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**Putting industrial policy to work for resource efficiency
in developing countries**

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1 Introduction

The global economy is posing increasing pressure on the environment. Resource scarcity is intensifying and water, land, biodiversity, materials, energy, fibre and other natural resources are being degraded and liquidated. In an article in the January 2015 edition¹ of the journal *Science*, an international team of 18 researchers put forward that four of nine planetary boundaries, defined as the safe operating space for humanity, have now been crossed as a result of human activity. These four boundaries are climate change, loss of biosphere integrity, land-system change and altered biogeochemical cycles (phosphorus and nitrogen). Nonetheless, environmental liabilities and risks continue to grow.

The outcome document of the Rio+20 Sustainable Development Summit, '*The Future We Want*', saw the renewed political commitment of the 192 Heads of State present reverse this trend through the promotion of a sustainable future, stating that governments "should contribute to eradicating poverty as well as sustained economic growth, enhancing social inclusion, improving human welfare and creating opportunities for employment and decent work for all, while maintaining the healthy functioning of the earth's ecosystems"².

To uphold their commitments to achieve poverty reduction, environmental protection, resource efficiency and economic growth in an integrated way, governments need to intervene and decouple their economic growth from environmental damage by implementing green growth strategies. Intervention areas for such strategies are countless, but failing immediate pressure from local constituencies on any given pressing environmental issues, improved Resource Efficiency (RE) could be an attractive and easy sell for governments, and it would help to stay within the safe operating planetary boundaries.

1.1 What is RE and why does it matter?

A broad understanding of RE implies using the Earth's limited resources for the production of goods in a sustainable manner, from raw material extraction to final use and disposal, while minimizing impacts on the environment. Hence, RE allows us to create more with less and to deliver greater value with less input, which is effectively the driving concept behind green industries.

RE seeks to tilt the balance in favour of resource security, which is important for any importer of raw materials in an age of growing global demand for resources. In addition, RE, not least

¹ Steffen et al., 2015. Planetary Boundaries: Guiding human development on a changing planet. *Science* Vol. 347 No. 6223.

² UNCSO, 2012. *The Future We Want: Outcome Document*. New York: UN DESA.

through its widespread cost effectiveness, helps build a more competitive economy, especially for the manufacturing sector which by definition converts raw materials, components, or parts into finished goods. RE measures accelerate investments in new technologies and resource efficient industries while managing costs and risks to domestic taxpayers, businesses, communities and consumers. RE is thus a ‘quick win’ measure for governments and the private sector to increase competitiveness by reducing spending on resources.

“Increased resource efficiency builds stability, while bringing opportunities for improving our lives in many ways. Using less today means saving money, but also having more for the future. It means doing less damage now, so systems (and ecosystems) can recover. It also means more resilience to future fluctuations in markets and to changes in environmental conditions.”³

1.2 Is RE complementary to growth?

Economic growth typically occurs through a structural transformation of the economy, initially through a shift from primary production, such as mining and agriculture, to manufacturing; and later within manufacturing from natural resource-based to more technology-intensive activities⁴. In short, growth was traditionally about structural change of the economy in favour of higher labour productivity.

All countries need to undergo this process and expand their industrial sector to pursue economic growth, create jobs and improve standards of living. However, we know that industrial transformation goes hand-in-hand with increasing competition for limited natural resources and higher pressure on our planetary boundaries. Yet we rely on these same natural resources for sustained economic growth.

The challenge ahead is therefore to achieve a sustainable transition and to promote a new pattern of industrial growth that does not come at the expense of our natural ecosystem or human health, finding ways to be more efficient while reducing the use of natural resources in production processes. Hence, in order to incorporate RE measures, a shift in thinking needs to take place from structural change of the economy in favour of higher labour productivity to the transformation of economic activity to improve efficiency and the management of natural resources⁵.

³ J. Potočník, former European Commissioner for Environment.

⁴ UNIDO 2013, IDR.

⁵ Green Growth in Practice: Lessons from Country Experiences, Green Growth Best Practice, 2014.

1.3 How can industrial policies affect RE?

Many argue that the free market will resolve the resource scarcity problem. Proponents of free market environmentalism rely on markets to take care of both supply and demand for environmental and natural resource goods⁶. As resources grow scarcer, their price rises, affecting demand for these resources and thereby indirectly regulating supply and demand. Yet natural resources continue to be degraded and overexploited as the prices (if at all) do not adequately reflect their level of scarcity⁷, societal value, nor are they comparable with the development costs and benefits of being able to depend on these resources to fuel future economic growth and sustain life. This provides an economic rationale for government intervention, for example through direct government provisions or regulatory policies, which would balance out market failures and enable the government to take a pseudo-free market environmentalism approach.

To correct other market failures as well as to direct and facilitate structural change of the economy and manufacturing sector in order to attain higher growth rates, job creation and technological progress, countries have and continue to develop industrial policy. RE motives can underpin industrial policy and macroeconomic goals. A growing number of national and local governments in all regions are making strides in implementing plans, policies, and programmes that promote private sector interest in RE and changes in consumer behaviour.

Pure growth-oriented policies include traditional industrial or economic policies and general regulatory measures relating to business environment or investment climate. Environmental policies, on the other hand, include regulatory and voluntary measures which cover the broad framework for environmental protection. An industrial policy with a RE twist aims to promote the comparative advantage of resource efficient industrial sectors as well as the advancement of RE technologies, and falls under the remit of the ministries of industry. In fact, deployment of new “vintage” RE technology also boosts labour and capital productivity, thereby leading to an overall increase in total factor productivity. In this paper, we present some examples of countries that have implemented such policies.

The role industrial policy plays in an economy varies depending on stage of development. The process of industrialization can be divided into ‘early’, ‘middle’ and ‘late’ stages, even if the transition between the stages is not particularly precise or empirically consistent. Hence, it is reasonable to assume that different types of policy instruments are better suited for specific

⁶ Economics of Natural Resource Scarcity: The State of the Debate Jeffrey A. Krautkraemer April 2005 Discussion Paper 05–14 Resources for the Future.

⁷ DG ENVIRONMENT. *Economic Analysis of Resource Efficiency Policies*. Final report. August 2011.

stages of industrialization. Similarly, motivations to improve resource efficiency through policy measures vary depending on the country's stage of development. In other words, if the intervention measures are to be effective, they need to correspond to the country's stage of development.

RE literature abounds with case studies of RE measures implemented by developed economies. The EU even introduced a flagship initiative for a resource efficient Europe under the Europe 2020 strategy. However, what are lacking in the literature are case studies for developing countries. If we agree that both developed and developing countries have a common yet differentiated responsibility in the pursuit of a more sustainable way of life and the safeguarding of our planet, we need to examine what measures developing countries are taking to improve RE. In this paper, we focus on case studies for the early and middle stage of industrialization and attempt to identify IP instruments for RE in these two stages.

Four case studies are presented in this paper. IP instruments to achieve RE include market-based instruments to promote the efficient use of material inputs through indirect taxation, recycling fees, the removal of harmful subsidies, access to finance, environmental taxes, provision of eco-efficient infrastructure, the introduction of industry-based standards and eco-labels, the harnessing of resource-efficient technologies, legal and regulatory frameworks, etc. It is then up to the policymakers to decide the extent to which policy should support industry on the whole (horizontal measures) and to which it should target specific industrial sub-sectors (vertical measures), since any given instrument or support measure can be generally applied or selectively. REIP that are too ambitious may lead to resource leakage, i.e. the relocation of resource-intensive industries to countries with lower standards and regulations. This argument limits the “greening” extent of industrial policies.

We build on and contribute to an analytical framework—UNIDO's Taxonomy of Industrial Policy developed by John Weiss—to foster a practical discussion on the application of industrial policy across countries in different stages of industrial development. The taxonomy distinguishes between five areas or policy domains (product, labour, capital, land and technology markets) and two broad categories of policy instruments or mechanisms within these areas (market-based interventions or public inputs). While market-based interventions have an impact on prices and taxes, public inputs reflect the provision of goods or services by the government, including institutional creation and upgrading. Using this 5x2 matrix of classification, we describe IP instruments that have been implemented by the ministries of industry in the case countries to achieve RE. Table 1 summarizes the features of REIP policy instruments.

These industrial policy instruments for RE primarily focus on manufacturers and producers. They do, however, have a significant influence on consumer behaviour by promoting the consumption of RE products. A higher demand for such products feeds back to the producer, resulting in increased RE production. RE policy instruments targeting consumers include⁸:

- *Purchasing schemes* with instruments such as savings cards designed to provide a financial incentive for consumers to purchase RE products, discount coupons or direct discounts for RE products at the cash register.
- *Information tools* such as marketing (TV, posters, etc.), labels with product information which provide information on the product's RE characteristics, labels with certifications or quality marks which provide assurance and a guarantee that an independent external party has verified that the product has been produced in a RE way.
- Implementation of *educational programmes* or development of curricula on sustainable development, which generally include materials for promoting sustainable consumption.

⁸ Policies to encourage sustainable consumption, 2012, European Commission.

		Resource efficient industrial policy instruments/mechanisms	
		Market-based interventions/ Decentralized provision	Public inputs/direct provision
Policy domain/market failure being addressed	Product	<ul style="list-style-type: none"> • Price fixing of resources • Public campaigns aimed at producers for product, product packaging and production process standards through exhibitions/trade fairs • Award scheme at sectoral, national and international level to educate and incentivize producers • PPPs as a strategy to ensure knowledge transfer 	<ul style="list-style-type: none"> • Setting quotas for firms on exploitation and use of resources • Policy document to operationalize RE improvement programmes • Establishing one-stop shops such as RECP centres for promoting, facilitating, catalysing RE and cleaner production through service providers: information dissemination, investment opportunities, guidelines and technical standards • Linkage and knowledge transfer programmes through participation in knowledge platforms, global RE programmes (e.g. RECPnet, SCP, Switch) • Promotion of environmental certifications & eco-labelling at industry level through information dissemination agencies such as industry associations & marketing boards, e.g. database of RE activities • Promoting RE along the supply chain through regulations • Green public procurement to incorporate RE values • Public disclosure programme for environmental compliance, targeting medium sized and large companies

Capital	<ul style="list-style-type: none"> • “Green” incentives and support mechanisms being granted for RE investments - Tax incentives such as corporate income tax holiday, free VAT, import duties exemptions - Direct subsidies - Retention of a share of revenues and royalties • Punitive taxes, fees and user charges - Environment-related taxes - Tax, levy and royalty for the use/extraction of natural resources - Advanced recycling fee through the extended producer responsibility approach • Promotion of targeted loans/ green loans/ soft loans/ commercial credits/ performance bonds to finance investment activities in environmental projects • Loan guarantees for investments in RE projects • Voluntary agreements among banks to provide lending for green projects and introduce environmental screening in credit risk analyses of investment projects • Setting up of “dedicated funds” such as <ul style="list-style-type: none"> - Green Investment Fund (GIF) - National Adaptation Funds - Biodiversity offsets 	
Labour	<ul style="list-style-type: none"> • Grants for capacity building and training • Tax incentive for hiring RE-trained personnel 	<ul style="list-style-type: none"> • Establishment of dedicated institutions, such as technical, industrial and vocational education training institutions (TIVETs) with RE expertise, in charge of spearheading RE skills • Promotion of trainings, audits and capacity building activities for producers

Land	<ul style="list-style-type: none"> • PPP scheme for development of eco-industrial parks • Tax incentives & subsidized rentals at industrial parks • Promotion of benefits of operating in eco-industrial parks for producers 	<ul style="list-style-type: none"> • Regulation for land law for industrial zoning • Creation of eco-industrial parks/clusters/business corridors/industrial technology parks, Special Economic Zones (SEZ), Free Trade Zone (FTZ) • Use of Strategic Impact Assessment (SEA) and Environmental Impact Assessments (EIA) for new developments
Technology	<ul style="list-style-type: none"> • R&D subsidies & grants to increase RE-related patents and adapt foreign RE technology to local needs 	<ul style="list-style-type: none"> • Promotion of RE technology alternatives • Technical assistance and technology transfer support through RECPnet, NCPCS, etc. • Technical environmental norms and certification for goods and services • Incubation centres for infant RE industries • Creation of a research board to provide technical assistance, research support and disseminate best practice.

In this paper, we address the importance of RE in the manufacturing of goods. We will focus neither on the extraction of raw materials nor on disposal methods, despite the fact that advanced waste disposal and recycling are an integral part of resource efficiency. Similarly, as green industry and RE measures have a positive impact on production processes to reduce the amount of emissions and pollution, this paper focuses on RE policy measures themselves.

We use four case studies to demonstrate how the ministries of industry have implemented RE through their industrial policies and thus assume a key role in greening their developing economies. More specifically, this paper focuses on countries that have introduced new forms of governance, a policy framework and market incentives to increase RE within industrial production. The following research questions are addressed: Do examples of developing countries exist whose governments prioritize green development and RE? What is their rationale for doing so? What role does the Ministry of Industry play? What types of policy interventions and/or policy instruments have been introduced?

Four countries (Zimbabwe, Kenya, Indonesia and Colombia) from three different continents (Africa, Asia, Latin America) were selected for our analysis. Kenya and Indonesia represent key examples of countries that have created visions for green development, including a shift towards innovation and sustainability. The vision was developed and all ministries, including the Ministry of Industry, played a part in turning that vision into reality. Colombia undertook significant efforts to enhance green manufacturing, RE and firm competitiveness, paving the way for the country to initiate accession negotiations with the OECD and enter the Global Green Economy Index. Zimbabwe, having signed the binding Montreal Protocol to phase out methyl bromide, successfully achieved that objective as a result of the Ministry of Industry's and the tobacco industry's commitment.

This investigation is limited in its scope and we acknowledge that some of the outlined policies and initiatives may not be applicable to all emerging economies and it is too early to adequately assess their effectiveness. It is nonetheless relevant to showcase these practices and raise awareness about the ongoing commitments to RE by governments, policymakers, industries and communities to RE. The focus in this paper is on the manufacturing sector (new and existing industries), and we identify a broad range of policy measures, initiatives and instruments adopted by national governments to promote the efficient use of natural resources. A number of REIP instruments for every case study are identified and classified according to the taxonomy presented in Table 1.

2. Case Study 1: Kenya – Improving resource efficiency through innovation

2.1 Introduction

Kenya's economic performance in the 1990s and early 2000s was characterized by low GDP growth, increasing unemployment, decline in productivity and high poverty incidence. The industrial sector⁹ experienced an average annual growth of only 1.77 per cent. At the same time, people living in poverty increased from 48.8 per cent in 1990 to more than 56 per cent at the end of 2002.¹⁰

Against this background, the Kenyan government had to find new ways to enhance economic growth and job creation, also due to scarcity of resources, rapidly growing population, soaring unemployment and poverty. The government implemented the Economic Recovery Strategy for Wealth and Employment Creation (ERS, 2003-2007), focusing on economic growth objectives, poverty reduction and improvement of universal primary education.¹¹ To move onto a higher growth and an inclusive, sustainable development path, the Kenyan government launched a new long-term development blueprint for the country, the Kenya's Vision 2030 (2008-2030), which asserts that the economy would need to grow at a rate of 10 per cent (per annum) for 20 years in order to effectively mitigate social, economic and political problems.¹²

The Vision's objective is to pursue a development strategy that promotes a prosperous society by "*transforming Kenya into a newly industrializing, middle income country providing a high quality of life to all its citizens in a clean and secure environment by the year 2030*". This is also embedded in the Constitution of Kenya 2010 (Art. 42), which stipulates that a healthy environment is a right and calls for "*sustainable exploitation, utilization, management and conservation of the environment and natural resources*".

Vision 2030 aims not only to meet the Millennium Development Goals (MDGs), but also to make the country globally competitive. Kenya seems to be emulating newly industrialized countries in South East Asia, which have created visions for green development and successfully galvanized the population around it.

⁹ Which grew at an average of 10.6 per cent in the 1970s.

¹⁰ According to WHO data and the Kenya Demographic and Health Survey (2003), the mortality rate increased from 62,000 in 1993 to 78,000 in 2003.

¹¹ Positive results were achieved and by the year 2007, the Kenyan economy recovered, growing by 7.0 per cent

¹² The country's economic growth rate has, however, been impeded by political instability and a host of international factors such as high oil prices and declining tourism. See also: <http://www.csae.ox.ac.uk/conferences/2009-edia/papers/509-owino.pdf> [Accessed 12.08.2015].

Vision 2030 is divided in successive five-year medium term plans. The Second Medium Term Plan (2013-2017) aims to mainstream green economy and can be considered Kenya's first innovation policy, since it entails a break with the past, pursuing clean production, institutional reforms, R&D, technology and human resource development. Kenya's Vision 2030 is built on three pillars, namely:

- Economic pillar: tourism, agriculture, wholesale and retail, manufacturing, business process outsourcing, financial services
- Social pillar: education, health, water and sanitation, environment, housing and urbanization, gender, vulnerable groups and youth
- Political pillar.

2.1.1 Natural resource management in Vision 2030

Since Kenya's Vision 2030 seeks to create a "*just, cohesive and equitable social development in a clean and secure environment*", it is crucial to look at environmental challenges. The environment section of Vision 2030 focuses on:

- Unsustainable management of natural resources like forests, wildlife and coastal marines
- Degradation of the environment through air pollution, solid and hazardous waste
- Climate change and desertification
- The country's inability to identify and develop strategic natural resources due to low innovative and exploration initiatives and capacity.

Kenya's natural resources are threatened by i) continued deforestation and poaching, ii) human wildlife conflicts, iii) increased occurrence of alien and invasive species, iv) depletion of marine resources (fish), v) lack of an effective policy, regulatory and institutional framework, and vi) environmental degradation and encroachment in fragile ecosystems. Low innovation and inefficiency in the utilization of natural resources also represents a key challenge and is mainly caused by two key factors:

1. inadequate capacity to apply scientific environmental research
2. the country's inability to adopt new technologies.

Kenya is undertaking efforts to overcome these challenges and to increase RE by pursuing technological progress in industrial production and by implementing conservation measures, pollution and waste management and environmental planning and governance.

2.1.2 *Resource efficiency and industrialization policies*

The Kenyan Ministry of Industrialization and Enterprise Development (MOIED) plays an important role in the achievement of the Vision 2030's priority targets, including those of the environmental pillar. MOIED shall:

1. Promote incentives for cleaner production technologies and tax exemptions at technology parks and Special Economic Zones (SEZs)
2. Ensure that waste management systems are implemented in SEZs
3. Ensure that (at least) 10 manufacturing firms attain ISO 14001 standards
4. Make use of incentives for environmental compliance and adopt multi-sectoral planning approach (e.g. implementing Strategic Impact Assessments, SEAs, for all new projects).

Specifically, the Ministry is in charge of implementing *ad hoc* measures for the manufacturing sector (economic pillar) whose growth has been stagnant for several years, although Kenya has one of the largest manufacturing sectors in sub-Saharan Africa. Among the key constraints identified, the sector has been classified as currently uncompetitive due to high resource costs, heavy regulation and disjoint taxation. Therefore, priority has been given to:

- Improving resource efficiency, pursuing higher resource productivity and reducing energy, water, material costs. This has been achieved in many companies by improving technology and changing attitudes through regular audits, training and capacity-building activities.
- Improving infrastructure, for example, through the creation of industrial technology parks and incubation centres linked to industry.
- Reducing the size of the informal economy, improving technical skills to meet quality standards and minimize counterfeit or sub-standard goods.
- Shifting from the 'business as usual approach' ('Red Tape') to an innovative business environment ('Red Carpet'), providing the best enabling conditions for focused investments (e.g. Special Economic Zones, Free Trade Zones, industrial and technology parks). The role of MOIED is crucial in this regard, as it is responsible for facilitating tax incentives at SEZs and industrial parks. Moreover, MOIED is in charge of setting up a Micro and Small Enterprise Authority (MSEA) aimed at restructuring the sector by mainstreaming small businesses and encouraging entrepreneurship.

MOIED also promotes cleaner and resource efficient production through the Kenya National Cleaner Production Centre (KNPCPC), which is registered as a trust fund within MOIED.¹³ KNPCPC carries out evaluations of resource efficient and cleaner production as well as audits in the manufacturing sector on companies processing tea, textiles, timber, paper, sugar, dairy and fish.

Finally, improvements in RE and productivity within the manufacturing sector have been greatly facilitated by innovative ICT products (technologies and applications).¹⁴

2.1.3 Other relevant policies for natural resource management

In 2009, a comprehensive Science, Technology, Innovation Policy and Strategy (STIPS) was developed within the framework of Vision 2030. STIPS seeks to mainstream the application of science, technology and innovation in all economic sectors and processes to ensure that Kenyans benefit from all available capacities and capabilities in order to achieve the objectives of Vision 2030. STIPS prioritizes several areas for intervention, including:

- Agriculture and rural development
- Health and life sciences
- Trade and industry
- Human resource development
- Physical infrastructure
- Energy, environment and natural resource management
- ICTs.

Beyond calling for a sustainable management of natural resources, the 2010 Constitution also recognizes the role of indigenous innovations in development (Art. 11); furthermore, the 2012 Science, Technology and Innovation Act was enacted, streamlining research and innovation in both policy and institutions.

¹³ It was established by the Government of Kenya through the Kenya Industrial Research and Development Institute (KIRDI) and the United Nations Industrial Development Organization (UNIDO) in July 2000, under the Country Co-operation Framework (1999-2003) between the Kenyan government and the United Nations Development Program (UNDP).

¹⁴ Adeya, I, Omae, O.M, (2011), Use of ICT in Manufacturing to Achieve Vision 2030. Strathmore University, Nairobi, Kenya.

2.2 Policy instruments in Kenya

The following industrial policy instruments have been identified:

		Resource efficient industrial policy instruments/mechanisms	
		Targeting producers/manufacturers	
		Market-based interventions/ decentralized provision	Public inputs/direct provision
Policy domain/market failure being addressed	Product	Public Private Partnerships (PPP) as a strategy to ensure knowledge transfer and modernize Kenya's industrial and manufacturing sector	<ul style="list-style-type: none"> • Greening Kenya Initiative (GKI) → database of green economy activities, including the manufacture of eco-friendly materials, eco-labelling, solid waste management, etc. • Participation in Switch African Green → to promote RE and sustainable consumption and production • Policy document (Sessional Paper No. 3) to operationalize resource productivity improvement programmes initiated by the government to achieve Vision 2030 • No and low cost investment options such as sub-metering of electricity and water consumption
	Capital	<ul style="list-style-type: none"> • 10-year corporate income tax holiday and exemptions from import duties on machinery, raw materials and inputs and from stamp duty and value added tax (VAT) • Promotion of loans and commercial credits through Kenya's Central Bank and Equity Bank • Green loans pilot plan 	<ul style="list-style-type: none"> • Loan from the African Development Bank, UN agencies

Labour	<ul style="list-style-type: none"> The Resource Efficiency and Clean Production Centre provides grants for training 	<ul style="list-style-type: none"> The Ministry of Education, Science and Technology was created to spearhead capacity building and innovation in all sectors Establishment of Technical, Industrial, and Vocational education training institutions (TIVETs) Trainings, audits and capacity building activities promoted by the Kenyan Resource Efficiency and Clean Production Centre The Association of Manufacturers (KAM) established the Centre for Energy Efficiency and Conservation
Land	<ul style="list-style-type: none"> Tax incentives at industrial parks Tax incentives at technology parks provided by the Ministry of Industry Public Private Partnership (PPP) scheme for infrastructure development 	<ul style="list-style-type: none"> Strategic Impact Assessment (SEA) and Environmental Impact Assessments (EIA) Industrial technology park (e.g. Konza Technology Park), Special Economic Zones (SEZ), Free Trade Zones (FTZ) → to revitalize the manufacturing sector.
Technology	<ul style="list-style-type: none"> Incentives for cleaner production technologies and innovation 	<ul style="list-style-type: none"> National Research Fund → this include funds for research in the environmental domain in both public and private institutions Manufacturing companies to achieve standards such as ISO 9000:2001 and ISO 14001 Enhance manufacturing by adopting eco-labelling → Kenya Bureau of Standards (KBS) and National Environmental Management Authority Promotion of ICT as a catalyst for technical innovation in the manufacturing sector Transfer of technical expertise through RECPnet, Kenyan National Cleaner Production Centre and Switch Africa Green (SAG) projects Incubation centres (e.g. Manu Chandaria Incubation Centre; IBM, the University of Nairobi C4DLab) including infant green industry

3. Case Study 2: Indonesia's Green Industry Strategy

3.1 Introduction

Indonesia's industrial policy framework has evolved over the years and currently comprises elements of both the green economy and the RE concept. Initially, the National Industry Policy (2008) prioritized the strengthening of the manufacturing industry's competitiveness as a driver of economic growth. The policy sought to strengthen the industry structure by enhancing the role of SMEs and improving productivity. By September 2009, Indonesia signed the Manila Declaration on Green Industry¹⁵, the output of an international conference held in the Philippines.

By signing this declaration, the Government of Indonesia pledged to establish policies and a regulatory and institutional framework that fosters a shift towards resource efficient and low carbon industries. The Declaration, among others, also promotes an intensified transfer of cleaner production technologies and promotes an increased use of renewable energy.

3.1.1 The Green Industry Strategy

The National Industrial Policy is supplemented by the Grand Strategy for Green Industry of 2010 which:

- Promotes efficient and effective use of resources (energy, water, materials) to minimize waste and prevent pollution.
- Sets precise targets in the industry sector for energy efficiency ¹⁶ (17 per cent by 2025) ¹⁷ and GHG emission reduction (2 per cent by 2020)¹⁸ as well as the development of a carbon footprint labelling scheme.

Furthermore, the Ministry of Industry proposed the Green Industry Roadmap (2011). Green industry is defined therein as an '*industry which prioritizes efficiency and effectiveness in its process that combine the synergy of economic profitability, social welfare and environmental protection*'. The roadmap outlines key mechanisms through which the Government of Indonesia aims to foster GI development, particularly:

¹⁵ https://www.unido.org/fileadmin/user_media/Services/Green_Industry/Manila_declaration.pdf

¹⁶ In 8 target sectors (cement, iron & steel, pulp & paper, textiles, petrochemical, food & beverages, ceramics & glass and chemicals) http://www.switch-asia.eu/fileadmin/user_upload/Final_Baseline_Study_Indonesia_.pdf [Accessed on 30.11.2015].

¹⁷ The national energy conservation goal is based on Energy Vision 25/25's energy conservation scenario, which expects progressive energy saving from 2011 to 2025, to achieve savings of 85 million tonnes oil equivalent in 2025 or 18% reduction through energy conservation measures compared to the 'business as usual' (BAU) case. http://aperc.ieej.or.jp/file/2013/7/23/PREE_201206_Indonesia.pdf [Accessed on 04.12.2015].

¹⁸ Share of the industrial sector, 2% of 41% by 2020.

1. Development of sector-based GI standards and input material catalogues; such sector-based documents aim to eliminate hazardous materials and foster and standardize the use of environmentally friendly materials in key consumer goods sectors, such as textiles, ceramics and food;
2. Eco-friendly machine restructuring: based on Indonesia's success with sector-based machine restructuring programmes, it is foreseen to provide technical and financial support for industries to adopt new and cleaner process equipment;
3. Professional training in Cleaner Production (CP) and Energy Efficiency (EE);
4. Launch of Green Industry Award (since 2012);
5. Issuance of CP guidelines and technical standards.

Table 1 Energy saving targets by 2025

Sector	Potential energy saving (%)	Target energy saving (by end of 2015)	Percent share by industry type based on final energy demand consumption	Total target energy saving (by end of 2025)
Industry	10-30%	17%	41%	6.9%
Commercial	10-30%	15%	5%	0.7%
Transportation	15-35%	20%	5%	7.4%
Household	15-35%	15%	37%	2.0%
Others	25%	0%	4%	0.0%
TOTAL			100%	17.0%

Source: APEC, 2012

Table 2 Indonesia's pledge for GHG emissions (against BAU scenario)¹⁹

On its own (% , by 2020)	With international support (% , by 2020)	On its own (% , by 2030)
26%	41%	29%

Source: UNFCCC, 2015²⁰

Finally, the Company Liability Act 40/2007 (Art. 74) introduced mandatory corporate social responsibility (CSR) for natural resource-based companies. This opens the opportunity to fund smart projects, which may help reduce the negative impact on the environment and society.

¹⁹ Baseline: business as usual scenario of emission started in 2010, with each sector having various data year interval (UNFCCC, 2015).

²⁰ http://www4.unfccc.int/submissions/INDC/Published%20Documents/Indonesia/1/INDC_REPUBLIC%20OF%20INDONESIA.pdf [Accessed on 04.12.2015]

Progressive and proactive companies, mainly the export-oriented sectors (e.g. palm oil, furniture, textiles) and large consumer goods corporations (e.g. Unilever, Nestle, etc.), have introduced international standards to comply with their international trade partners' demands (environment management, OHS, energy management or even ISO 26000 on CSR) and/or agreed to voluntary reporting initiatives (GRI, IFC Performance Standards or similar).

3.1.2 Indonesia's Vision for the Future

In accordance with Article 4 of Law Number 25, 2004 on National Development Planning, the National Long Term Development Plan (RPJPN 2005-2025) has been drawn up as a continuation and renewal of earlier stages of development planning. According to the RPJPN 2005-2025, the establishment of a solid structure in which the agricultural economy (in the broad sense) and mining form the basis of an economy that produces in both an efficient and modern way, and in which the manufacturing sector is characterized by global competitiveness and eventually becomes the motor of the economy, while services become the glue of economic resilience.

The RPJPN is divided into four separate five-year medium term plans (RPJMNs). Currently, the third plan is being implemented, which contains specific policies and goals on mainstreaming sustainable development and natural resource and environmental management, aiming at greater consolidation of development in a comprehensive manner in all fields by emphasizing the attainment of economic competitiveness on the basis of:

- Competitiveness of natural resources
- Quality of human resources
- Increasing capability to master science and technology.

Indonesia aims to accelerate and expand its economic development and to support its transformation into a developed country by 2025. Within the next 15 years, Indonesia plans to develop industrial clusters to improve the linkages between upstream and downstream industries and between growth centres and buffer zones. To realize its vision, Indonesia developed the Master Plan for Acceleration and Expansion of Indonesia's Economic Development (MP3EI, 2011-2025)²¹, which entails the transformation of the national economy based on strong economic growth and inclusive and sustainable development. The implementation of the Master Plan is expected to drive economic growth and job creation and to encourage equitable

²¹ MP3EI is an integral part of the national development planning scheme and is not meant to substitute it.

development. MP3EI puts forward a ‘non-business-as-usual’ approach, involving all stakeholders and focusing on tangible and measurable priorities. Its three main goals are:

- Increase value added and expand the value chain for industrial production processes, and enhance the distribution network’s efficiency.
- Encourage efficiency in production and improve marketing efforts to further integrate domestic markets in order to promote competitiveness and strengthen the national economy.
- Strengthen the national innovation system in the area of production processes and marketing, with a focus on the overall strengthening of sustainable global competitiveness towards an innovation-driven economy.

In terms of investments within RPJPN, Indonesia launched a USD 6.3 billion (IDR 73.3 trillion) fiscal stimulus in February 2009, adding up to 1.4 per cent of GDP of 2008. Around 7 per cent of the total stimulus consisted of funds to boost energy saving investments.²² Another 17 per cent was invested in building roads in villages and municipalities, and developing irrigation schemes to encourage employment.

Moreover, to realize a transformation to innovation-based, sustainable economic growth based on science & technology and R&D, Indonesia intends to invest up to 1 per cent of its annual GDP. This share shall increase gradually to 3 per cent of GDP by 2025. In line with the economic progress of a factor-driven towards an innovation--driven economy, it is expected that the role of government R&D funding will decrease while that of the private sector will increase.

The purpose of MP3EI is to help Indonesia become one of the world’s developed countries by 2025, with an expected per capita income of USD 14,250 – 15,500 and a total gross domestic product of USD 4.0 – 4.5 trillion. To achieve these objectives, real economic growth of between 6.4 per cent to 7.5 per cent was expected for the period 2011–2014.²³ Unfortunately—according to WB data—Indonesia only registered a GDP growth of 5.0 per cent in 2014, as the country was affected by the global economic downturn. However, within two and a half years of the introduction of MP3EI, a total of 365 projects had been realized, with a combined investment value of IDR 828.7 trillion (USD 68.5 billion). An additional 166 projects (totalling IDR 628.9

²² <http://www.unep.org/greeneconomy/AdvisoryServices/Indonesia/tabid/56278/Default.aspx> [Accessed on 03.12.2015].

²³ A decrease in the rate of [inflation](#) from 6.5 per cent in 2011 – 2014 to 3.0 per cent in 2025 was also expected. <http://www.indonesia-investments.com/projects/government-development-plans/masterplan-for-acceleration-and-expansion-of-indonesias-economic-development-mp3ei/item306>. [Accessed on 03.12.2015].

trillion) were expected to be initiated in 2014, covering all of MP3EI's six economic corridors and developed based on key resources and other (economic) potentials of each region.

Table 3 Economic corridors in MP3EI

Sumatra	Centre for production and processing of natural resources and the nation's energy reserves
Java	Driver of national industry and service provision
Kalimantan	Centre for production and processing of national mining and energy reserves
Sulawesi	Centre for production and processing of national agriculture, plantation, fishery, oil & gas and mining
Bali - Nusa Tenggara	Gateway for tourism and national food support
Papua - Moluccas	Centre for development of food, fisheries, energy and mining

Source: Indonesia-Investment.com, 2015

Table 4 Investments per economic corridor in 2014

Region	Value (IDR)
Sumatra	111.6 trillion
Java	67.8 trillion
Kalimantan	129.0 trillion
Sulawesi	79.9 trillion
Bali & Nusa Tenggara	114.7 trillion
Papua & Maluku	125.8 trillion

Source: Indonesia-Investment.com, 2015

The majority of investments in these corridors originate from the private sector (around 65 per cent), followed by state-owned enterprises (11.4 per cent) and the government (5.1 per cent). Other investment sources are a mix of various stakeholders, for example, PPP schemes.

The main focus of MP3EI is on infrastructure development to improve both inter- and intra-island connectivity, thus reducing logistics costs (which are currently quite high compared to regional peers). If the country's connectivity improves, industries will become more competitive. This is particularly relevant in the context of the implementation of the ASEAN Economic Community (AEC) in 2015. The AEC will transform the ASEAN region into one of free movement of goods, services, investment, skilled labour and flow of capital. To fully benefit from this new community, Indonesia's industries need to be competitive. As such, Indonesia has been giving top priority to infrastructure projects that boost the country's connectivity, such as harbours, airports, coastal shipping, energy, water, telecommunication and railways.

3.2 Policy instruments in Indonesia

The following industrial policy instruments have been identified:

		Resource efficient industrial policy instruments/mechanisms		
		Directed at producers/manufacturers		Directed at consumers
		Market-based interventions/ decentralized provision	Public inputs/direct provision	
Policy domain/market failure being addressed	Product	<ul style="list-style-type: none"> The Green Industry Award scheme, a programme that educates and incentivizes businesses to use more environmentally friendly production technologies. Among the criteria applied are: 1. Eco products; natural resource-based industry; 2. Price competitiveness; 3. Meeting consumer needs; 4. Environmentally friendly product Participation of Indonesia in the Sustainable Business Award²⁴, aiming to increase awareness of sustainable business best practices and to demonstrate how sustainable business benefits companies, the environment and all stakeholders. 5R initiative – Rethink, Reuse, Recycle, Recovery, Reduce to prevent and minimize waste generation Public campaigns on green products: <ul style="list-style-type: none"> Capacity building of SMEs Product promotion through mass media and exhibition 	<ul style="list-style-type: none"> Establishing the Centre for Resource Efficient & Cleaner Production Indonesia to promote, facilitate and catalyse cleaner production through service providers: linkage programme (e.g. RECPnet with UNIDO, SCP, Switch), information dissemination, investment opportunities, guidelines and technical standards. Green public procurement: mentioned in Presidential Decree 54/2010, Article 105 (amended by Presidential Regulation 70/2012). The Indonesian government further acknowledges (Presidential Decree No. 80 of 2003 on Public Procurement revised by LKPP in 2009) that eco-friendly procurement of goods and services provides benefits to the community and the economy, with minimum impact on the environment. Initiating a public disclosure programme (PROPER) aimed at environmental compliance, targeting medium sized and large companies. 	<ul style="list-style-type: none"> Public campaigns on green products: <ul style="list-style-type: none"> Product promotion through mass media and exhibitions Education of consumers Eco-product festival and competition The Ekolabel Indonesia is one of Indonesia’s voluntary environmental management instruments aiming at protecting the environment by providing increased production efficiency information to the consumer

²⁴ The Sustainable Business Awards (SBA) uses a comprehensive framework which evaluates business actions across ten categories. This framework has been developed in collaboration with stakeholders as well as leading global experts and is fully consistent with international best practice. <http://sustainablebusinessawards.com/winners/sba-indonesia/>

	<p>Capital</p> <ul style="list-style-type: none"> •Incentives and support mechanisms provided to industry, meeting the following requirements: strong R&D, remote location, green mandate, partnership with SMEs, preference for local products and employment generation (priority for agro-industry: palm oil, rubber, wood, pulp and paper) •Share of revenues and royalties from non-renewable natural resource extraction to be retained for the benefit of future generations •Free import tariff/duty on waste treatment equipment (e.g. on waste paper) •Tax holidays, free VAT and customs facilitation for environmentally friendly investments/ installation of cleaner technology •Direct subsidies as an instrument of social protection by switching from a subsidy for goods into a direct subsidy for the poor •Government loans to finance investment activities in the areas covered by MP3EI •Soft loans & grants (e.g. to encourage clean production in the pulp and paper industry) •Performance bond •Reforestation fund (to maintain forest sustainability) •In 2010, Indonesia established a USD 1bn Green Investment Fund (IGIF) to boost economic growth and reduce emissions, providing additional funds for projects in which lenders seek additional injections of equity to their project. •Many banks, e.g. Bank Nasional Indonesia (BNI), Bank Mandiri, and the private Bank Central Asia (BCA), Bank Internasional Indonesia (BII), and Bank Danamon have experience in promoting soft loans and commercial credits to environmental projects. 	<ul style="list-style-type: none"> • Indonesia is part of the Association for Sustainable and Responsible Investment in Asia (ASrIA), the leading industry association in Asia dedicated to promoting sustainable finance and responsible investment across the region 	
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Labour	<ul style="list-style-type: none"> The Resource Efficiency and Clean Production Centre (capacity building and training component) delivers professional RECP training (through training grants) to professionals in the industry sector covering both clean production and resource efficiency 	<ul style="list-style-type: none"> Skill council and certification include: European Union Certification Catch Fish and Regional Plan of Action (RPOA) to pursue responsible fisheries, including the fight against illegal, unreported unregulated fishing. Indonesian Timber Legality Verification System (SVLK), licensing scheme that guarantees the export of timber in accordance with Indonesia's forestry laws. This certificate is a cornerstone for sustainable forest management and a national commitment to eradicate illegal logging and illegal trading 	
Land	<ul style="list-style-type: none"> Public Private Partnership (PPP) scheme for infrastructure development 	<ul style="list-style-type: none"> Industrial Policy Presidential Decree No. 28/2008: regulating incentives for industry with a green mandate located in remote locations (e.g. palm oil, rubber, wood, pulp and paper) Regulations for domestic and foreign investment and land laws have been introduced to improve investment climate and to provide certainty for business activities in Indonesia Masterplan for Acceleration and Expansion of Indonesia's Economic Development 	
Technology		<ul style="list-style-type: none"> Setting up of the Centre for Resource Efficient & Cleaner Production Indonesia acted as a catalyst for technical assistance and technology transfer support 	

4 Case Study 3: Columbia – Towards a resource efficient, green industry

4.1 Introduction

Colombia is an upper middle-income country and Latin America's fifth largest economy (OECD, 2014) with a steady GDP growth rate of more than 4 per cent over the past three years (WB, 2015). As the second most bio-diverse country in the world, the Government of Colombia has taken several measures to protect and conserve its natural resources, although major environmental challenges are far from being resolved.²⁵

According to the 2014 Global Green Economy Index, Colombia is one of the leading countries in terms of environmentally-friendly policies.²⁶ The relevance of green manufacturing of products, in particular, has increased and the Colombian government has undertaken significant efforts over the past 20 years in the development of policy guidelines for changes in production and consumption patterns to enhance resource efficiency and business competitiveness. This was also publicly acknowledged by UNECLAC, which acknowledged that Colombia's policy framework is the most comprehensive in the region²⁷ and has paved the way for accession negotiations with the OECD.

4.1.1 Resource efficiency and production sustainability

One of the first measures to increase material efficiency within industrial production in Colombia was the National Cleaner Production Policy of 1997, a comprehensive policy document providing the institutional, regulatory and economic framework to pursue clean production at industrial level.²⁸ The key policy objective was to strengthen the production and trade capacity of industrial companies of all sizes by assisting them to:

- include environmental concerns into production and trade functions
- transfer and deploy innovative and resource efficient production technologies²⁹.

²⁵ Mainly due to deforestation, over-utilization of toxic chemicals, land degradation and soil erosion.

²⁶ Its green institutional and policy framework includes:

- The Law on Environmental Management (1993), the foundation for environmental management
- The Colombia National Environmental System (SINA, 1994), a decentralized management, planning, coordination and implementation system
- The Ministry of Environment and Sustainable Development (MADS, 2011), formulating policies for the regulation, protection, exploitation and sustainable utilization of natural resources
- The National Environmental Licensing Authority (ANLA, 2012), responsible for issuing permits and licenses for projects pending compliance with environmental regulation
- The National Development Plan (PND, 2010-2014), recognizing the need to integrate environmental protection and resource efficiency into economic policies.

²⁷ See also https://sustainabledevelopment.un.org/content/documents/LAC_background_eng.pdf

²⁸ See also:

https://www.minambiente.gov.co/images/BosquesBiodiversidadyServiciosEcosistemicos/pdf/Normativa/PoliticasyPoliticait_produccion_mas_limpia.pdf [17.12.2015].

²⁹ See also: <http://www.seco-cooperation.admin.ch/projekte/01009/05070/index.html?lang=en> [Accessed on 13.12.2015].

Its operational arm, the national Clean Production Centre (CPC), was established in 1998,³⁰ and advises industry as well as the service sector to make substantial investments in their production processes in order to increase productivity, save resources and improve competitiveness. More than 25 cleaner production initiatives have been implemented since 2005, with an investment of close to USD 4.2 million. The CPC participated in the CP Latin Net,³¹ becoming one of the reference centres in Latin America, along with others in Brazil, Nicaragua and Mexico.³² CPC Colombia has an ample portfolio of services; however, three activity lines generate the highest income:

- Training for CP in a number of industrial and service sectors
- Support for building environmental management systems in larger firms
- A more eco-efficient use of resources.

Colombia's commitment to resource efficiency and clean production is also expressed in the National Development Plan 2006–2010, which sets down the basis for a series of agreements with industry, environmental authorities, technical experts and civil society, the most relevant being:

- The National System of Competitiveness (2006)
- The Environmental Programme for Businesses and Industries (2007)
- The National Policy of Logistics (2008).

The National Development Plan 2010–14 recognizes the need to improve the integration of economic and environmental policies and refers to Colombia's compliance with the OECD Green Growth Declaration (2012). The declaration commits Colombia to:

- Encourage green investment and sustainable management of natural resources
- Reform subsidies and long-term price signals
- Liberalize trade in environmental goods and services
- Promote green growth in partner countries through international cooperation.

As already mentioned, Colombia's strong commitment to achieve sustainability—along with its remarkable economic performance—has paved the way for the country to start accession negotiations with the OECD. Following the OECD Council's decision in May 2013, the 34

³⁰ In cooperation with UNIDO, UNEP and SECO (Swiss State Secretariat for Economic Affairs) in association with EMPA (Swiss Federal Laboratories for Materials Science and Technology).

³¹ A network of CPCs from 12 Latin American countries established by UNIDO/UNEP with support from Switzerland and Austria.

³² See also: <http://www.oecd.org/aidfortrade/47428242.pdf> [Accessed on 15.12.2015].

OECD Members approved a roadmap to accession for Colombia and in October 2013, OECD Secretary-General Angel Gurría formally launched Colombia's accession process with President Juan Manuel Santos.

As a follow-up to the process and since the environmental *acquis* constitutes a core component of the accession roadmap, green growth features even higher in the current National Development Plan (2014-2018). Moreover, environmental departments were created in most ministries in order to integrate green objectives across all sectors of the economy.

4.1.2 Towards a Colombian green industry

The Colombian Ministry of Industry, Trade and Tourism plays a key role in the pursuit of a green and inclusive paradigm of growth. In fact, the ministry's commitment at international, national and regional level is one of the main reasons for the OECD's decision to launch accession negotiations with Colombia.

At international level, Colombia has been a member of the Platform for Green Industry since February 2013 and has a seat on its advisory board, with direct access to international dialogue on the matter. The Platform for Green Industry (PGI) is a mechanism of the United Nations Industrial Development Organization (UNIDO), which aims to promote sustainable development among governments and industries.³³ The Platform's objective is to create new green industries and help existing ones increase their contribution to social and economic development, environmental protection, as well as the creation of a manufacturing base that is more innovative, responsive and resilient.³⁴

The previous Minister of Trade, Industry and Tourism, Sergio Diaz-Granados, signed the statement of support for PGI.³⁵ As noted by the Minister back in 2013, "[...] *sustainable development is essential for Colombia. We have undertaken this because we know that development and industrial innovation are prerequisites to reducing poverty, creating decent jobs, achieving security in food, energy, and water resources, developing a supply of sustainable goods and services, worldwide, and raising the standard of living for all*".

³³ See also <http://www.mincit.gov.co/englishmin/publicaciones.php?id=5553&dPrint=1> [Accessed on 06.12.2015].

³⁴ The Advisory Board of the Platform for Green Industry consists of 20 members. It is responsible for developing the work plan for the next 12 months and for advising the Executive Committee on how to promote the objectives of the Platform. The current members of the Advisory Board include the governments of Jordan, Kenya, the Philippines, and Poland, as well as the following organizations: China Broad Group, Microsoft Corporation, Novozymes A/S of Denmark, the business group ViyellaTex of Bangladesh, the Directorate General for Environment of the European Commission, the Global Environmental Facility, the Global Green Growth Institute, the International Chamber of Commerce, and the Turkish Association for Energy Efficiency.

³⁵ Cecilia Alvarez-Correa Glen is the current Minister of Trade, Industry and Tourism.

Through its membership in the Platform, the ministry aims to:

- Increase efficiency in the use of resources
- Improve waste management
- Better utilize renewable energy
- Support research and innovation for green industry
- Promote more green industries and green jobs.

At regional level, the Ministry of Trade is cooperating with the Closed Looped Cycle Production in the Americas (CLCPA) programme in partnership with the Organization of American States (OAS). Colombia is participating in the project 'Productive Development, towards a Sustainable Circular Economy in Colombia', focusing its efforts on providing training and technical support to entrepreneurs from micro, small and medium enterprises (MSMEs).

At national level, the Ministry launched the Productive Transformation Program (PTP, 2013) with the aim of developing sustainable initiatives for Colombia's industry, with a particular focus on:

- Promoting industrial innovation and competitiveness
- Developing productivity, efficiency and sustainable supply chains for manufacturing, the service sector and agribusiness
- Strengthening regional development, also through the creation of clusters and business corridors
- Enhancing internationalization by positioning Colombian products in the global value chain.

Finally, the National Federation of Businessmen (FENALCO) coordinates activities jointly with the Ministry for the Environment to facilitate the incorporation environmental sustainability criteria among its members, aimed at improving production efficiency and reducing the consumption of natural resources as well as decreasing the production of solid waste and waste water.

4.1.3 Financing the green sector

Despite the extensive policies in place, according to an OECD report of 2014, expenditure on natural resources and environmental protection is increasing, but generally remains low. The total expenditure on environmental protection as a share of GDP was stable in the first half of the 2000s at slightly below 0.5 per cent of GDP and increased to 0.65 per cent of GDP by 2010, including a 0.55 per cent of public expenditure. However, this is still far from the levels of

OECD countries at this stage of development, which commonly range between 1 per cent and 2 per cent of GDP or more.

Government spending on R&D was also low, at only 0.15 per cent of GDP in 2011. Although environmental regulations have been relatively strong, fiscal measures to support the green economy are still weak; for example, Colombia's revenue from environmental taxes increased by 30 per cent between 2000 and 2011, but represented only 0.7 per cent of GDP and 3.7 per cent of total tax revenue in 2011.

4.2 Policy instruments in Colombia

The following industrial policy instruments have been identified:

Resource efficient industrial policy instruments/mechanisms	
Directed at producers/manufacturers	
Market-based interventions/ decentralized provision	Public inputs/direct provision
Policy domain/market failure being addressed Product <ul style="list-style-type: none"> • Tax and royalties for the extraction of natural resources • National Royalty Fund³⁶ → intended for mining promotion, environmental protection and regional investment projects • Use of ex-ante cost-benefit analysis and evaluation of the environmental and social impact of projects and programmes • Technical norms and certification for goods and services • Colombian Environmental Eco-Label 	<ul style="list-style-type: none"> • Green public procurement policy → priority of the National Development Plan 2010-2014 • Establishment of the new central procurement agency Colombia Compra Eficiente in 2012 → expected to facilitate green public purchasing • Clean Production Centre (CPC) → it has been advising industry as well as the service sector since 1998 in making substantial investments in their production processes to increase productivity, save resources and improve competitiveness • The SEED Award → (supported by UNEP) awarded to individuals or institutions that exemplify a strong spirit of entrepreneurship in the developing world on ways to create a green economy. • Membership to the Platform for Green Industry (Advisory Board – UNIDO)

³⁶ In 2012, a new royalty system was introduced, allocating royalties to six main funds. The objective was for the regions' direct allocations to decrease from 80% of royalties in 1994-2010 to 25% in 2012 and 10% in 2014. From 2014, the Regional Compensation Fund was to invest 24% of royalties in infrastructure in the poorest regions and municipalities, and the Regional Development Fund was to obtain an additional 16% of royalties (not earmarked). The Autonomous Regional Corporations (CARs) thus no longer receive support from the National Royalty Fund to finance environmental investment.

Capital	<ul style="list-style-type: none"> • Environment-related taxes • Tax incentives for clean vehicles → 0 per cent import tax • Income tax deductions for investment in environmental protection • Introduction of biodiversity offsets • Forestry levy • Advanced recycling fee through the extended producer responsibility approach • National Adaptation Fund created after the La Niña events • The Colombian banking association, Asobancaria, signed the Green Protocol → a voluntary agreement involving 11 of Asobancaria's 24 member banks. It focuses on three areas: 1. Providing lending for green projects 2. Improving the signatories' environmental performance and 3. Introducing environmental screening in credit risk analysis of investment projects 	<ul style="list-style-type: none"> • External financial support for environmental activities through multilateral channels (GEF, climate finance, multilateral banks)
Labour	<ul style="list-style-type: none"> • The National Clean Production Center (CPC) provides training, capacity building and technical assistance to increase resource efficiency and productivity 	
Land		<ul style="list-style-type: none"> • Use of Strategic Environmental Assessment (SEA) • Creation of clusters and business corridors
Technology		<ul style="list-style-type: none"> • Technology transfer through the Clean Production Centre (CPC)

5. Case Study 4: Methyl bromide phase-out in Zimbabwe's tobacco industry

5.1 Introduction

Methyl bromide (MB) is a potent ozone depleting substance increasingly preferred for pest and disease control by farmers around the world following its introduction in the 1970s. Aside from its ozone depleting potential, MB is highly toxic for humans and is a possible carcinogen. The Copenhagen Amendment, adopted by the Parties to the Montreal Protocol in 1992, brought MB under the jurisdiction of the Montreal Protocol as an ozone depleting substance (ODS). Distinct phase-out schedules were agreed for developed countries—non-Article-5 (non-A-5) parties to the Protocol—and for developing countries, Article-5 (A-5) parties. Developed countries phased out controlled usage of MB in 2005 while developing countries were required to phase out controlled uses of MB by 1 January 2015.³⁷

A total of 147 A-5 countries are parties to the Montreal Protocol;³⁸ 10 of them, including Zimbabwe, are classified as large consumers of MB, since domestic consumption in the past exceeded 500 metric tonnes. By the end of 2012, Zimbabwe, together with Brazil, South Africa and Turkey, was able to completely phase out MB (UNEP, 2014).³⁹ This was possible due to the commitment of the Zimbabwean government, the industries involved in the phasing-out (especially the tobacco industry) as well as the technical and financial assistance provided by investment projects implemented by the Montreal Protocol agencies (Multilateral Fund, MLF, but also UNIDO, UNEP).

Zimbabwe is also responding to the growing need of establishing a green economy. For this purpose, the tobacco industry together with the tobacco merchants and the Ministry of Agriculture initiated a local association⁴⁰ to promote sustainable fuel use in the tobacco industry and sound environmental and natural resource management.

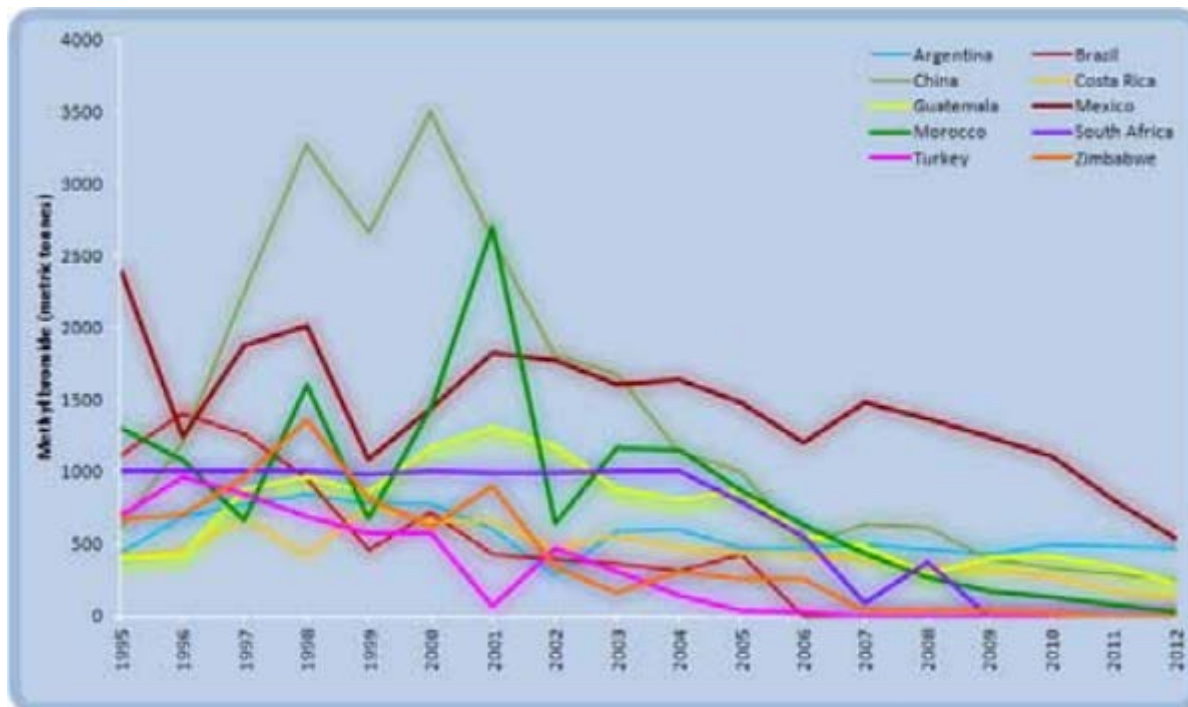
³⁷ A special provision was left for countries to apply for time-limited critical use exemptions (CUE) under specific circumstances where replacing MB was particularly difficult. MB is also used for quarantine and pre-shipment treatment (QPS) to prevent the introduction and/or establishment of quarantine pests which could endanger the livelihood of different productive sectors in many countries. Since such applications are not controlled by the Protocol, QPS uses are referred to as exempted uses.

³⁸ However, 59 countries never used methyl bromide and their baselines were therefore zero. The remaining 88 parties can be classified as follows according to their baselines: 39 low volume consumers – consumption < 8.3 metric tonnes (5 ODP tonnes), 23 small consumers – consumption < 100 metric tonnes, 15 medium consumers – consumption between 100 and 500 metric tonnes, 10 large consumers – consumption > 500 metric tonnes (UNEP, 2014).

³⁹ By the end of 2013 (the last date for which full official reporting information is available), approximately 85% of the controlled consumption in A5 parties had been phased out ahead of the 2015 deadline. See also UNEP, 'Evaluation of 2015 Critical Use Nominations for MB', May 2015.

⁴⁰ Recognizing the extensive consumption of wood in tobacco curing, the Sustainable Afforestation Organization was established in 2013 to focus on fuel utilization with the aim of promoting sustainability through an afforestation programme.

Figure 1 Phase-out schedule of largest A-5 MB consumers, including Zimbabwe (orange)



Source: UNEP, 2014

5.2 Brief history of MB phase-out in Zimbabwe

Zimbabwe actively participated in the Earth Summit held in Rio de Janeiro, Brazil, in June of 1992. As a follow-up to Rio, the government launched a report which sets out a course of action for the government and for non-governmental organizations. Zimbabwe decided to actively support the respective protocols and conventions adopted at the Earth Summit, including Agenda 21. It ratified (1992) and enforced (1993) the Montreal Protocol, along with its subsequent amendments (London, Copenhagen and Beijing). An Ozone Office was created to coordinate the implementation of projects under the Montreal Protocol and to collect data on ozone depleting gases, their consumption, importation and exportation.

Along with other ODSs, methyl bromide (MB) was implicated in the depletion of the ozone layer and hence targeted for complete phase-out in developing countries by 2015, except for critical use exemptions. In 1994, Zimbabwe consumed 600 tonnes of MB, the ninth highest user of this pesticide among developing nations. Of this amount, 85 per cent was used for soil sterilization, 13 per cent for post-harvest, 2 per cent for quarantine and pre-shipment and less than 1 per cent for other uses.⁴¹ Tobacco seedling production alone accounted for 83 per cent of

⁴¹ Mazarura, U., et al, (2012), 'Response of Farmers to Technological Transfer in the Methyl Bromide Phase-out Programme in Zimbabwe: the Floating Tray System', Harare, University of Zimbabwe.

the methyl bromide used for soil treatment.⁴² Hence, from early 1990 to about 2005, intensive research efforts were undertaken to find alternatives for methyl bromide and these efforts primarily targeted the floating tray system.⁴³

Two demonstration projects on alternative technologies for MB were approved by the Multilateral Fund (MLF) at a total cost of USD 583,500. Based on the results of these demonstration projects, the Executive Committee of MLF approved two investment projects for the complete phase-out of MB in the fumigation of cut flowers (USD 904,200) and for the fumigation of tobacco seedlings (USD 3,724,972). Funding for the remaining tranches of the project to phase out methyl bromide in tobacco seedbeds were disbursed by UNIDO in line with the annual budget breakdown in Table 5.

Table 5 Funding to phase out MB, annual budget breakdown

Year	Flowers (USD)	Tobacco (USD)	Grain (USD)	Total Funding (USD)
2001	298,320			298,320
2002	298,320			596,640
2003	307,560	0		904,200
2004	0	0		0
2005	0	1,862,486		2,766,686
2006	0		192,073	2,958,759
2007	0	1,862,486		4,821,245
2008	0			

Source: UNEP, 2006

In 2004, all the research conducted through the demonstration projects was compiled in a user manual, the ‘Methyl Bromide Phase-Out Handbook’, published by the Tobacco Research Board. In cooperation with UNIDO, Zimbabwe decided to train slightly over 28,033 tobacco farmers within five years to phase out the last 182 tonnes of methyl bromide. The handbook was disseminated after each training session and floating tray equipment distributed for the phase-out as planned. According to a UNIDO survey, this method has proven to be environmentally sustainable, inexpensive and easy to apply. The inclusion of staff from contracting companies in the training teams was important, as 70 per cent of the national tobacco crop in Zimbabwe is

⁴² This was mainly related to the fact that Zimbabwe had been using methyl bromide fumigation for years to control pests in tobacco production.

⁴³ Mazarura, U., Asher, F.I., (2001), ‘The Floating Tray System: Theory, Techniques and Technology, Sable Printers.

grown under the contract system. The project's follow-up is now with the Tobacco Industry Association and the Tobacco Research Board.

5.3 The role of Zimbabwe's tobacco industry in the MB phase-out

Tobacco production has been extremely important for African economies for many years, especially in southern countries, where some of the largest MB consumers were once found. Production is generally exported in the form of unmanufactured dried (cured) leaves that are purchased by large multinational cigar and cigarette companies. In the past, the tobacco industry used large amounts of MB for seedling production. However, following the adoption of the Montreal Protocol, large companies in the industry—especially in Brazil—began adopting alternatives as early as in the 1990s.

In Zimbabwe, the MB phase-out in the tobacco industry was considered a key priority. This is partially related to the government's obligations under the Protocol, however, the industry itself also put it on the political agenda to prevent the golden leaf—which is largely exported—from encountering consumer resistance. Also, tobacco is subjected to certification schemes involving good agricultural practices, hence moving away from MB is considered a step in the right direction. The industry sought to stay competitive on the global market by:

1. Providing quality products and
2. Improving resource efficiency.

Following the example of Brazilian producers, Zimbabwe's tobacco industry began adopting alternatives to the widespread use of MB. Specific projects were financed by the Multilateral Fund for the Implementation of the Montreal Protocol (MLF),⁴⁴ which further supported the phase-out process through monitoring and evaluation studies to assess barriers to the adoption of alternatives⁴⁵ and identify feasible solutions. Replacement took place rapidly and quite successfully on account of technical and logistical changes in the industry as well as strong political support, in particular from the government and the tobacco industry's management board.

⁴⁴ The Multilateral Fund for the Implementation of the Montreal Protocol (MLF) has continuously assisted developing countries in meeting their MB phase-out obligations by providing technical and financial support for projects that identify and implement effective and appropriate alternatives to MB. By the end of 2013, the MLF had approved over USD 120 million for 239 such projects (excluding 15 global projects) to be implemented by its bilateral and implementing agencies.

⁴⁵ There are two broad categories of alternatives to MB: in-kind alternatives or systems aiming to replace MB with another fumigant that produces comparable effects (e.g. dichloropropene, chloropicrin, phosphine) and not-in-kind systems including soilless systems, steaming, grafting, hermetic storage and heating systems used within an integrated pest management approach. See also [http://www.unep.fr/ozonaction/information/mmcfiles/7674-e-Phasing out methyl bromide in developing countries.pdf](http://www.unep.fr/ozonaction/information/mmcfiles/7674-e-Phasing%20out%20methyl%20bromide%20in%20developing%20countries.pdf) [Accessed on 20.12.2015].

The technical changes introduced were substantial since the entire system and approach had to be modified. The tobacco industry adopted the floating tray technology for seedling production,⁴⁶ helping farmers to produce seedlings free of nematodes, hence reducing use of pesticides. The system required a lot of ancillary technical developments, such as devising small tools for hand-sowing tiny seeds, seed pelleting technologies, advanced seed trays, addressing fungal growth in float systems and cold temperatures in some regions. There were many challenges for different parts of the tobacco industry and appropriate training programmes were designed for both employees and farmers.

The Zimbabwe Tobacco Association (ZTA) and the Tobacco Industry and Marketing Board (TIMB) played a leading role in supporting research, adopting float tray technology and training to ensure the continued development and expansion of the flue cured tobacco growing industry. ZTA reached out to all involved in the tobacco industry, including both large scale commercial and small scale tobacco growers. ZTA calls for:

- Efficient natural resource management (e.g. reduce water use and pollution, promote afforestation programmes, develop sustainable sources of leaf curing)
- Good agricultural practice (e.g. crop rotation, seed and variety integrity)
- Reduce the use of manufactured pesticides through alternate methods of pest control.

It also promoted the establishment of the Tobacco Research Board (TRB), which is responsible for:

- Training technical staff, employees and farmers to replace the ozone-depleting fumigant methyl bromide with a non-chemical alternative, namely the “floating tray system”
- Publishing the handbook on “Methyl Bromide Phase-Out,” disseminated after each training session

⁴⁶ The floating seed-tray technique was developed in the late 1990s and was adopted by many thousands of tobacco growers around the world, who previously used large amounts of MB for seedling production. To set up the system, a shallow pool is built on leveled ground and a low wall of brick or wood (12 cm high) is constructed around the bed, which is then covered with thick black polyethylene. The pool is filled with clean water and fertilizers and algacides may be added. Tobacco seedlings are planted in polystyrene trays of 288 cells or less (according to particular site conditions) which are filled with substrate. The trays are placed inside the pool where they float. Tobacco seedlings grow quickly, and the resulting plantlets are more uniform and of higher quality grade than those produced with MB fumigation. The system is also very efficient with regard to space or land needed to develop a nursery. See also http://www.unep.fr/ozonaction/information/mmcfiles/7674-e-Phasing_out_methyl_bromide_in_developing_countries.pdf [Accessed on 20.12.2015].

- Implementing projects with the support of international agencies (UNIDO, WB) to integrate the principles of sustainable development into country programmes and policies and reverse environmental resource loss.

Box 1 Challenges related to the MB phase-out

MB phase-out is a complex process, especially as regards the adoption of alternatives that require technical trainings (for the users), technology transfer and substantial changes in infrastructure, equipment, production and supply chain. Examples of a successful adoption of alternatives were observed particularly in Zimbabwe, where the floating tray system led to efficient production of high quality seedlings. Nevertheless, while this technology is mostly accessible to large-scale growers, a proliferation of small farmers has recently taken place in the country. Some of them do not have access to the floating tray system for reasons including technical challenges or costs and have adopted chemical options, mainly dazomet, to fumigate ground beds used for traditional seedling production. Potential problems with smuggling/illegal trade have been observed and are constantly reported in Zimbabwean media⁴⁷; regulations of varying scope were in place to regulate MB imports and occasionally ban its use following the phase-out. However, these measures need to be part of a wider approach, including registration and commercial availability of successful alternatives (MLF, 2012).⁴⁸

Finally, it is important to keep in mind that MB is unique amongst ODS, since it is always theoretically possible to return to this fumigant after having used alternatives, as the production capacity will remain after the phase-out to supply exempted Quarantine and Pre-Ship ment treatment (QPS).⁴⁹

5.4 Greening the tobacco industry

The Tobacco Industry and Marketing Board (TIMB) recognizes that the economic benefits derived from tobacco production should not come at the expense of the environment. Preservation and efficient use of natural resources are the cornerstone of sustainability in tobacco production. This is why TIMB initiated the Sustainable Afforestation Association (SAA) in 2013, in cooperation with the Tobacco Merchant Companies and the Ministry of Agriculture, to put in place key initiatives to protect biodiversity and foster the development and maintenance of healthy ecosystems. SAA members self-levy at a rate of 0.5 per cent of the gross

⁴⁷ See, for example, <http://www.financialgazette.co.zw/porous-borders-fuel-influx-of-ozone-depleting-substances/> [Accessed on 18.12.2015].

⁴⁸ See also <http://www.multilateralfund.org/68/English/1/6811.pdf>. [Accessed on 06.01.2016].

⁴⁹ See UNEP (2014) "Phasing-out Methyl Bromide in Developing Countries".

purchase value for 2013 and up to 1.5 per cent of the gross value in 2014,⁵⁰ and the revenue raised is used to carry out:

1. Sustainable afforestation, a proven solution in major tobacco producing countries (e.g. Brazil), which makes extensive use of wood in tobacco curing. SAA has started growing large-scale forests, with the target of establishing up to 4,500 hectares of trees annually.⁵¹ This model promises to be a viable foundation for the growth of sustainable large-scale forestry. It is founded on inclusiveness, with communities, schools, churches, government bodies and private individuals actively participating in the process. Apart from efforts by SAA, re-afforestation efforts are also being championed by individual contracting companies, some grower associations and TIMB.
2. Development and promotion of fuel-efficient curing facilities and technologies. The Tobacco Research Board conducts research on and development and perfection of more efficient rocket barns, using 50 per cent less fire wood as compared to conventional barns. Efforts are currently being undertaken by contractors and TIMB to help tobacco growers construct these rocket barns. TIMB has already rolled out a revolving fund for the construction of rocket barns and provided resources to build 200 of these barns in 2014.
3. Research into the use of alternative sources of energy for curing tobacco to facilitate the use of renewable sources of energy for curing tobacco. These include the use of biogas and solar hybrid barns. Research is also being carried out to evaluate the suitability of other species of trees as sources of fuel (e.g. giant bamboo).
4. Farmer awareness and education programmes. TIMB and other organizations offer training to growers on maintenance and management of forest resources.

⁵⁰ See also “Tobacco Industry Initiatives to reduce the negative environmental footprint caused by Tobacco Production”, <http://www.timb.co.zw/downloads/2014%20INITIATIVES%20TO%20REDUCE%20THE%20NEGATIVE%20ENVIRONMENTAL%20FOOTPRINT%20OF%20TOBACCO.pdf> [Accessed on 04.12.2016].

⁵¹ A total of 600 ha of gum trees were planted during the 2013/14 season. Each hectare holds 2,200 trees. This will be expanded to the small-scale sector as the programme progresses (TIMB, 2015).

5.5 Policy instruments in Zimbabwe

The following industrial policy instruments have been identified:

		Resource efficient industrial policy instruments/mechanisms	
		Directed at producers/manufacturers	
		Market-based interventions/ decentralized provision	Public inputs/direct provision
Policy domain/market failure being addressed	Product		<ul style="list-style-type: none"> • Sustainable Afforestation Association (SAA) → green economy activities which include afforestation, education and training, research and development of eco-alternatives to traditional tobacco manufacturing • Zimbabwe Tobacco Association → Social Responsibility Programme, networking, good agricultural practice, advice on input procurement and financing, integrated pest management, development of sustainable sources of leaf curing, training programmes for employees and farmers
	Capital	<ul style="list-style-type: none"> • Levies → (Tobacco Association members) for green initiatives (0.5% of the gross purchase value for the 2013 season and up to 1.5% of the gross value from 2014) 	
	Labour		<ul style="list-style-type: none"> • Provision of training programmes through the Sustainable Afforestation Association (SAA) and the Zimbabwe Tobacco Association for 7,500 tobacco growers on the floating tray system (UNIDO, MLF). The handbook on “methyl bromide phase-out,” published by the TRB was disseminated after each training session • Trainings and capacity building activities promoted by AGRITEX (Agricultural Research, Training and Extension)
	Land		<ul style="list-style-type: none"> • The Zimbabwe Tobacco Association (ZTA), together with Tobacco Industry and Marketing Board (TIMB), re-initiated the gum seedlings project in 2014 identifying suitable producers in the districts for the production of eucalyptus camaldulensis seedlings. A total of 252,200 gum seedlings were produced in the Madziwa, Karoi, Odzi, Macheke, MT Darwin, Rusape and Marondera areas. ZTA and TIMB growers were allocated 450 seedlings each, enough to plant 0.3 of a hectare that ultimately cures 1 hectare of tobacco crop. Five hundred and fifty growers benefited from this programme. Field days to create awareness of the programme for both growers and stakeholders were held as well.

	Technology		<p>Promotion of non-chemical alternatives to MB → technical assistance from UN agencies, WB and MLF to adopt the floating tray technology through MLF investment projects; by June 2009, a total of 679,822 trays covered 180,737 m² of plastic</p> <p>Funds for research support and technical assistance in the environmental domain is provided to the Tobacco Research Board</p> <p>The Zimbabwe Tobacco Association (ZTA) and the Tobacco Industry and Marketing Board (TIMB) play a leading role in supporting research and the adoption of the float tray technology to ensure continued development and an expansion of the flue cured tobacco growing industry.</p>
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6 Conclusions

New industrial policies should be designed to support long-term societal goals, including sustainable development. Dedicated resource efficiency policy frameworks are recognized responses to expected increases in natural resource depletion and free market failures. Since manufacturing plays a key role in how natural resources are processed into consumer goods, interventions to overcome these failures should also be targeted at the manufacturing sector through industrial policies that incorporate resource efficiency measures. Failing this, it may be problematic for a resource rich country to base its industrialization on low resource costs in the long run, and even more so for resource poor countries.

This paper, based almost entirely on desk research and extensively drawing on existing literature, has presented four case studies of developing countries and economies in transition, namely Kenya, Indonesia, Colombia and Zimbabwe. In all four countries, “greening” the economy or implementing resource efficiency measures became a national priority. In Kenya the motivation was to increase economic activity and job creation against the backdrop of increasing resource scarcity, a growing population, soaring unemployment and poverty. Indonesia’s motivation was to strengthen the competitiveness of the country’s manufacturing industry to become a driver of economic growth. Indonesia amended its national Industry Policy of 2008 to incorporate RE measures as a result of signing the Manila Declaration on Green Industry in 2009. It also developed a Green Industry Roadmap in 2011 to “prioritize efficiency and effectiveness in its process that combine the synergy of economic profitability, social welfare and environmental protection.” According to UNECLAC, Colombia’s comprehensive policy framework, which also covers sustainable production and consumption to enhance resource efficiency and business competitiveness, paved the way to opening accession discussions with the OECD. Indeed, since the environmental acquis constitutes a core component of the accession roadmap, green growth has a high priority in the country’s National Development Plan. Zimbabwe signed the binding treaty and became party to the Montreal Protocol Annex 5, requiring it to phase-out ozone depleting substances by 2015, including methyl bromide which was heavily used in Zimbabwe’s tobacco industry.

All these drivers entailed the development of new policies or the adaptation of existing policies to incorporate resource efficient measures for the manufacturing sector in order to achieve the overall aim of green growth. Responsibility for achieving these objectives reaches far beyond the Ministry of Industry, but as our case studies show, the latter has a part to play, nonetheless. This paper further illustrates the work of the four ministries of industry to contribute to the greening of their country’s economy.

The Ministry of Industry in Kenya was specifically responsible for:

1. Promoting incentives for cleaner production technologies and tax exemptions at technology parks and Special Economic Zones (SEZs)
2. Ensuring that waste management systems are implemented in SEZs
3. Ensuring that (at least) 10 manufacturing firms attain ISO 14001 standards
4. Making use of incentives for environmental compliance and adopt multi-sectoral planning approach (e.g. implementing Strategic Impact Assessments, SEAs, for all new projects).

The Ministry of Industry in Indonesia was specifically responsible for:

1. Promoting efficient and effective use of resources (energy, water, materials) to minimize waste and prevent pollution.
2. Setting precise targets in the industry sector for energy efficiency (17 per cent by 2025) and GHG emission reduction (2 per cent by 2020) as well as the development of a carbon footprint labelling scheme.
3. Developing sector-based GI standards and input material catalogues to eliminate hazardous materials and foster and standardize the use of environmentally friendly materials in key consumer goods sectors;
4. Eco-friendly machine restructuring and to provide technical and financial support for industries to adopt new and cleaner process equipment.

The Ministry of Industry in Colombia was specifically responsible for:

1. Increasing efficiency in the use of resources and developing sustainable initiatives for Colombia's industry, with a particular focus on promoting industrial innovation and competitiveness, developing productivity, efficiency and sustainable supply chains for manufacturing, the service sector and agribusiness;
2. Improving waste management
3. Better utilization of renewable energy and providing training and technical support to entrepreneurs from micro, small and medium enterprises for productive development
4. Supporting research and innovation for green industry and promoting more green industries and green jobs.

The four case studies demonstrate that the policy instruments/mechanisms put in place to achieve RE are the same type of policy instruments/mechanisms typically deployed for traditional industrial policies, but with an environmental twist – tax incentives, subsidies, fees

and user charges, special funds and grants, capacity building, targeted loans, R&D subsidies and grants, industrial zoning, creation of agencies, technology transfer support, etc.

One major difference is the focus on consumer education to change consumption patterns and thereby influence the production of RE goods. While this is usually associated with higher earning consumers, we demonstrate that such policy instruments are also being used in developing countries.

Environmental objectives are still in their infancy in developing countries in terms of integration in mainstream growth-oriented industrial policies, but their relevance is increasing. As this development is relatively new, we cannot yet assess the effectiveness of these policy instruments, nor are we in a position to recommend best practices in this field based on the given implementation resources and capacities of developing countries. What is nonetheless interesting to note is that in all four case studies, irrespective of the main driver for implementing RE measures, RE measures helped the industries provide quality products and increase their competitiveness. Although not backed by hard evaluation figures, this goes to show that RE is indeed complementary with economic growth and that industrialization does not need to come at the expense of our planet's natural resources. As such, developing countries ought to share their common albeit differentiated responsibilities in preserving them.



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