LOCAL ECONOMIC DEVELOPMENT, CLIMATE CHANGE AND FISCAL INSTRUMENTS IN INDONESIA*

PEMBANGUNAN EKONOMI LOKAL, PERUBAHAN IKLIM DAN INSTRUMEN FISKAL DI INDONESIA

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Abstrak

Tujuan tulisan ini adalah untuk menganalisis kaitan antara pembangunan ekonomi lokal dengan perubahan iklim dan instrumen fiskal dilndonesia. Data yang digunakan adalah data sekunder tahun 2005 – 2010 seperti produk domestik regional bruto, pendapatan per kapita daerah, indeks kualitas lingkungan daerah tahun 2009, dan kebijakan pembangunan berorientasi lingkungan. Metode analisis data dalam kajain ini adalah analisis deskriptif, korelasi dan analisis kebijakan.Hasil kajian ini menunjukkan bahwa pembangunan ekonomi lokal di Indonesia didasarkan pada koridor-koridor ekonomi berbasis industri. Ada beberapa instrumen fiskal yang dapat diterapkan untuk mengurangi atau mengendalikan dampak perubahan iklim di Indonesia yaitu pajak dan retribusi daerah. Dalam konteks desentralisasi fiskal, instrumen fiskal dalam bentuk retribusi daerah relatif lebih mudah untuk diterapkan. Berdasarkan hal ini, pemerintah pusat dan daerah perlu merumuskan kebijakan pengendalian dampak lingkungan dan perubahan iklim terutama instrumen fiskal yang dapat ditetapkan oleh pemerintah daerah.

Kata-kata kunci: pembangunan ekonomi lokal, perubahan iklim, instrumen fiskal, koridor ekonomi

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Abstract

The purpose of this study is to analyze local economic development linked to climate change and fiscal instruments in Indonesia. Data include secondary data in 2005-2010 such as gross domestic regional product, local per capita income, local environmental quality index 2009, and policy oriented environment development. Analytical method applies descriptive analysis and correlation and policy evaluation. This study shows that local economic development in Indonesia is based on the determination of the economic corridor with a base industry cluster. This essay says that there are several instruments that can be applied to control climate change in Indonesia, among other, are taxes and local retributions. Fiscal instrument in form of local retributions is relatively easier to implement, therefore, the central and local governments need to formulate control policies for environmental impacts and climate change, particularly fiscal instruments that can be set by local governments.

Keywords: local economic development, climate change, fiscal instruments, economic corridors

I. INTRODUCTION

A. Background

Local economic development in Indonesia is an inseparable part of the process of fiscal decentralization. The fiscal decentralization process has been started in 2001[2]

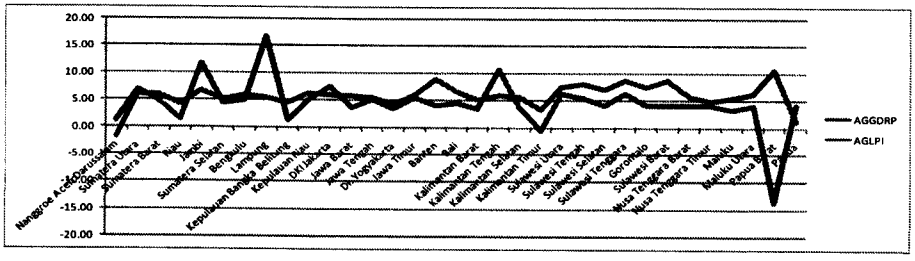
The process of decentralization stresses that local government can manage its economic potential can impact the environmental conditions. The environmental conditions in the aggregate will be able to affect climate change.

[2] In accordance with Act No. 32/2004 about Local Government, and Government Regulation No. 25/2000 about Government Authority and Provincial Authority as Autonomous Region, in the environmental field gives political recognition through the transfer of authority from central government to the regions, are:
a. Leaving the region in an important position in environmental management.
b. Requiring local initiative in designing policy.
c. Building a relationship of interdependence between regions.
d. Establishing local approach.

Indonesia as a developing country can be affected by climate change due to several factors that have not been stable and well established. These factors are social factors, technology and finance. These have been evidenced empirically by Lis and Nickel (2009)[3]. Other empirical studies also can be seen on the results of the study Fiscal Affairs Department-IMF (2008), Kosonen and Nicodème (2009), Kamal-Chaoui and Robert (2009).

Figure 1 describes the average of local economic growth and per capita income in Indonesia in the year 2006 to 2010. The average of local economic growth in the region of Sumatra was 4.86% with the highest economic growth in North Sumatra and Riau Islands (6.18% and 6:23%). The average of local economic growth in the region of Java, Bali, Kalimantan, Sulawesi, Nusa Tenggara and Papua are 6.12%, 6:52%, 5:04%, 8.00% and 5.71%. The highest local economic growth in those regions are respectively Banten (8.95%), Bali (6:52%), Central Kalimantan (6:01%), Southeast Sulawesi (8.80%), and West Papua (10.64%). Data of local economic growth provide information on the economic performance or achievement of each region. Economic achievements can be utilized by the central government to accelerate economic growth in a relatively undeveloped region. In addition, it can also be used by each local government to cooperate in the economic field. Local governments that have achieved relatively high economic growth can focus on the quality of economic growth policy. The quality of economic growth can be directed to the distribution of development and fairness in economic activities in the field. Equitable development and justice in the economic field are an integral part in the process of achieving local economic growth. This will indirectly bring quality economic decentralization. In addition, the quality decentralization of the economy will also reduce the negative impact of the economic inequalities among regions.

Figure 1
Average Growth of Regional Economic and Per Capita Income in Indonesia, 2006-2010 (%)



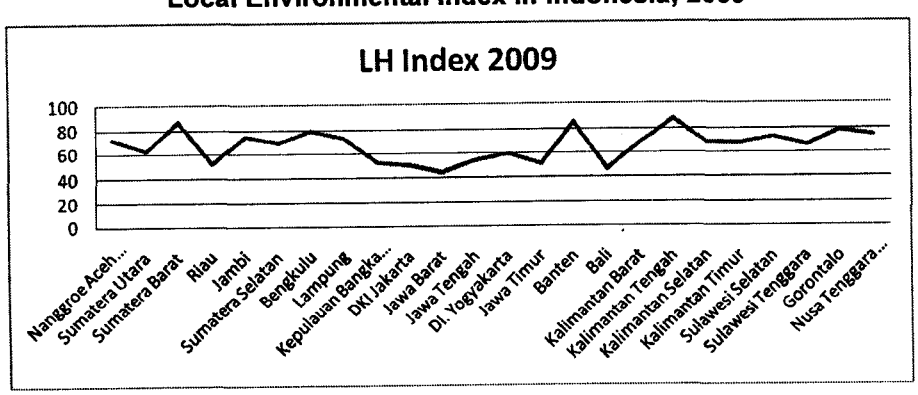
Source: BPS (processed)
Note: AGGDRP is average growth of gross domestic regional product, and AGLPI is average growth of local per capita income.

[3]Lis and Nickel (2009) describes the implications of climate change on fiscal policy, especially on public budgets. The implications are likely to be experienced by the Developing Countries. To that end, developing countries need to clarify the position of the budget to climate change.

While the average of the highest per capita income growth in the years 2006 - 2010 in Indonesia were Lampung (16.75%) and Jambi (11.70%). By region, average per capita income growth in Sumatra, Java, Bali, Kalimantan, Sulawesi, Papua and Nusa Tenggara respectively are 5.81%, 4.83%, 4:45%, 4:29%, 5:01%, and 0.97%. These data provide an explanation that during five years tend to Sumatra and Sulawesi could encourage an increase in per capita income.

Figure 2 illustrates the environmental quality index in the area of Indonesia in 2009. The highest environmental quality and the lowest are 88.21 (Central Kalimantan) and 44.4 (West Java). Based on the region, the average of environmental quality index in Sumatra, Java, Bali, Kalimantan, Sulawesi and East Nusa Tenggara are 69.26, 57.16, 45.7, 73.24, 73.03, and 75.3. It describes the level of water quality, air quality, and forests in Indonesia. Based on these data the government can determine the development of environmental quality in Indonesia as well as a picture of the role of Indonesia in the world related to climate change.

Figure 2
Local Environmental Index in Indonesia, 2009



Source: Ministry of Environment RI (2010)

Indonesia through 2000 has contributed at 1.47% green house gases (GHGs) to the world. That year, Indonesia is a country in a position about 16th in the world and about 6th position in the developing countries under China, India, Brazil, South Korea, and Mexico. Sources of GHGs in Indonesia come from burning fossil fuels for electricity generation and transportation, agricultural activities, forestry and industrial waste. In order to support the improvement

of climatic conditions in the world, Indonesia has ratified two agreements of climate change through Act No. 6/1994 on the Ratification of the United Nations Framework Convention on Climate Change and Act No. 17/2004 on the Ratification of the Kyoto Protocol to the United Nations Framework Convention on Climate Change. However, the implementation of both acts is not maximized[4], including the application of policy instruments.

There are some fiscal policy instruments that can be applied to the case of climate change. These instruments are taxes, fees and charges, grants, and carbon finance.[5] Meanwhile, based on study of World Bank (2008) can be seen that fiscal policy instruments that can be used for mitigation of climate change are carbon-pricing and technology-based policies[6]. Based on local economic conditions in Indonesia, Indonesia's commitment to addressing climate change, and empirical studies of fiscal instruments, so this study will analyze the local economic development related to climate change and fiscal instruments in Indonesia.

B. Research Question

Research question in this study is "Does local economic development in Indonesia link to climate change and environmental fiscal instruments?".

C. Research Objective

The research objective in this study is to analyze the local economic development linked to climate change and environmental fiscal instruments in Indonesia.

[4] According Sudarmadji (2007) there are some aspects that led to the implementation of environmental policy is not maximized, are: 1) sectoral and local ego, 2) planning overlap between sectors, 3) funding is still very poor for the environmental field, 4) limitations of human resources, 5) the exploitation of natural resources is still high, put forward the profit from the economic side, 6) weak implementation on legislation, 7) weak enforcement of environmental laws, especially in surveillance, 8) understanding the community about the environment, and 9) the application of technologies that are not environmentally friendly .

[5] Lamia Kamal-Chaoui and Alexis Robert (eds.), "Competitive Cities and Climate Change", *OECD Local Development Working Papers* No 2, 2009.

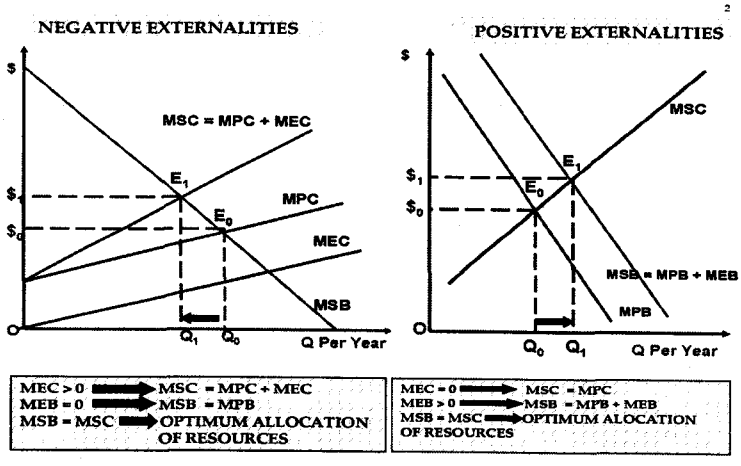
[6] Carbon pricing policies include a carbon tax, emissions trading schemes, and hybrids of these two approaches. All other policies are labeled technology-based (or, simply, technology) policies because they are all, to some extent, technology-specific.

D. Review of Related Literature

D.1. Externalities, Economic and Fiscal Policy

In a modern economy every activity has a connection with other activities. Linkages between activities that are not through the kind of market mechanism, then is called as an externality[7]. In general, the existence of externalities will not disturb the achievement of the efficiency of society if all adverse or beneficial. It is included in the determination of the calculation of prices and production quantities of goods (internalize externalities in the market mechanism). In this case the efficient (optimum allocation of resources) will be achieved when the marginal social cost (MSC) is equal to marginal social benefit (MSB). Basically there are two kinds of externalities, are positive externalities and negative externalities, as shown in the figure below:

Figure 3
Positive and Negative Externality



Source: David N. Hyman, *Public Finance: A Contemporary Application of Theory to Policy*, Sixth Edition, The Dryden Press, 2002.

Note:

MEC = marginal external costs
MEB = marginal external benefits
MSC = marginal social costs
PMC = marginal private costs
MPB = marginal private benefits
MSB = marginal social benefits

[7] David N. Hyman, *Public Finance: A Contemporary Application of Theory to Policy*, Sixth Edition, The Dryden Press, 2002.

Based on Figure 3 can be seen that the problem of externalities will occur when the social cost and social benefit are not calculated in determining the price of the product. This can happen because in the calculation of the private sectors, the balance in pricing occurred in the condition of the private marginal cost equal to marginal private benefit, which ignores social benefits and costs. The effort to internalize the externalities in the market mechanism can be done by the government, through a policy of direct regulation (command and control) or through a policy of Market-Based Policy in the form of fiscal policy, such as corrective tax and corrective subsidy, and policies to provide incentives and disincentives.[8]

Based on the explanation above it is known that to solve the pollution problem required government intervention. In this case the government can use several ways, are the application of taxes and subsidies, externalities authorize the auction system or by direct regulation. Some forms of taxes and subsidies that can be applied, are presented in the following table:

Table 1

Taxes and Subsidies Related to Externality

Items	Taxes and Subsidies	Taxes/Subsidies
MSC>PMC	Consumer Taxes	MSC-PMC
MSC<PMC	Consumer Subsidies	PMC-MSC
MSB<MPB	Consumer Taxes	MPB-MSB
MSB>MPB	Consumer Subsidies	MSB-MPB

Source: Guritno Mangkoesoebroto, *Ekonomika Publik,* Edisi Ke-3, Yogyakarta: BPFE, 1998.

Climate change mitigation policy is also related to the economic conditions of a region or city.[9] The city's economic condition is closely related to advances in life and increase urbanization. This will impact on the increasing negative impact on the environment. Negative impact on the environment can be either increasing air pollution, greenhouse gas (GHG) and emissions of carbon dioxide (CO2). GHG emissions include carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O) emissions from energy conversion; CH4 emissions from the landfill decomposition of municipal solid waste, CH4 and N2O from anaerobic decomposition and nitrification-denitrification of

[8] David N. Hyman, *Public Finance: A Contemporary Application of Theory to Policy*, Sixth Edition, The Dryden Press, 2002.

[9] Lamia Kamal-Chaoui and Alexis Robert (eds.), "Competitive Cities and Climate Change", *OECD Local Development Working Papers* No 2, 2009.

nitrogen during wastewater treatment; CO2 emissions from waste incineration; flurocarbon (HFC, PFC) and sulfur hexafluoride (SF6) emissions from refrigerants, semiconductor manufacturing and insulators; and CO2 and N2O emissions from rural-urban land conversion.

The policy can be implemented by the government in preventing or reducing the negative impact on the environment described by Kosonen and Nicodème (2009), and Goulder and Pizer (2006). The government can set taxes policy and subsidies as fiscal instruments.[10] Taxes and charges levied on goods directly or indirectly linked to polluting activities. Subsidies accorded directly or through the tax system to encourage producers and consumers to choose the inputs and goods that have favourable properties from the environmental perspective. In contrast with taxes, they provide incentives by decreasing the price or purchasing costs of a product. In this context, government can focus on fiscal instrument such as taxes.[11]

D.2. Local Economics and the Environment

Implementation of decentralization policy in Indonesia refers to the Act No. 32/2004. In the context of environmental management legislation is supported by Government Regulation No. 25/2000. These regulations specify that environmental management is focused in the region (province and district or city). As for the national development plan has been established program of natural resource development and environment. Programs include:

1. Improvement program and access to information of natural resources and environment.
2. Improvement effectiveness program of management, conservation and rehabilitation of natural resources.
3. Prevention programs and control of pollution and environment damage.
4. Institutional setup program and law enforcement, management of natural resources and environment.
5. Improvement Program community in natural resources management and preservation of the environment function.

[10] Katri Kosonen and Gaëtan Nicodème, "The role of fiscal instruments in environmental policy", *Working Paper* No 19 June, EC, 2009.,

[11] Lawrence H. Goulder and William A. Pizer, "The Economics of Climate Change", *Resources for the Future*, June, 2006.

The action plan on sustainable development in environmental protection and management is conducted in order to improve the quality of the environment through the efforts of developing the legal system, legal instruments, compliance and enforcement including alternative instruments, as well as environmental remediation efforts. As for local policy in addressing environmental issues, especially issues of policy and law enforcement include:[12]

1. Regulation of environmental management and protection.
2. Institutional strengthening of environment.
3. Application documents for environmental management in the permitting process.
4. Socialization/education about environmental laws and regulations, and environmental knowledge.
5. Improvement the quality and quantity coordination with relevant agencies and stakeholders.
6. Integration monitoring of environmental law enforcement.
7. Formulation form of sanctions and environmental violations.
8. Improvement the quality and quantity of human resources.
9. Improvement funding in environmental management.

E. Methodology

This study uses secondary data years 2005 - 2010 are gross domestic regional brutto, local per capita income, environmental index, planning and policies in Indonesia related to local economic corridors, climate change and environment. Areas of research include thirty-three provinces in Indonesia. Data analysis methods include descriptive analysis, correlation[13] and policy analysis. The descriptive analysis will describe the direction of local economic development in Indonesia or known by the development of economic corridors. Meanwhile correlation test will analyze the relationship between gross domestic regional brutto, local per capita-income, and local environmental index. The correlation is intended to support the analysis of fiscal policy in each province

[12] Sudarmadji, "Pembangunan berkelanjutan, lingkungan hidup dan otonomi daerah (Sustainable development, environment and local autonomy)", Paper is presented at National Seminar in UGM, Yogyakarta, 27 October, 2007.,

[13] The correlation method in this study is the Pearson correlation introduced by Galton (1886) and later formulated by Karl Pearson (1896) and later by Fisher (1935).

in Indonesia by considering the economic ability and environmental quality, especially when the government sets policy of environmental tax or retribution.

II. ANALYSIS AND DISCUSSION

II.1. Local Economic Development, Climate Change and Fiscal Instrument in Indonesia

A. The Role and Commitment of the Government of Indonesia

Finance Ministers Meeting, High Level Event on Climate Change for Finance Ministers or HLECC-FM, on 11 December 2007 in Bali have discussed about climate change impacts from the viewpoint of financial and fiscal policies. The end result of this meeting is increasing attention and commitment of the regulator to draw up an action plan for implementation of fiscal and financial policies and international cooperation to support mitigation efforts and adaptation to climate change, including cooperation among finance ministers roadmap with clear targets and timetables and scalable.

Another meetings also discuss effort to mitigate and adapt to climate change (UNFCCC) has held in Bali December 4 to 15, 2007. This meeting produced several agreements as follows:

1. Adaptation funds.
2. Technology transfer.
3. REDD (Reduced Emissiom from Deforestation and Degradation).
4. CDM (Clean Development Mechanism).

In an effort to realize the commitment of HLECC - FM in Bali, the Ministry of Finance of the Republic of Indonesia can affect the policy of climate change mitigation and adaptation through the regulation of investment climate, taxation policy, budget policy, as well as setting other policies. Investment policy can be done through improving the investment climate, regulation of the banking sector, non-bank financial sector, as well as local financial regulations. Policies on taxation can be done through setting tariffs, tax incentive in the form of tax holidays, tax deferral and so forth. Policies in the state budget can be done through the preparation of budget priorities, policies to invest directly into projects of mitigation or adaptation to climate change, the formation of public service obligation, green procurement, and funding for

socialization in order to build and enhance public awareness about climate change.

In addition, the Ministry of Finance of the Republic of Indonesia can also play a role in regulating the mechanism of raising funds for mitigation and adaptation to climate change, both from the global financial sources - such as CDM, REDD, GEF and others - as well as those sourced from the private sector. In addition, the Ministry of Finance can also play a role in regulating mechanisms of the use of these funds for purposes of mitigation, adaptation, or providing compensation as well as a stimulus for those who are considered to contribute significantly in mitigation efforts and adaptation to climate change.

Policies and action plans for the Ministry of Finance of the Republic of Indonesia can be seen in the document published by the Fiscal Policy Office (2009). The document describes the main activities of the Ministry of Finance of the Republic of Indonesia in 2010, are:

1. Support for climate policy decision processes through development of white papers based on special studies, as well as macro/micro economic assessments and modeling. This work would be integrated with ongoing modeling and capacity development activities. A series of focus group discussions is planned to compile information on methodology and measurement for reaching national emission reduction targets for 2020.
2. Capacity development to ensure that the unit has the appropriate skills for managing policy development, quantitative policy analysis, environmental economics, legal analysis and drafting, macro economic impact modeling, and risk analysis. Training will be carried out on several economic modeling approaches that allow the quantification of the effects of climate change policies and financing interventions at sectoral level.
3. Forecasting budget allocation and external funding for climate change activities through 2020.
4. Public dissemination of analytical findings from studies related to climate change.

B. Local Economic Development and Fiscal Instruments

National Summit on Climate Change in Bali (2011) gives direction that the Government of Indonesia has a commitment to address climate change

impacts. This commitment is directly related to development plan policy. National Medium-Term Development Plan (RPJMN) 2009-2014 has set environmental management priorities aimed at "conservation and utilization of the environment to support economic growth and sustainable prosperity, accompanied by mastery and disaster risk management in anticipation of climate change". This is in line with Indonesia's commitment to GHG emission reduction of 26% of bussiness as usual in 2020, performed in 5 (five) sectors, namely Forest and Peat 22.78%, Waste 1.63%, Agriculture 0.27%, Industry 0.03%, and 1.29% for Energy and Transport.

Based on the economic potential that can still be managed, until the year 2010 Indonesia remains one of the major manufacturers in the world for various commodities, including oil palm (producer and largest exporter in the world), cacao (the world's second largest producer), tin (the second largest producer in the world), nickel (the fourth largest reserves in the world) and bauxite (the seventh largest reserves in the world) as well as other commodities such as steel, copper, rubber and fishery. Indonesia also has a very large energy reserves such as coal, geothermal, natural gas, and water is mostly used to support the mainstay industries such as textiles, shipbuilding, transportation equipment and food-beverage.

Economic development, environmental impact and fiscal policies that can be applied in Indonesia related to controlling GHG emissions can be seen in Table 2. In this table the local economic development in Indonesia is based on several economic corridors with an emphasis on industry clusters. Activities undertaken in each of these industry clusters will lead to a variety of environmental impacts. In the case of fiscal decentralization in Indonesia, the environmental impact of control policies can refer to or integral with the central government fiscal instruments taxes. However, local governments can also implement a policy of retribution. This policy is relatively easier to apply primarily to support the green city in Indonesia.

Table 2

Local Economic Development, Environment and Fiscal Instruments in Indonesia

No.	Area and Economic Corridors	Industry Cluster	Average of (LPI/GDRP), 2005 - 2010 (%)	Correlation of LPI – GDRP, 2005 – 2010	Enviromental Impacts Identification	Fiscal Instruments Identification
1	Sumatera Center for Production and Processing the Earth Resources and National Energy Barn	-Palm trees -Rubber -Coal -Shipping -Iron-Steel -National Strategic Areas Sunda Strait	-Aceh (0.05) -North Sumatera (0.07) -Riau (0.18) -West Sumatera (0.20) -South Sumatera (0.85) -Jambi (0.12) -Lampung (0.27) -Bengkulu (0.86)	-Aceh (0.19) - North Sumatera (0.97) -Riau (0.75) - West Sumatera (0.99) - South Sumatera (0.99) -Jambi (0.98) -Lampung (0.99) -Bengkulu (0.99)	- waste - Crater Mining - Industrial rubbish -Water pollution	-Taxes -Local Retributions
2	Java Thrusters National Industries and Services	-Food and Drink -Textile -Transportation Equipments -Shipping -Telematica -Defend Equipments System	-Jakarta (0.06) -West Java (0.03) -Central Java (0.03) -Jogjakarta (0.29) -East Java (0.03) -Banten (0.10)	-Jakarta (0.84) - West Java (0.99) - Central Java (0.99) - Jogjakarta (0.99) - East Java (0.99) -Banten (0.98)	-Industrial rubbish -Air pollution -Waste -Water pollution	-Taxes -Local retributions -Carbon Pricing
3	Kalimantan Center for Production and Processing of National Mines and Energy	-Oil and gas -Coal -Palm trees -Iron-steel -Bauxite -Forestry	-East Kalimantan (0.03) -South Kalimantan (0.29) -Central Kalimantan (0.91) -West Kalimantan (0.23)	- East Kalimantan (0.13) - South Kalimantan (0.99) - Central Kalimantan (0.99) - West Kalimantan (0.99)	- Crater Mining -Forestry Disaster	-Taxes -Local retributions -Reforestation and Conservation
4	Sulawesi Center for Production and Processing on National Agriculture, Plantation, Fisheries, Oil and Gas, and Mining	-Agriculture (food) -Cacao -Fishery -Nickel -Oil and gas	-North Sulawesi (0.45) -South Sulawesi (0.13) -Southeast Sulawesi (0.48) -Gorontalo (0.19) -Central Sulawesi (0.40) -West Sulawesi (0.12)	- North Sulawesi (0.99) - South Sulawesi (0.99) - southeast Sulawesi (0.99) -Gorontalo (0.99) - Central Sulawesi (0.98) - West Sulawesi (0.99)	-Industrial rubbish - Crater Mining -Water pollution	-Taxes -Local retributions

5	Bali and Nusa Tenggara Gateway Support of National Tourism and Food	-Tourism -Fishery -Animal husbandry	-Bali (0.28) -East Nusa Tenggara (0.19) -West Nusa Tenggara (0.14)	-Bali (0.99) -East Nusa Tenggara (0.99) -West Nusa Tenggara (0.97)	-Water pollution -Waste	-Taxes -Local retributions
6	Papua and Kepulauan Maluku Center for Developing National Food, Fisheries, Energy, and Mining	-Agriculture (food) -Copper -Nickel -Oil and Gas -Fishery	-Maluku (0.69) -North Maluku (0.15) -Papua (0.44) -West Papua (0.29)	-Maluku (0.98) -North Maluku (0.99) -Papua (0.44) -West Papua (0.55)	-Industrial rubbish - Crater Mining -Water pollution	-Taxes -Local retributions

Source: - Kementrian Koordinator Perekonomian RI (Coordinating Ministry for Economic Affairs RI), *Masterplan Percepatan dan Perluasan Pembangunan Ekonomi Indonesia 2011-2025* (*Masterplan of Economic Development Acceleration and Expansion of Indonesia 2011-2025*), Jakarta, 2011.
-Data analysis (average, correlation, and fiscal instrument)

Note: LPI is local per capita income, and GDRP is gross domestic regional product.

Based on the calculation of the ratio of the average local per capita income (RPI) to the gross domestic regional product (GDRP) can be seen that the ratio value for all provinces in Indonesia less than 1%. However, the correlation between GDRP and RPI is closing to 1. This information may be one consideration for local governments in Indonesia to establish the appropriate fiscal instruments, affordable by the community. It is intended to facilitate local government in achieving optimal economic development, environmental impact reduction targets (climate change) and increased community participation. Appropriate fiscal instruments, affordable by the community in the context of fiscal decentralization in Indonesia is retribution. Meanwhile the tax policy should follow central government policies.

Sumatra Region is focused on the Center for Production and Processing the Earth Resources and the National Energy Barn. In this region some of the developed industrial clusters are Palm trees, Rubber, Coal, Shipping, Iron-Steel, National Strategic Areas of Sunda Strait. Identification of the environmental impact of industrial activities in Sumatra Region are waste, crater mining, industrial rubbish, and water pollution. While the identification of environmental impacts related fiscal instruments in the Sumatra Region are the Taxes and Local Retributions.

Economic conditions in the Sumatra region in the year 2005 - 2010 can be seen from the development of GDRP (gross domestic regional product) and per capita income. The ratio between the per capita income of GDRP are: Aceh (0.05%), North Sumatra (0.07%), New York (0.18%), West Sumatra (0.20%), South Sumatra (0.85%), Edinburgh (0.12%), Lampung (0:27%), and Bengkulu (0.86%). Value of the ratio shows the per capita income contribution to GDRP. The higher value of the ratio can be interpreted that the region's economy developed along with improvements in public welfare. Conversely, the lower value the ratio indicates that economic development has not been able to improve the welfare of the community. This means that the quality of the economy is not maximize.

Java region is focused on the thrusters National Industries and Services. Industries in Java region are the Food and Drink, Textile, Transportation Equipments, Shipping, Telematica, and Defend System Equipments. Development of industrial activities will be able to create a negative impact on the environment. Negative impacts on the environment are rubbish Industrial, Water pollution, Waste, and Water pollution. Negative

impacts need to be controlled or reduced. Fiscal instruments for environmental control in Java region are Taxes, Local retributions, and Carbon Pricing.

Economic development and welfare of the people on the Java region have a strong correlation. However, the public welfare contribution to the regional economy is relatively low. Correlation values in each region were Jakarta (0.84), West Java (0.99), Central Java (0.99), Jogjakarta (0.99), East Java (0.99), and Banten (0.98). Meanwhile the value of contributions in each region, are: Jakarta (0.06%), West Java (0.03%), Central Java (0.03%), Jogjakarta (0.29%), East Java (0.03%), and Banten (0.10%). These conditions provide direction to the government to focus on improving the welfare of society, not only the target of increasing the economy. It is given that Java is a barometer of the national economy. Economic development that is not offset by an increase in the welfare of society at large would create a disincentive for people to participate in improving the condition of economy. Form of disincentive is the unwillingness to be more productive over time. In addition, it could be a disincentive to the insensitivity of community about negative impacts of economic activity on the environment.

Kalimantan regoin is directed on Center for Production and Processing of National Mines and Energy. Industries in this area are Oil and gas, Coal, Palm trees, Iron, steel, Bauxite, and Forestry. Industry activity in this area will impact on the environment such as the Crater Mining, and Forestry Disaster. Environmental impacts can be controlled with fiscal instruments such as Taxes, Local retributions, Reforestation and Conservation. Based on the calculation of the ratio between income per capita on GDRP during the year 2005 - 2010 can be seen that the ratio value is below 1%. Ratio values are East Kalimantan (0.03%), South Kalimantan (0.29%), Central Kalimantan (0.91%), and West Kalimantan (0.23%). This condition explains that the economic development in the Kalimantan region has not been able to significantly improve the welfare of the community. It is possible the economic development in the region is largely driven by the activity of medium and large industry. Industries have not been able to involve the community in the region of Borneo to the fullest.

Sulawesi region is directed on Center for Production and Processing on National Agriculture, Plantation, Fishery, Oil and Gas, and Mining. Industries in this area are Agriculture (food), Cacao, Fishery, Nickel, Oil and gas. Industry activities can impact negatively on the environment such as the industrial rubbish, Crater Mining and Water pollution. Environmental impacts need to be controlled or reduced. Instrument controller can through fiscal instruments,

are Taxes and Local retributions. Based on economic development, income per capita and GDRP, it is known that both are relatively low ratio. Ratio values are North Sulawesi (0.45%), South Sulawesi (0.13%), Southeast Sulawesi (0.48%), Gorontalo (0.19%), Central Sulawesi (0.40%), and West Sulawesi (0.12%). The value of this ratio indicates that the economic development in Sulawesi region has not been able to significantly improve the welfare of the community. Several large industrial, fisheries industry, is growing especially in this region need to increase the active role of the community. In addition, the industry also needs to increase awareness on environmental conservation from stakeholders.

Bali and Nusa Tenggara regions are focused on the Gateway Support of National Tourism and Food. Growing industries in the region are Tourism, Fishery and Animal husbandry. Industry activities can impact negatively on the environment. Negative impacts on the environment are the pollution and Waste Water. Negative impacts on the environment need to be controlled or reduced. Fiscal instruments can be used to control the environmental impact. They are Taxes and Local retributions. Economic development in Bali and Nusa Tenggara regions can be seen from GDRP development and per capita income. The ratio between income per capita on GDRP are Bali (0.28%), East Nusa Tenggara (0.19%), and West Nusa Tenggara (0.14%). Both of these areas can maximize the community's role in optimizing fish production capacity and maintain interest in a foreign society against various types of tourism. Active role of society is not only beneficial to the local economy but also beneficial to the increase in welfare.

Papua and Maluku Islands are focused on Developing National Center for Food, Fisheries, Energy, and Mining. Growing industries in this area are Agriculture (food), Copper, Nickel, Oil and Gas, and Fishery. Industrial activities can impact negatively on the environment such as industrial rubbish, Crater Mining, and Water pollution. Negative impact on the environment needs to be controlled through fiscal instruments. Fiscal instruments can be applied to this area such as taxes and local retributions.

Economic development in Papua and Maluku Islands can be seen from GDRP development and per capita income. The ratio between income per capita on GDRP is less than 1%. Ratio value are Maluku (0.69%), North Maluku (0.15%), Papua (0.44%), and West Papua (0.29%). Based on the value of this ratio can be seen that the eastern region of Indonesia has been unable to perform the optimization of the economy and public welfare. This

condition is relatively logical as eastern Indonesia have limited on infrastructure and human resources. However, the orientation of the government for economic development in eastern Indonesia is correct. However, the orientation is still fully support the community of the eastern region of Indonesia.

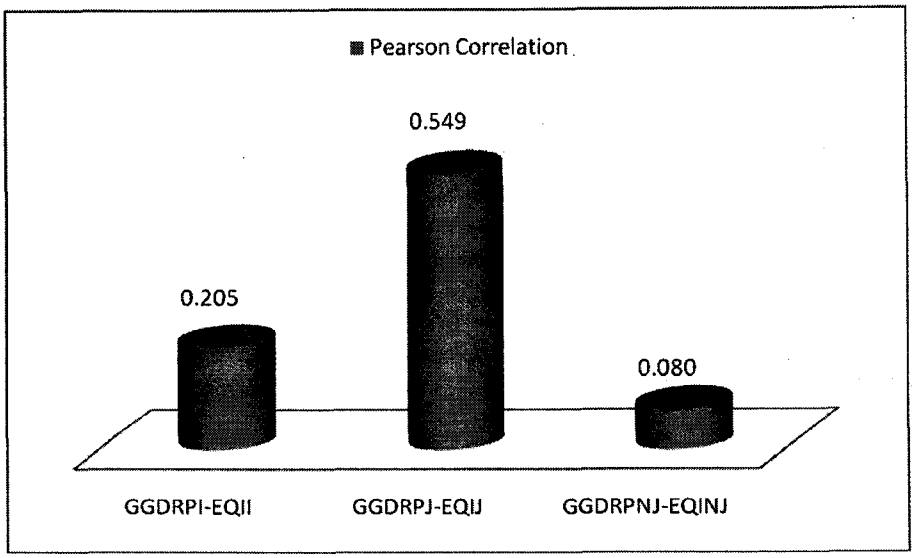
Based on Table 2 can be observed the identification of the impact of industrial activities on the environment and fiscal instruments for its control. Taxes and Local retributions are fiscal instruments that can be applied in all regions of Indonesia. However, the implementation of fiscal instruments in the form of a local retribution is relatively easy to implement. It is based on the retribution rate is considered based on the real conditions in their respective areas. In addition, the environmental retribution tariffs can be set by local governments, but still referring to government regulations.

Meanwhile, the identification of the negative environmental impact on industrial activity in each region is based on the type of industry in the area. It reflects the early indication of the impact of climate change in Indonesia. Further analysis of the indications of climate change in Indonesia is through the analysis of regional environmental quality. Analysis of environmental quality will be correlated to the growth of local economies.

Testing the correlation between local economic growth and environmental quality index in Indonesia is indicating of a weak correlation (Figure 4). This is consistent with the degree of correlation between local economic growth and environmental quality index of non Java. Different conditions occur in Java, the correlation between local economic growth and environmental quality index is moderately correlated. This becomes important for the government information related to economic development and environmental policy (environmentally sound economic development). Java is an economic region with the largest proportion of economic activity in Indonesia. However, Java will also provide a relatively large negative impact on the quality of the environment in Indonesia. The treatment is balanced between economic activity and environmental impacts in Java would be a barometer in the non regions of Java.

Figure 4

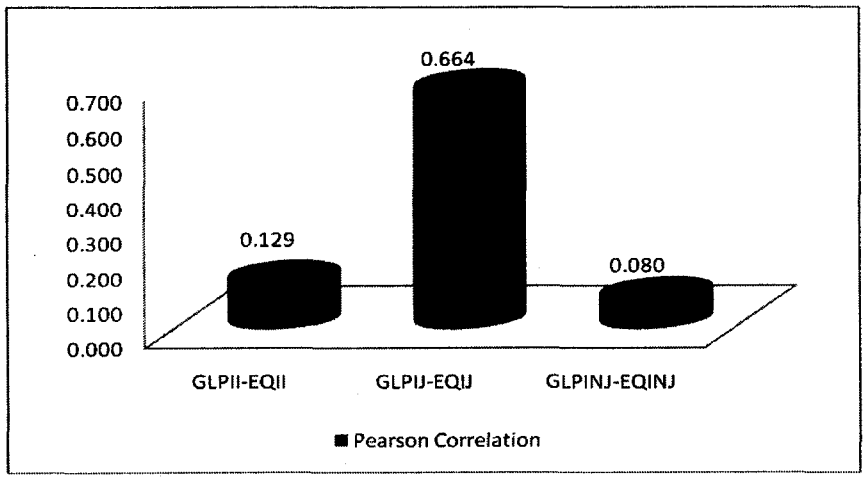
Correlation between Growth of Gross Domestic Regional Product and Environmental Quality Index in Indonesia, 2009



Source: BPS and Ministry of Environment RI (processed)

Note:
a). GGDRPI is growth of gross domestic regional product in Indonesia, and EQII is environmental quality index in Indonesia
b). GGDRPJ is growth of gross domestic regional product in Java, and EQIJ is environmental quality index in Java
c). GGDRPNJ is growth of gross domestic regional product in non Java, and EQINJ is environmental quality index in non Java

Figure 5
Correlation between Growth of Local Per Capita Income and Environmental Quality Index in Indonesia, 2009



Source: BPS and Ministry of Environment RI (processed)
Note: a). GLPII is growth of local per capita income in Indonesia, and EQII is environmental quality index in Indonesia
b). GLPIJ is growth of local per capita income in Java, and EQIJ is environmental quality index in Java
c). GLPINJ is growth of local per capita income in non Java and EQINJ is environmental quality index in non Java

Figure 5 describes the correlation between local per capita income growth and environmental quality index in Indonesia. The figure shows that the correlation both variables in 2009 tend to be weak. These conditions are suitable for testing the correlation between local per capita income growth and environmental quality index of non Java. The test result is different between the local income per capita growth and environmental quality index in Java, moderately correlated. Figure 4 and 5 illustrate a relatively consistent on economic activity and environmental conditions in Indonesia, Java and non Java.

For comparing the application of fiscal policy instruments to control climate change can be seen in Table 3. Based on this table the financial instruments described in some of the world's advanced city like Paris, London, Tokyo, Mexico City, Los Angeles and others. Local governments in Indonesia may consider a variety of fiscal instruments to be applied in each region.

Tabel 3

Financial/Fiscal Instruments in Selected City's Climate Change Plans

No.	City	Financial/Fiscal Instrument
1	Paris	a. Innovative financial partnerships needed between national, local and local governments in renovation of buildings. Involve banks for attractive interest rates and adjust loan repayment charges to the cost effectiveness of the energy-saving work. b. Voluntary fund to finance sustainable development project in tourism. c. Total cost-based accounting method. d. Tax credit in property tax for energy-saving renovation (from 2008). e. Energy-saving certificates or projects set up by the Caisse des Depots et Consignations buying emission reductions and selling on international carbon market. Carbon credit; finance social housing. f. Discount rates in parking tariffs for small and electric vehicles. g. Shifting burden to eco-taxes: transferring TIPP to STIFF, raising Versement Transport, transferring FARIF to local authorities. h. Fines for energy suppliers that do not save energy, giving them an incentive to partner with local authorities by financing part of investments. i. Performance information (Bleu budgetaire).
2	Mexico City	Additional resources from sale of GHG emission reduction credits.
3	London	a. Introduce carbon pricing; host carbon-trading markets. b. Carbon pricing for transport: charge cars to enter in the central business area on the basis of their carbon emission levels. c. Become world leader in financial development on climate change: carbon emission trading, green funds, pricing climate change risks, financing climate change research. d. Lobby the national government to change vehicle charges in different Vehicle Excise Duty bands. e. Support carbon pricing initiatives: permit-

		parking charges on the basis of CO2-emissions.
4	Tokyo	a. Climate Change Fund. b. Examine the introduction of Energy Efficiency Promotion Tax System.
5	Philadelphia	a. Systems benefit charge for demand side management programmes by local utilites. b. Update pricing of parking.
6	Austin	Development of carbon offset credits
7	Toronto	a. Investigate road pricing in the Greater Toronto Area. b. Financial incentives to use public transit.
8	Portland	a. Public utility charges funding energy conservation programmes. b. Support extension of the State Business Energy Tax Credit.
9	Los Angeles	Increase of LA Department of Water and Power rebates for energy efficient investment by customers.
10	San Fransisco	a. Expand transportation impact fee assessment to all the downtown commercial space. b. Increase Gas Tax. c. Investigate congestion pricing and cordon tolls. d. Consider charging market rates for parking permits; differentiate parking rates based on vehicle size. e. Collecting parking lot taxes from hotels. f. Differentiate vehicle registration fees based on vehicle size or emissions. g. Promote bridge toll waivers for alternative fuel vehicles. h. Commuter tax benefit programmes for city and county employees. i. Reduce city permit fees for solar energy. j. Provide differentiated rates for waste recycling.
11	Seattle	a. Road pricing b. Parking tax: implementation and increase c. Consider open-space impact fee
12	Stockholm	Congestion charge

Source: Lamia Kamal-Chaoui and Alexis Robert (eds.), *Competitive Cities and Climate Change*, OECD Local Development Working Papers No 2, 2009.

Note: the elements in the table have the common characteristic of being mentioned in the city's climate change plan, but express a large heterogeneity, as they refer to measures already implemented as well as projected plans and principles.

C. Indonesia's vulnerability to Climate Change

Indonesia is an archipelagic country relatively vulnerable to climate change. Various researches and government policies try to explain and quantify of Indonesia's vulnerability phenomenon. In general, Indonesia has the potential vulnerable to climate change in several aspects. These aspects are the increase in temperature, higher rainfall, rising degradation of coastal areas, and food security, marine biodiversity. Based on these aspects, Indonesia must be based on sustainability several orientations. They are emphasized on:[14]

1. The cost of environmental degradation and climate change decreases, so that the less wealth is diverted from growth;
2. Environmental management with a focus on contributing to poverty alleviation;
3. Renewable resources are used sustainably.

Climate change which is not quickly controlled will have a direct impact on economic conditions, poverty, health and the environment. Based on the degree of vulnerability at the local level, Jakarta is one of the areas in Indonesia are quite vulnerable to climate change. In addition, West Java region is also relatively vulnerable to climate change. It is based on several factors such as high population, high pollution, ecosystem disorganization, floods and landslides. They give a signal to local governments and central government to formulate environmental policy and sustainable economic resilience.

Some coastal areas in Indonesia are also indicated vulnerable to climate change, for example Cirebon coastal. This area indicated that the relative erosion will occur because it is a coastal area with low elevation. In addition, the area most beaches experienced erosion in various scales, land use and exploitation of water resources in line with population growth and economic activity.[15].

Under the conditions of vulnerability of the region in Indonesia, there are some precautions that need to be done by the government. *First,* in the short term the government policy focuses on aspects of the reduction of fuel consumption by reducing the number of private vehicles circulating on the

[14] World Bank, *Adaptasi terhadap Perubahan Iklim (Adaptation to Climate Change)*, Jakarta, Undated.

street, tightening the exploitation of underground water resources, establishing policies and penalties against to people who are taking the garbage out in the watershed, and implementing pro-environmental policies on industrial activities.

Second, the government's medium-term policy focuses on the identification of landslide prone areas, deforestation, destruction of coastal areas, acceleration of the development of environmentally sound economic and spatial plans (national and local). At this stage the government must implement economic development policy with reference to MP3EI, spatial plans and policies to anticipate of climate change at national and international level.

Third, in the long-term the government policy focuses on sustainable economic development, environmental quality and sustainable resource use. This stage will determine the active role and strategic position of Indonesia on the world in the achievement of economic development, social welfare and the anticipation of climate change.

D. Regulatory - Invitations and Indonesia Green

Indonesia is a country in Southeast Asia that has been committed to anticipate the impact of climate change. Commitments are followed through in the form of establishing regulations and policies of Indonesia Green. Some of these regulations are:

1. Act No. 6/1994 on the Ratification of the United Nations Framework Convention on Climate Change (UNFCCC).
2. Act No. 17/2004 on the Ratification of the Kyoto Protocol to the United Nations Framework Convention on Climate Change.
3. Regulation of the Minister of Finance of the Republic of Indonesia 101/PMK.04/2007 number of exemption from import duty on import equipment and materials used to Prevent Environmental Pollution.
4. Act No. 30/2007 on Energy.
5. Decision of the Minister of Environment No. 408/2006 on Board Consideration Assessment toward Green Indonesia Program. Green Indonesia is one of the programs of the Ministry of Environment Republic of Indonesia. It is expected to enhance the environmental

[15] Ricky Rositasari, dkk.," Kajian dan Prediksi Kerentanan Pesisir terhadap Perubahan Iklim: Studi Kasus di Pesisir Cirebon (Coastal Vulnerability Prediction to Climate Change: Study Case in Cirebon Coastal Land)", *Jurnal Ilmu dan Teknologi Kelautan Tropis*, Vol. 3, No. 1, hal. 52-64, Juni 2011.

quality and open opportunities for people to take an active role in the preservation of natural resources and environmental control.

Indonesia Green policy is supported by the strategic plan documents of the ministry of environment of Indonesia in 2010 to 2014. This strategic plan led to the four priority programs, are: 1) control of pollution and environmental destruction, 2) protection and conservation of natural resources, 3) development the capacity of natural resource management and environment, 4) improvement quality and access to information resources and the environment. In the context of the response of local governments in Indonesia, local policy makers have agreed to establish an environmental policy and green city. It can be seen in two policies or documents are the green city map analysis and review of local spatial plan by adopting the concept of climate change, Indonesia Green and green city.

II.2. Discussion

Local economic development in Indonesia is focused on the economic potential specialization. Specialization lies in determining the policy of the economic corridor of each region. On the one hand, the economic policy is expected to drive local economic development acceleration. But on the other hand, central government needs to be aware of it impact to the quality of the environment (will be leading on climate change). In this context, central and local government need to formulate environmental control instruments. Instruments in this policy are taxe, retribution and carbon pricing. Specifically for local government is expected to review the implementation of the environmental retribution (climate change). Implementation of the environmental retribution on each local government has various level of tariff. The level of tariff is figuring out differences in the environmental impact of industry and community activities. In addition, the differences are also based on ability or willingness to pay of industry and society.

The resuls of the linkage between economic development and environmental quality in Indonesia is a weak correlation. This is need to be aware by the central and local government in Indonesia. Empirically, this is corresponding with finding of Ministry of Environment RI (2010). This suggests that local economic development in Indonesia has been unable to adjust to the environmental quality improvement.

The central government needs to do some strategic actions. *First*, the central government needs to adjust policies to control local economic corridor to climate change. *Second*, the central government need to give authority to local governments for determining and implementing of control instruments for industrial activities to environmental quality. *Third*, the central government needs to implement policies of Green Indonesia and Green City consistenly.

III. CONCLUSION

Local economic development in Indonesia is based on the determination of the economic corridors with a base industry cluster. Activity in each industry cluster will produce a variety of environmental impacts directly related to climate change process. There are several fiscal instruments that can be applied in order to control climate change in Indonesia, are taxes and local retributions. In the context of fiscal decentralization, fiscal instrument in the form of local retribution is relatively easier to implement. In the context of connectedness between local economic development and climate change (environmental quality) show weakly correlated. To that end, the central government and local government need to formulate control policies and the environmental impacts of climate change in particular fiscal instruments that can be set by local governments. In addition, the implementation of Green Indonesia or green city as the implementation of climate change control must be implemented consistently with the full support of the community.

This study still have several weaknesses; a) further research is expected to perform the deepening of the implementation of environmental fiscal instruments in Indonesia, and b) further research also needs to examine and to evaluate the implementation of green city commitments in Indonesia associated with the development of local economic corridors.

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