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Global  
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# Global Green Growth: Clean Energy Industrial Investments and Expanding Job Opportunities

The report, “Global Green Growth: Clean Energy Industrial Investments and Expanding Job Opportunities” introduces a study which shows clear net-gains in employment generation by making investments in the clean energy industry rather than in the conventional fossil fuel industry. The second volume of the report examines policy environments to reduce CO<sub>2</sub> emissions without inhibiting the opportunities for economies to grow while drawing valuable lessons from green growth policy experiences from the five selected countries of Brazil, Germany, Indonesia, the Republic of Korea, and South Africa.



# Volume 1

## Overall Findings

As of 2010, total world greenhouse gas (GHG) emissions amounted to about 45,000 million metric tons (mmt). In order to control climate change, the Intergovernmental Panel on Climate Change (IPCC) estimates that total emissions will need to fall by about 40 percent as of 2030, to 27,000 mmt, and by 80 percent by 2050, to about 9,000 mmt. Of the 45,000 mmt of total GHG emissions, about 82 percent are generated by energy-based sources. This includes 33,615 in CO<sub>2</sub> emissions from energy sources, equaling about 75 percent of total GHG emissions itself.

This report focuses on measures to reduce CO<sub>2</sub> emissions from energy-based sources. Expressed on a per capita basis, global CO<sub>2</sub> emissions in 2010 averaged 4.6 metric tons (mt). We can express our intermediate emissions reduction goals in terms of this measure, within the framework of reducing the absolute level of carbon emissions by 40 percent, to around 20,000 mmt, within 20 years. With the global population expected to rise to about 8.4 billion by 2030, this means that carbon emissions will need to be at no more than 2.4 mt per capita within 20 years.

The purpose of this report is to examine policy frameworks through which these CO<sub>2</sub> emission reduction targets can be met, without inhibiting the opportunities for economies to grow and expand well-being for their citizens. We are especially concerned that developing countries be able to grow at healthy rates as the global clean energy transition advances. For developing countries to sacrifice economic growth as a means to reverse climate change will also entail sacrificing opportunities to expand decent employment opportunities and dramatically reduce poverty. Limiting opportunities for countries to proceed on a healthy economic growth trajectory will also face formidable political resistance. This resistance will in turn create unacceptable delays in proceeding with effective policies to control climate change.

### By investing in the clean energy industry, more jobs will be created.

The core arguments of this report are simple. The global economy is capable of meeting the IPCCs' 20-year intermediate emission reduction target if most countries – including and especially most countries with either large GDPs or population – devote about 1.5 percent per year of their economy's GDP to investments in energy efficiency and clean renewable energy sources. These clean renewable



sources include solar, wind, geothermal, and small-scale hydropower, as well as low-emissions bioenergy sources. They exclude corn ethanol and other high-emissions bioenergy sources, whose use generates CO<sub>2</sub> emissions at levels equivalent to oil.

The conclusion is that, as a general proposition, countries that sustain this 1.5 percent of GDP level of annual investments in energy efficiency and clean renewables will also be able to maintain economic growth at healthy rates while providing a sufficient supply of energy resources to undergird growth. These investments in energy efficiency and renewable energy will also be a net new source of job opportunities. More specifically, new investments in energy efficiency and renewable energy will generate more jobs for a given amount of spending than maintaining or expanding each country's existing fossil fuel sectors.

To support the argument, the report presents employment impacts of large-scale clean energy plans in Brazil, Germany, Indonesia, South Africa and the Republic of Korea by generating the figures through each country's national input-output (I-O) model. The five countries have been chosen based on their major economic and environmental impact in a regional and global setting but also on the availability of national five-digit IO tables offering detailed information for the estimates.

# Summary of Results

## Brazil

Brazil is at 2.0 mt per capita emissions under the clean energy strategy. This is a 38 percent improvement over the BAU model, even while Brazil is devoting only 0.9 percent of GDP to the project.

## Germany

Germany is at 5.5 mt per capita emissions through the proposed strategy. This is a 43 percent improvement relative to 2010 and a 29 percent improvement relative to Germany's 2030 BAU scenario.

## Indonesia

Indonesia is at 2.6 mt at the end of the 20-year investment strategy. This figure is 67 percent lower than Indonesia's BAU framework for 2030 underscoring how the country can proceed on a rapid GDP growth path without increasing its per capita emissions.

## Republic of Korea (ROK)

The ROK can reduce its CO<sup>2</sup> emissions per capita by 56 percent relative to its 2030 BAU scenario over the 20-year investment cycle, while still maintaining an average annual GDP growth rate over this period of 3.3 percent.

## South Africa

South Africa can support a 4 percent GDP growth trajectory while still lowering its emissions within 20 years by 50 percent relative to its 2030 BAU scenario. The results of the study, the impact of this 20-year clean energy investment plan on emissions level and employment creation, is significant highlighting major gains in emissions reductions relative to both 2010 levels and Business-as-Usual (BAU) assumptions as of 2030.

## Summary of emissions reduction and employment expansion effects through 20-year country-specific clean energy investment plans

	Brazil	Germany	Indonesia	South Africa	ROK
<b>Emissions reductions</b>					
Per capita emissions in 2030	2.0 mt	5.5 mt	2.6 mt	8.7 mt	5.9 mt
Per capita emissions in 2030 relative to 2010	-13.0%	-43.3%	+52.9%	-8.4%	-49.1%
Per capita emissions in 2030 relative to 2030 BAU	-37.5%	-28.6%	-66.7%	-49.7%	-55.6%
<b>Employment expansion</b>					
Clean energy jobs per \$1 million	37.4 jobs	9.5 jobs	103.3 jobs	66.2 jobs	15.1 jobs
Clean energy minus fossil fuel jobs per \$1 million	16.2 jobs	1.9 jobs	81.3 jobs	33.1 jobs	1.5 jobs
Midpoint 2030 employment through clean energy investments	806,000	352,000	1.8 million	398,000	276,000
Midpoint 2030 employment as share of labor force	0.7%	0.9%	1.3%	1.9%	1.0%

Note: mt - metric tons

Source: UNIDO and GGGI (2015) Global Green Growth: Clean Energy Industrial Investments and Expanding Job Opportunities. Volume 1: Overall Findings. Vienna and Seoul.

# Volume 2

## Experiences of Brazil, Germany, Indonesia, the Republic of Korea and South Africa

The second volume looks into policy frameworks in place in the selected countries for promoting green growth through clean energy investments, and investigates the potential for employment creation of such investments. The highlight of country findings are described in the box below.

### **Brazil**

Brazil has made significant progress in reducing GHG emissions within a short period of time, while still expanding its economy and reducing poverty by implementing national policy framework that includes a set of industry-specific GHG mitigation and clean energy promotion policies with implications for job creation. The case of Brazil serves as a good example of environmental stewardship for many developing countries. Technological innovations and targeted policy incentives that promote the use of unconventional renewable energy will become particularly important if Brazil is to stay on track towards a green economy pathway.

### **Republic of Korea (ROK)**

The ROK stands out as an example country that in short time has significantly progressed in achieving its 2020 target to reduce GHG emissions to 30 percent below its Business As Usual (BAU) level through the introduction of various policies that have promoted clean energy investments. Under a national agenda “Low Carbon, Green Growth,” government spending into the new and renewable energy sector on employment generation has increased employment in the sector. To prepare the economy for the major transformation effects as it transitions into a low carbon economy progresses will be critical for ROK to achieve its 2020 emission targets.

### **Germany**

Germany used to be an energy intensive manufacturer but has made important progress in the transformation of its energy system (called “Energiewende”): GHG emissions have been reduced by 25 percent since 1990, renewables have reached a share of over 12 percent in gross final energy consumption, and primary energy consumption has dropped by nearly five percent since 2008. Naturally, these developments have spurred large employment generation around 370,000 jobs. The scope is large for a country like Germany to further expand through the export of technology to other countries where even more job could be generated.

### **South Africa**

The country achieved remarkably widespread buy-in to the national green industry agenda and hence presents a good case study of a South-South developing country. With the strategy so-called “climate change resilient development,” the government has so far succeeded in managing the country’s competing demands in a manner that has essentially morphed the agenda for a low-carbon economy into a positive change agent for economic transformation. To reduce the risk of derailing due to financial constraints, the international community must support the transition process.

### **Indonesia**

Indonesian government has adopted a 4-track development strategy based on the pillars “pro-growth, pro-poor, pro-job and pro-environment.” These plans include investment measures to create green jobs and alleviate poverty through the advancement of green skill development. It is suggested that more than 8.3 million jobs potentially could be created from clean energy investments in this country. Two of the most urgent challenges suggested in the report are 1) the lack of technological improvements in the industrial sector and 2) the presence of high subsidies on electricity and fossil fuels that distorts the energy pricing mechanism in the domestic market. The development of clear policies that are coordinated among stakeholders will be critical for green growth in Indonesia.



This report is prepared by the Global Green Growth Institute (GGGI) and United Nations Industrial Development Organization (UNIDO).

For the full report, visit : [www.gggi.org](http://www.gggi.org) / [www.unido.org](http://www.unido.org)