



## Indonesia Environmental and Climate Change Policy Brief

8 September, 2008

This Environmental and Climate Change Policy Brief was carried out as a desk study during mid-2008.<sup>1</sup> In line with the Swedish development cooperation goal the document aims to summarise the key issues pertaining to environment and climate change facing Indonesia, related to poverty reduction and economic development. The Policy Brief will inform the Selective Cooperation Strategy process for Indonesia.

### Contents

Executive Summary .....	2
Introduction.....	2
1. Key Environmental Problems and Opportunities .....	3
1.1 Key environmental problems and their causes .....	3
1.2 Opportunities .....	5
2. Effects of the Environmental Problems .....	6
2.1 Impacts on Poverty (Vulnerability, Security, Opportunity) .....	6
2.2 Impacts on Economic Development.....	7
2.3 Impacts on Health.....	7
3. Indonesia and Climate Change .....	8
3.1 Trends and future climate .....	8
3.2 Impacts of climate change .....	9
3.3 Response to Climate Change - Mitigation.....	10
3.4 Response to Climate Change - Adaptation.....	10
3.5 Capacity for Adaptation and Mitigation.....	11
4. What key actors are doing to manage the environmental problems (special focus on urban water, sanitation, sewage and wastewater treatment) .....	12
4.1 National development plans .....	12
4.2 Environmental mainstreaming.....	12
4.3 Water, sanitation, sewage and wastewater treatment .....	12
4.4 Key actors .....	13
4.5 Gaps and overlaps.....	13
4.6 Other actors .....	13
5. How and to what extent are the responses to environmental problems implemented and followed-up? .....	14
5.1 Governance and enforcement .....	14
5.2 Capacity constraints.....	16
6. Conclusions and implications for Sida .....	16
6.1. Issues for Sida to consider .....	16
References.....	19
Appendix 1: Climate change and the Millennium Development Goals .....	23
Appendix 2: Sector contributions to economic growth .....	24

---

<sup>1</sup> This Environmental and Climate Change Policy Brief was written as a desk study, at the request of Sida (att: Kerstin Lindberg) and the Embassy of Sweden in Jakarta (att: Frederik Frisell) by Gunilla Ölund Wingqvist and Emelie Dahlberg at Sida Helpdesk for Environmental Economics, University of Gothenburg as part of Sida-EEU's institutional collaboration on environmental economics and strategic environmental assessment, with contributions from SEI Oxford (Ben Smith) and SwedeBio (Maria Berlekom). The views expressed in this policy brief are those of the authors and do not necessarily represent the views of Sida. Comments are welcome and can be sent to [gunilla.wingqvist@economics.gu.se](mailto:gunilla.wingqvist@economics.gu.se)

## **Executive Summary**

Indonesia is endowed with rich biodiversity and natural resources, which to a large extent has constituted the basis for the past decades of macro-economic growth. However, these natural resources have not been managed in a sustainable or equitable manner, which has led to over-exploitation and depletion. Poor environmental quality negatively and disproportionately affects the poor and their livelihood opportunities, and causes diseases as well as losses to the national economy. Indonesia is extremely vulnerable to climatic hazards, including a sea-level rise, and the impacts of climate change will be felt across different sectors. There is greater awareness of climate change mitigation than of adaptation, although mitigation and adaptation are strongly coupled in Indonesia.

Indonesian environmental legislation is extensive and detailed but lacks common vision and established policies, and implementation and enforcement remains very weak. The rapid decentralisation has created additional challenges for environmental and natural resources managers. These challenges can, however, be turned into opportunities; there is a high potential for pro-poor economic growth, provided there is good governance, effective regulatory frameworks, and rigorous environmental and social safeguards. Sustainable and equitable use of its natural resources is a prerequisite to keep Indonesia's economy competitive in the long run.

## **Introduction**

Indonesia is the world's largest archipelagic state encompassing over 17,000 islands and home to over 237 million inhabitants<sup>2</sup>, which makes it the fourth most populated country in the world. The population has more than doubled since 1970 and is estimated to grow to 262 million people by 2020.<sup>3</sup> The urbanisation rate is very high (4.4%). Two-thirds of the total population and more than half of the poor (57%) reside on Java.<sup>4</sup> Indonesia supports tremendous species diversity of both animal and plant life in its pristine rain forests and its rich coastal and marine areas. Nearly 60% of Indonesia's terrestrial area is forested. The landscape is also mountainous and volcanic with over 500 volcanoes out of which 129 are still active.<sup>5</sup> Furthermore, Indonesia holds at its disposal deposits of petroleum, natural (fossil) gas, and metal ores. Indonesia's macro-economic development during the past 30 years is to a large extent based on its natural resources. However, these resources have been exploited unsustainably and communities living in the vicinity of formerly resource rich areas are experiencing increasing levels of poverty.<sup>6</sup> Half of the population lives below the poverty line of US\$2 per day, un- or underemployment rates are high (27.6%), and corruption is a major problem at all levels of society (Transparency International's 2007 Corruption Perception Index ranks Indonesia 143 of 180 economies). Because of its size, economic importance and conflict pattern, Indonesia is of strategic importance to the development and stability of the region as a whole.

---

<sup>2</sup> CIA Fact Book

<sup>3</sup> EC, 2005

<sup>4</sup> World Bank, 2006b; and World Bank, 2008.

<sup>5</sup> World Bank, 2003

<sup>6</sup> UN CCA, 2004.

# 1. Key Environmental Problems and Opportunities

## 1.1 Key environmental problems and their causes

Below follows a short description of the key environmental problems facing Indonesia (not in order of priority):

**Deforestation:** Indonesia holds the world's third largest tropical forests, covering almost two-thirds of the country's land area, and globally significant biodiversity. Over the past 50 years Indonesia has lost over 40% of its total forest cover.<sup>7</sup> Currently the deforestation rate is very high (1.8% annually).<sup>8</sup> Between 2000 and 2005, 1.8 million ha of Indonesia's forests were destroyed (equal to eight football fields per minute). This is alarming as the forest sector provides important ecosystem services (such as regulating climate and water, providing material for fuel and medicine, etc.), significantly supports the country's economic development and contributes to livelihoods, particularly for the rural poor. The Indonesian forests are threatened by logging and agricultural clearance that results in deforestation. In addition, forests and land fires<sup>9</sup>, illegal logging, illegal mining, large scale mining and development of roads pose further pressure on the country's forest resources. Besides wood for fuel, global energy demand pose a future threat as an increase in production of biofuel has the potential to adversely affect land use and forest cover by creating incentives to convert forest into plantation crops, rather than planting in degraded areas.<sup>10</sup>

The exploitation of Indonesia's forests contributes to floods, landslides, and water shortages.<sup>11</sup> Moreover, it adds to soil erosion and land degradation decreasing agricultural production, hydropower production and pollutes water resources. Also, the tropical deforestation has a significant negative effect on climate change, as it is an important source of greenhouse gases.<sup>12</sup> The severe forest loss undermines rural livelihoods, ecosystem services and Indonesia's ability to meet poverty alleviation goals.<sup>13</sup>

**Water resources – pollution and scarcity:**<sup>14</sup> In terms of quantity, Indonesia holds a large part (over 20%) of the Asia Pacific freshwater. Even so, water resources are scarce and Indonesia is struggling to provide clean water for human consumption, and adequate water supply for industry and agriculture. Industry, agriculture and domestic users consume the majority of the water. Water availability during the rainy season is sufficient but during the dry seasons there is a shortage of surface water supply especially on the main centres of population of Java, Bali and Nusa Tenggara. The water quality is low. Unsafe water is one of the major causes of diseases. In downstream areas less than 10% is considered to be suitable for human consumption. Industry and domestic sources are major causes of both surface and ground water pollution. The greatest industrial polluters and water consumers are the micro-industries, pulp and paper, crude palm oil, tapioca, petrochemical, oil and mining activities. There is a lack of adequate wastewater treatment and sanitation facilities in urban centres and

---

<sup>7</sup> World Bank, 2006a

<sup>8</sup> World Bank, 2008. The deforestation rate in Indonesia is significantly higher than it the other two most tropical-forested countries, Brazil (0.6%) and Democratic Republic of Congo (0.3%). The global mean deforestation rate is 0.5%.

<sup>9</sup> For thousands of years, agriculturalists have used fire to clear land for agricultural development. However, the scale of fire use has increased with the expansion of oil palm and timber plantations.

<sup>10</sup> World Bank, 2006b

<sup>11</sup> EC, 2005.

<sup>12</sup> Chomitz, K., M. 2007

<sup>13</sup> World Bank, 2006a

<sup>14</sup> EC, 2005; and World Bank, 2003.

wastewater is thrown directly into rivers and canals. Agricultural run-off and improper storage and use of agricultural chemicals (including fertilizers and pesticides) exacerbate the problems. Lack of an appropriate pricing policy and slow and declining aquifer recharge has led to over-exploitation of groundwater beyond sustainable yields and to saline intrusion in coastal areas. In addition, the lack of wastewater treatment has led to *e coli* contamination of aquifers in the Jakarta region.

**Air pollution:**<sup>15</sup> has become a major environmental problem in Indonesia, urban areas being most affected. The transportation sector contributes the most (80%) to the air pollution followed by emissions from industry, forest fires and domestic activities. The large number of vehicles together with lack of infrastructure results in major traffic congestions (mainly in urban centres) resulting in high levels of air polluting substances, which have a significant negative effect on public health, quality and quantity of crops, forests buildings and surface water quality. Besides the transportation sector, forest fires are a major contributor to air pollution on a local, national and regional scale.

**Loss of biodiversity and ecosystem services:** Indonesia is one of the 10 mega-diversity centres in the world. It supports tremendous species diversity of both animal and plant life in its rainforest and in its rich coastal and marine area. The country's rich biodiversity is being rapidly degraded. With the world's largest archipelago Indonesia's over 50,000km<sup>2</sup> coral reefs (representing 18% of the world's coral reefs) are deteriorating at rapid pace.<sup>16</sup> It is estimated that over 70% of all coral reefs in Indonesia are damaged.<sup>17</sup> 47 terrestrial, freshwater and marine ecosystems are recognised as threatened with more than 700 of the country's species threatened with extinction.<sup>18</sup> Overexploitation of natural resources, the rapid deforestation, unsustainable coastal and economic development (housing, industrial development) and bad environmental management are some of the causes of loss of biodiversity and ecosystem services. Key ecosystem services e.g. carbon sinks and carbon sequestration are declining as rainforest and peat swamps are degrading leading to more greenhouse gas emissions. Coastal zone protection against severe floods and storms e.g. coral reefs and mangroves are being degraded at rapid pace.

**Natural disaster risks:** Due to its geographic location, composition and demography, Indonesia and its population are highly vulnerable to disasters. In the last decade as many as 6.8 million people in Indonesia were affected by various types of natural disasters.<sup>19</sup> Between 2003-2005, 1 430 disasters occurred including floods, droughts, earthquakes, tsunamis and volcanic eruption.<sup>20</sup> In the 2004 Aceh tsunami nearly 170 000 people died and in the 2006 Yogyakarta earthquake over 5 700 people lost their life.<sup>21</sup> Furthermore, landslides are commonly occurring as a result of forest clearance and town development on land prone to landslides.

---

<sup>15</sup> EC, 2005; World Bank, 2003.

<sup>16</sup> UNDP, 2007/2008

<sup>17</sup> EC, 2005

<sup>18</sup> IATP, 2008

<sup>19</sup> UN, 2006

<sup>20</sup> Between 1900 and 2008, earthquakes/tsunamis have been the major cause of deaths, while droughts, earthquakes and wildfires have affected most people. Wildfires and earthquakes/tsunamis have caused the highest economic damage loss. EM-DAT: The OFDA/CRED International Disaster Database.

<sup>21</sup> World Bank 2008-06-11

**Climate change:** Indonesia is highly vulnerable to climate change. Climate change will further aggravate the above mentioned issues, particularly disaster risks. For a more detailed analysis of climate change in Indonesia see section 3 below.

**Weak environmental governance and institutions:**<sup>22</sup> Indonesian legislation within the environmental and natural resources management fields is extensive and detailed but lacks common vision and established policies. The country faces many constraints in its efforts to improve environmental regulations and policy and their application. Lack of clear mandates between central and regional governments often leads to contradictory and overlapping regulations. Lack of funds made available for environmental protection, corruption amongst officials, weak enforcement, lack of follow up on prosecution, lack of technical capability especially in local government, and perverse economic incentives all lead to over-exploitation of natural resources and environmental pollution.

## 1.2 Opportunities

According to the UN, there is currently an unprecedented window of opportunity to support the achievement of the Millenium Development Goals (MDGs) in Indonesia<sup>23</sup>: a new government committed to governance reform has been elected, the level of violence stemming from social conflicts is at the lowest level since 2001, the economy is showing sustained growth for the first time since the Asian financial crisis, and Indonesia is in focus of vast international attention. The government administration is already decentralised to a large extent, which provide an opportunity for provinces and districts to develop and implement plans adapted to local preferences. The abundant natural resources could constitute a solid basis for economic development and poverty reduction in Indonesia, provided there is good governance at all levels, effective regulatory frameworks, rigorous environmental and social safeguards, redistribution of wealth and the protection of rights.

To narrow the gap between rich forests and poor people, progress can be made by recognising that forestlands are part of the rural economy and people's livelihoods. Policies could better address the linkages among community livelihoods, investments, markets and infrastructure, rather than viewing forests as raw material for export-oriented processing.<sup>24</sup> In a longer term there is a large potential for innovative carbon funding for avoided deforestation in Indonesia. Project based transactions, such as Clean Development Mechanism (CDM), Joint Implementation Projects (JIP), or Voluntary programs are possible. However, the creation of these instruments is subject to a lengthy process and the projects themselves require several years to develop, why benefits would be gained only in a longer term.

Indonesia is endowed with resources for renewable energy. The potential for solar energy, geothermal energy and hydro power is rather good. A constraint to technological development within this field is the high price. It is still not competitive compared to fossil energy. An energy price policy could be an opportunity for the country to encourage the development of more renewable energy.

Another opportunity is to continue ongoing support (e.g. to the Indonesian Sanitation Sector Development Program), as needs in urban areas remain vast and networks and contacts are

---

<sup>22</sup> EC, 2005

<sup>23</sup> UN CCA, 2004.

<sup>24</sup> World Bank, 2006b

already established. This may prove to be efficient as time and effort for preparation could be minimised.

## 2. Effects of the Environmental Problems

### 2.1 Impacts on Poverty (Vulnerability, Security, Opportunity)

*Poverty in Indonesia is closely related to access to and quality of natural resources. Poor communities are very vulnerable to changes in the pattern of natural-resource utilisation and changes in the natural environment, as a majority of the poor are depending on these natural resources for their livelihoods. The process of becoming poor occurs with the narrowing and loss of sources of earnings of the poor communities due to the decline in the quality of the environment, mainly forests, sea, and mining areas.<sup>25</sup> Thus, degradation of natural resources negatively and disproportionately affects the poor and their livelihood opportunities..*

17% of all Indonesians live in extreme poverty and half of the population lives on less than US\$2 per day.<sup>26</sup> Most of the poor live in rural areas with agriculture as the main source of livelihood.<sup>27</sup> Urban poverty has become a serious problem in Indonesia and while rural and total poverty rates declined, urban poverty has been increasing (1.15% between 1999–2002).<sup>28</sup> According to the UN, *the major causes of poverty and hunger* include: insufficient budgetary allocations to key human development sectors, unemployment, poor nutrition, unfulfilled basic rights, and a lack of adequate livelihood opportunities, gender and culture disparities and the over-exploitation of natural resources.<sup>29</sup> Given the high rate of poverty, there is a large group of people who are highly vulnerable to external shocks such as natural disaster or price rises of food staples.

Approximately 40 million Indonesians are directly dependant on forest resources. Poor people are most dependent on natural resources for their livelihoods and suffer the most from the loss of biodiversity and the degradation of ecosystem services. Half of the country's poor are severely affected by deforestation as it limits their access to the forest, which bring with it *livelihood- and human rights problems* for a large part of vulnerable groups including indigenous people.

Furthermore, the coastal and marine sector (particularly small scale fisheries) contributes significantly to the country growth as millions of poor people depend on them for employment and their livelihood. Two thirds of the Indonesian population live less than 100 km from the coast and rely on fish for 60% of their animal protein intake.<sup>30</sup> However, fishermen are presently experiencing drastic drops in their catch.<sup>31</sup>

The process of democratisation and decentralisation of political power have increased the opportunities for local natural resource management but it has also increased the poor

---

<sup>25</sup> MDTP 2004-2009

<sup>26</sup> According to the Human Development Report 2007/2008 the Human Development Index is 0.728 ranking Indonesia 107<sup>th</sup> out of 177 countries, and the country's Human Poverty Index ranks the country 47<sup>th</sup> out of 108 countries.

<sup>27</sup> World Bank, 2006b; UNEP Integrated Assessment of the PRSP.

<sup>28</sup> Marcus et al, 2006

<sup>29</sup> UN CCA, 2004.

<sup>30</sup> UN, 2006

<sup>31</sup> MTDP 2004-2009.

people's demand for increased access to, and compensation for, lost natural resources (e.g. agricultural land and forest). Hence, conflicts over natural resources between the poor and commercialised exploiters have increased.<sup>32</sup>

## **2.2 Impacts on Economic Development**

*Even though the Indonesian economy is based on its natural resources, the natural capital is consumed rapidly in an unsustainable way, causing human poverty as well as losses to the national economy. Indonesia must balance the need of making productive use of its natural resources with maintaining and managing its natural capital.*

Indonesia is highly dependent on its natural resources, which have been, and still are, the basis for Indonesia's economic growth. Numerous wild plants and animals are harvested for domestic or commercial consumption for food, handicrafts, medicines, and materials for fuel and constructions.<sup>33</sup> The forests and coastal and marine areas' exceptional biodiversity are a source of livelihoods, nutrition and economic growth. Agriculture, forestry and mining contribute to about 25% of the country's GDP. However, the natural resources have not been managed in a sustainable or equitable manner, which has led to over-exploitation, depletion and increased poverty.<sup>34</sup> The economic growth rate in 2007 (6.3%) was the highest since 1996. The agricultural output growth of 3.5% was mainly driven by an increase in rice production and higher world prices for plantation crops (e.g. palm oil and rubber).<sup>35</sup>

The growing population pressure together with inadequate environmental management is a challenge for Indonesia. For example, total economic losses attributable to limited access to safe water and sanitation are estimated to be equivalent to more than 2% of GDP (or close to US\$29 per person) annually while the annual costs of air pollution to the Indonesia economy have been calculated at around US\$400 million.<sup>36</sup> The failure to treat wastewater leads to pollution of water sources, which further raises costs of clean water production and contributes to the high prevalence of typhoid and other water-related diseases with related health costs. According to the EC, illegal logging has reach epidemic proportions in Indonesia with an estimated loss to State revenue of up to IDR 30.42 trillion per year (>USD 3 billion).<sup>37</sup>

## **2.3 Impacts on Health**

*Poor environmental quality enhances poverty, causes diseases, and affects living standards, food security and livelihood opportunities negatively. Access to water and sanitation of adequate quality and quantity is of utmost importance for improvement of public health, reducing poverty, and achieving many of the MDGs.*

Population growth and the rapid urbanisation have created a waste disposal problem in Indonesia. Urban areas generate about 55,000 tons of solid waste every day out of only about half is collected.<sup>38</sup> Large quantities of wastewater are dumped directly into rivers and for

---

<sup>32</sup> Friends of the Earth et al., 2008; Forest Watch Indonesia et al., 2002.

<sup>33</sup> Rhee et al, 2004

<sup>34</sup> World Bank 2008-06-11; and UN CCA, 2004.

<sup>35</sup> ADB, 2008

<sup>36</sup> World Bank 2008-06-11

<sup>37</sup> These figures are much higher than those produced by the World Bank which estimates the losses to be in the order of IDR 5.4 trillion per annum (USD 0.6 billion). EC, 2005.

<sup>38</sup> MacMillan, 2007

proper solid waste disposal there is little reuse or recycling undertaken. These trends pose a health threat to the urban population, especially the poor.<sup>39</sup> There is significant difference between rural and urban households in terms of access to improved sanitation. In rural areas only 40% have access to improved sanitation while the number for urban areas is 73%. 77% of the Indonesian population have access to improved water sources.<sup>40</sup> However, only half of the population obtained its water from sources further than 10 metres from excreta disposal sites (a universal standard for water safety). High occurrences of diarrhoea, skin disease, intestinal and other waterborne diseases in low-income communities therefore remain a frequent obstacle to improving child health more generally. WHO estimates that there are more than 75 000 annual deaths in Indonesia due to diarrhoea caused by polluted water/bad hygiene, indoor air pollution and outdoor air pollution. See table below for comparison with neighbouring countries Malaysia, Philippines and Vietnam.

WHO estimates	Water Sanitation & Hygiene		Indoor air pollution		Outdoor air pollution	
	Country	Diarrhoea deaths/year	Diarrhoea DALYs/1000 cap/ year	Deaths/year	DALYs/1000 cap/ year	Deaths/year
<b>Indonesia</b>	<b>31 200</b>	<b>5</b>	<b>15 300</b>	<b>1.5</b>	<b>28 800</b>	<b>1.2</b>
Malaysia	300	1	<100	0.0	500	0.2
Philippines	10 600	5	6 900	3.0	3 900	0.5
Vietnam	9 400	4	10 600	2.0	6 300	0.5

Source: WHO, 2007

Indonesia is still lagging behind its neighbours on major health outcome indicators such as infant and under five mortality and maternal mortality rates, due to e.g. poor quality of and access to basic healthcare, especially by the lowest poverty quintiles, and low levels of preventative care. Furthermore, Indonesia has some of the lowest rates of access to water, energy and sanitation services in the region.<sup>41</sup>

### 3. Indonesia and Climate Change

#### 3.1 Trends and future climate

Indonesia is extremely vulnerable to climatic hazards, and the frequency of natural hazards appears to be increasing<sup>42</sup>, for example before 1960 droughts occurred once every 4 years, and after 1960 droughts occurred once every 3 years<sup>43</sup>. Since 1990 the temperature in Indonesia has increased by 0.3C, and it is expected to increase in the range of 1.5-3.7C by 2100, with a mean increase across models of 2.5C.<sup>44</sup> It is difficult to generalise about changes in precipitation, however some studies indicate that the trend for increasing precipitation in the North of Indonesia, and decreasing precipitation in the South will continue in the future.<sup>45</sup> Changing climate is already affecting the timing of seasons in Indonesia, with the onset of the wet season delayed by up to 20 days in the period 1991-2003 compared to 1960-1990 in parts of Sumatra and Java, and it is expected that climate change will cause a longer dry season and

<sup>39</sup> EC, 2005

<sup>40</sup> WB, 2008

<sup>41</sup> WB, 2007

<sup>42</sup> Suryanti, 2006

<sup>43</sup> UNDP, 2007

<sup>44</sup> IPCC, 2007

<sup>45</sup> AIACC 2006, MOE 2007.



more intense wet season over much of Indonesia.<sup>46</sup> There will be significant local variations to these changes, but further work, perhaps using downscaled climate data or regional climate models is needed to examine these differences.

El Niño has a large impact on Indonesian climate, its effects including decreased rainfall and water storage and an increased area affected by drought and fire amongst others, whereas La Niña increases precipitation and is linked to flooding.<sup>47</sup> It is difficult to assess the impact of climate change on El Niño, but the number and intensity of events has increased over the last 100 years, and it has been argued that current El Niño conditions may serve as a proxy for future conditions in Indonesia under climate change. It is also not possible to say what the effect of climate change on tropical cyclones will be, although it is clear they will continue to be a major hazard in Indonesia.

### **3.2 Impacts of climate change**

As an archipelago, Indonesia and its population are extremely vulnerable to sea-level rise, with the 42 million people who live less than 10m above sea-level particularly at risk. A 1m rise in sea-level could inundate 405,000ha of land and reduce Indonesia's territory by inundating low-lying islands which mark its borders, and a 50cm rise in sea-level, combined with land subsidence in Jakarta Bay, could permanently inundate densely populated areas of Jakarta and Bekasi with a population of 270,000.<sup>48</sup> The impacts of climate change will be felt across many different sectors. Agricultural production will be disrupted by changing rainfall patterns, increased drought, inundation of productive coastal areas and an increase in the incidence and range of pests due to higher temperatures.<sup>49</sup> It is difficult to predict local effects on production, however several studies suggest yields will decrease, for example farmers may no longer be able to plant 2 rice crops due to a shorter rainy season. Decreased rainfall in many areas, combined with higher temperatures and increased demand is likely to require water storage or water transfer mechanisms to equitably distribute diminished or more erratic water resources.<sup>50</sup> Sea-level rise will disrupt coastal fish and prawn farming, and changing distribution of marine species may make fish catches less reliable.<sup>51</sup> Increased floods are likely from sea-level rise and extreme rain events and are expected to increase the incidence of water-borne diseases such as cholera and dysentery, while increased temperatures will aid the spread of vector-borne diseases such as Dengue Fever (which increases during warm El Niño years) and Malaria into new areas.<sup>52</sup>

Climate change could negatively affect the attainment of the MDGs in Indonesia, for example reduced yields impacting on poverty reduction (MDG 1), or reduced availability and quality of water affecting health (MDGs 4,5 and 6). It is the poorest and most marginalized groups of the population, which will be most vulnerable to climate change, as they often live in hazard prone areas, and lack access to the resources and information needed to adapt. It is vital that adaptation efforts contribute to poverty alleviation, and that pro-poor development projects incorporate adaptation so that a changing climate does not reduce the effectiveness of poverty reduction efforts. (See Appendix 1 for a table of climate change impacts on the MDGs.)

---

<sup>46</sup> Kunkel 2007, IPCC 2007

<sup>47</sup> UNDP 2007

<sup>48</sup> PEACE, 2007; and UNDP, 2007.

<sup>49</sup> PEACE, 2007; and UNDP, 2007.

<sup>50</sup> MOE, 2007.

<sup>51</sup> UNDP, 2007.

<sup>52</sup> MOE, 2007; and PEACE, 2007.

### 3.3 Response to Climate Change - Mitigation

Mitigation refers to anthropogenic actions to reduce the emissions of greenhouse gasses to the atmosphere, and thus reduce the magnitude of future climate change<sup>53</sup>, and is important in Indonesia due to its status as the 3<sup>rd</sup> largest emitter of greenhouse gasses, principally from large emissions from deforestation. Policies exist to reduce deforestation and thus emissions, but are currently not well implemented (see section 3.5). Indonesia's energy policy is to increase use of fossil fuels, in particular coal, with the result that emissions from the energy sector are expected to triple by 2030.<sup>54</sup> Policies are in place to support the use of renewables, but there is a lack of financial incentives to support these policies and encourage uptake. The government is also expanding the production of biofuel, for both domestic use and export. This is largely produced from palm oil, and will require an extra 200,000ha of plantations in 2009, driving deforestation.<sup>55</sup> Biofuel produced from *Jatropha* has the potential to rehabilitate degraded land and provide a source of rural livelihoods, but issues around deforestation and conflict over land remain to be resolved.

It is estimated that Indonesia has the potential for 235 million tonnes of CO<sub>2</sub> equivalent (mtCO<sub>2</sub>e) in emissions reductions through the Clean Development Mechanism<sup>56</sup> (CDM), however there are currently only 8 projects registered with the Executive Board of the CDM, accounting for 13mtCO<sub>2</sub>e of reductions. GTZ and the Asian Development Bank have been building the capacity for CDM in Indonesia, however, compared to neighbouring countries in Asia CDM is under-developed in Indonesia.<sup>57</sup> Indonesia is currently lobbying the UNFCCC to include the proposal on avoided deforestation (REDD), whereby developing countries would receive compensation for preventing deforestation, as part of the next international agreement on climate change. Forests provide key ecosystem services, including regulating climate, reducing flood risk by slowing run-off and maintaining habitat and biodiversity. The protection of these services can reduce the impacts of climate change (for example fewer floods) increase the ability of communities to adapt to climate change, and support livelihood activities thus aiding poverty alleviation efforts. As such, there is great potential in Indonesia for mitigation projects (CDM, and REDD if this becomes operational) which also have adaptation and poverty alleviation benefits, such as the afforestation of mangroves which also protect against rising sea-level and contribute to improved livelihoods.

### 3.4 Response to Climate Change - Adaptation

Adaptation can be seen as adjustments in human or physical systems in response to current or expected climate changes in order to cope with the impacts of climate change and take advantage of any new opportunities.<sup>58</sup> To achieve its goals for economic development and poverty reduction, in particular amongst the poorest and most marginalized sectors of population, Indonesia will need to adapt to climate change. It is also clear that many Indonesians are already adapting to climate change, for example by building houses on stilts to respond to increased flooding, or responding to decreased reliability of fish catches by

---

<sup>53</sup> IPCC, 2007b.

<sup>54</sup> PEACE, 2007; and MOE, 2007.

<sup>55</sup> PEACE, 2007.

<sup>56</sup> The Clean Development Mechanism (CDM) was set up under the Kyoto Protocol and allows industrialised countries to receive 'carbon credits' for investing in projects that reduce greenhouse gas emissions in developing countries. To qualify as a CDM project, however, the emissions reductions must be shown to be 'additional to those that would have taken place without the project. These credits then count towards the industrialised countries' obligations on emissions reductions under the Kyoto Protocol.

<sup>57</sup> PEACE, 2007.

<sup>58</sup> IPCC, 2007b.

diversifying livelihoods, and that indigenous adaptation strategies should form the base for building adaptation to future change.<sup>59</sup> Adaptation and Mitigation in Indonesia are strongly coupled, as continued rapid deforestation will not only exacerbate the impacts of climate change, but also constrain the adaptation options that are available to vulnerable communities. The priority sectors for adaptation are seen as agriculture, water, coastal and urban areas. There will be adaptation options that are specific for each of these sectors, for example faster growing crop varieties in the agricultural sector, however there are also general needs to be addressed which will build capacity for adaptation across sectors.

These include the development of a system to provide climate information to actors at different scales, for example seasonal forecasts, and training in how to use this information effectively to manage climate risks. Training in vulnerability analysis and assessment of adaptation options would help to identify priorities for adaptation. Initiatives such as the development of community action plans to cope with flooding are being pursued in the field of disaster risk reduction (DRR), but are equally relevant in building community resilience to future climate change. Following this model of community engagement in projects would address one of the problems identified with several ongoing climate change initiatives in Indonesia, that of a lack of community ownership in projects.<sup>60</sup> Adaptation to climate change will be a long-term process, and as such will require long-term partnerships and cooperation between different actors at different scales. Encouraging dialogue between these different actors, in a similar way to the workshop convened to discuss the Climate Change Adaptation Programme (ICCAP), will help to foster the relationships needed to enable adaptation to take place.

### **3.5 Capacity for Adaptation and Mitigation**

There is much greater awareness of mitigation in Indonesia than awareness of adaptation, reflecting the broader international landscape but also Indonesia's status as the 3<sup>rd</sup> biggest emitter of greenhouse gasses, 85% of which come from deforestation.<sup>61</sup> The Ministry of the Environment (MOE) has been the focal ministry for climate change, which means that integration with development priorities has been a problem, and has created certain situations where government policies such as a push to expand the use of fossil fuels, work against legislation from the MOE.<sup>62</sup> The awareness created from hosting the 13<sup>th</sup> Conference of Parties to the United Nations Convention on Climate Change (COP13) may change this, as work is ongoing on a National Adaptation Plan on Climate Change (RANPI) and the ICCAP. It appears that Indonesia is building on the momentum from hosting COP13 to further develop these policies, for example through a multi-stakeholder workshop on the ICCAP held in March by the Ministry of Environment and UNDP which will hopefully create greater awareness on adaptation amongst different government departments.<sup>63</sup> Good policies exist to reduce the rate of deforestation and protect forests, but there is limited capacity to enforce these legislations at the local level due to institutional and financial constraints. There has been a degree of decentralisation of government in recent levels, and local authorities are able to develop their own plans for forest conservation, however the same issues remain around the enforcement of these policies.<sup>64</sup>

---

<sup>59</sup> UNDP, 2007.

<sup>60</sup> PEACE, 2007.

<sup>61</sup> UNDP, 2007.

<sup>62</sup> PEACE, 2007.

<sup>63</sup> UNDP, 2008.

<sup>64</sup> PEACE, 2007.

Capacity constraints for adaptation include: (i) awareness of adaptation as an issue; (ii) ability to analyse and apply climate information; (iii) capacity to assess vulnerability to climate change; (iv) effective system for dissemination of climate information; and (v) technical assistance to assess and implement adaptation options.<sup>65</sup>

#### **4. What key actors are doing to manage the environmental problems (special focus on urban water, sanitation, sewage and wastewater treatment)**

##### **4.1 National development plans**

The top priority for the Government of Indonesia is poverty reduction as shown by Act No. 25 year 2000 on National Development Program (PROPENAS).<sup>66</sup> Indonesia's guiding development document is the Medium Term Development Plan (MTDP) 2004-2009, formulated after the first ever direct presidential elections and outlining the key policy priorities and direction of the government. The MTDP use a rights-based approach and states as its main goals: (i) a safe and peaceful; (ii) a just and democratic; and (iii) a prosperous Indonesia.<sup>67</sup> The third goal is divided into five targets, off which Target 1 (poverty alleviation), Target 4 (improved quality of the environment and management of natural resources), and Target 5 (improved infrastructure) are most relevant to water, sanitation, sewage and wastewater treatment. The government has also formulated a National Poverty Reduction Strategy (commonly referred to as the PRSP) 2004-2014. The National Planning Development Agency (BAPPENAS) took over the responsibility to draft the PRSP from the Ministry of Peoples' Welfare. This institutional change also marked a change from economic focus to a rights-based approach. Poverty reduction in Indonesia is based on four pillars: (i) opportunity creation; (ii) community empowerment; (iii) capacity building; and (iv) social protection. Gender equality, good governance, decentralisation and environment shall be integrated into the four pillars and a participatory approach shall prevail.<sup>68</sup>

##### **4.2 Environmental mainstreaming**

Environmental mainstreaming is weak in Indonesia. There is in practice little integration of environmental considerations at the planning and programmatic levels, especially in the public investment planning process and in regional plans for land and resource use.<sup>69</sup> According to UNEP<sup>70</sup>, environment is mainstreamed into the PRSP. However, this integration seems to be mostly rhetorical as the PRSP process failed to involve the 'technical' ministries (including Ministries of Agriculture, Forestry, Marine affairs and Fisheries, Mining and Energy, and Environment). This approach is likely to fail to secure commitment from these important institutions.

##### **4.3 Water, sanitation, sewage and wastewater treatment**

The MTDP states that access to clean water and basic sanitation is a right. Increased access to water and basic sanitation is included in the first target (poverty alleviation) under the third development goal in the MTDP. Target 4 (environment and natural resources) focus on restoring and preserving, and enhancing the quality of the environment, which implicitly would include aspects of wastewater collection and treatment. Related to water, sanitation,

---

<sup>65</sup> Kunkel, 2007.

<sup>66</sup> Interim PRSP, 2003

<sup>67</sup> Ishikawa, 2005; MTDP 2004-2009; and BAPPENAS 2008-06-23

<sup>68</sup> UNEP, Indonesia - Integrated Assessment of the PRSP.

<sup>69</sup> WB, 2008-06-11.

<sup>70</sup> UNEP, Indonesia - Integrated Assessment of the PRSP.

sewage, and wastewater treatment, Target 5 (infrastructure) highlights the need to increase the coverage of (affordable, available and of high quality) potable water, as well as to improve the quality of surface water. This will be done *inter alia* through increasing wastewater processing, developing the wastewater disposal system including a centralised sewerage system for large cities. Overall, the emphasis of infrastructure development shall be on improving rural infrastructure, strategic economic infrastructure and infrastructure in conflict regions.

#### 4.4 Key actors

After the “big-bang decentralisation” in 2001, Indonesia is one of the most decentralised countries in the world; as much as one-third of central government expenditures are transferred to the regions.<sup>71</sup> The State Ministry of Environment (MOE) is Indonesia’s central environmental authority. It has an overall responsibility for environment including strategy-, legislation- and policy formulation, and establishing quality standards. It also supervises and supports provincial and local authorities in environmental management and the implementation of national policy and regulations. Monitoring and enforcement is done by the MOE together with various other agencies. Municipalities are responsible for planning and managing environmental services including waste management, water supply, and wastewater treatment. Key duty bearers for water supply and sanitation are thus the MOE and various other agencies.

#### 4.5 Gaps and overlaps

Indonesia’s administrative and regulatory framework cannot yet meet the demands of sustainable development in spite of a long history of support for policy and capacity development both from within the government and with international donor support.<sup>72</sup> The rapid decentralisation process has created additional challenges for environment and natural resources managers and is considered to have generated a negative impact on the environment.<sup>73</sup> There are gaps between policy and practice, unclear national priorities, and weak vertical and horizontal integration. National strategies are lacking, e.g. related to increased access to sanitation, or rural electrification (generally correlated to poverty alleviation and easing of gender imbalances). Regulatory bodies in many provinces and districts fall directly under the governor or district head, which sometimes are the proponents of the projects that shall be regulated, and many provinces and districts are making new interpretation of existing rules. While some of these innovations strengthen environmental controls, many relax them or bypass national standards entirely.<sup>74</sup> Furthermore, environmental data and information on municipal budget allocation and private expenditures are scarce and difficult to gather.

#### 4.6 Other actors

Although Indonesia is not one of the poorest countries in the region, it enjoys support from a number of bilateral and multilateral donors, international financing institutions, and NGO’s, which is a sign of the regional importance placed on Indonesia. After a common country assessment, the UN agencies developed an Assistance Framework (UNDAF 2006-2010) based on the MTDP and the PRSP. Support from international agencies is focusing on *inter*

---

<sup>71</sup> World Bank, 2007, page xiv.

<sup>72</sup> WB, 2008-06-11

<sup>73</sup> UN CCA, 2004; and WB, 2008-06-11.

<sup>74</sup> WB, 2008-06-11

*alia* achieving the MDGs, promoting good governance and reducing vulnerability. Civil society organisations are providing basic services, increasing public awareness, etc.

The Indonesia Sanitation Sector Development Program (ISSDP) was established to assist the government of Indonesia (GOI) to attain the MDG related to sanitation. The ISSDP, supported by the Netherlands, the World Bank and Sida, and managed by the WSP, states as its purpose to support the GOI to create effective and coordinated policy, institutional reform, strategic planning and awareness building. Initial donor funding was allocated for two years (until April 2008) and by completion it is assessed that Indonesia will be at the ‘starting line’ of improving sanitation. A Joint Mid-Term Review (JMTR) performed during 2007, states a number of difficulties with the program, including problems with defining the scope, especially related to the ‘enabling environment’, the lack of city-level ownership over sanitation, and the lack of plans for cost recovery of operation and maintenance. The review-team recommends that if the ISSDP is to be continued, it should be transformed from identifying constraints and developing tools to be *assisting in policy/strategy planning, capacity building exercises and planning of scale-up across the country*.

A Sanitation Donor Group (SDG) has been established to enhance donor coordination and improve aid effectiveness. The SDG consists of multilateral and bilateral donors, IFIs and NGOs and is committed to support the Indonesian government in *developing and meeting* sanitation policies and strategies, and build capacity. WSP is chairing the SDG.<sup>75</sup>

International companies, e.g. extractive industries, are showing great interest in investing in Indonesia. Tens of billions of dollars are planned for coalmines, extraction of ores and petroleum, palm-oil plantations and power generation. Most investments are made where little capital is required and the returns are rapid; investments with a longer pay-off are rarer, likely due to problems with corruption, difficult bureaucracy and legal uncertainty.<sup>76</sup>

## **5. How and to what extent are the responses to environmental problems implemented and followed-up?**

### **5.1 Governance and enforcement**

In 2005 the Indonesian government reduced some of its fuel subsidies, which opened up space for additional spending and gave more environmentally sensible incentives. According to a Public Expenditure Review, Indonesia now has sufficient financial resources to address its development needs.<sup>77</sup> However, the public investment rate is still one of the lowest among middle-income countries, and domestic fuel prices are still well below international prices.

The composition of public spending changed substantially after decentralisation, with local authorities giving higher priority to education and administration while infrastructure investments declined. Indonesia has fallen behind most other countries in the region with some of the lowest rates of access to water, energy and sanitation.<sup>78</sup> *Political commitments made to the MDGs (including sanitation) remain largely rhetoric until they are supported by concrete plans and funds to achieve the objectives.*

---

<sup>75</sup> SDG Fact Sheet.

<sup>76</sup> Economist, 1 May 2008.

<sup>77</sup> WB et al., 2007.

<sup>78</sup> WB et al., 2007.

Perverse economic incentives hinder the sustainable use of natural resources; According to the World Bank Indonesia's macroeconomic policies do not favour sustainable use as they "reward district governments on resources revenue and not performance or stewardship (and under-tax forestry and fisheries)".<sup>79</sup> Although almost doubling the past seven years, the *budget allocation for 'Environment and Spatial Planning' was a low 1.1% in 2007*<sup>80</sup>, which is considerably lower than the World Bank recommended spending on the environment for developing countries (between 1.4% and 2.5%).

In 2006, total government transfers to the poorest regions of Indonesia (Aceh, Papua, and Maluku) increased nominally by 47%. Today, the main challenge is not to increase transfers to poor areas but to ensure effective spending of the available resources.<sup>81</sup>

Although the legal instruments are more than adequate for sustainable environmental management, both implementation and enforcement of these laws are very weak, due to lack of political will, inadequate coordination among various agencies, low technical capability for proving violations, limited access to information, and lack of adequate funding.<sup>82</sup>

Water and sanitation: Only in 2001 was wastewater from households defined as a water pollutant and municipalities were made responsible for managing it. Ambient river quality monitoring data is not sent to a central location anymore and it becomes increasingly difficult to comprehensively address the conditions of Indonesia's waters. Although access to sanitation is stated as a right and a priority in Indonesia, and donors are involved in the sector, there are many gaps to be filled, including development of a national sanitation strategy, local plans to increase access to sanitation, increased city-level ownership for sanitation, and plans to improve the financial viability of utilities. Urban water utilities are not operating on a cost recovery basis; utilities cannot finance new investments or cover costs for operation and maintenance, and are not credit-worthy to borrow. The average water tariff for low-income households in Indonesia is less than half the lowest tariff in Viet Nam (a much poorer country), and far below those of other ASEAN countries. With the water and sanitation sector in crisis, there is a need to implement demand management measures in combination with new (pro-poor) tariff arrangements and access to finance together with enforcement of regulations.

There is limited monitoring of solid and hazardous waste, and few cost-recovery mechanisms in place for the expensive treatment of wastes, which is a disincentive for industry to dispose of hazardous waste at existing treatment facilities. Jakarta inhabitants pay a fee for initial waste collection (no information on fees in other cities are available).

The government is attempting to supplement command-and-control regulations with market-based instruments, such as pollution charges to control water pollution from industrial enterprises. Implementation is limited this far, to a pilot phase in one region.<sup>83</sup> Furthermore, the Indonesian government is attempting to put in place regulations to limit agricultural land conversion, particularly wet rice fields, with limited success.

---

<sup>79</sup> WB 2008-06-11.

<sup>80</sup> WB et al., 2007.

<sup>81</sup> WB et al., 2007.

<sup>82</sup> Joint Midterm Review of ISSDP, 2007; WB, 2003.

<sup>83</sup> WB, 2003.

## 5.2 Capacity constraints

A key constraint remains the poor knowledge of, and incentives to adhere to, environmental law among all duty bearers. There is a need to strengthen the environmental management capacities of local government agencies; this is particularly important in the context of the vast decentralisation.<sup>84</sup>

## 6. Conclusions and implications for Sida

Indonesia is endowed with rich biodiversity and vast natural resources, which to a large extent has constituted the basis for the past decades of macro-economic growth. However, the *natural resources have not been managed in a sustainable or equitable manner*, which has led to over-exploitation and depletion. Poor environmental quality enhances poverty, causes diseases, and affects living standards, food security and livelihood opportunities, as well as the national economy, negatively. Poor environmental practices in combination with climate change may further aggravate environmental and human poverty. *The crisis in the water, sanitation and waste sectors in Indonesia today is contributing to public unhealth and environmental pollution.*

Indonesia has detailed environmental laws but *implementation and enforcement remains very weak*, and the fast-track *decentralisation has posed new challenges for environmental management*. The challenges could, however, *be turned into opportunities*; there is a high potential for pro-poor economic growth provided there is good governance, effective regulatory frameworks, rigorous environmental and social safeguards, and the protection of rights. As the important economic sectors are related to natural resources, a *sustainable and equitable use of these resources is a prerequisite for long-term development*. If the pressure for further exploitation (e.g. mining and forest concessions or biofuel production) is not met by political will and institutional capacity to meet these demands, the potential vacuum that would follow is a breeding ground for corruption, abuse of local communities, and unsustainable exploitation of natural resources. The tensions between economic development and environmental protection could be managed with support from donors.

### 6.1. Issues for Sida to consider

The purpose of this Policy Brief is to provide input to Sida's selective cooperation strategy for actor-driven support for Indonesia, and strategic suggestions particularly with regard to water supply and sanitation. The below listed 'issues for Sida to consider' are not comprehensive or subscriptive, but should be seen more as input for continued dialogue and analysis.

- ❖ There is a need to strengthen basic environmental management capacities of local government agencies, particularly in the context of the vast decentralisation. Are there lessons to be learned from the institutional arrangements in Sweden, for example in the *relationship between local authorities and central government*, which could be applied in the context of Indonesia, e.g. through a twinning arrangement?
- ❖ There might be an opportunity for Swedish waste management/recycling organisations to work together with Indonesian partners on issues around management of solid and hazardous waste, for example related to: *waste minimisation; collection and route planning; or biogas (methane) collection from landfills*. Biogas collection has the

---

<sup>84</sup> UN CCA, 2004.



potential to not only supply energy but also to be (potentially) eligible for CDM funding through its climate change mitigation measures.

- ❖ There is a need to continue addressing aspects of urban and rural sanitation and wastewater management, especially in the context of the decentralisation process and spread of duty bearer's responsibilities. A continuation of the support to build an enabling environment including *inter alia* development of a national strategy for access to sanitation and wastewater treatment, to strengthen ownership at all levels, and develop plans for environmental, economic, and socially sustainable water and wastewater utilities, could be relevant. Swedish actors should be well-suited to assist in this regard.
- ❖ Sweden has experiences from working with municipal water and wastewater utilities in transition and developing countries, to *increase efficiency and service quality, reduce wasteful practices and enhance credit worthiness* (i.e. to improve the sustainability of the utilities) which might be valuable for Indonesian water and wastewater/solid waste utilities. Synergies can be obtained when infrastructure investments are coupled with grant-financed institutional support (billing-collection, metering, reduction of unaccounted-for-water and tariff-reforms, etc.). It could be investigated if a twinning arrangement could provide a base for supporting institutional reforms.
- ❖ Indonesia has a spectacular nature and wildlife of interest for tourism. Eco-tourism could potentially increase without disturbances of the sensitive ecosystems when combined with pro-poor, community-based natural resources management.
- ❖ Today's decision and investments in energy, industry, infrastructure, rural and urban land-use, etc., will largely determine the CO<sub>2</sub>-emissions of tomorrow. Improved spatial planning can both *reduce future emissions and reduce vulnerabilities* to climate change. Promoting inclusion of environmental and climate change aspects in spatial planning is therefore important and could be considered by Sida.
- ❖ It is clear that the government has struggled to turn good policies on forest protection into effective action on the ground. This is a critical issue for Indonesia, and issues of governance and uncertainty over land tenure have been highlighted as contributing to the lack of action on the ground. Support for implementation of policies on forest protection and natural resource management, perhaps through supporting a clearer system of land tenure could be considered.
- ❖ Climate change Adaptation and Mitigation in Indonesia must be tackled together. A valuable input from Sida could be working with other donors to prioritise CDM projects with benefits for adaptation and poverty reduction, and raise awareness of the links between mitigation and adaptation.
- ❖ Adaptations to climate variability and change are already taking place in Indonesia. A stock-taking of existing adaptation activities in Indonesia would be a valuable step towards learning from these experiences and building capacity for adaptation.
- ❖ There is a capacity gap in Indonesia of how to disseminate and use climate information in an applied way to support adaptation. Training on the use of climate information to support adaptation should be expanded so that this capacity is not solely within 3-4 core institutions but reaches different organisations.

- ❖ Indonesia is very vulnerable to natural disasters, and there is a well-developed disaster risk reduction community. It is important to build links between this community and those involved in adaptation, and to learn lessons from the DRR community, for example about community ownership of projects. Much work on disaster risk reduction will contribute to increasing resilience to climate change.
- ❖ Could Sida connect actors in Indonesia to each other and broader networks on adaptation to foster the long-term relationships needed for adaptation?

## References

- AIACC (2006) *A final report of the Assessments of Impacts and Adaptations to Climate Change (AIACC) project AS21: An Integrated assessment of climate change impacts, adaptations and vulnerability in watershed areas and communities in South-East Asia*. The International START Secretariat, Washington DC. ADB, 2008 “*Asian Development Outlook 2008: Indonesia*”, Asian Development Bank.
- Chomitz, K., M. 2007, “*At loggerheads?: agricultural expansion, poverty reduction, and environment in tropical forests*”, The World Bank
- Coady, D., El-Said, M., Gillingham, R., Kpodar, K., Medas, P., Newhouse, D. 2006, “*The Magnitude and Distribution of Fuel Subsidies: Evidence from Bolivia, Ghana, Jordan, Mali, and Sri Lanka*”, IMF Working Paper WP/06/247, International Monetary Fund
- European Commission, 2005, “*Country Environmental Profile Indonesia*”, European Union.
- Friends of the Earth, LifeMosaic and Sawit Watch, 2008. *Losing Ground - The human rights impacts of oil palm plantation expansion in Indonesia*.
- Forest Watch Indonesia, World Resources Institute, Global Forest Watch, 2002. *The State of the Forest Indonesia*, Ed. Emily Matthews
- IATP, 2008, “*Biofuel and Global Biodiversity*” Institute for Agriculture and Trade Policy.
- IPCC (2007): Working Group I, Chapter 11: Regional Climate Projections. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
- IPCC (2007b) *Appendix 1: Glossary*. In *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, [M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds.], Cambridge University Press, Cambridge, UK, 273-313.
- Ishikawa, Sumio, 2005. “Indonesia’s Medium-term Development Plan and Public Debt Sustainability” in *JBICI Review No.12*, pp 60-73, August 2005. Available on: [http://www.jbic.go.jp/english/research/report/review/pdf/report12\\_3.pdf](http://www.jbic.go.jp/english/research/report/review/pdf/report12_3.pdf)
- ISSDP Joint Midterm Review Report (JMTR), 2007. *Report of Indonesia Sanitation Sector Development Program (ISSDP)*. The Water and Sanitation Program – East Asia and the Pacific (WSP-EAP). Government of Indonesia, Netherlands Embassy, Swedish International Development Cooperation Agency, Water and Sanitation Program, and World Bank office Jakarta, June 2007.

- Kunkel, N. (2007) *Adapting to Climate Change in Indonesia: Water Sector*. GTZ: Eschborn, Germany.
- MacMillan, N., 2007, “*Community Solutions for Indonesia’s Waste*” International Development Research Centre
- Marcus, A., Asmorowati, S., 2006, “Urban poverty and the Rural Development Bias: Some notes from Indonesia”, *Journal of Developing Societies* 2006; 22; 145
- Ministry of Environment (MoE), 2007. *Indonesia Country Report: Climate Variability and Climate Change, and their Implications*. Ministry of Environment, Republic of Indonesia, Jakarta.
- NIRAS, June 2007. Joint Midterm Review of support to ISSD/WSP/SUSEA, Republic of Indonesia. Final review report. For official use only.
- PEACE (2007) *Indonesia and Climate Change: Current status and policies*. PEACE, Jakarta.
- Republic of Indonesia, BAPPENAS. *The national Medium-Term Development Plan (MTDP) 2004-2009*. Information collected from the internet (August 11, 2008): <http://bappenas.go.id/index.php?module=ContentExpress&func=display&ceid=2820>
- Republic of Indonesia, 2003. *Interim Poverty Reduction Strategy Paper. A Process Framework of Strategic Formulation for Long Terms Poverty Alleviation*. Committee for Poverty Alleviation. Jakarta, March 2003.
- Rhee, S., Kitchener, D., Brown, T., Merrill, R., Dilts, R., Tighe, S., 2004, “*Report on Biodiversity and Tropical Forests in Indonesia*”, Report prepared for USAid/Indonesia
- SDG Sanitation Donor Group, Fact Sheet.
- Smith Ben, 2008. *Indonesia Climate Analysis*. SEI Oxford, June 23, 2008.
- Suryanti, Y. *Summary on awareness raising and capacity building to address vulnerability and adaptation to climate change*. Ministry of Environment, Republic of Indonesia: Jakarta.
- UN, 2006. *United Nations Development Assistance Framework Indonesia (UNDAF) 2006-2010*.
- UN Common Country Assessment (CCA) Indonesia, 30 November 2004.
- UNDP (2007) *The other half of climate change: Why Indonesia must adapt to protect its poorest people*. UNDP Indonesia Country Office, Jakarta.
- UNDP, 2007/2008, “*Human Development Report 2007/2008*”,
- UNEP. *Indonesia: Integrated Assessment of the Poverty Reduction Strategy Paper - With a case study on sustainable fishery initiatives*.

WHO, 2007. “*Estimated Deaths and DALYs Attributable to selected Environmental Risk factors, 2002*”, WHO, Department of Public Health

World Bank, 2008, “*The Little Green Data Book*”, The World Bank

World Bank and IPEA, June 2007. “Spending for Development Making the most of Indonesia’s New Opportunities.” *Indonesia Public Expenditure Review 2007*. Second edition. The World Bank.

World Bank, 2006a, “*Sustaining Indonesia’s forests: Strategy for the World Bank 2006-2009*”, The World Bank

World Bank, 2006b, “*Sustaining Economic Growth, Rural livelihoods, and Environmental benefits: Strategic Option for Forest Assistance in Indonesia*”, The International Bank for Reconstruction and Development, The World Bank

World Bank, 2003. *Indonesia Environment Monitor 2003*. World Bank Indonesia Office, Jakarta January 2003.

#### **Internet sources:**

Central Intelligence Agency (CIA), The World Fact Book – Indonesia (updated 10 June 2008). <https://www.cia.gov/library/publications/the-world-factbook/geos/id.html>

*Economist*, 1 May 2008. “One-pronged attack”  
[http://www.economist.com/displayStory.cfm?story\\_id=11294314](http://www.economist.com/displayStory.cfm?story_id=11294314)

EM-DAT: The OFDA/CRED International Disaster Database, 8 September 2008.  
<http://www.emdat.be/Database/CountryProfile/countryprofile.php#top10lists>

Republic of Indonesia, BAPPENAS, 2008-06-23: Overview of Indonesia’s Medium Term Development Plan. <http://www.bi.go.id/NR/rdonlyres/6BB37174-B6BE-4728-A8AD-D602AB32ACAD/3439/UpdateRPJM.pdf>

UNEP: <http://www.roap.unep.org/press/NR08-03.html>

World Bank 2008-06-11  
<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/INDONESIAEXTN/0,,contentMDK:21481510~pagePK:141137~piPK:141127~theSitePK:226309,00.html#coremap>

World Bank, 2008-06-24  
<http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/EASTASIAPACIFICEXT/EAPREGTOPENVIRONMENT/0,,contentMDK:20266323~menuPK:537827~pagePK:34004173~piPK:34003707~theSitePK:502886,00.html#Rapid>

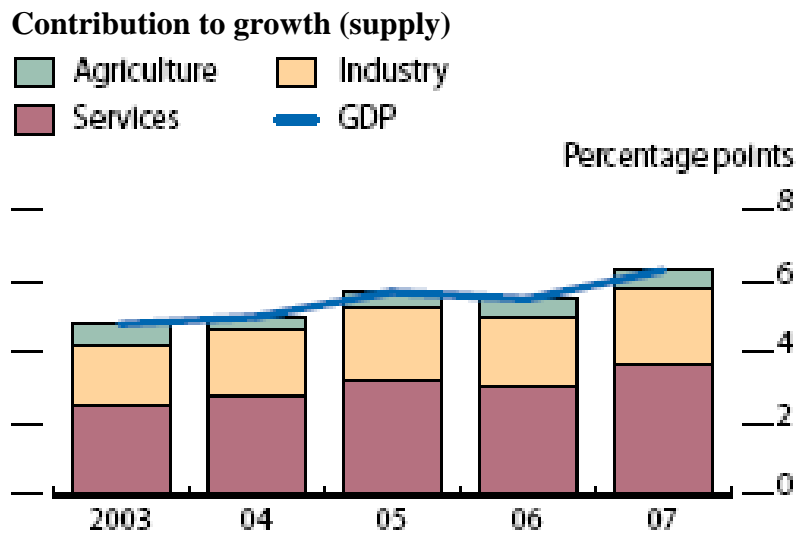


## Appendix 1: Climate change and the Millennium Development Goals

Box 2: Climate change and the Millennium Development Goals	
Goal	Potential impacts of climate change on the MDGs
1. <i>Eradicate extreme poverty and hunger</i>	<p>Climate change is expected to:</p> <ul style="list-style-type: none"> <li>• Degrade the forests, fish, pastures, and crop land that many poor families depend on for their food and livelihoods.</li> <li>• Damage poor people's homes, water supply, and health, which will undermine their ability to earn a living.</li> <li>• Exacerbate social tensions over resource use, which can lead to conflict, destabilizing livelihoods and forcing communities to migrate.</li> </ul>
2. <i>Achieve universal primary education</i>	<p>Climate change could undermine children's ability to attend school.</p> <ul style="list-style-type: none"> <li>• More children (especially girls) are likely to be taken out of school to help fetch water, care for ill relatives, or help earn an income.</li> <li>• Malnourishment and illness among children could reduce their school attendance, and impair their learning when they are in class.</li> <li>• Floods and storms destroy school buildings, and force migration.</li> </ul>
3. <i>Promote gender equity and empower women</i>	<p>Climate change is expected to exacerbate current gender inequalities.</p> <ul style="list-style-type: none"> <li>• Women tend to depend more on the natural environment for their livelihoods than do men, and so are more vulnerable than men are to its variability and change.</li> <li>• Women and girls are typically the ones to fetch water, fodder, firewood, and often food. In times of climate stress, they must cope with fewer resources and a greater workload.</li> <li>• Female-headed households with few assets are affected particularly severely by climate-related disasters.</li> </ul>
4. <i>Reduce child mortality</i>	<p>Climate change will lead to more deaths and illness due to heat-waves, floods, droughts, and hurricanes.</p>
5. <i>Improve maternal health</i>	<ul style="list-style-type: none"> <li>• It may increase the prevalence of diseases spread by mosquitoes (such as malaria and dengue fever) or of those spread in water (such as cholera and dysentery). Children and pregnant women are particularly vulnerable to these diseases.</li> </ul>
6. <i>Combat major diseases</i>	<ul style="list-style-type: none"> <li>• It is expected to reduce the quality and quantity of drinking water, and exacerbate malnutrition among children.</li> </ul>
7. <i>Ensure environmental sustainability</i>	<p>Climate change will alter the quality and productivity of natural resources and ecosystems, some of which may be irreversibly damaged. These changes will also reduce biological diversity and compound existing environmental degradation.</p>
8. <i>Develop a global partnership</i>	<p>Climate change is a global challenge, and responding to it requires global cooperation, especially to enable developing countries to tackle poverty and inequality. It heightens the need for donors to honour their official development assistance commitments, and to provide additional resources for adaptation.</p>

Source: Oxfam, 2007. Briefing paper. Adapting to climate change. What's needed in poor countries, and who should pay.

## Appendix 2: Sector contributions to economic growth



Source: ADB, 2008