risks. It means that we need attention on the development processes that causes disaster risks while keeping the processes development that reduces risks of disaster.

Table 1. Disaster-Development Interactions

	Economics Development	**Social Development**
Disaster limits development	Destruction of fixed assets. Loss of production capacity, market access of material inputs. Damage to transport, communications or energy infrastructure. Erosion of livelihoods, savings and physical capital	Destruction of health or education infrastructure and personnel. Death, disablement or migration of key social actors leading to an erosion of social capital
Development causes disaster risk	Unsustainable development practises that create wealth for some at the expense of unsafe working or living conditions for others or degrade the environment	Development paths generating cultural norms that promote social isolation or political exclusion
Development reduces disaster risk	Access to adequate drinking water, food, waste management and a secure dwelling increase people's resiliency. Trade and technology can reduce poverty. Investing in financial mechanisms and social security can cushion against vulnerability	Building community cohesion, recognising excluded individuals and social groups (such as women), and providing opportunities for greater involvement in decision-making, enhanced educational and health capacity increases resiliency

Source: UNDP (2004: 20)

Choosing the focus: consequences of socio-economic factors

Table 1 can be used in classifying the relationship between development and disaster. In general, we can classify them into two types or groups of study. The first concerns on the impact of disaster on the economic development based on understanding that disaster limits development, and the second one is about the influence of development on reducing or increasing the disaster impacts. The concern of the first type of disaster studies is to explore the negative consequences of disasters mainly on economic growth, as conducted by BAADE, BAUMANN, and MATHESON (2007) in the case of the Hurricane Katrina and STROBL (2008) that focuses on the hurricane strikes in Central American and Caribbean Region. Meanwhile, the second one concerns

on how development should be addressed in order to reduce the disaster vulnerability. TOYA and SKIDMORE (2007) worked in this second type of disaster studies.

Many concerns have been emphasized on the impact of disasters mainly on the macroeconomic performances. HEWITT (1997) said that a consequence as many different functions and institutions can be destroyed all at once by disaster and cause a large crisis (in PELLING, OZERDEM, and BARAKAT 2002). There are a lot of potential disaster losses that can be classified into tangible and intangible losses that indicates the impacts of disaster not only in term of economic losses but also in social and cultural losses. Most of natural disasters can bring economic consequences immediately. According to the ADSR 2008, the economic costs caused by natural disasters in 2008 were over 190 million US$, more than 235.000 people were killed and 214 million people were affected (RODRIQUEZ *et al* 2009). Moreover, there was an increase on the number of victims since 1990s that enhances the growing concern on the impact of natural disasters, mainly on the economic indicators.

Table 2. The Economic Impact of Disasters

Direct impacts	Physical damage, including that to productive capital and stocks (industrial plants, standing crops, inventories, etc.), economic infrastructure (roads, electricity supplies, etc.), and social infrastructure (homes, schools, etc.)
Indirect impacts	Downstream disruption to the flows of goods and services- e.g., lower output from damaged or destroyed assets and infrastructure and the loss of earnings as income generating opportunities are disrupted. Disruption of the provision of basic services, such as telecommunications or water supply, for instance, can have far-reaching implications. Indirect costs also include the costs of both medical expenses and lost productivity arising from the increased incidence of disease, injure and death. However, gross indirect costs are also partly offset by the positive downstream effects of the rehabilitation and reconstruction efforts, such as increased activity in the construction industry.
Secondary effects	Short-and long-term impacts of disaster on the overall economy and socio-economic conditions, e.g. fiscal and monetary performance, levels of household and national indebtedness, the distribution of income and income and incidence of poverty, the effect of relocating and restructuring elements of economy or workforce.

Source: BENSON (2002), quoted from UNDP (2004: 12).

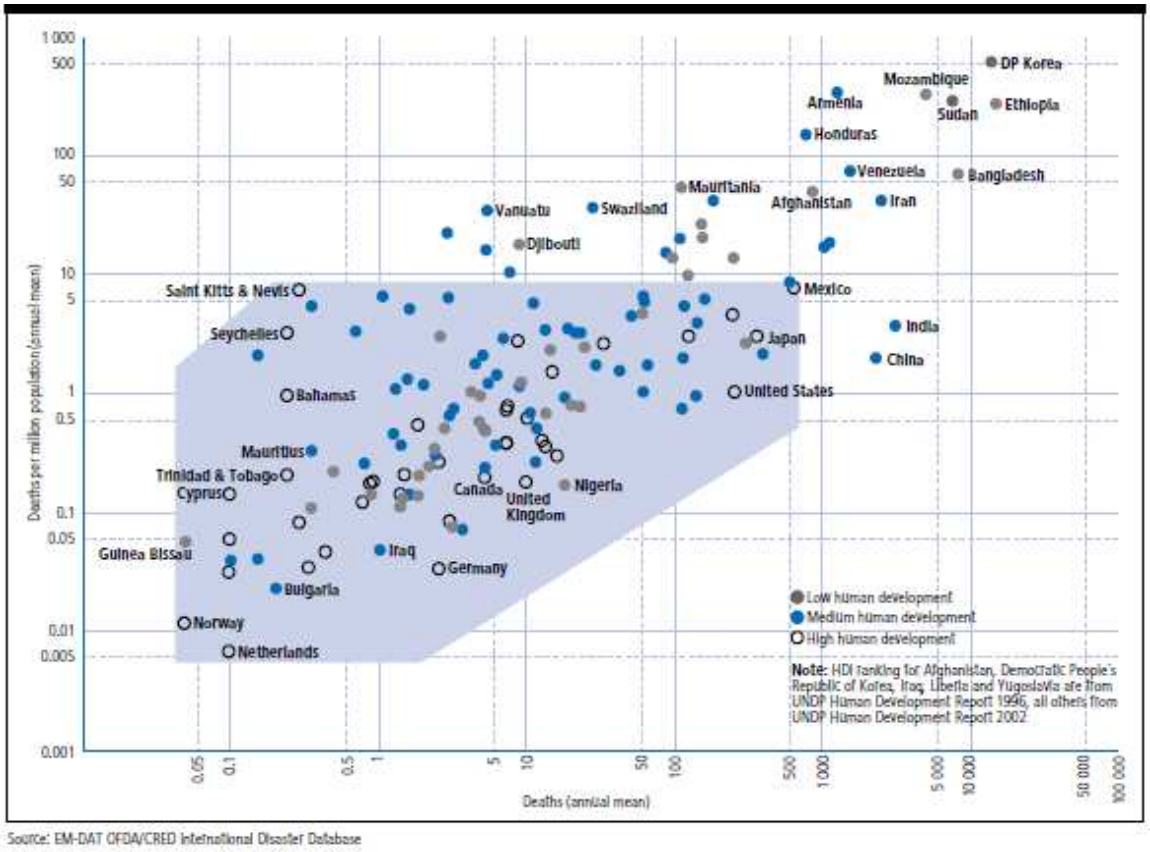
UNDP (2004) also gives a summary of impact of disasters on the economy (Table 2). Three categories of the economic impact of disasters are direct impacts, indirect impacts and secondary effects. Direct impacts refer to physical damages while indirect impacts rise as direct consequences of physical damages and costs in caring the victims. Positive impacts of rehabilitation and reconstruction activities in indirect impacts may offset this negative effect. However, benefits of these post-disaster activities may be questionable in term of its distribution. For example, TAKASAKI (2008) found, in the case of cyclone in rural Fiji, traditional kin elites who have power, such as the chief's clans, receive benefits earlier than other in recipient villages. The secondary effects include widely impacts of disaster on the overall socio-economic conditions in short and long term. The report also mentions that empirically direct costs were predominantly reported data on the disasters cost and the true cost of indirect and secondary impacts

may unavailable for several years after a disaster event. However, it argues that the secondary effects of disasters can have impacts on long-term human and economic development as suggested by the ongoing research.

Although it is agreed that disasters may bring a highly damaging power on various aspects of life, however the important question is how to reduce the disaster vulnerability. BASHER (2008) gives a good statement for that issue that if a community is unable to cope the natural hazard it faces, then disasters arise. He mentions that a hazard by itself does not necessarily lead to a disaster. In other word, preparedness of community and of course underlying conditions that enable them to take preparation in facing natural disasters is one of the keys in determining whether a disaster will cause bigger losses or not.

As was mentioned in previous section, the word "disaster" historically comes from astrology that was ***dis+astro*** or "bad star" and then it is beyond of human responsibilities or just a product of the God's Hand. However, recent concern disagrees with the "dis+astro" reasons behind the natural disaster impacts. Based on analysis on the horrific images of disasters in several developing countries, EL-MASRI and TIPPLE (2002) concluded that there is an importance of shifting from post-disaster emergency actions to pre-disaster mitigation mainly in urban areas.

Figure 1. Development Status and Disaster Deaths



Source: UNDP (2004: 31)

During a major earthquake, a poor constructed building become vulnerable. If this building was destroyed by an earthquake, then number of people might be killed. It was argued that appropriate house design is important in strengthening the house structure that will increase its resilience. But why the building was constructed poorly? Constructing a better building of course needs more money. Therefore lack of income may reduce opportunity to have a better building. It may also be a result of bad policy in facing disaster vulnerability.

The above illustration indicates the connection between development level and natural disaster impacts. Moreover, according to UNDP (2004), natural disaster can be a cause and product of failed development. The report also mentions two important issues regarding many killed by natural disasters, 185 deaths per days. First, this statistic is only the tip of the iceberg in term of losses in the quality of life, livelihoods, and economic development. Second, the victims are unevenly distributed around the world. As indicated by Figure 1, losses from natural disaster are tied to development status. Countries with high human development recorded low number of deaths than other countries.

TOYA and SKIDMORE (2005) contributed an understanding of the relationship between economic development and the impacts of natural disasters. In their study they use a framework that show that because of the demand for safety rises with income then a good indicator of a country' safety level is its per capita income; thus it indicates protection against natural disasters. They analyze several socio-economic indicators, besides income (per capita GDP), that may determine the degree of exposure for society. These indicators are educational attainment (total years of schooling attainment), openness (export+import/GDP), financial development (M3/GDP), and size of government (government consumption/GDP). Other control variables are population, land area, and a series of dummy variables indicating type of disaster. The dependent variables are number of killed and economic damage/GDP.

Using data of disaster and economic development of 151 countries, TOYA and SKIDMORE found that countries with higher income, higher education attainment, more complete financial system and smaller government size experience fewer losses caused by natural disasters. They also conclude that the role of income in this relationship is as an underlying socio-economic fabric that can improve the level of safety. This finding supports confirms previous studies such as KHAN (2003). Using a data set on annual deaths from disasters in 48 nations from 1980 to 1999, KHAN found that as income rises, the number of deaths, injured, and homeless are decreased. Rich countries do suffer less death from disasters than poorer countries although there is no different in number of disaster events experienced by both country groups.

Recent studies in this issue tend to focus on disaster in developing countries. CHHIBBER and LAAJAJ (2007) reviewed natural disasters and economic development in several developing countries and came with some interesting findings. One of the important finding is the impact of disaster will differ according to type of disaster, its frequency, contribution of international aid, and the socio-economic conditions of the country. YAMAMURA (2009) uses data set of 47 prefectures in Japan from 1988 to 2001 got three important findings. First, social capital reduces the damage caused by natural disaster. Second, the risk of a natural disaster makes people more apt to cooperate and then social capital is more effective to prevent disasters. Third, income is an

important factor for reducing damages, but hardly influences it when the scale of a disaster is small.

Meanwhile, PADLI and HABIBULLAH (2009) focus their study on the fifteen Asian countries over the sample period from 1970 to 2005. Using a panel data analysis they found that a country at lower income level is more disaster resilience however at higher income level it become less disaster resistant. They also concluded that education attainment reduces number of deaths caused by disaster, larger population will increase death toll and larger land area will reduce disaster victims.

To sum up, there are many variables that may determine the number of losses caused by the natural disasters. Difference in socio-economic conditions as indication of regional diversity may cause different impact on the magnitude of disasters in term of losses. Since Indonesia is a disastrous country and the high impact of natural disasters was already known over the country, then the important issue that needs more examination is the impact of socio-economic measures on the size of impact of natural disasters. This issue is also related to the fact of regional diversity in term of socio-economic among the regions or provinces in Indonesia. In short, this study uses a framework of development increase/decrease risks of disaster.

DATA SOURCES AND MODEL

Data sources

There are two groups of data used in this study. The first group is data on natural disasters that taken from the Indonesian Disaster Data and Information – National Management Disaster Agency (DIBI-BNPB). This government institution provides several statistic of disaster in Indonesia which covers since 1990s to 2000s. The research focuses only on the period of 2004-2008. There are many types of disasters in the data base of disasters provided by DIBI-BPNP. It is consist of 527 events of 2004-2008. However, since this research focuses on the natural disaster then the database should be classified into several categories of disasters. According to Law No. 24/2007 on the Disaster Mitigation, there are three type disasters: natural disaster, non-natural disaster, and social disaster. Classifying using this definition resulted in 385 natural disaster events, 118 non-natural disaster events, and 24 social disaster events. Therefore, total observations for this study are 385 natural disaster events.

Details of natural disaster events that used in this study are presented at Table 3. This table shows that floods (including landslides) contribute more than 40 percent of natural disaster in Indonesia during 2004-2008. Earthquake (including tsunami) contributes only about 10 percent of total natural disaster. However, as already known, this type of disaster has destroyed power in a much larger scale than other type of natural disasters. It was known i.e. in the case of earthquake and tsunami in Aceh-Nias in 2004 (NAZARA and RESOSUDARMO 2007) and earthquake in Yogyakarta in 2006 (BAPPENAS *et al* 2006). Due to the above reason, this type of disaster should get a specific estimation tool. Dummy variable of earthquake and tsunami can be considered as the tool.

Table 3. Distribution of Natural Disaster Event Based on Type of Disasters

Type of Disaster	Frequency	Percent
Climate changes	1	.3
Earthquake	37	9.6
Earthquake and tsunami	5	1.3
Eruption	3	.8
Floods	107	27.8
Floods and landslides	53	13.8
Landslides	57	14.8
Strong wind	87	22.6
Surge	35	9.1
Total	385	100.0

One of the problems in the estimation is in selecting indicators of natural disaster. As described in the previous section, the impact of development will be estimated on the natural disasters. In the DIBI-BNPB database, there are several available indicators of the impact of disaster. This research chooses to classify these indicators into two groups. The first group is indicators of impact of disaster on the human being or labelled as "human loss", and the second one is indicators on the economic side or "material loss". Each group consist of selected indicators are shown in Table 4.[3]

These indicators will be used in the estimation. In the human loss model there are three estimations, as well as for the material loss model. This estimation strategy that provides several alternatives of losses caused by natural disasters is used to solve the problem of quality of data. For example, when data of economic loss is quite small then it should be accompanied by other indicators that perhaps give better estimation results.

Model

Model used in this study is referred mainly to TOYA and SKIDMORE (2005) and PADLI and HABIBULLAH (2009). The explanatory variables of disaster impacts are consist of real per capita gross domestic regional product (gdrpcap), human development index (HDI), expenditure of provincial government (provgov), and two dummy variables (*Eastern* Indonesia dummy and *Earthquake* dummy). Data of GDRP per capita and HDI are taken from the BADAN PUSAT STATISTIK (CBS), while data of provincial government expenditure is collected from publication supplied by the office of MINISTRY OF FINANCE. Both of these data are taken at provincial level.[4]

[3] Other indicator in human losses is number of missing persons. However, the regression of this indicator was dropped since its number of observations is somewhat small, only 50 events.

[4] Data of disasters are also provided at *kabupaten/kota* level. Using this level data in estimation of course needs data of explanatory variables at the same level. One of the problems at this level is availability of local government statistics. Therefore, the alternative chosen for this study is employing data at provincial level.

In general, there are two sets of regressions in logarithmic function that will be estimated, as following:

$$(1)\ \text{Log(Human loss)}_{jit} = \beta_0 + \beta_1\ \text{Loggdrpcap}_{it} + \beta_2\ \text{HDI}_{it} + \beta_3\ \text{Logprovgov}_{it} + \beta_4\ \text{Eastern}_{it} + \beta_5\ \text{Eathquake}_{it}$$

$$(2)\ \text{Log(Material loss)}_{jit} = \beta_0 + \beta_1\ \text{Loggdrpcap}_{it} + \beta_2\ \text{HDI}_{it} + \beta_3\ \text{Logprovgov}_{it} + \beta_4\ \text{Eastern}_{it} + \beta_5\ \text{Eathquake}_{it}$$

Where Log(Human loss) $_{jit}$ and Log(Material loss) $_{jit}$ are logarithmic values of the total number of human losses and material losses caused by natural disaster **j** in province **i** in year **t**. The human loss and material loss are measured by indicators as described in Table 4.

Tabel 4. Descriptive Statistics

Variable	Description	Obs.	Mean	Std. Dev.
Logdeath	Log of number of deaths	224	1.751	1.643
Loginjured	Log of number of persons injured	182	3.421	2.605
Logdisplaced	Log of number of persons displaced	183	7.376	2.237
Logeconloss	Log of cconomic loss in current local prices (Rp)	152	7.724	2.610
Loghousedes	Log of number of houses destroyed	339	4.112	2.140
Loghousedam	Log of number of houses damaged	203	5.253	2.212
Loggdrpcap	Log of GDRP per capita (Rp)	385	15.647	0.595
HDI	Human development index	385	69.249	3.226
Logprovgov	Log of provincial government expenditure (Rp)	360	28.076	0.917
Eastern (dummy)	Eastern province=1, otherwise=0	385	0.319	0.467
Earthquake (dummy)	Earthquake/tsunami event=1, otherwise=0	385	0.109	0.312

It should be noted that number of observations of estimations are depended on the data availability and the transformation processes of data into logarithmic value. Technically, a zero value can not be transformed into logarithms. Therefore, the disaster events with zero values, as well as cases with incomplete data will be dropped automatically in the estimation procedures. Thus, although number of disaster events in the database are 385 however the number of observation in the estimations are only between 149 and 316 events.[5] Descriptive statistics used in the estimation are presented in Table 4. Least square procedure is employed in estimating the regression models using the Eviews.

[5] Using the non logarithmic model may keep number of disaster events still as large as the total disasters in the database. However, the statistical fit of estimation results of this approach is somewhat low. Therefore, this study continues in using the logarithmic model that provides better results.

ESTIMATION RESULTS AND DISCUSSIONS

Table 5 shows the empirical results for three indicators of human loss aspect. The adjusted R squared of the regressions is rather low, ranging from 3.6 percent (in "Logdisplaced" column) to 12.3 percent (in "Logdeath" column). Based on the explanatory power, the best estimation is human loss measured by number of deaths in column "Logdeath". This estimation also used larger observations than other columns. There are three variables that influence number of deaths. These variables are Loggdrpcap, Logprovgov, and dummy variable of earthquake events.

In column "Logdeath", the coefficient of regression indicates that as income rises, then the number of death will decrease. Meanwhile, the impact of the government expenditure on the human loss indicators is positive. It indicates that as size of government increase then the number of deaths that affected by natural disasters also increase. In all estimations, the human development index does not influence significantly on the human loss indicators. Dummy variable of earthquake events show significantly positive coefficient which confirms that number of human losses affected by earthquakes and tsunami are higher than losses affected by other natural disaster events.

Estimation results in Table 5 also indicate that number of deaths is the most appropriate indicator of human aspect of natural disaster. It implies that study on natural disaster in Indonesia may use deaths data as the main indicator in term of the human loss.

Table 5. Human Loss

Explanatory variables	Dependent variables		
	Logdeath	Loginjured	Logdisplaced
Constant	-3.706	-23.395**	-2.333
	(-1.052)	(-2.422)	(-0.268)
Loggdrpcap	-0.565*	0.381	0.267
	(-2.008)	(0.700)	(0.561)
HDI	0.002	0.087	0.072
	(0.048)	(1.072)	(1.239)
Logprovgov	0.493*	0.503***	0.006
	(3.454)	(1.815)	(0.018)
Eastern	-0.077	1.235**	0.442
	(-0.271)	(2.048)	(0.853)
Earthquake	1.491**	1.686*	1.396*
	(2.582)	(3.109)	(2.651)
Number of Observations	213	175	170
Adjusted R2	0.123	0.064	0.036

Note: numbers in parentheses are t-statistics (White heteroscedasticity-consistent standard errors & covariance)
* significant at 1%, ** significant at 5%, *** significant at 10%

There are three indicators of material losses in Table 6. Explanatory powers of regression are ranging from 6.3 percent (in column "Logeconloss") to 17.7 percent (in "Loghousedes"). It suggests that the best fit model is the estimation which used number

of destroyed houses as the independent variable. This estimation also has an advantage since its number of observation is near the sample size in the database of disaster events.

In the "Loghousedes" column, only variable of government expenditure that does not significantly influence the number of houses destroyed. Negative coefficient of Loggdrpcap indicates that as income increase, then, number of houses destroyed because of natural disaster fall. In contrast to human loss, the impact of human development index in the material loss is negative and significant. It indicates that as the index increase, then number of houses destroyed fall. Consistent with human losses estimations, dummy variable of earthquake shows a positive coefficient that means earthquake and tsunami has larger impact in destroying houses than other natural disaster events. Meanwhile, dummy variable of province in Eastern Indonesia shows a negative coefficient. This negative sign indicates that number of houses destroyed caused by natural disasters in the Eastern provinces of Indonesia is smaller than provinces in the Western part of this country.

Based on estimation results in Table 6, it can be concluded that the most appropriate indicator of material loss of natural disaster is number of destroyed houses. In cross-countries studies, economic loss is commonly used as indicator of material loss. However, in case of cross regions in Indonesia, this study implies that since economic loss data are not quite available or tend to underestimate, then the best indicator is number of destroyed houses.

Table 6. Material loss

Explanatory variables	Dependent variables		
	Logeconloss	Loghousedes	Loghousedam
Constant	19.820	17.867*	15.730***
	(1.588)	(3.622)	(2.092)
Loggdrpcap	0.641	-0.813*	-0.685
	(1.161)	(-2.924)	(-1.401)
HDI	-0.12	-0.104**	-0.080
	(-1.161)	(-2.218)	(-1.248)
Logprovgov	-0.491	0.215	0.199
	(-1.455)	(1.293)	(0.827)
Eastern	-0.291	-0.594***	-0.523
	(-0.380)	(-1.836)	(-1.069)
Earthquake	1.743	2.297*	1.756*
	(1.625)	(4.891)	(3.686)
Number of Observations	150	317	195
Adjusted R2	0.063	0.177	0.094

Note: numbers in parentheses are t-statistics (White heteroscedasticity-consistent standard errors & covariance)
* significant at 1%, ** significant at 5%, *** significant at 10%

To summarize, the impact of income as measured by GDRP per capita on the number of deaths is negative as well as in the number of houses destroyed estimation. This result is consistent with TOYA and SKIDMORE (2007) in their cross country

studies. This finding could be interpreted that disaster vulnerability can be reduced by improving the economic development. People in provinces with better income are able to better prepare in facing natural disasters. This interpretation is also partially supported by the negative impact of human development index on the number of destroyed houses. As known, households or individuals with better human capability, such as in term of education are able to access information of vulnerability caused by natural disasters that enable them in preparing themselves in facing the disasters. It suggests that the impact of natural disasters can be lowered by enhancing not only economic development but also human development as indicated by UNDP (2004). An appropriate indicator of human development may be used to assess the benefit of human quality in reducing the impact of natural disaster.

There is also an intriguing question in regards to the positive impact of government expenditure as a measure of government size on the disaster impact related to the number of deaths. In their study, TOYA and SKIDMORE (2005) did not provide an exact prediction on the impact of government size on the natural disaster's indicator. They said that it is a priori ambiguous and proposed two expectations. If its impact is negative then it indicates a larger government may translate into greater public assistance and stronger social response to disaster risk and risk management. However, the opposite impact of this variable indicates that a larger government may be less responsive and less efficient at handling disaster response initiatives. Since they found positive and significant then they interpreted as indication that a larger public sector is associated with more deaths.

In the case of Indonesia, one of possible interpretations is larger government size does not guarantee in responding sufficiently to disaster events, moreover in which those disasters has high destroying power such as earthquake and tsunami. Lack of awareness on natural disaster will also reduce expenditure allocation for disaster prevention. Thus, its consequence is large local government expenditure will not guarantee the regions in reducing the impact of natural disasters. It should also be noted that there are problems in delivering aid for the victims of disasters. One of crucial problems is corruption practices in the distribution of aid moreover in case of there is a massive flow of fund from various sources for natural disaster mitigation or emergency response on disasters (see NEGARA and BARY 2008). However, this corruption issue needs a further analysis that could be conducted by other research.

CONCLUSION

The purpose of this paper is to explore the relationship between social and economic factors on the economic loss and number of victims of natural disaster occurring in Indonesia using a pooled data from 2004 to 2008 of all provinces. This study found income as measured by GDRP per capita have negative impact on the number of deaths as well as in the number of houses destroyed. It also suggests that the impact of natural disasters can be lowered by enhancing not only economic development but also human development. Therefore, regional development should consider both of developments in order to reduce the impact of natural disasters. Other important finding of this study is the positive impact of government expenditure on the disaster impact

related to the number of deaths. It means that large local government expenditure will not guarantee the regions in reducing the impact of natural disasters.

The positive impact of government size on the disaster impact is an interesting issue for a further study that may be related to other issue such corruption in the distribution of aid regarding disasters. The study also suggests further research may use other appropriate indicator of human development in estimating the benefit of human quality in reducing the impact of natural disaster.***

REFERENCES

BAADE R. A., BAUMANN R., and MATHESON V. (2007) Estimating the economic impact of natural and social disasters, with an application to Hurricane Katrina, *Urban Studies* **44**(11), 2061-2076.

BAPPENAS, THE PROVINCIAL AND LOCAL GOVERNMENTS OF DI YOGYAKARTA, THE PROVINCIAL AND LOCAL GOVERNMENT OF CENTRAL JAVA, and INTERNATIONAL PARTNERS. (2006) *Preliminary Damages and Loss Assessment Yogyakarta and Central Java Natural Disaster*. Bappenas, Jakarta. (available at http://www.un.or.id/yogya/docs/Damage%20Assessment.pdf)

BASHER R. (2008) Disaster impacts: implications and policy responses, *Social Research* **75**(3), 937-954.

CHHIBBER A., and LAAJAJ R. (2007) Natural disasters and economic development: impact, response and preparedness. (available at http://depot.gdnet.org/cms/conference/papers/Chhibber_paper_plenary3.pdf)

EL-MASRI S., and TIPPLE G. (2002) Natural disaster, mitigation and sustainability: the case of developing countries, *International Planning Studies* **7**(2), 157-175.

FREUDENBURG W. R., GRAMLING R., LASKA S., and ERIKSON K. T. (2008) Organizing hazards, engineering disasters? improving the recognition of political-economic factors in the creation of disasters, *Social Forces* **87**(2), 1015-1038.

KHAN M. E. (2003) The death toll from natural disasters: the role of income, geography and institutions,(available at SSRN: http://ssrn.com/abstract=391741 or doi:10.2139/ssrn.391741).

NAZARA S., and RESOSUDARMO B.P. (2007) *Aceh-Nias Reconstruction and Rehabilitation: Progress and Challenges at the End of 2006*. Discussion Paper No. 70. Tokyo, Asian Development Bank Institute (available at: http://www.adbi.org/discussion-paper/2007/06/26/2288.acehnias.reconstruction.rehabilitation)

NEGARA S. D., and BARY P. (2008) Bencana alam: dampak dan penanganan sosial ekonomi, *Masyarakat Indonesia* **34**(1), 115-134.

PADLI J., and HABIBULLAH M. S. (2009) Natural disaster death and sosio-economic factors in selected Asian countries: a panel analysis, *Asian Social Science* **5**(4), 65-71.

PALLING M., OZERDEM A., and BARAKAT S. (2002) The macro-economic impact of disasters, *Progress in Development Studies* **2**, 4 (2002), 283-305.

REPUBLIK INDONESIA (2007), *Undang-undang No. 24/2007 tentang Penanggulangan Bencana*.

RODRIQUEZ J., *et al*. (2008) *Annual Disaster Statistical Review 2008*, CRED, Brussel.

STROBL E. (2008) *The Macroeconomic Impact of Natural Disasters in Developing Countries: Evidence from Hurricane Strikes in the Central American and Caribbean Countries*. DDX-08-04. Ecole Polytechnique, Paris (available at: http://ceco.polytechnique.fr/CDD/PDF/DDX-08-04.pdf)

TAKASAKI Y. (2009) *Do Local Elites Capture Natural Disaster Reconstruction Funds?* Tsukuba Economics Working Papers No. 2009-012. Department of Economics, University of Tsubaka, Tsubaka (available at: http://www.econ.tsukuba.ac.jp/RePEc/2009-012.pdf)

TOYA H., and SKIDMORE M. (2005), *Economic Development and the Impact of Natural Disasters*. Working Paper 05-04. University of Wisconsin, Whitewater (available at: http://academics.uww.edu/business/economics/wpapers/05_04_skidmore.pdf)

UNDP (2004) *Reducing Disaster Risk: a challenge for development*, UNDP, New York.

YAMAMURA E (2009) *Effects of Interactions Among Social Capital, Income, and Learning from Experiences of Natural Disasters: A Case Study from Japan*. MPRA Paper No. 16223 (available at: http://mpra.ub.uni-muenchen.de/16223/2/MPRA_paper_16223.pdf)