

CATASTROPHE MODEL FOR ANALYZING BEHAVIOUR OF DEVELOPMENT POLICIES IN INDONESIA

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ABSTRACT

Based on the concepts of catastrophe theory, we develop a model to analyze the behaviour of development policy of Indonesia. This paper is part of research on the development of Social Early Warning System, which is a system to detect or anticipate social unrest. This idea was developed on the basis of concern for the amount of conflict and social unrest occurring in Indonesia. This approach was chosen based on a variety of results of previous studies such as studies potential conflicts of Indonesia in 2000 4, study riots in Jakarta in May 1998 6, the conflict assessment Jakarta in 2000, The review of development and human rights violations in Aceh in 2002. These studies show that the social dynamics that have occurred appear to be a catastrophic phenomenon, which is discontinuous event. We implement this model for analyzing the social stability in national level and provincial level (Bali). The model show that In 1997 to 1998 can be considered as a critical year. In terms of the theory of catastrophe, Indonesia and Bali are in a position of "folds" or "cusp". This model proved that both Bali and Indonesia, in this year is enter to the "turbulence" situation or often called multi-dimensional crisis. By using this model we can predict the impact of development policy to the social stability of Indonesia.

Key words : Catastrophe model, Social early warning, Simulation.

1. INTRODUCTION

1.1 Background

This paper is part of research on the development of Social Early Warning System, which is a system to detect or anticipate social unrest. This idea was developed on the basis of concern for the amount of conflict and social unrest occurring now in Indonesia. As we know that since 1997 Indonesia persistent social conflicts and other multidimensional crisis. Social conflicts with violence emerging in various areas such as Ambon, Aceh, Poso, Sampit and others. Seeing the intensity and violence of these conflicts make us feel strange and surprised with the behavior some of the Indonesian today. The fundamental question that arises is, what causes that some Indonesian become violent today.?. The strands emeralds on the equator has now turned into a string of blood and anger at chatuslistiwa.

Observing this phenomenon, ahead of the 1999 elections, Trisakti University Research

Institute has conducted research on the potential conflict of Indonesia. From the results of the mapping riots during 1998 to mid-1999 looks no less than 75 riot has occurred throughout Indonesia (see figure 1). Besides social unrest, student protests and community members are spread everywhere and occurs nearly every corner of Indonesia (see Figure 2) (Dadan, 2000).

Similar studies have been conducted by the University of Trisakti in collaboration with BAINTELKAM Police. From the results of this study shows that social conflict (vertical and horizontal) from year to year tend to increase. In 2002 occurs no less than 153 conflict, then in 2003 as many as 180, in 2004 there were 206, in 2005 totaled 303, while in 2006 as many as 311 of 2007 till June recorded 177 conflicts have occurred (see Figure 3) (Baintelkam, 2006)



Figure 1. Panoramic of social conflict in Indonesia during period 1998-1999 (Source: Dadan, 2000)



Figure 2. The distribution of Student Demonstration during periode 1998-1999 (Source: Dadan, 2000)

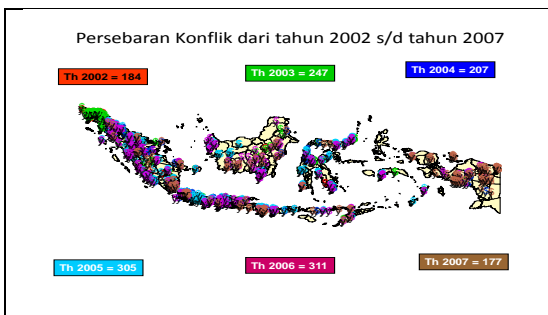


Figure 3. Panoramic of social unrest in Indonesia during 2002-2007 (Source: Baintelkam, 2006)

From various studies we have done, shows that one of the root causes that led to the conflicts is the existence of socio-economic inequality, both at the level of individuals, groups and regions. Our research also showed that after six decades of independence, the economy of Indonesia has achieved a lot of progress, but economic progress has not been felt equally by all the people of Indonesia.

From the results of our study in year 2000 on the human development, are still not evenly

distributed (see figure 4), as well as the development of industry in the area has not been well distributed (Fig. 5).

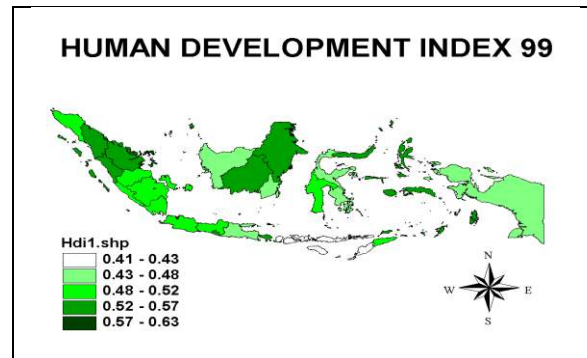


Figure 4 : HDI of Indonesia at year 1995 (Source: Dadan, 1999)



Figure 5. Map of distribution of Industries at year 1998 (Source: Dadan, 1999)

If economic progress can be considered to represent prosperity and the gap represents the level of justice, it can be concluded that an equitable prosperity has not been fully achieved. According to one of the founding fathers, Indonesia is borned for creating the prosperous society. Ir Sukarno in a speech on June 1, 1945 stated that "... we do not establish a state for one person, one group, but all for all, one for all, all for one, and for the country to be strong". This statement clearly implies that in order to make this country strong, stable and sustainable existed then economic progress (prosperity) which is to be enjoyed equitably (fairly) by the Indonesian people.

1.2 Problem Definition

Various social facts as noted above, is certainly not something that comes suddenly, but rather the fruit of development policies that have been implemented in this

country. Therefore need to be studied more in depth about the Indonesia development policy that has been implemented with regard to the pattern, structure, direction and other characteristics. For that that purpose we will develop a model that is expected to recognize the behavior of Indonesia's development. By using this model we can evaluate and formulate the development policy in the future.

2. THEORETICAL BACKGROUND and MODEL DEVELOPMENT

The basic theory is used as the basis for the construction of the model is the theory of "catastrophe". This approach was chosen based on a variety of results of previous studies such as studies potential conflicts of Indonesia in 2000 (Dadan, 2000), study riots in Jakarta in May 1998 (Dadan, 2000b), the conflict assessment Jakarta in 2000, The review of development and human rights violations in Aceh in 2002 (Agus, 2002). These studies show that the social dynamics that have occurred appear to be a catastrophic phenomenon, which is discontinuous event.

This catastrophic phenomenon for the first time introduced by the French mathematician Rene Thom in 1960 (RJ Rummel,-). This theory is a special branch of dynamical systems theory is used to explain a variety of phenomena characterized by sudden changes that appear discontinuous (no surprise). Some examples are the aircraft stall events, anomalous behavior of water and a plague of locusts.

Thom in his book "catastrophe-Theory" (RJ Rummel,-) have discussed a theory of "catastrophe" which involves social dynamics. With these considerations, we use the catastrophe theory as an approach to study the behavior of the development policy in Indonesia.

Based on catastrophe theory, as well as the findings of various studies about the conflict that we have done, then proposed a hypothesis about the social dynamics of Indonesia's growing over the years. The Indonesia's social dynamics can be

described as a surface "catastrophe" three-dimensional with the third dimension is as follows (Agus, 2004) :

1. Social inequality, this dimension reflects Justice. (X axis)
2. Economic development, this dimension reflects essentially Prosperity (Y axis)
3. Social stability (Z axis).

The third dimensions of this relationship illustrates hypothetical catastrophe curve as can be seen in Figure 6 below.

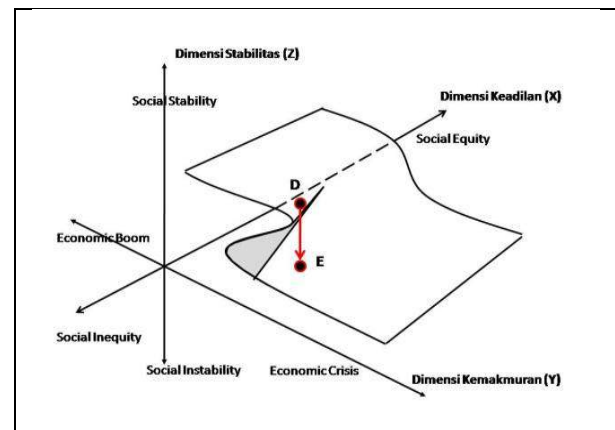
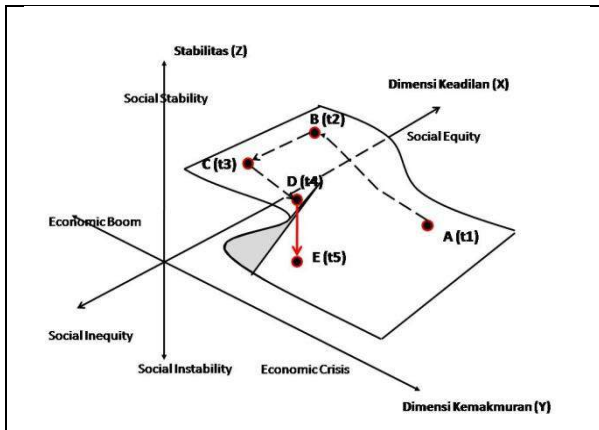


Figure 6. D is the critical point of catastrophe model (Agus, 2004)

Characteristics of each point on the surface of the "catastrophe" that shows the state of the economy (prosperity), social (justice) and social dynamics (stability) at any given time. A crisis occurs at points located in the folds of the curve (cusp catastrophe), in Figure 6 above illustrates the condition of point E. If the condition of a nation entered the crease area, then the dynamics of the community is in the region of turbulence that is what we expect to see the multidimensional crisis in 1998. In early 1997, social and economic slump has brought Indonesia Indonesia at a critical point (D) and then enter the area of turbulence point (E).

By putting all the variables that describe the social condition of the country on the surface of the "catastrophe", then it can be learned alure Indonesia's development from year to year. So that decision makers can formulate future development well. Policies are meant to be bringing people out and away from the crease catastrophe. Analysis of various points on the surface of the catastrophe illustrated in Figure 7 below.



Figur 7 Catastrophe curve of development behaviour Behaviour (Agus, 2004)

From the picture above can be illustrated the behavior of a country's development over the years, move from a stable position A (t1), B (t2), C (t3) and D (t4) to get stuck in the folds of the catastrophe point E (t5).

1. Point A (t1) illustrates that social dynamics will be in a stable condition despite the economic dimension (prosperity) is low as long as social inequalities are also low in other words, a high level of fairness.
2. Social dynamics more stable in line with the increase in wealth (economy) and the level of social inequality is still relatively low (point B (t2)).
3. Social dynamics will culminate when the economic dimension (prosperity) continues to increase although at the time it began to widen the social gap is illustrated by point C (t3). In this position, if the economic dimension (prosperity) decreased due to the crisis, the conditions will change, and dragged in the direction of point D (t4). The position is commonly known as the critical point. Because of economic crisis that continues, then social dynamics will be stuck in the folds of the catastrophe curve point E (t5).

In other words it can be described as follows:

1. Time t1 = time when the economic and social inequality low.
2. Time t2 = Time dimension at a time when the economy started looking up other dimensions remain low

3. Time t3 = time when the economic and social inequalities high.
4. Time t4 = time when other dimensions remain high but declining economic dimension.
5. Time t5 = time when social conditions fall or "jump" into the low condition.

As mentioned above, by analyzing the position of the social dynamics of the curve catastrophe, then the decision-makers can formulate future policy direction so that we avoid turbulence conditions (fold areas).

3. IMPLEMENTATION MODEL

Starting from the conceptual model as described above, we built a model catastrophe for the case of Indonesia, with the following variables:

1. Dimensions of Justice (social inequality). All the symptoms of inequality such as educational inequality, religion, race and other demographic variables. Similarly, the gap in the form of disintegration spatial infrastructure.
2. Dimensions of Wealth (economics). All the symptoms of economic fluctuation GDP, rising cost of living, fuel prices and more.
3. Dimensions of social stability include things like protests, demonstrations, riots, crime and others.

Basic data for the three-dimensional model of a catastrophe it was sourced from the Central Bureau of Statistics (BPS) in the interval 1990-2004. Catastrophe model we built in addition to the national level is also built models catastrophe for the region, in this case we choose Bali as a case study. This province was chosen because Bali is very unique. Bali is a province whose economies are deeply touched by international developments, and it's social dynamics also is very high enough.

Basic mathematical model used to construct the curve behavior catastrophe Indonesia's development are:

$$Z^4 + aXZ + bYZ^2 = 0$$

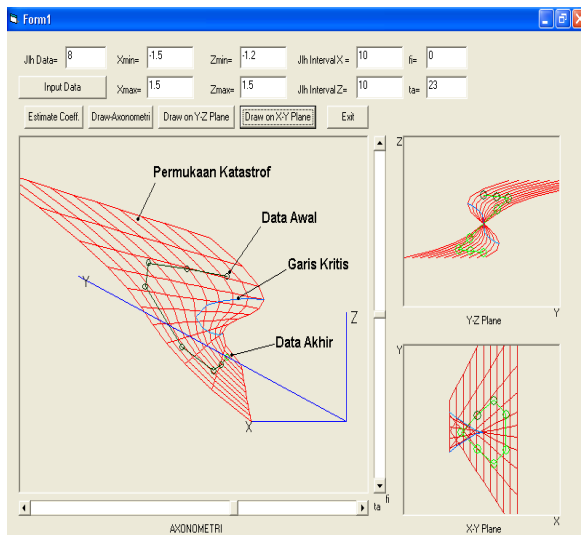
Adopted from the "Catastrophe Theory" Rene Thom (RJ Rummel,-)

Assuming:

If $Y = 0$ obtained Z_1, Z_2 and Z_3
 X = 0 Z_1 and Z_2 values obtained

To facilitate delineation and mapping catastrophe curve behavior development from year to year, at Trisakti University research institute has designed a simple simulation application, so that every moment can be used to describe a variety of catastrophe curves for different regions and different periods.

Display application development model development catastrophe behavior Indonesia can be seen in Figure 8 below.



Gambar 8: The simulation for analyzing the catastrophe model (Agus, 2004)

Diagram Catastrophe above can be read as follows:

1. Catastrophe three-dimensional surface can generally be seen as a form of curves or surfaces with a similar three-dimensional folds. If a state is on the hem of this it can be said that the state has reached a critical point.
2. Data sorted by time. In this case the data sorted according to years beginning from the year earlier period until the end of analyzing periode.
3. To reduce the impact of the nominal amount of each dimension has been

standardized, so that all data will lose the value of the average.

4. X axis is the gap dimension. The larger X means more social gap. Y axis is the economic dimension. The bigger the better Y then economic conditions. Z axis is the dimension of Social Dynamics. The bigger the better Z social stability.
5. Especially for the Z axis, so that the index multiplied by minus seen that the greater the value the better the axis of the social dynamics in the community.
6. The red line is the surface grid catastrophe. Each small circle indicates a state in a given year. Relatively dark circle means precedes the lighter circle.
7. The blue line shows where the critical line ready state changed drastically.

3.1 Catastrophe Model For National Level

By using the data of the periode 1994 s / d 2004 (10 years) can be described National Catastrophe surface. The data used are the data related to the three dimensions above then factor analysis obtained by using index of each dimension (Inequality, Economic and stability) as can be seen in table 1 below

Tabel 1. Index of Inequality, Prosperity and Social stability

Year	Inequality	Prosperity	Social Stability
1994	-1.67953	-0.17521	0.82737
1995	-1.20691	0.31455	0.66613
1996	-0.966	0.86389	0.45991
1997	-0.57583	0.58054	0.68667
1998	-0.20254	-1.83266	-0.38556
1999	0.33185	-1.03916	0.15234
2000	0.32051	-0.58403	-1.78423
2001	0.60224	-0.66463	-1.84335
2002	0.96013	0.00497	-1.21086
2003	1.18945	0.84115	-0.74412
2004	1.22663	1.6906	-0.32386

Based on that data, then we can create the catastrophe curve as shown in figure 9 below.

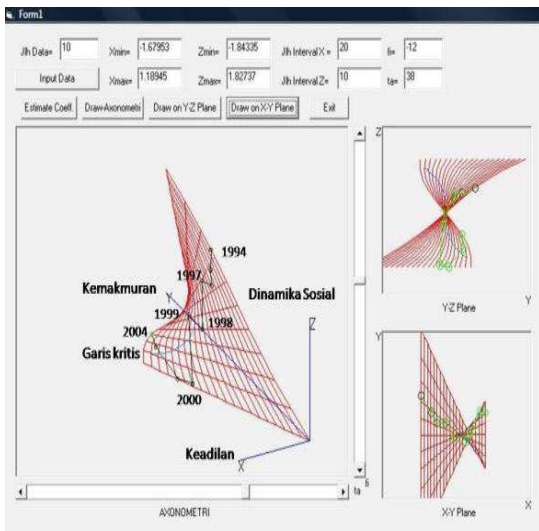


Figure 9: The curve catastrophe of national development behavior from 1994 s / d 2004

From the surface Catastrophe seen that in 1994 the construction of Indonesia has been able to create social stability is quite good, but look closely at the crease that led to a critical position. Starting from 1997 seen declining social stability, and in 1999 put Indonesia on the crease position catastrophic.

From figure 9, it is also seen that in order to improve the social stability, national development policies taken appears to be more geared to the economic recovery. This is illustrated by the path that seems to only rely 2000-2004 economic improvements (path is relatively parallel to the Y axis), and seemed to ignore the disparity reduction efforts. Through this policy does seem to improve economic conditions in Indonesia. Various economic indicators in particular macroeconomic giving signs that there is some progress after the critical period, the Indonesian economy as though better than in times of crisis. However, the picture above shows that such efforts have not succeeded in improving stability, even there is a tendency that the policy actually increase the gap or in other words, justice has not been fully realized.

If this policy continues to run, the economy will not change in a positive impact to the community because of the dynamics of the policy position of Indonesia will continue and are likely to be at the lowest point and into the trap of turbulence or bending curves

catastrophe (with low Z values). With the growing value of X (Dimensional Gap) policy is even even more put Indonesia at the lowest point to the value of Z axis which tends to shrink. This analysis is confirmed by many observers as published commentary on some in the media stating that economic improvement is occurring now is not perceived by the public. The strengthening of the macroeconomic indicators are not accompanied by the strengthening of the real sector that can significantly increase employment, which in turn will reduce social inequalities. In catastrophe curve, social stability downturn caused a higher priority improvement efforts on improving the economy than reducing the gap, visible from the movement of points on the surface of the catastrophe that is parallel to the Y axis (Economic Dimension) and away from the X axis (Decrease Inequality).

3.2 Catastrophe Model of Bali

Similar to the national model, to analyze the dimensions of Bali was used is the same that prosperity dimensions (economic) justice dimension (social inequalities) and dimensional stability. These three dimensions are abstracted from variables-variables as follows:

1. Dimensions of Justice (social inequality) X axis abstracted from a range of variables related to social inequality, economic disparity and inequality infrastructure.
2. Dimension prosperity (economic) y axis abstracted from various variabel describing economic development diataranya.
3. Dimensions of social stability z axis formed by abstraction variables related to community conflict, crime rate, etc.

Source of data used are secondary data from BPS taken from the figure for the district in the province of Bali. Similarly, the data processing is done at the national level, for the case of Bali were carried calculating index of each dimension. The results of processing the data from each of these dimensions can be seen in Table 2.

Table 2 Index of Inequality, Economy (prosperity), and Social Stability of Bali

Year	Inequality	Economic	Social Stability
1990	-1.6277	-0.64069248	-0.69317256
1991	-1.58325	-0.599654901	0.215236831
1992	-1.3628	-0.49925576	0.786479586
1993	-0.77866	0.742490389	1.167308089
1994	-0.60236	1.331286102	0.822864475
1995	-0.30516	1.243392303	0.477208031
1996	-0.23794	1.404485927	0.832567112
1997	0.65352	0.722840585	1.140625837
1998	0.65698	-1.891670366	-0.278384827
1999	0.77542	-1.603937191	-0.166804501
2000	0.68963	-0.104743073	0.081825572
2001	0.49766	-0.506635463	-0.227445983
2002	0.94539	-0.148414509	-0.214104857
2003	0.82876	0.166364382	-1.422083166
2004	1.4505	0.384144055	-2.522119639

By using the data in table 2 above are then calculated using the equation, it will be produced catastrophe curve as shown in Figure 10 below.

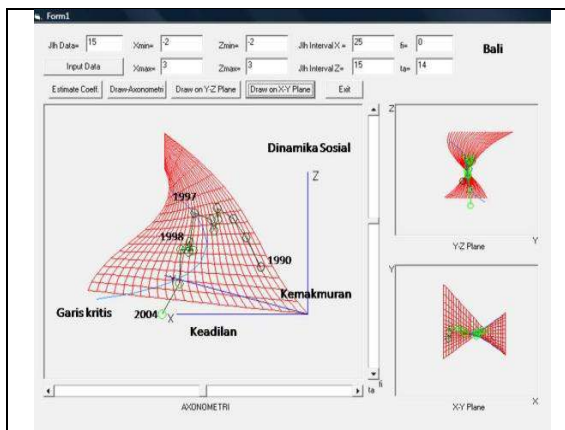


Figure 10: The curve catastrophe of Bali

From the picture above shows that in the 1990 Bali relatively low social stability but does not go into the area because of the gap sosialnyapun turbulens still low. From the start of 1991, there was a tendency of social stability is increasing in line with rising levels of prosperity, but unfortunately not accompanied by increased equity or berkurangnya gap, then in 1992 to 1993 and 1998 to get in on the relative critical areas. It also proved to be a year full of social unrest.

Markedly in 1997, it appears that the position of Bali right on the Critical Line (blue line) and the following year social stability in Bali declined drastically. Thus, in 1996-1997 is a critical year, due to the small dimensions of economic decline has caused Bali enters the "turbulence". Years 1998-2003 were the years of "turbulent". While the year 2004 has started out of the catastrophe. Its interesting to note, is that while the 2004 rate increased stability, but it can get out of this critical region due to decrease social inequalities, seen from the direction towards increasing the level of justice.

4. DISCUSSION

If we look at the development of national behavior and Bali, the existence of a topological similarity is as follows:

1. In 1997 to 1998 can be considered as a critical year. In terms of the theory of catastrophe in the two years Indonesia and Bali are in a position of "folds" or "cusp". In both Bali and Indonesia this year is "turbulence" or often called multi-dimensional crisis, known as "Monetary Crisis".
2. Years prior to the critical interval was either at national level or Bali has a positive social dynamics. Levels of social conflict in the interval (either in the form of crime and human rights violations) are relatively small. It can be seen on the surface in the form of catastrophe value of Z (Dimension Social Dynamics) is relatively large.
3. In the interval before the "financial crisis" (1997-1998) both at the national and Bali have relatively low levels of inequality. On the surface this catastrophe can be seen from the value of X (gap dimension) are relatively small.
4. After the critical period, between Bali and National also have similarities in the form of relatively low levels of the economy. On the surface this catastrophe can be seen from the value of Y (Economic Dimension) is relatively low.
5. At the same time interval (after the critical interval) in both Bali and national levels of social inequality conditions can be relatively high. On the surface

Catastrophe this can be seen from the value of Z (axis Social Dynamics) are relatively small.

From the comparison between the surface and the Bali National catastrophe, it could be said that the growing trend in Bali are similar to trends in the national level. So although Bali has been considered not too influenced by the dynamics of national (perhaps even more considered Balinese influenced by the dynamics of the Global National), can not be said to be entirely correct. Thus, social stability and central regions have the same pattern, although the new validation by only one region, namely Bali.

From an analysis of national conditions and the case of Bali, it is seen that in fact Indonesia has not fully freed from the trap catastrophe. Indeed, there are economic conditions improved but remained elevated turbulence sosialpun because the gap is still large. This condition is critical, because if there is little economic disruption, it is certain that Indonesia would go again in regional turbulence. By looking at these conditions interesting question is, how development policies that should be taken, so we quickly get out of the trap catastrophe? If it returns a reference to the conceptual model where noted above (see figure 7), the simulative to get out of the slump (catastrophe position), there are several scenarios as follows:

1. Approaching t3-t4 t5 through route-t3. This scenario prioritizes economic approach to achieve its original state at t3.
2. Approached via a route t5 t3-t1-t2-t3. This scenario is relatively longer but still be considered because it does not require more energy because the slope is more gentle route. This scenario begins with the closing of the gap or equity and continue with efforts to boost the economy.
3. Approached via a route t5 t3-t2-t3. This route combines the efforts to boost the economy by reducing the inequalities in society. The third scenario is in terms of the use of enegri can be said to be in between the two previous scenarios. Based on a review of the National Development and Balinese behavior of

these three seems sekanario scenario 2 and 3 who should choose.

5. FINAL REMARK

As the end of this paper we would like to mention an important lesson from past experience that needs attention is that "for avoiding deeper slump, the future of development policy should not only be focused on economic growth (growth), but must pay attention to the level of equity.

"This policy is in accordance with the vision of the founding fathers of Indonesia : Prosperity for all of Indonesia's Citizen"

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