INDONESIAN DATABASES: THEIR QUALITY AND THEIR USE TO SUPPORT DECENTRALISATION

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ABSTRACT

The availability of data in the public domain is quite common in developed countries, where widely used data such as socio-economic and demographic data are obtainable relatively easily. Unfortunately, this is not the case for developing countries such as Indonesia. As decision makers need well-prepared and well-managed database to formulate their policies, the existence of high quality data is essential. This paper will discuss the quality of Indonesian databases and their possible use of the database to support decentralisation.

This paper is based on experience in collecting data from Indonesian government institutions, in particular during research on vehicle ownership characteristics in Indonesia. The data included 11 years (1990-2000) of secondary data from 21 municipalities and 28 regencies. 12 variables were collected, i.e. per capita GRDP, consumer price index, ratio between minimum regional wage and minimum physical needs, percentage of population that is working, percentage of population aged between 15-24 years, population density, total road length, number of public buses, average ground elevation above sea level, yearly rainfall, number of cars and number of motorcycles. Although one full year of research time was dedicated to collect the data, only about 75% of the required data was successfully obtained. There are several reasons for the difficulties in the data collection. The two most important being the weak database system and the existence of non-standard terminologies.

The weak database systems in Indonesian government institutions were a result of the lack of special units in the institutions responsible for their management. If there was any unit, it did not function well. Therefore, many kind of useful data were filed and documented in sporadic units. When there were changes in the organizational structure and personnel of such units, there was no guarantee that the data archive would be handed over to the new officer.

Some widely used socio-economic data, e.g. per capita GRDP, consumer price index, etc. in Indonesia have been published using standard terminologies. The calculation method behind the published data of these types was also standardised. However several types of data were published using inconsistent terminologies. For example data regarding road length and number of vehicles could be presented differently (in terms of road and vehicle classification) in different volumes of a serial publication even if they were published by the same institution. Further differences could be anticipated if these data were published by different agencies.

Keywords:
Indonesian databases, decentralisation, database system, terminologies, vehicle ownership

1. Introduction

The new Indonesian law on regional government administration (Law No.22/1999) and on balanced budgets between the central and regional governments (Law No.25/1999) were enacted under the Habibie government, not long after the collapse of 32 years of Soeharto government. Sato (2000) stated that these laws emphasized the abolition of the hierarchical structure between central and regional governments. In previous laws named as law on regional government administration (Law No.5/1974) and law on village administration (Law No.5/1979) the vertical control-subordination relationship between central and regional governments were highlighted. Under the new laws, second level regions, i.e. municipalities and regencies were given more powers, e.g. in the election of regional government heads, in using regional revenues to develop the region, etc.

In order to use the opportunities given by these new laws, the decision makers need well-prepared and well-managed databases to support the formulation of their policies. Therefore, the existence of high quality data is essential. This paper will discuss the quality of Indonesian databases and their possible use of the database to support decentralisation. The main discussion on this paper is based on experience in collecting data from Indonesian government institutions, in particular during research on vehicle ownership characteristics in Indonesia. The data included 11 years (1990-2000) of secondary data on 12 variables from 21 municipalities and 28 regencies.

The next section will briefly discuss the essence of the new decentralisation laws with some comparisons against the previous laws. The comparisons are required to understand the huge changes that should be made in terms of governmental structures and human resources. This will be followed by a discussion regarding the quality of the Indonesian databases with specific examples from the authors present research. Before concluding, this paper will provide an identification of the strengths, weaknesses, opportunities and threats regarding Indonesian databases in their use to support decentralisation.

2. Central-Regional Relationship in Indonesia

Following the twofold typology of local autonomy developed by Gurr and King (1987), Dunleavy (1980) in King and Piere (1990) stated that *Type I autonomy refers to the local government's pursuit of interests independently of local economic and social interests and organizations*, whilst *Type II autonomy refers to the local government's pursuit of interests independently of central government restrictions and preferences*. The spirit of the Indonesian new decentralisation laws is closer to the Type II autonomy defined above. Under previous laws the governmental structure was very centralistic (see Figure 1), whilst

after the introduction of the new decentralisation laws, the regional governments were given more powers (see Figure 2).

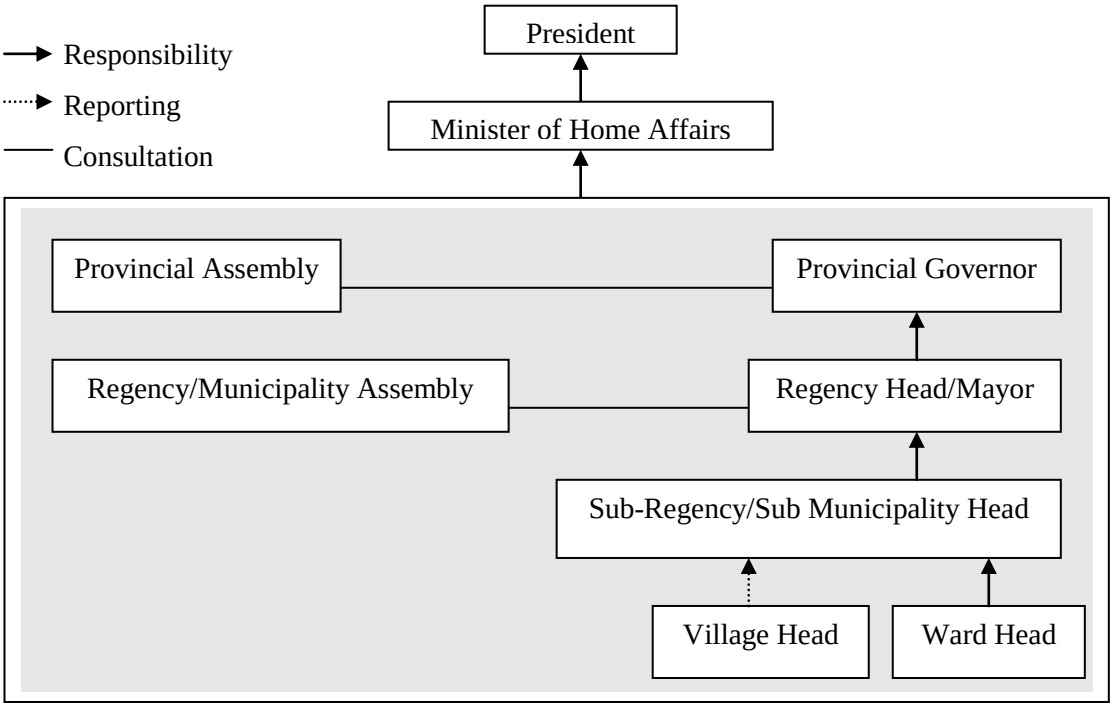

Figure 1. Previous Government Structure under Law No.5/1974 and Law No.5/1979
Source: Sato (2000) with some adjustments

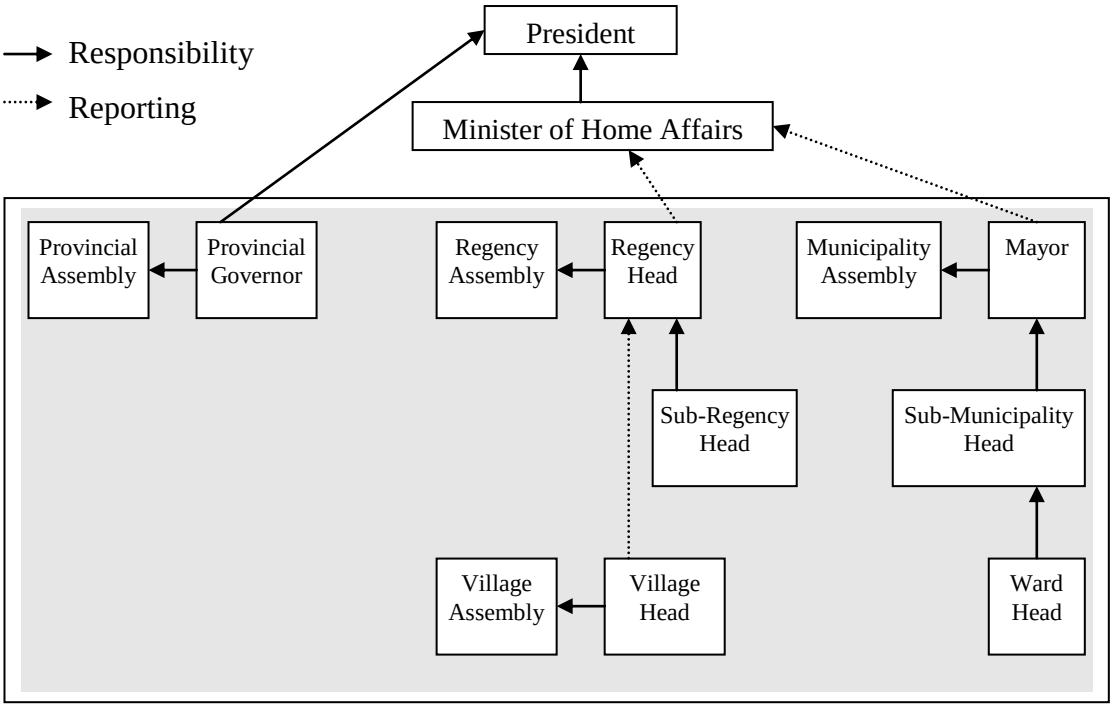

Figure 2. Present Government Structure under Law No.22/1999
Source: Sato (2000) with some adjustments

Under the previous laws (see Figure 1), a lower level of government was responsible to the higher level of government. Under the new law heads of regional government are only responsible to the regional assembly (see Figure 2). As province level readers act as both regional government and representatives of central government in the regional level, the provincial governor is therefore responsible to both the provincial assembly and the president. The heads of the second level of regional governments, i.e. the regency head and the mayor are responsible to the regency assembly and the municipality assembly respectively and should only report to the minister of home affairs (on behalf of the president). Under the new law, the village is allowed autonomy in accordance with local customary law. Therefore, the village head is only responsible to the village assembly and should only report to the regency head (instead to the sub-regency head under the previous laws).

The discussion in the previous paragraph describes the important role of the second level of regional governments under Law No.22/1999. In terms of pursuing a more balanced budget between the central and regional government, Table 1. describes the essence of Law No.25/1999.

Table 1. Fiscal Revenues of Regional Governments
Source: Sato (2000) with some adjustments

Category	Sub-Category	Notes
Local Revenue		
Balancing Fund	Land and Building Tax	90% of Land and Building Tax 80% of the Acquisition Fee for Rights on Land and Building. Central government takes the remainder but all of this is redistributed to the regencies/ municipalities
	Natural Resources	80% of revenue from forestry, mining (other than oil and natural gas) and fishery 15% of revenue from oil 30% of revenue from natural gas
	General Allocation Fund	Central government allocates at least 25% of national revenue to this fund in total, with 10% going to provinces and 90% to regencies/ municipalities. The fund is allocated to each region based on the fund demand and potential demand.
	Special Allocation Fund	Designed to meet the specific fund required for particular regions that cannot be financed by the general allocation fund, e.g. tree-planting fund (concerned regions get 40% and central government gets the rest)
Loans		
Other Revenues		

The most important feature of the new law is the balancing fund. This provides more satisfactory budget allocation for the regions rich with natural resources compared to the budget allocation under the previous law in which the central government disbursed subsidies to regions based mainly on population. It should be noted that further calculation is needed to distribute regional revenues between each province and regencies/ municipalities within each province. Each sub-category of revenues (e.g. natural resources) might also be divided into more items (e.g. oil and natural gas, forestry etc.) and each item requires different law (e.g. Law No.22/2001 on Oil and Gas). A rather detailed example will be given in sub-section 3.4. regarding oil and gas revenues in Kutai Regency, East Kalimantan Province.

In order to accurately calculate the budget allocation for each region, the existence of good quality databases is required. In the next section, the quality of Indonesian databases will be discussed.

3. The Quality of Indonesian Databases

As stated previously, the discussion in this section is based on experience in collecting data from Indonesian government institutions, in particular during research on vehicle ownership characteristics in Indonesia. The data included 11 years (1990-2000) of secondary data on 12 variables from 21 municipalities and 28 regencies. The list of municipalities and regencies involved is provided in Table 2. The order of the regions in the list is based on the per capita GRDP at provincial level (not provided in the table), i.e. from the poorest province to the richest province (it is not necessarily from the poorest regency/ municipality to the richest regency / municipality). This order was used in the stage of selecting provinces to be included in the sample, i.e. to ensure the variation of level of wealth within the sample. The regency / municipality per capita GRDP and population density are provided in Table 2. to describe the characteristics of the regions.

The main sources of data were official publications from the Indonesian Central Agency of Statistics and Provincial Agency of Statistics. Most of the official publications were in the form of printed publication or book. Printed publications can be borrowed from the libraries of the agencies or purchased from the agency bookshops. A limited amount of data can be obtained on-line. The addresses, telephone numbers, facsimile numbers and e-mail addresses of the offices nationwide are available on-line. The central agency also produces a number of publications recorded in compact disks. However as some of the data published by the agency was originally collected by other institutions, it was assumed that obtain such data from the original sources might be better (see Table 3.).

Table 2. Municipalities and Regencies Included in the Sample

Selected Provinces (1)	Selected Municipalities (2)	Selected Regencies (3)	Population Density Per km^2** (4)	Per Capita GRDP At 1993 Constant Prices (Rupiahs)** (5)	Year of the Data*** (6)
Nusa Tenggara Barat	Mataram		5,138	1,261,697	2000/1999
		Lombok Timur	616	712,912	2000/1999
South-East Sulawesi	Kendari		677	1,374,861	2000/1999
		Muna	55	873,899	1999/1997
Lampung	Bandar Lampung		4,871	1,743,427	1999/1999
		North Lampung	195	657,655	2000/1998
Bengkulu	Bengkulu		2,205	1,580,960	2000/2000
		Rejang Lebong	108	1,344,995	2000/2000
South Sulawesi	Makasar		6,330	2,405,676	2000/1998
		Takalar	408	n.a.	1998/n.a.
		Barru	132	1,424,597	1998/1997
		Pinrang	158	1,285,196	2000/1998
Jambi	Jambi		2,136	1,668,603	1999/1998
		Sarolangun Bangko	30	1,060,751	1999/1998
Central Java	Surakarta		12,494	2,296,532	2000/1999
	Semarang		3,505	3,959,928	2000/2000
		Wonosobo	721	713,077	2000/1999
		Sragen	948	782,783	2000/2000
		Demak	1,070	791,967	2000/2000
West Java	Bandung		15,303	2,112,661	2000/1999
		Bekasi**	2,184	2,595,360	1999/1999
		Garut	624	1,157,439	1999/2000
		Sumedang	585	1,269,533	1998/1997
Yogyakarta	Yogyakarta		15,314	2,745,668	2000/2000
		Bantul	1,532	1,093,849	2000/2000
East Java	Malang		6,878	3,289,878	2000/2000
	Mojokerto		6,611	2,167,352	2000/2000
		Lumajang	528	998,852	2000/2000
		Sidoarjo	1,997	3,069,546	2000/1999
		Bojonegoro	513	852,498	2000/2000
South Kalimantan	Banjarmasin		7,734	2,260,548	1999/1998
		Tapin	52	1,567,896	2000/2000
North Sumatra	Tanjung Balai		2,181	2,830,615	2000/2000
	Tebing Tinggi		3,254	2,448,473	2000/1999
		Central Tapanuli	117	1,634,571	1998/1998
		Simalungun	195	2,370,911	2000/2000
Bali	Denpasar		4,088	3,100,474	2000/1998
		Gianyar	999	2,337,664	2000/1999
Aceh	Banda Aceh		3,570	2,133,380	2000/1998
		Aceh Tengah	40	1,933,058	1999/1999
Irian Jaya	Jayapura		251	n.a.	2000/n.a.
		Nabire	10	n.a.	1997/n.a.
		Yapen Waropen	4	1,731,407	2000/1999
Riau	Batam		709	7,312,916	2000/2000
		Kepulauan Riau	66	1,467,059	1999/1999
Jakarta*	All		14,691	5,932,471	2000/1999
East Kalimantan	Balikpapan		815	4,452,383	2000/2000
		Kutai	8	4,640,307	1998/1998

Source: Various sources listed in Appendix 1

* 5 municipalities in Jakarta were treated as one city

** Since 1997 the area of Bekasi Regency was splited into Bekasi Regency and Bekasi Municipality. Therefore for Bekasi, the analysis in this research was based on the weighted average figures from the regency and the municipality. Population density was weighted by area and per capita GRDP was weighted by population.

*** First figure for population density year, second figure for per capita income year

Table 3. Assumed Best Source of Data for Each Variable

Variable	Assumed Best Source of Data
per capita GRDP	Central Agency of Statistics
consumer price index	Central Agency of Statistics
minimum regional wage/minimum living needs	Ministry of Manpower
percentage of population that is working	Central Agency of Statistics
percentage of population aged between 15-24 years	Central Agency of Statistics
population density per km^2	Central Agency of Statistics
road density (km road per km^2 area)	Ministry of Settlement and Regional Development (Formerly: Ministry of Public Work)
static capacity of public transportation fleets per 1000 population	Ministry of Transportation and Communication
average ground elevation above sea level (m)	Central Agency of Meteorology and Geophysics
yearly rainfall	Central Agency of Meteorology and Geophysics
number of vehicles	Traffic Division of National Police or Regional Revenue Office

Using the Pearson correlation analysis of the latest available data, it was found that the higher the per capita GRDP of a municipality the higher the degree of the completeness of the dataset in both the regencies and municipalities. This suggests that in the wealthier regions the quality of databases were better. It was also found that the higher the population density in the municipalities, the greater the degree of completeness of the dataset. This suggests that in more urbanized municipalities the quality of databases better, whilst surprisingly in the regencies the opposite was true, which was unexplainable.

Problems in data collection may vary from area to area. The degree of the problem may also differ between variables. In this section, the discussion will start with general problems, i.e.:

- weak database system
- the existence of non-standardized terminologies

followed by a discussion of the problems specifically concerned with the data collection of each variable

3.1. Weak Database System

It was very difficult to obtain the required data from almost every institution that was approached in Indonesia. The main reason was that there was no special unit in the institution responsible for the management of the database. If any existed, this unit was not functioning well. Therefore, many kinds of useful data were filed and documented in sporadic units. Every time there were changes in the organizational structure and personnel of such units, there was no guarantee that the data archive would be handed over to the new officer.

Actually by law, certain institutions should supply certain types of data to the Central Agency of Statistics. However, it is not generally possible to directly obtain good quality data.

3.2. The Existence of Non-Standard Terminologies

Some of main macro economic terms have already been standardized appropriately in Indonesia. For example, one can confidently believe that inflation rate, consumer price index, and regional per capita income are calculated using consistent methods in every region. Slight differences may occur but these are not generally caused by different methodologies but rather due to unreliable raw data. Several macro economic terms were also presented in standardized base years. For example income data from 1983-1992 used a 1983 base year. Most consumer price index data from 1989-1996 used a 1988/1989 base year, although several regions used 1990 as a base year. By adjusting to base years, data values were comparable between years.

Some demographic variables have also been standardized. For example working age was defined as 10 years or older (after 2000 the definition became 15 years or older). The age groups in demographic tables were usually also standardized. Starting with 0-4 years old, 5-9 years old, 10-14 years old, …….60-64 years old and ending with 65 years old or older.

On the other hand, road and vehicle databases were examples of databases with non-standardized terms. Vehicle classification might vary from one institution to another. The same term does not always have the same meaning.

3.3. Problems in Collecting Population Data

There were several types of population data that should be collected in the research on vehicle ownership characteristics. The most basic data was the number of total population. One should be aware that there were several sources of this data. Local government used official population registrations to produce these figures. Registration was done in several ways. An adult resident aged 17 years old or over should apply for a resident identity card. A family should apply for a family card containing a list of basic demographic data of each household member either blood related or not. Parents should apply for a birth certificate of a newborn baby and then update the content of the family card by reporting the existence of the new baby to the local government office. Although these documents will be needed for a lot of legal maters, not all residents apply for such documents. Therefore, in an area in which local government management is weak, one should critically decide whether to adopt the

local government data or not. Another source of total population data of an area is from national census, which is held every 10 years by the Central Agency of Statistics. The last population census was in 2000. In the national census, every resident should be enumerated. One should consider that the census was carried out in a very short period. Scarcity of funds should also be considered. In some very remote areas, population enumeration in a very short period is quite impossible. In some parts of Indonesia, enumeration could not be held due to security reasons. Another weakness is of the frequency of the census. Since it was only done every 10 years, the data from the other years can only be obtained by interpolation. Total population reported from an inter-census survey, which is held in the middle of a decade, e.g. 1985, 1995, etc and from yearly socio-economic surveys or other yearly specific surveys must be obtained by interpolation, since the objective of these surveys is not population enumeration. From a limited sample (about 0.1% of total population of each region) the dynamics of various cohorts in the population was predicted using these surveys. Therefore if the result of the national population census does not conform to local government official time series registration, data from local government was used. Data from local governments were considered to be more reliable than population census firstly since these were updated at least yearly. Secondly, compared to the central government who conducts the census, a local government was assumed to be more knowledgeable about the characteristics of its own area.

A lot of missing values were found in the data set for percentage of population aged between 15-24 years old. Very few areas reported the number of population classified by age or age group. Several areas used the result of yearly sampling surveys as explained before to predict the number of population of each age on each group. Several others used a constant value from the latest population census.

For the calculation of per capita GRDP, the value of the mid-year population was used. For some reasons, a figure describing 1998 mid-year population for example does not always lie between 1997 and 1998 end of year population. It was preferred then to recalculate the mid-year population assuming that a mid year population is an average between the end year population of a particular year and a year before (the use of geometric mean was not considered since the time gap was only a year).

The number of the population aged 10 years or older that was working was only available year by year in very few areas. This data was usually available for years in which the population census or socio-economic surveys were held. Sometimes only the number of the total working force was reported. The working force consists of the currently working

population and the number of jobseekers. In such cases, the previous proportion of working population might be applied to the total work force to predict the required data.

The main problem with population density data was caused by changes in the area border. As with any other data that is calculated as a rate (such as per capita GRDP, road density and vehicle ownership rate) if the denominator changed then one must adjust the numerator as well. This was not an easy task. In an area in which the border has just been changed, the required data based on the new border was not available immediately.

3.4. Problems in Collecting Socio-Economic Data

There are three socio-economic variables used in the research on vehicle ownership characteristics, i.e. per capita GRDP, consumer price index and the ratio between the minimum regional wage and minimum living needs. Per capita GRDP was chosen instead of per capita income in consideration of data availability in most areas. The calculation of GRDP needs a lot of different data from various institutions, such as the Ministry of Trade, the Ministry of Mining, the Ministry of Finance, etc. Therefore, it takes considerable time to collect the required data, make appropriate calculations and publish the final statistics. As a result, the earliest publication of this figure for a particular year was only available in the subsequent year. In most cases, on first publication the per capita GRDP figure for a particular year was reported as a temporary figure due to incompleteness in the required data for its calculation. A revised figure was given in the following year's publication. The revision was usually done twice. Therefore the most up to date figure should always be used. Per capita GRDP can be mainly found in certain Municipality or Regency in Figures publication e.g. (Badan Pusat Statistik Propinsi DKI Jakarta (1990) et seq) or in a publication concerning specifically GRDP of a certain area. It could be published by national, provincial or regency/municipality governments. If there were any differences in figures between sources, more specific publications and publications from the lowest level of government, i.e. regency or municipality, were selected (based on the assumption that these were closest to the original data collected).

One should also carefully examine the base year of each data. The base year was changed every 10 years. In the research on vehicle ownership characteristics, 1990-1992 data could only be found in a 1983 base year and 1993-2000 data were in 1993 base year. In order to make all yearly data comparable a 1993 base year was chosen and the 1990-1992 data were adjusted. The adjustment was carried out using the following procedure:

$$\text{Per Capita GRDP}_{1993}\,(i) = \frac{\text{Per Capita GRDP}_{1993}\,(1993)}{\text{Per Capita GRDP}_{1983}\,(1983)} \times \text{Per Capita GRDP}_{1983}\,(i)$$

i = 1990, 1991, 1992; years in the small font represent base years

If the per capita figure was not available, it could be calculated by dividing GRDP by the mid-year population. A region rich with oil and gas should be treated carefully since the real locally usable income might be different from the published GRDP figure. The following illustration might be helpful to explain the reason. About 60% of Kutai Regency GRDP for example comes from oil and gas. According to Indonesian Oil and Gas Law No.22/2001 the income from oil and gas should be shared as described on Table 4.

Table 4. Oil and Gas Income Distribution

Type	Oil or Gas Income Share (%) by Governmental Level			
	Central Government	Province in which Oil/Gas Regency or Municipality Producer Located	Other Regencies/Municipalities in the Province	Regency or Municipality Producing Oil or Gas
Oil	85	3	6	6
Gas	70	6	12	12

It can be calculated from Table 4. that the regency or municipality producing the oil or gas can only receive very small share of the oil or gas income. In the case of Kutai (located in East Kalimantan Province, which has 4 regencies and 2 municipalities before 1999), the oil income share should be 7% (6 + 6/(4+2)) and the gas income share should be 14% (12 + 12/(4+2)). This research uses 1990 – 2000 data when this law had not yet been implemented and the regency or municipality share during that era was considerably smaller than the current share. There is no guarantee that the central government share will be redistributed to develop the oil or gas producer areas. Therefore, to avoid overestimation of the wealth of an area, one should adjust the oil and gas income in the GRDP calculation of regencies or municipalities rich in oil and gas resources.

The second socio-economic variable is general consumer price index. The reason for using a general index was the difficulty in finding a suitable specific index that reflects the fluctuation of motorized vehicle price appropriately. There is a specific index for the motorized vehicle price in wholesale price index publications, but this index can only be found nationally or provincially, which is not suitable with the aggregation level of the study. Moreover the publication of this specific index was very limited. During the time period considered in this study (1990-2000) there were two groups of different methods in calculation of general consumer price index as detailed in Table 5.

The transport price index in Table 5. reflects transport cost in general, not only concerning the cost of owning and using private transport but also including the cost of using public transport. An effort to extract a specific index for private transport costs for this index will end up with too many unrealistic assumptions. Moreover the availability of the transport cost index was limited. Another problem with the consumer price index data was that in many of the selected areas in this study there was no living cost survey. A consumer price index available from the nearest area was then used as a predictor. The index was calculated monthly and can be summarized as a yearly figure by averaging indices from 12 consecutive months. A complication occurs since previously the yearly index was calculated using fiscal years starting from April (base year for method 1 was April 1988 – March 1989). In method 2 although it was valid from April 1998 the base year used the calendar year starting from January (base year for method 2 was January 1996 – December 1996). In order to make all yearly data comparable a 1988/1989 base year was chosen and the 1998-2000 data were adjusted. The adjustment was done using following procedure:

$$\text{Consumer Price Index}_i\ (1988/1989) = \frac{\text{Consumer Price Index}_i\ (1996)}{100} \times \text{Consumer Price Index}_{1996}\ (1988/1989)$$

i = 1998, 1999, 2000; years in the small font represent base years

Before any adjustment was made, the yearly consumer price index was in the form of calendar year index.

Table 5. Two Methods of General Consumer Price Index Calculation

Method 1: Valid from April 1988	Method 2: Valid from April 1998
• Using 200-224 types of goods and services commodities to calculate consumer price index. • The result of 1988/1989 Living Cost Survey conducted in 27 capitals of provinces is used as the base of the index • The general consumer price index is a weighted average of consumer price indices of 4 groups of commodities, i.e.: ➢ Food ➢ Housing ➢ Clothing ➢ Various goods and services	• Using 249-353 types of goods and services commodities to calculate consumer price index. • The result of 1996 Living Cost Survey conducted in 27 capitals of provinces and 17 capitals of regencies or municipalities is used as the base of the index • The general consumer price index is a weighted average of consumer price indices of 7 groups of commodities, i.e.: ➢ Food ➢ Prepared food, drink, cigarettes and tobacco ➢ Housing ➢ Clothing ➢ Health ➢ Education, recreation and sports ➢ Transport and communication

Source: http://www.bps.go.id

The last socio-economic variable is the ratio between the minimum regional wage and minimum living needs. Minimum living needs is a new term used since 1995 based on the decree issued by Ministry of Manpower No. Kep-81/Men/1995 replacing a previous term called minimum physical needs. The main difference is in the new term the minimum amount of food and drink consumption was increased from 2600 calories to 3000 calories per day. Actually both minimum wage and minimum living needs were published not only at provincial level but also at the regency or municipality level. However, publication at the regency and municipality level was very limited, therefore the figure from provincial level was used. Instead of using a single provincial figure, East Java and West Java has 4 sub-regions each. Every sub-region has a different minimum regional wage and minimum living needs. The interesting thing was that majorities of the minimum regional wages were under the level of minimum living needs. Even in the early 1990's there was a minimum regional wage, which only covered as little as 35% of the minimum living needs. The best range for the ratio of minimum regional wage to minimum living needs was in 1995. It was between (0.83 and 1.36). During the peak of the Indonesian economic crisis (1998-1999) the ratio in all provinces was below 1.00. Actually these circumstances indicate that this variable was appropriate for explaining vehicle ownership rate fluctuations. Unfortunately, using provincial data to express municipality and regency conditions might decrease the accuracy of the analysis, since within a province the ratio was assumed to differ considerably between different municipalities and regencies.

3.5. Problems in Collecting Terrain and Climate Data

The terrain condition in the research on vehicle ownership characteristics is represented by average ground elevation above sea level. This data, which was published by the Central Agency of Statistics and its regional offices using data from various sources, could easily be obtained in most areas. Sometimes the source provided a direct average ground elevation figure. However in most cases a more detailed description of terrain condition of an area was given. The general way of presenting this data is by stating the percentage of the area which has certain range of elevation, e.g.:

50% area 0 – 100 m
35% area 100 – 300 m
15% area >300 m

To calculate the average ground elevation, a weighted average procedure was carried out as follow:

Average Ground Elevation = 50% x ((0 + 100)/2) + 35% x ((100 + 300)/2) + 15% x 300
= 25 + 70 + 45
= 140 m

The use of 300 m to represent the area having elevation >300 may lead to an underestimation of the actual figure. However if no other reference was available this procedure might provide the most representative result.

Climate conditions were represented by yearly rainfall in mm. This data was published by the Central Agency of Statistics and its regional offices using data from regional offices of Meteorology and Geophysics Agency and Ministry of Agriculture. A direct yearly rainfall figure for an area was usually unavailable. In some areas, monthly rainfall was given detailed by the measurement station. In every area there was more than one measurement station. Equipment in a measurement station could occasionally be broken. If there were two or more months (in a particular season, either dry or wet season) in which the monthly rainfall was not documented due to equipment problem or other problems, the measurement of that particular station was ignored. The rainfall measurement of a station was assumed to represent the rainfall measurement of the village in which the station was located and the surrounding villages. If for example the yearly rainfall measurement of an area was reported as follow:

Station Name	**Representative Area (km^2)**	**Yearly Rainfall (mm)**
1	200	1,000
2	50	800
3	250	2,000

then to calculate the yearly rainfall, a weighted average procedure was carried out as follow:

$$\text{Yearly Rainfall} = \frac{(200 \times 1{,}000) + (50 \times 800) + (250 \times 2{,}000)}{200 + 50 + 250}$$

$$= \frac{200{,}000 + 40{,}000 + 500{,}000}{500}$$

= 1,480 mm

Problems arose when the name of the measurement station did not correspond with any village, or alternatively there were villages which did not correspond with any measurement station name. Let us assume following data exist:

Station Name	Representative Area (km^2)	Yearly Rainfall (mm)
A	100	1,000
B	200	1,500
C	unknown	2,000
D	unknown	1,000

Village Name	Area (km^2)
A	100
B	200
X	100
Y	100
Z	200

The total villages area with unidentified corresponding station name:

Area of (X+Y+Z) = 100 + 100 + 200

= 400 km^2

Measurement stations with unidentified correspond village name:

Number of stations = 2

Assumed representative area = 400 / 2 = 200 km^2

The previous incomplete table then become as follow:

Station Name	Representative Area (km^2)	Yearly Rainfall (mm)
A	100	1,000
B	200	1,500
C	200	2,000
D	200	1,000

i.e. the average representative area was calculated. To calculate the yearly rainfall, a weighted average procedure was carried out as follow:

$$\text{Yearly Rainfall} = \frac{(100 \times 1{,}000) + (200 \times 1{,}500) + (200 \times 2{,}000) + (200 \times 1{,}000)}{100 + 200 + 200 + 200}$$

$$= \frac{100{,}000 + 300{,}000 + 400{,}000 + 200{,}000}{}$$

700

= 1,429 mm

3.6. Problems in Collecting Transport Data

There are two groups of transport data in the research on vehicle ownership characteristics, i.e. road data and vehicle data. The required road data is road density, defined as total length of road (km) per 1,000 km^2 area. The main source of this data was the Ministry of Settlement and Regional Infrastructure and its regional offices which can be found in 'Regency (or Municipality) in Figures' published by the Central Agency of Statistics and its regional offices. Indonesian roads are classified for various purposes in different ways. At least 6 different types of classification exist in the Indonesian road database as described in Table 6 . In many cases the total road length of each classification type did not match each other. For example the total road length from arterial, collector and local roads of a regency is 100 Km. It could be found that the total road length data for the same regency, but tabulated using for example type of pavement was less or greater than 100 Km. In such cases the highest figure was selected, assuming the lower figure arose due to underreporting. The nature of the classification process may cause this problem since there was no "not known" category to facilitate any difficulties in road class identification during the classification process. Ideally, if this road density variable was intended to be used as an expression of accessibility, only roads in good condition should be considered. However considering the limited availability of data in that level of detail, the total length of road that physically exists in a municipality or regency was used.

Table 6. Basis of Road Classification in Indonesia

Basis of Classification	Classification
Level of government which is responsible for the operation, maintenance and development of the road.	• National • Provincial • Regency / Municipality
Level of network	• Primary (inter-city, inter-regency etc.) • Secondary (intra-city, intra-regency etc.)
Function	• Arterial • Collector • Local
Permitted weight and dimension of vehicle	There are 5 classes determined by combination of maximum allowable axle load, length and width of a vehicle to enter the road.
Type of pavement	• Flexible pavement • Rigid pavement • Gravel road • Unpaved road
Road condition	• Good • Fair • Damaged

Another problem was the nature of the road data reporting. The reported data may not directly reflect the real length of the existing road. It may only reflect the length of road officially operated, maintained and developed by the government as determined in a government decree.

Motorized vehicle data can be obtained from various sources. The main source was the National Police and its regional offices. For further details of vehicle classification of public transport and goods vehicles, the data from the Ministry of Transportation and its regional offices can be referred to. Since vehicle registration was related to vehicle tax payment, useful data can also be provided by the offices of Regional Revenue. The Central Agency of Statistics and its regional offices publish motorized vehicle data from any combination of these institutions.

The first serious problem in the vehicle data collection is that vehicle registration data is not aggregated according to local government administrative areas such as municipality and regency but by regional police areas. For example, before September 1997 the Luwu Police were not only responsible for the registration of vehicles from the Luwu Regency residence but also covered the registration of vehicles from smaller nearby regencies, e.g. Enrekang. Starting from September 1997 vehicle registrations in the Enrekang Regency were moved to another regional police area nearby. Therefore very careful examination was made before using any data reported by particular regional police areas. Relevant notes given in the vehicle records indicating any inclusion or exclusion of certain areas were critically taken into notice and appropriate adjustment factors were applied based on known proportion of registered vehicle in each area.

Another serious problem with the vehicle data collection was the vehicle classification system. As stated earlier, there was no standardized system of vehicle classification across databases. In most areas the distinction between private vehicles and public transport was sufficiently clear. However, in several areas vehicles were classified directly into vehicle types such as passenger car, multi purpose vehicle, jeep and pick up. The passenger car class might include both private passenger cars and taxis. Multi purpose vehicles might include both private vehicles and public transport. As a result, expertise given by local experts (i.e. local transport researchers, transport engineers, etc.) was used to produce the most appropriate assumption on classification. Details regarding government or company vehicles were very limited. However, since cars and motorcycles owned by the government or companies are also used daily for private use, they are considered as private vehicles in this research. From the limited available data, registered government cars were about 10-20% of

private cars and registered government motorcycles were less than 5% of private motorcycles.

The local names for certain types of vehicles may also be confusing. Public transport vehicles with up to 10 seats operating on fixed routes in several cities in Sumatra were called 'Taxis', whilst in Makassar such vehicles are called 'Pete-Pete'. In Java 'Taxi' has absolutely the same meaning as a Taxi in western terms.

There were also some vehicles that operate as illegal public transport and were still used daily for private transportation by the owner or driver. The validity of using vehicle registration as the basis for determining vehicle ownership was also debatable. In some remote areas, some vehicles were not registered regularly and / or legally. In some cases used vehicles were sold without any appropriate legal registration, e.g. the vehicles were still registered under the previous owners.

3.7. Summary of the Problems in Indonesian Databases

The problems in dealing with Indonesian databases have been discussed in this section. The main problems were the weak database system and the existence of non-standard terminologies. Therefore during the secondary data collection in Indonesia, one should carefully examine every single data to avoid using unreliable and invalid data. The examples provided in this section also show that many adjustments should be made before the raw data ready to be used for a particular purpose. In the next section, the identification of the strength, weakness, opportunities and threat regarding the Indonesian databases in their use to support decentralisation.

4. The Use of Indonesian Databases to Support Decentralisation

The quality of Indonesian databases is still far from acceptable. However, one can still use this source of data as to support development planning in Indonesia, especially at the regional level. The next four sub-sections will identify the strengths, weaknesses, opportunities and threats regarding the Indonesian databases in their use to support decentralisation.

4.1. Strengths in Supporting Decentralisation

- Under the Statistics Law No.16/1997, every institution that collects data should report the results to the Central Agency of Statistics (or its regional offices). If this law is well-enforced and the reported data are well-managed, one can expect to use the agency as a useful entry point in obtaining various types of data across the country.

- The Central Agency of Statistics has regional offices throughout Indonesia at the provincial level and the regency/ municipality level. In some regions, it has regional offices at the sub-regency/ sub-municipality level. In the central office and in each regional office, there is library, a dissemination unit and a bookshop. Most of the staffs are very helpful in dealing with various enquiries from the public.
- Other governmental institutions also develop integrated databases (between regions) in individual sectors. For example the Ministry of Settlement and Regional Development develops an Urban Road Management System to assist planning on urban road maintenance, improvement and new construction based on periodically updated database in road conditions. National Police also develop a very comprehensive database regarding registered vehicles and licensed drivers. This kind of initiative can be used as a basis for further integration between sectors.

4.2. Weaknesses in Supporting Decentralisation

- The human resources quality in database management is still far from satisfactory, especially in regional level. As the result the basic information services such as a library cannot be used optimally. Even a conventional printed catalogue is sometimes not available in governmental institutions libraries, including the regional offices of the Central Agency of Statistics. This is not necessarily related to the wealth level of an area. For example Abdul-Gader (1999) stated that in relatively rich Arab Gulf Countries they must face the scarcity of local skilled labor in information system due to lack of anticipation to develop human resources in this area. Therefore, they should depend on foreign labor forces.
- The lack of knowledge at the level of decision makers of the power of computer based information systems to disseminate information. It is common in developing countries that the degree of involvement of top management in computerization is very low (Abdul-Gader (1990)). Therefore not only the use of intranet and internet to disseminate information become inferior, but the whole process of developing the computerized database faces huge barriers.

4.3. Opportunities in Supporting Decentralisation

- With the implementation of new laws in decentralisation, many regional governments are showing enthusiasm in improving their local databases. Some of them even develop e-government not only to improve public services but also to attract investors by providing easy access on information and registration on-line.
- The interest of young people to learn information systems and technology is increased. Despite the continuing decrease of potential students in “conventional engineering” such

as civil, electrical and mechanical engineering, the information technology department which usually offers a large portion of courses in information systems is one of the most popular undergraduate courses in Indonesia.

4.4. Threats in Supporting Decentralisation

- Several institutions might still keep dishonest culture in providing various versions of data. These institutions will release data from a particular version depending on the purpose of the data enquiry. For example if an enquiry regarding the present availability of a road maintenance equipment is asked by a consultant hired by international funding agency conducting assessment on the requirement of a new equipment then the provided data will be from the version which give impression of inadequate fleet of road maintenance equipments. If the same question is asked by the regional assembly which conduct performance evaluation of the institution the opposite version of data will be provided.
- As Indonesia has not yet been released from the economic crisis which started at the end of 1997, it is unlikely that sufficient budget will be allocated to database management sector in the near future.

5. Concluding Remarks

The new laws on decentralisation provide more power to the regency and municipality governments to plan and implement a development program according the aspirations of the people in each individual region. The implementation of these laws requires well-prepared and well-managed databases both at national and regional levels. Despite the present inadequacy in human resources, lack of awareness of top management and scarcity of funding in the information system sector, the present regulation, supporting agencies and interest of young people in database management and information systems provide hope for improvement in the future.

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