Poverty Mapping and Characterizing the Poor Using Geographical Information System: Case Study in Terengganu, Malaysia

Chamhuri Siwar
Institute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia
43600 Bangi, Selangor
E-mail: csiwar@ukm.my

Shaharudin Idrus
Institute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia
43600 Bangi, Selangor
E-mail: dinn6358@ukm.my

Nor Diana Mohd Idris
Institute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia
43600 Bangi, Selangor
E-mail: dianamohdidris@yahoo.com

Siti Zalikha Zahari
Institute for Environment and Development (LESTARI)
Universiti Kebangsaan Malaysia
43600 Bangi, Selangor
E-mail: sitizalikha87@gmail.com

ABSTRACT

Poverty alleviation is the main agenda of sustainable development in most developing countries. In Malaysia, problems of poverty are addressed through various strategies and programs of the New Economic Policy (1971-1990), National Development Policy (1991-1999) and the National Vision Policy (2000-2010). Currently, Malaysia implements the National Transformation Policy (NTP), in order to move towards a high-income country. Various efforts have been undertaken by the government to overcome the poverty problem with significant success. However, poverty still persist in some states, including the East Coast Economic Region (ECER) comprising of three major east coasts of Kelantan, Terengganu, and Pahang. The study aims at mapping poverty and identify the characteristics the hard-core poor and the poor in the state of Terengganu. The study uses secondary data from the Implementation and Coordination Unit (ICU) via *e-Kasih* portal system consisting of 368 heads of household of the hard core poor and 7219 poor households in Terengganu registered during the period from 2008 to August 2011. This study used ArcGIS 10 to map the locality of the hard-core and poor households. The result indicates that the poor are mostly concentrated poverty in Besut and Kuala Terengganu the state capital of Terengganu. The overall unfavorable characteristics like lower education, more family members and, engage in low paying jobs provide challenges to government agencies to provides proper assistance to them. Policy implications will be discussed, to improve the successful implementation of poverty alleviation programs through economic transformation to drive the country to achieve a high income nation, improve the quality of life of people and sustainable development in the state of Terengganu.

Keywords: Hard core poor, poor group, poverty analysis, poverty mapping, GIS, sustainable livelihood, Terengganu.

ABSTRAK

Pembasmian kemiskinan merupakan agenda utama pembangunan mapan di kebanyakan negara membangun. Di Malaysia, masalah kemiskinan ditangani melalui pelbagai strategi dan program-program yang digariskan dalam Dasar Ekonomi Baru (1971-1990), Dasar Pembangunan Nasional

(1991-1999) dan Dasar Wawasan Negara (2000-2010). Pada masa ini, Malaysia melaksanakan Dasar Transformasi Negara (DTN) untuk bergerak ke arah sebuah negara berpendapatan tinggi. Pelbagai usaha telah dilaksanakan oleh kerajaan untuk mengatasi masalah kemiskinan dengan kejayaan yang ketara. Walau bagaimanapun, kemiskinan masih berterusan di beberapa negeri termasuk Wilayah Ekonomi Pantai Timur (ECER) yang terdiri daripada tiga negeri pantai timur utama iaitu Kelantan, Terengganu dan Pahang. Kajian ini bertujuan untuk memetakan kemiskinan dan mengenal pasti ciri-ciri golongan miskin tegar dan miskin di negeri Terengganu. Kajian ini menggunakan data sekunder dari Unit Pelaksanaan dan Penyelarasan (ICU) melalui portal system e-Kasih yang terdiri daripada 368 ketua isi rumah daripada golongan miskin tegar dan 7219 isi rumah miskin di Terengganu yang berdaftar dalam tempoh dari 2008 hingga Ogos 2011. Kajian menggunakan ArcGIS 9.3 untuk tujuan pemetaan kawasan isi rumah miskin tegar dan miskin. Hasil kajian menunjukkan kemiskinan tertumpu di Besut dan ibu negeri Terengganu. Tahap pendidikan yang rendah, bilangan ahli keluarga yang ramai dan terlibat dalam pekerjaan berpendapatan rendah memberikan cabaran kepada kerajaan bagi penyaluran bantuan yang sewajarnya kepada mereka. Implikasi dasar turut dibincangkan bagi meningkatkan kejayaan pelaksanaan program pembasmian kemiskinan melalui transformasi ekonomi demi mencapai negara berpendapatan tinggi, meningkatkan kualiti hidup masyarakat dan pembangunan mapan di negeri Terengganu.

Kata Kunci: Miskin tegar, golongan miskin, analisis kemiskinan, pemetaan kemiskinan, sistem informasi geografi (GIS), penghidupan lestari, Terengganu.

INTRODUCTION

The poverty eradication has become the important agenda for the government by trying to improve on the poverty targets set through the Millennium Development Goals (MDGs). The Malaysia Ninth Plan 2006-2010, repeated the commitment to achieve growth with distribution and set targets of reducing the overall poverty rate to 2.8% and eradicating hard-core poverty by 2010. It also set ambitious targets to narrow income disparities and improve equity. In 2007, the government has developed the *e-Kasih* system which contained the complete information of the poor family nationwide. This system is to help government in planning, implementing, and monitoring the poverty eradication programs.

Poverty is defined variously as hunger, lack of opportunity, lack of options, education, health, productive assets, susceptible to risks and vulnerability . Every welfare state has this basis of reducing poverty and attaining development (World Bank, 2005). According to Sen (1999), the concept of development has been evolving to encompass several definitions ranging from freedom, to gross national happiness (Ura & Galay, 2004), and to a conventional welfare state and millennium development goals (UNDP 2003), but these definitions have the same underlying basis of promoting equitable growth and reducing poverty. In Malaysia, poverty is commonly conceptualized and operationalized from the monetary approach perspective. Economists have argued that the current monetary approach is not able to reflect the multidimensional nature of poverty, which has developed due to the rapid economic development process via globalization and liberations of trade and businesses. Malaysia has formulated a range of policies and plans to guide the management of national development during 1970s such as New Economic Policy (1970-1990), then National Development Policy (1991-2000) and followed by National Vision Policy (2001-2010), has been devised to address economics imbalances and eradicate poverty. These policies have succeeded in maintaining economic growth of the country (Ali et al., 2009). The success of Malaysia's poverty eradication programs is evidenced by the sharp decline in the incidence of poverty, which decreased from 52.4 % in 1970 to 12.4% in 1992 and recently 1.7 % in 2012 (Economic Planning Unit, 2012). However, in 2012 some states still showed high poverty rates such as Sabah (7.8 %) and Kelantan (2.7 %). The data presented by Economic Planning Unit (EPU) is based on the definition and measurement of poverty from the perspective of income using the concept of Poverty Line Income (PLI) food and non-food.

The government requires a comprehensive mechanism to ensure that poverty problem can be solved effectively. In this respect, Malaysia has begun to explore the geographical disparities in poverty rates within the country through an emerging concept known as poverty mapping which has become one of the important methods to prevent poverty problems in developing countries (Koh, 2009), and can also be used to inform formula for fiscal transfers that accompany decentralization of responsibilities (Henninger and Snel, 2000). Poverty mapping is a method to combine survey and census data to estimate income inequality through geographical factors. This is because at present the main problem for reaching out to the poor in addressing their specific needs, require poverty statistics at smaller geographical disaggregation: the state, counties and parishes. It also to identify the poor and

their needs, data on their social situation is important. Therefore, it becomes important for Department of Statistics Malaysia to use Geographical Information System (GIS) to improve and combine more additional variables on the map as outlined in the Strategic Plan 2010-2014 (Department of Statistics Malaysia, 2012).

GIS IN POVERTY MAPPING

According to Baker and Grosh (1994) and Bigman and Deichmann (2000), poverty maps are important tools for geographical targeting where resources are directed towards areas that have been identified as poor. Geographical targeting requires relatively low administrative costs. Therefore, rather than relying on a single aggregate or an estimated welfare indicator, a comprehensive poverty measure can be compared against regional patterns of other economic, social or biophysical indicators. The GIS database contains information not only on the value of social, economic, climatic, and environmental observations, but also on the location and spatial arrangements (Bigman and Fofack, 2000). According to Haining et al. (2000), GIS in poverty mapping could be used not only to visualize spatial data in the form of maps but also as a tool to extract information from datasets. GIS is needed for developing data visualization methods, as these are easily understandable by non-specialists rather than the numeric or statistical formats. This would encourage a wider participation of users in spatial data interpretation. A study conducted by Sherma Lawrence (2001) used GIS applications to produce the Settlement Boundaries in St. Lucia. One of the many applications of these new boundaries was in the area of poverty. Using a poverty index developed from the census data and linked to the GIS by the settlement code, a classification scheme was produced along with a map. With this approach, areas with a low poverty index are indicated by the map as poor areas and areas with a high poverty index are indicated as upper class areas. The poverty index and associated maps have assisted agencies such as the World Bank through local organizations like the Poverty Reduction Fund, in targeting communities for poverty alleviation initiatives.

STUDY AREA

In this study, the Terengganu state is selected to map the locality of hard core poor and poor households (Figure 1). It is located on the east coast of Peninsular Malaysia at the latitude of 04° 00'N - 05° 50'N and the longitude of 102° 25'E - 103°50'E. The state has a total area of 1,295,638.3 hectares/1,295,512.1 hectares. It comprises of 7 districts, namely Besut, Dungun, Hulu Terengganu, Kemaman, Kuala Terengganu, Marang, and Setiu. The population of 40063 consists of four main ethnic groups, namely Malay (99.63%), Chinese (0.26%), Indian (0.05%), and others (0.05%). Terengganu showed a reduction of poverty rate with a decrease from 4.0% in 2009 to 1.7% in 2012 (Department of Statistic, 2012). However, the coastal communities especially the fishermen, are still among the lowest income communities that are poor and marginalized (Nor Hayati Sa'at, 2011).

MATERIAL AND METHODS

In this study, secondary data was used to map the locality of the hard-core and poor households in the state of Terengganu. The data was obtained from the Implementation and Coordination Unit (ICU) via the *e-Kasih* portal system, consisting of 368 heads of hard core poor households and 7219 heads of poor households in Terengganu registered during the period of 2008 to August 2011. The data for evaluating and explaining the groups of poverty in Terengganu consisted of 7 districts (Figure 2). ArcGIS 10 (ESRI 2010) was used to map the locality of the hard core poor and poor households in Terengganu. The poverty status is categorized into two groups namely the hard-core poor and poor. The former consists of households with incomes that are lower than the food poverty line. The food poverty line is based on the daily needs of each individual according to the food calorie recommendation of the PLI 2005 methodology for Malaysia, which is valued at about RM415.00. The latter group consists of those with incomes of less than RM763.00 in Peninsular Malaysia, RM1048 for Sabah, and RM912 for Sarawak.

The identification of the 'pocket of poverty' or the low-income areas and the surrounding areas is based on the Household Income Survey (HIS) conducted by the Department of Statistics of Malaysia. However, the indigenous people, FELDA settlements, and estates that have their own administration have been excluded (ICU, 2007).

RESULT AND DISCUSSION

The distribution of the poverty status by district for the entire state of Terengganu is shown in Figure 2. The distribution of poverty by district in Terengganu indicates that most of the hard core poor respondents are centered in Besut at 38.0%. The highest number of hard core poor in the urban areas is in the state's capital, Kuala Terengganu, with a rate of 67.2%, followed by Besut at 11.7%, and Marang at 9.5%. Meanwhile, the hard core poor in the rural areas is concentrated in Besut at 53.7%, followed by Marang at 19.9%, and Setiu at 9.5%. In addition, the highest number of poor in the urban areas is in the state's capital, Kuala Terengganu, with a rate of 61.7%, followed by Kemaman at 8.7%, and Besut at 7.1% while the poor in the rural areas is concentrated in Besut at 37.6%, followed by Marang at 16.0%, and Setiu at 13.8%.

Overall, the result shows that two out of the seven districts experience high incidences of poverty at above 20%, namely Besut and Kuala Terengganu districts at 21.4% and 20.8%, respectively. Meanwhile, the other districts have a range of 20% and below.

POVERTY AND EDUCATION

Education levels have been grouped into four major categories which are secondary school and above (postgraduate university/college/polytechnic), medium level (GCE/O-Level/Vocational/Technical school/Form 4-5/Form 1-3), Primary School and below (Primary/Pre-school), and no schooling. Table 1 shows the level of education by poverty status among the heads of hard core poor and poor households in Terengganu. Subsequently, the results show that a majority of heads of households have completed secondary school and above. This is followed by the medium level, primary school and below, and no schooling categories (refer Table 1). Among the hard-core poor and poor in urban and rural areas in this study, most have had a medium level of education, followed by primary school and below. Therefore, more than half of the respondents from both categories lack education as they have only had primary school education. This is a common characteristic among the poor as proven by (Bigsten, Kebede, Shimeles, & Taddesse, 2003) and according to Njong (2010), educational attainment is a critical determinant factor and a major tool in implementing poverty reduction programs.

POVERTY AND OCCUPATION

The occupational level is an important determinant of the socioeconomic status of the population. This study reviewed seven categories of occupation namely self-employed jobs, salaried workers, students and retirees, housewife, unemployed, and others. However, for this study, job categories have been classified into three main categories: salaried, self-employed, and other jobs. The overall categories of occupation that the respondents are engaged in are salaried employment at 23.6%, followed by self-employed at 22.3%, and 54.2% had other jobs (Table 2). A majority of the hard core poor in the urban areas are self-employed and have other jobs at 35.0%; within this percentage, 31.4% were unemployed. Furthermore, in the rural areas, most of the hard core poor are self-employed at 30.3%, followed by 43.7%, and 26.0% who have other jobs and salaried employment, respectively. It is also shown that 20.3% of heads of poor households in urban areas and 17.4% of those in rural areas have no jobs. This study found that in general, the macroeconomic problems still emerge among the poor and hard-core poor based on strata in Terengganu.

TABULATION OF EDUCATION AND OCCUPATION

Crosstab between education and occupation for hard core poor in Terengganu is shown in Table 3. The results indicate that a majority of heads of households with a medium level of education are engaged in salaried employment at about 50.3%. However, a majority of heads of households with primary school and below level of education are also engaged in salaried employment. In addition, more than half of the heads of households with no schooling at 68.6% are engaged in other occupations and majority of them are unemployed at about 58.1%. Furthermore, the distribution of crosstab between education and occupation for the poor in Terengganu indicates that majority of heads of households with secondary and above level of education are engaged in salaried employment at about 53.7%. Similarly, the result

also found that more than half of those with a medium level education are engaged in salaried employment at about 67.8%. Meanwhile, more than half of the heads of households at 60.0% with no schooling are engaged in other occupations and majority of them are unemployed at about 54.7% (see Table 3).

The mapping of education and occupation distribution for hard core poor and poor by districts in Terengganu are shown in Figure 3. The study indicates that the hard core poor with a medium level of education were mainly found in Kuala Terengganu and Besut with the percentage of 28.6% and 45.5%, respectively. A majority of heads of households in Besut are engaged as a salaried employee (56.45%), followed by self-employed (30.7%), and other jobs (12.9%). Meanwhile, the poor category with a medium level of education was also found in Kuala Terengganu and Besut at about 44.1% and 20.2%, respectively. The study also found that a majority of heads of households in Kuala Terengganu are engaged in salaried employment at about 69.5%, followed by self-employed at 23.3%, and other jobs at 7.3%. In addition, a majority of heads of households in Besut are engaged in salaried employment at 66.1% followed by those who are self-employed at 28.4%. The distribution of the hard core poor in urban and rural areas with a medium education level is presented in Table 4. The results of the numerical simulation indicate that those with salaried employment are dominantly found in urban and rural areas with the percentage of 45.3%, and 53.9%, respectively. More than half of the hard core poor in rural areas are involved in this category compared to those in the urban areas. However, the main feature of the poor and hardcore poor in Malaysia, especially in Kuala Terengganu, is still focused on the poorly educated, where more than 70 percent are engaged in other occupations that produce lower returns. Therefore, training and skills programs to improve the income of this group should be given attention in order to achieve a high-income nation.

CONCLUSION

In conclusion, the majority of heads of households for the hard core poor and poor in Terengganu have a medium education level with the percentage of 43.7% and 45.5%, respectively. For the hard core poor category, those with a medium education level are mainly located at Besut and Kuala Terengganu with the percentage of 28.6% and 45.5%, respectively. Similarly, for the poor category, those with a medium education level are mostly located at Kuala Terengganu and Besut with the percentage of 44.1% and 20.2%, respectively. Meanwhile, the majority of hard core poor in urban areas have salaried employment with the percentage of 45.3%, followed by self-employed at 34.4%, and other jobs at 20.3%. Similar patterns are also found in the rural areas with salaried employment at about 53.9%, followed by self-employed at 27.0%, and other jobs at 19.1%. It is quite surprising that a majority of those who are salaried employees in the hard core poor category come from the rural areas with the percentage of 62.3% compared to the urban areas, which has only 37.7%. The possible reason is due to the number of household members. However, unemployment still happens in both areas due to lack of knowledge and low educational levels. Thus, the introduction of intensive training and income generating programs are needed in order to improve the country's competitiveness at the international level. This study has identified and characterized the hard core poor and poor in the state of Terengganu and this would be useful for policy makers to target intervention at the domestic level and to monitor and evaluate the effectiveness of projects and policy interventions geared towards the poor.

REFERENCES

Baker, J.l. and M.E. Grosh (1994). *Measuring the effects of Goegraphic Targeting on Poverty Reduction.* World Bank Living Standards Measurement Study. Working Paper 99.

Bigman, D and Fofack, H. (2000). *Geographical Targeting for Poverty Alleviation: Methodology and Applications.* World Bank Regional and Sectoral Studies.The World Bank, Washington.D.C.

Bigman, D. & Deichmann, U., (2000). Geographic targeting for poverty alleviation. In D. Bigman & H. Fofack, eds., *Geographic targeting for poverty alleviation: methodology and application.* Washington DC, World Bank.

Bigsten, A., Kebede, B., Shimeles, A., & Taddesse, M. (2003). Growth and Poverty Reduction in Ethiopia: Evidence from Household Panel Surveys. *World Development*, *31*(1), 87–106. doi:10.1016/S0305-750X(02)00175-4

Deichmann, U. (1999). Geographic aspects of inequality and poverty. Text for World Bank's Website on Inequality, Poverty, and Socioeconomic Performance: http://www.worldbank.org/poverty/inequal/index.htm

Henninger, Norbert and Mathilde Snel, (2002). *Where are the Poor?: Experiences with the Development and Use of Poverty Maps*. World Resources Institute.

Kamarudin Mohamed and Shahriman Haron, (2011). Poverty Mapping: An Effective Approach in Determining the Poor Area - Case Study of Johor. *Journal of the Department of Statistics Malaysia.Volume 1*. Jabatan Statistik Malaysia.

Koh, R.T. (2009). Poverty Mapping In Sabah.Berita Institute Development for Sabah.Vol 23. Issue 1/July 2008-June 2009.

Malaysia Ninth Plan 2006-2010. (2006). The Economic Planning Unit, Prime Minister's Department, Putrajaya.

Malaysia Tenth Plan, 2011-2015. (2010). The Economic Planning Unit, Prime Minister's Department, Putrajaya.

Nor Hayati Sa'at, (2011). Social Mobility among the Coastal Community: A Case Study in Kuala Terengganu. *Kajian Malaysia*, Vol. 29, Supp. 1, 2011, 95–123.

Njong, A. M. (2010). The effects of educational attainment on poverty reduction in Cameroon. *Journal of Education Administration and Policy Studies*, 2(1), 1–8.

Sen, A.K,. (1999). Development as Freedom. New York: Alfred A.Knoff.

Sherma Lawrence. (2001). GIS and Census Mapping in St. Lucia. Central Statistics Office, St. Lucia. https://unstats.un.org/unsd/demographic/meetings/wshops/Trinidad_22Oct07/docs/Countries_ presentations/St_Lucia_Paper.pdf

World Bank. (2005). *The geography of poverty: estimation and analysis of small-area welfare indicators*. Washington DC (mimeo).
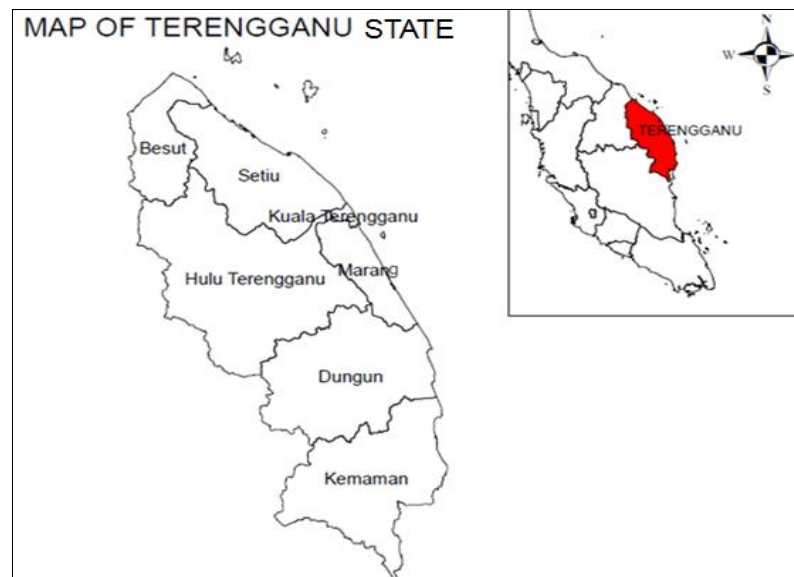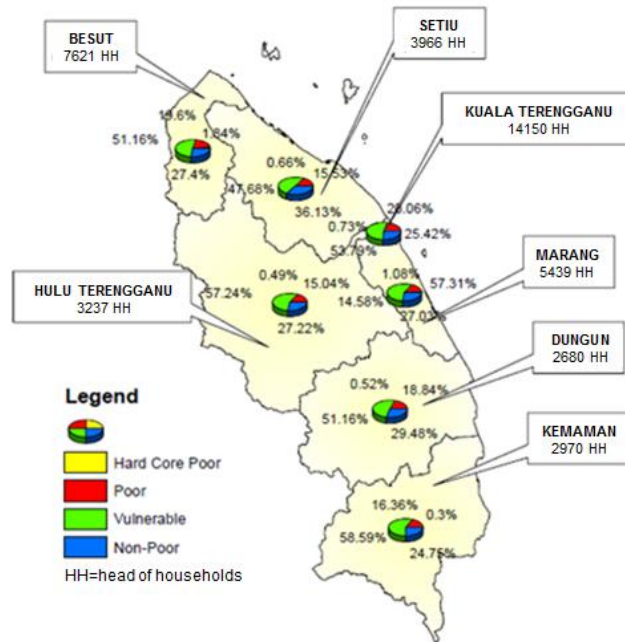

FIGURE 1: Map of Terengganu

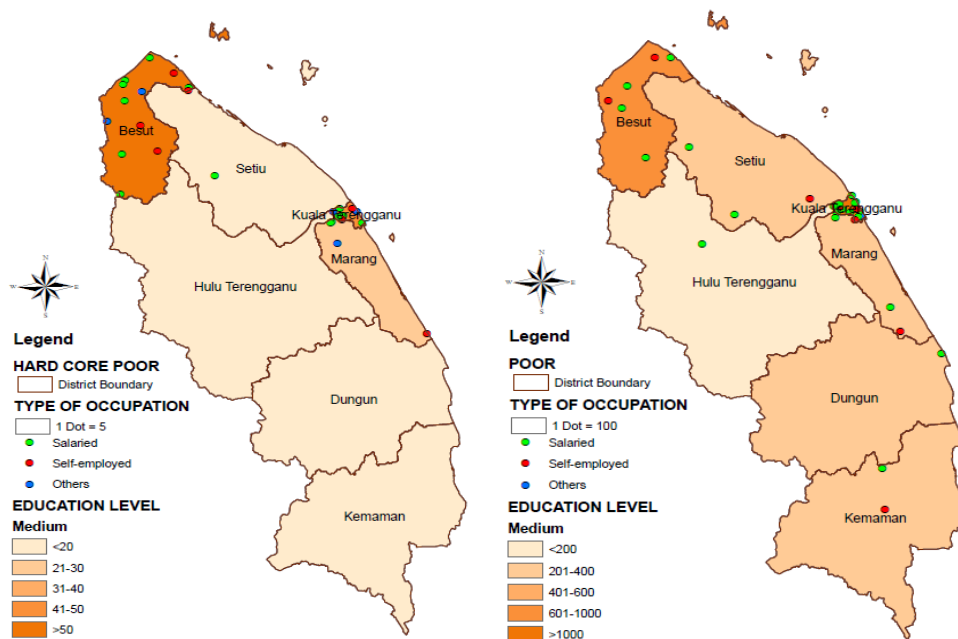FIGURE 2: Distribution Of Poverty Status By Districts In Terengganu

FIGURE 3: Distribution Of Education And Occupation By District In Terengganu

TABLE 1: Distribution Level Of Education By Poverty Status In Terengganu

Level of education	Poverty status (%)				Total (%)
	Hard core poor		Poor		
	Urban	Rural	Urban	Rural	
Secondary school and above	1(0.73)	4(1.73)	68(1.70)	5(1.58)	124(1.63)
Medium	64(46.72)	89(38.53)	1965(49.16)	1318(40.91)	3436(45.29)
Primary school and below	42(30.66)	82(35.50)	1246(31.17)	1205(37.40)	2575(33.94)

| No schooling | 30(21.90) | 56(24.24) | 718(17.96) | 648(20.11) | 1452(19.14) |
| Total | 137(100) | 213(100) | 3997(100) | 3222(100) | 7587(100) |

Source: Tabulated by authors from ICU *E-kasih* data base, 2011

TABLE 2: Distribution of poverty status by occupation types in Terengganu

	Poverty status (%)				
Types of Occupation	Hard core Poor		Poor		Total (%)
	Urban	Rural	Urban	Rural	
Salaried	41(29.93)	60(25.97)	850(21.27)	837(25.98)	1788(23.57)
Self-employed	48(35.04)	70(30.30)	934(23.37)	637(19.77)	1689(22.26)
Others	48(35.04)	101(43.72)	2213(55.37)	1748(54.25)	4110(54.17)
Total	137(100)	231(100)	3997(100)	3222(100)	7587(100)

Source: Tabulated by authors from ICU *E-kasih* data base, 2011

TABLE 3: Distribution of education level and occupation by poverty status in Terengganu

Education/ Occupation	Secondary school and above		Medium		Primary school and below		No schooling		Total	
	HCP	P	HCP	P	HCP	P	HCP	P	HCP	P
Salaried	2 (40)	64 (53.8)	77 (50.3)	2225 (67.8)	54 (43.6)	1319 (53.8)	16 (18.6)	353 (25.8)	149 (40.5)	3961 (54.9)
Self-employed	2 (40)	40 (40)	46 (30.1)	832 (25.3)	42 (33.9)	622 (25.4)	11 (12.8)	193 (14.1)	101 (27.5)	1687 (23.4)
Others	1 (20)	15 (12.6)	30 (19.6)	226 (6.9)	28 (22.6)	510 (20.8)	59 (68.6)	820 (60.0)	118 (32.1)	1571 (21.8)
Total	5 (100)	119 (100)	153 (100)	3283 (100)	124 (100)	2451 (100)	86 (100)	1366 (100)	368 (100)	7219 (100)

Source: Tabulated by authors from ICU *E-kasih* data base, 2011

TABLE 4: Types Of Occupation With Medium Education Level In Urban And Rural Area For Hard Core Poor And Poor In Terengganu

	Urban		Rural		
Occupation	Head of Household (HP)	Head of Household (P)	Head of Household (HP)	Head of Household (P)	Total
Salaried	29(45.31)	1343(68.35)	48(53.93)	882(66.92)	2302
Self-employed	22(34.38)	471(23.97)	24(26.97)	361(27.39)	878
Others	13(20.31)	151(7.68)	17(19.10)	75(5.69)	256
Total	64(100)	1965(100)	89(100)	1318(100)	3436

Source: Tabulated by authors from ICU *E-kasih* data base, 2011