Recommendations for an Indian Resource Efficiency Programme (IREP)

A Guiding Document for Policy Makers by the Indian Resource Panel

POLICY BRIEF

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New Delhi, India
April 2017
This Policy Brief is developed by the Indian Resource Panel (InRP). In its development, it was supported by the Indo-German bilateral project “Fostering Resource Efficiency and Sustainable Management of Secondary Raw Materials”, which is being implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH, jointly with the Indian Ministry of Environment, Forest and Climate Change (MoEFCC) as part of the International Climate Initiative (IKI) of the German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). InRP consists of Mr. Vishwanath Anand, Dr. Prodipto Ghosh, Dr. Tishyarakshit Chatterjee, Mr. Rajen Habib Khwaja, Dr. Ajay Mathur, Dr. Ashok Khasola, Ms. Seema Arora, Mr. Ravi Agarwal and Dr. Prasad Modak.
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Major Action Points for a Resource Efficiency Strategy for India 20
Resource efficiency is built around needs, ecological limits, and social acceptability, and is a key element of sustainable development. The 2030 Agenda for sustainable development defined by the Sustainable Development Goals (SDGs) have also assigned an important position to resource efficiency. This is directly reflected in Goal 12 on ensuring sustainable consumption and production patterns, specifically in terms of substantially reducing waste generation through prevention, reduction, recycling and reuse. Eight other goals (Goals 2, 6, 7, 8, 9, 11, 14 and 15) also directly refer to resource efficiency or sustainable use of resources.

Resource efficiency also directly contributes to mitigation of climate change targets, in most cases without necessarily having adverse economic effects. The International Resource Panel, hosted by the United Nations Environment Programme (UNEP) in a recent (May 2016) report notes that more efficient resource use coupled with ambitious action on climate change, could achieve up to a 74% reduction in greenhouse gas emissions by 2050, whilst also stimulating economic growth. Besides the positive economic, social and environmental advantages, the benefits from resource efficiency could be technical, monetary, aesthetic and cultural.

Resource efficiency thus, because of its strong influence on the attainment of the SDGs and of the nationally determined contributions to the Paris Agreement, is a top priority for enabling sustainable development now and in the future. The flow of materials and resources along globalized supply chains and product life cycles strengthens the need for a global perspective of resources as well as a need for integrating various policy areas for promoting resource efficiency. Over the years, the Government of India has taken many initiatives in terms of policies and programmes to implement its commitment to the principles and goals of resource efficiency. However, most of this commitment has resulted in bringing about improvements in energy and waste use efficiency. With the passage of time, new challenges and constraints to meeting the objectives of resource efficiency for metals and minerals have emerged, which also need to be addressed.

This guiding document outlines the broad contours of India’s first resource efficiency program (IREP) and ways to mainstream resource efficiency and secondary raw materials in policies with focus on metals and mineral resources in India. The program focuses on our social and economic conditions, but at the same time draws upon the learning from global initiatives and best practices. The work on the document was commissioned and coordinated by the Indian Resource Panel (InRP) and was based on a consultative process involving all the relevant Ministries of the Government of India and various other stakeholders including those representing important hotspot sectors. I hope the document will serve as a useful reflection on the pursuit of resource efficiency in the country and help position India on a more sustainable path of development.

Dr. Ajay Mathur  
*Member, InRP*

New Delhi, April 2017
The past four decades have witnessed deep, structural changes in the range of issues that policy makers are used to dealing with. Until the 1980s, the primary topics of concern related to politics were: economics, international relations — and war and peace. While these worries have not gone away, in recent decades the corridors of power and the headlines of newspapers are increasingly being overtaken by problems that have virtually no precedents in history: local and global processes that threaten the very life support systems of our fragile planet. Much of the attention of world leaders, the media and the public is now increasingly being captured by such complex and possibly irreversible anthropogenic processes as climate change, biodiversity loss and species extinction, large-scale destruction of lands, forests and oceans.

Successive summits of national leaders and other high-level conferences have taken place, currently at a rate of several per year, and numerous conventions, treaties, accords and institutions are now in place, constituting an elaborate web of “multilateral environmental agreements.” Largely because of the complexity and economic costs involved, the process of identifying and defining the respective problems, and negotiating agreements and setting in place the institutional machinery needed, is usually quite long, in the order of two or three decades. Today, the machineries to deal with several global issues such as climate change, biodiversity, ozone depleting substances, hazardous wastes and other environmental issues are attracting significant attention from decision-makers.

However, international or national efforts to address the issues related to sustainable management of the Earth’s biophysical resources, though of importance comparable to those of the other environmental issues, are in their infancy. The United Nations Environment Programme took the first step in this direction in 2007 by setting up the International Resource Panel (IRP). Over the past decade, the IRP has produced detailed reports on resources such as Metals, Water, Land, Biomass and other materials; and on sectors that affect or are heavily affected by resource availability or resource use such as Cities, International Trade and Energy Production. The main emphasis of the work of the IRP has been on identifying and documenting practical and economically viable ways to decouple economic development from material consumption. The easiest, primarily technological, means for doing this is through improvements in resource efficiency. Other means include changes in lifestyles, consumption patterns and production systems. Policy instruments to facilitate these changes include innovation, fiscal incentives and regulations.

India is the first country to have set up a national-level counterpart to the IRP, the Indian Resource Panel (InRP), a body of eminent resource experts drawn from government, industry and civil society. The Ministry of Environment, Forests and Climate Change, with considerable support from the German Government’s development agency, GIZ, has played a most valuable part in initiating, nurturing and building up the InRP’s capability to address resource issues from a national perspective.

Broadly speaking, societal concerns regarding natural resources fall into two broad categories: (i) How can the economy get greatest benefit for all citizens from the Earth’s resource endowments? And (ii) How can our technologies, economic policies and lifestyles be moulded to ensure that our consumption of resources does not transgress the upper limits of the biosphere or the lower limits of human wellbeing?

This policy brief sets out an agenda for India to initiate policy formulation in the sphere of natural resources, starting as a first step, with active promotion of resource efficiency in all sectors of the national economy.

Dr. Ashok Khosla
Member, InRP
Co-Chair, IRP (2007 to 2016)

New Delhi, April 2017
1. Context Setting for a Resource Efficiency Strategy

1.1 Introduction

Natural resources are vital for our economy and society. Driven by rapid economic and population growth, the demand for natural resources, especially materials has grown manifold over the last few decades. Consequently, concerns over resource depletion and scarcity have also gained greater prominence. Resource supply constraints and price shocks can not only produce potentially severe economic and social consequences, but can also engender political and social conflicts when vital resources are unequally distributed. In addition, resource extraction, utilisation and disposal also typically impose significant environmental burdens, many of which, particularly climate change, are becoming acute in the 21st Century and are borne disproportionately by the poor and vulnerable. Therefore, judicious use of resources through a combination of conservation and efficiency measures for economic, social and environmental sustainability is in every society’s interest. While targeted policies such as those that promote recycling have been around for decades all over the world, many governments are now moving towards more comprehensive strategies to promote resource efficiency (RE) at the national or supra-national scale. The German Resource Efficiency Programme (ProgRess)\(^1\), and the European Commission’s Roadmap to a Resource Efficient Europe\(^2\) can be regarded as most prominent examples. The International Resource Panel (IRP), launched in 2007 under the United Nations Environment Programme (UNEP), examines most critical resource issues with an aim of providing government, industry and society guidance towards an equitable and efficient path of resource use.

In a resource constrained world, the challenge for a developing country like India is to find a balance between the developmental needs and minimizing the negative impacts associated with resource use. In order to face these challenges in future, a comprehensive and holistic national resource efficiency programme can chart out a vision with policy strategies and action plans that supports India’s development goals. These strategies and plans can also contribute towards meeting the Sustainable Development Goals (SDGs), and the Nationally Determined Contributions (NDCs) under the 2015 Paris Climate Agreement. India is the first country to have instituted a national resource panel – the Indian Resource Panel (InRP) – under the aegis of the Ministry of Environment, Forest and Climate Change (MoEFCC) with the objective to advice the government on resource efficiency and secondary raw material management issues and strategies. Thus, India has the opportunity to become a role model for other countries. This brief provides an outline of the Panel’s guiding document for policy makers for a resource efficiency programme.

1.2 What is Resource Efficiency?

In the context of this InRP Brief, it is necessary to define the term resource efficiency more precisely:

Resource efficiency or resource productivity is the ratio between a given benefit or result and the natural resource use required for it.\(^3\)

While the term “resource efficiency” is predominantly used in business, product or material context, “resource productivity” as a term is used in an economy-wide, national context.

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Although indicators for measuring resource productivity exist, those for measuring resource efficiency need to be developed at national level. As different countries follow diverse approaches based on their national goals and strategies for RE, a single universally applicable indicator does not exist. For India, based on the recommendations developed by Indian Resource Panel (InRP), the definition of a goal and an ascribed value can be devised towards development of indicators. In the initial phase, like UNEP and other countries, India can use GDP\(^4\) per DMC (Domestic Material Consumption) for measuring RE.

While the overall RE indicator is useful in the macro-economic context, it is also important to take a product’s life-cycle approach (as depicted in Figure 1) when thinking of RE, since there are opportunities to enhance RE at each of these stages.

1.3 Why does India need Resource Efficiency?

Resource efficiency is a strategy to achieve the maximum possible benefit with least possible resource input. Fostering resource efficiency aims at governing and intensifying resource utilisation in a purposeful and effective way. Such judicious resource use brings about multiple benefits along the three dimensions of sustainable development - economic, social and environmental. Sustainable Development, by its very definition, must also take into consideration three critical aspects related to resource equity and access. Firstly, that all human beings, regardless of their location in the global socio-economic-environmental matrix, must have access to a minimum level of income and environmental quality for a dignified sustenance. Secondly, it also must ensure that the benefits, burdens and risks of resource use and conservation be equitably distributed. Thirdly,

**Economic benefits:** RE has the potential to improve resource availability that is critical to the growth of industries, which translates into reduced price spikes due to supply constraints or disruptions. By using resources more efficiently, or by utilizing secondary resources, industries can improve competitiveness and profitability, since material cost is typically the largest cost for the manufacturing sector. RE-based innovations can also give industries an edge in the export market, as the experience of global leaders such as

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\(^4\) Gross Domestic Product.

as Germany and Japan has shown. New industries can be created including those in the recycling sector, as well as in innovative design and manufacturing, and India can aspire to become a key innovation hub for RE (like it has for ITES\(^6\)). Finally, reduced import dependence for critical minerals helps to improve the country’s trade balance and promote economic stability.

**Social benefits:** Reduced extraction pressures due to adoption of RE strategies have the potential to reduce conflict and displacement in mining areas, as well as improve health and welfare of local communities. RE can contribute to improved affordability of and access to resources critical for poverty reduction and human development. For example, the use of recycled aggregates and other secondary raw materials can help protect the soil by reducing impetus for land use conversion from agriculture to soil mining. RE has enormous potential for job creation, not only in the recycling sectors, but also high skilled jobs in innovative design and manufacturing. Finally, RE strategies contribute towards preserving resources for future generations.

**Environmental benefits:** Reduced extraction pressures due to adoption of RE strategies will help to reduce ecological degradation and pollution associated with mining. Reduced pressures from mining will provide further opportunities for undertaking landscape restoration and regeneration of degraded mined areas. Reduced waste generation will not only reduce pollution associated with disposal but also save related costs. Finally, resource extraction and use is highly energy intensive; and since our energy system is dominated by fossil fuels, it contributes to significant GHG\(^7\) emissions. Indeed, it is unlikely that global climate change mitigation goals can be met without a strong commitment to RE.

### 1.4 India’s Recent Material Use Trends

A combination of drivers including economic growth, expanding middle class, increase in consumption, population growth, urbanization and industrialization, have contributed to rapid increase in resource use in India over the past few decades. In India, extraction of primary raw materials increased by around 420% between 1970 and 2010, which is lower than the Asian average but higher than the world average. While extraction of biotic materials only increased by a factor of 2.4, extraction of abiotic materials, particularly of non-metallic minerals, show remarkable increase reflecting the growth of the construction sector. Till the 1970s-80s, biomass constituted the predominant share of resources consumed, but by 2010, the share of abiotic materials has climbed to nearly 50% (Figure 2).

![Figure 2: Material consumption in India, 1970–2010](image)

In 2010, India’s material demand\(^9\) at 5 billion tonnes was the third largest in the world, after China and the United States. India consumed about 7.2% of globally extracted raw materials in that year. Notably, despite high aggregate consumption levels, per capita consumption in India remains lower than the world average. The UNEP assessment\(^8\) demonstrates that it has increased from 2.1 tonnes per capita in 1970 to 4.2 tonnes per capita in 2010 – less than half the world average. Consumption patterns, notably a more important driver than population growth according to the same UNEP assessment, also remain highly differentiated in India with an urgent need to reconcile the oversupply of resources and materials to the upper and middle classes and an undersupply along with severe lack of access of basic minimum resources for the poor.

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\(^6\) Information Technology and Information Technology Enabled Services  
\(^7\) Greenhouse Gas  
\(^9\) Measured in Domestic Material Consumption (DMC)
In Figure 3, resource consumption and resource productivity measured as GDP/DMC, are used to provide an overview of recent trends in India. India has experienced a remarkable growth of GDP, resource consumption and resource productivity. Resource productivity increased slightly until around 1990 and faster during the last decade. However, resource productivity increases in India has lagged behind many other comparable countries which indicates much room for improvement. India is still predominantly fulfilling its resource demands domestically, and thus, is less affected by international price trends and scarcities than other import dependent countries. However, it does remain highly import dependent for critical materials such as molybdenum, copper, nickel (see Figure 4). This may in future make it vulnerable to supply shocks.

**Figure 3: Trends in resource consumption, GDP and resource productivity in India, 1970 – 2010**

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India is still predominantly fulfilling its resource demands domestically, and thus, is less affected by international price trends and scarcities than other import dependent countries. However, it does remain highly import dependent for critical materials such as molybdenum, copper, nickel (see Figure 4). This may in future make it vulnerable to supply shocks.

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**1.5 India’s Future Material Demand Trajectories**

In parallel with global trends, India’s material demand is expected to grow significantly as its economy transitions towards greater shares of industrial and service sectors supported by a growing middle class. Thus, the question is not if material demand will grow, but rather how fast and to what extent it will grow. IGEp (2013)\(^{11}\) study compared three different scenarios reflecting the impact of different development paces until 2050 (see Figure 5):

- **Slowdown of development process**: 5% annual GDP growth (among other factors);
- **Continuing current dynamic**: 8% annual GDP growth until 2030, thereafter 5% (among other factors);
- **Fast catching up**: 12% annual GDP growth, as observed in China, until 2020, thereafter 8% (among other factors).

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The medium scenario results in a per-capita consumption of about 9.6 tonnes in 2030 which is near the current global average. The total consumption for the medium scenario in 2030 is projected to be 14.2 billion tonnes consisting of about 2.7 billion tonnes of biomass, 6.5 billion tonnes of minerals, 4.2 billion tonnes of fossil fuels, and 0.8 billion tonnes of metals. This means that India would nearly triple its demand for primary materials compared to 2010, particularly the demand for energy carriers, metals and non-metal minerals.

India is meeting its material demand for resources predominantly domestically; thus, most of the impacts of material extraction, use and disposal occur domestically impacting a sizeable population negatively. If India triples its material demand in about twenty years, the question arises where do the required raw materials come from and what are the associated social, economic and environmental implications?

Tripling domestic resource extraction of biomass, minerals and fossil fuels will be linked to increasing pressure on natural resources such as land, forest, air and water. India already has one of the highest extraction pressures in the world; 1,579 tonnes/acre compared to a global average of 454 tonnes/acre. Mining activity has led to large-scale destruction of forests, displacement of millions accompanied by loss of land and livelihood for many. Owing to deteriorating socio-environmental conditions, the opposition of tribals and other local communities against mining has increased during recent years.

Thus, further significant increase of mining activity will lead to even more social and environmental conflicts than today.

Imports of materials also face severe constraints; import dependencies and costs for imports would increase. Moreover, 3.8 billion tonnes of fossil fuels or 4.6 billion tonnes of construction minerals annually would be further required. It would mean that India would have to import about 2/3 of internationally traded fossil fuels or about 4.5 times more than the internationally traded amount of non-metal minerals in 2010.

The implications of these future trajectories are clearly worrisome and require a thoughtful approach to counteract. Moving the economic trajectory in a more desirable direction is difficult and takes a long time; therefore it is important to start planning for the transition early and avoid locking in undesirable policies and infrastructure that will be difficult to change in the future.

1.6 Existing Policies as a Foundation for a RE Strategy

In India, there are many existing policies influencing resource use at different lifecycle stages starting from mining to designing, followed by manufacturing, consumption and ultimately end-of-life management (disposal or recycling). However, their design, emphasis, integration or implementation is often sub-optimal in terms of achieving RE goals.
At the mining stage, the National Mineral Policy already includes zero-waste mining as a national goal and emphasizes the need to upgrade mining technology. In addition, there is a need to promote extraction of associated metals (Tin, Cobalt, Lithium, Germanium, Gallium, Indium, etc.) along with major metals like Copper, Lead and Zinc to enhance resource efficiency in the sector. Just as the Steel Policy aims to increase extraction rate from present 93.5% to 98%, there is a need to increase efficiency in extraction of other minerals to reduce mining and associated environmental impacts.

At the design stage, policies like the National Housing and Habitat Policy, 2007 and the Pradhan Mantri Awas Yojana (PMAY), 2015 emphasize on developing appropriate ecological design standards for building components, materials and construction methods and there is a need to introduce such components in other sector policies. The Department of Science and Technology, Ministry of Science and Technology, is promoting R&D related to waste management and there is a need to further enhance funding for RE and Secondary Raw Materials (SRM) related R&D. Further, there is a need to promote voluntary standards, like Green Reporting Initiative and ISO 14062:2002 to develop and strengthen design initiatives for improving resource efficiency and promoting use of secondary raw materials across sectors.

At the manufacturing stage, flagship programmes like “Make in India” that provide special assistance to energy efficient, water efficient and pollution control technologies through Technology Acquisition and Development Fund (TADF) can promote RE and SRM approaches as well. Industrial and sectoral policies can include promotion of industrial symbiosis (where waste from one industry is raw material for another), process efficiency programs and use of recycled materials in manufacturing.

While an eco-labelling scheme from MoEFCC is in place, its impact has been rather limited; there is a need to include provisions for preferential procurement of eco-labelled products through Green Procurement Policies. In addition, incentives should be provided through tax benefits for eco-labelled products to encourage consumers to purchase such products.

In case of end-of-life stage policies, while there are policies existing to tackle all types of waste ranging from hazardous waste to Municipal Solid Waste (MSW), Construction and Demolition (C&D) waste, plastic waste and e-waste, enforcement has been limited due to lack of support for business models that lead to better implementation. There is a need to mobilize funding or cost of treatment for waste through Extended Producer Responsibility (EPR) and Polluter Pays Principle. Also, there is a need for a unifying framework that brings together these different sources of secondary raw materials for effective closed-loop recycling. To effectively manage the dispersed waste streams there is also a need to involve the informal sector by providing them with technical capacity building and financial support.

1.7 Congruence of RE Strategy with Government Obligations and Priorities

Not only does a RE strategy provide multi-dimensional benefits for sustainable development as outlined in Section 1.3, judicious use of resources is an important part of several SDGs, most obviously Goal 12 (responsible consumption and production) and Goal 8 (decent work and economic growth), but also those related to sustainable cities and communities (Goal 11), industry, innovation and infrastructure (Goal 9), climate action (Goal 13) and affordable & clean energy (Goal 7). Further, an ambitious RE strategy has the potential to make a substantial contribution to India’s Nationally Determined Contributions (NDC) commitments under the 2015 Paris Climate Change Agreement.

Further, it is important to recognize the implications of and potential for overlap of a RE strategy with several key policy priorities of the Government of India. With the government’s goal of promoting India as a global manufacturing hub through its Make in India campaign and Zero Defect—Zero Effect scheme, the issue of using resources more efficiently and strategic planning for critical resources becomes extremely pertinent. The Smart Cities program envisages efficient urban infrastructure and the Housing for All mission has ambitious goals for affordable housing; both need judicious planning for resources to fulfil their aims. Waste and pollution reduction through adoption of RE approach can also contribute positively to the Swachh Bharat (Clean India) and Ganga Rejuvenation missions. Therefore, the rationale is overwhelming for India to adopt a comprehensive RE strategy as central to its developmental goals.

12 ISO 14062 deals with integrating environmental aspects into product design and development.
2: Policy Options and Recommendations

2.1 Policy Principles and Approaches

Natural resource management should be shaped by two guiding principles:

- Maximizing the value contributed by natural resources to overall human wellbeing
  – by raising resource efficiency/productivity ("doing more with less")
  – by ensuring equitable access to resources, including for future generations ("fairness in distribution")
  – by using appropriate decision tools ("lifecycle analysis")

- Minimizing the overall costs to society of consuming natural resources
  – to the economy by efficient technologies, reducing waste, the 5Rs (Reduce, Reuse, Recycle, Refuse, Recover)
  – to the community by fair access, burden sharing and reduced conflict
  – to the ecosystem by minimizing pollution and maximizing circular loops

Based on these principles, policy measures need to be formulated and their use integrated along four perspectives: the stages of the lifecycle, selected sectors, selected materials, and cross-cutting measures. To begin with, India could focus on designing policy instruments (including the cross-cutting instruments such as sustainable public procurement, standards, eco-labelling and certification) for promoting resource efficiency in the use of critical materials in the hotspot sectors (key industrial and strategic sectors) of the economy. There will also need to be multi-stakeholder involvement including cross-industry collaboration as well as collaboration among public, private, academic, and non-profit institutions, and information exchange to harmonize the interests and constraints of the different groups involved in these sectors along the different life-cycle stages.

2.2 Institutional or Coordination Mechanism

The support for policy formulation/policy advice can be extended by a dedicated institution that engages in coordination with the InRP and aims to promote resource efficiency in India beyond individual sectors or regional interests. The work of the said body would also look into the development of RE measures across the lifecycle to avoid burden shifting across stages, sectors and resources, keeping in mind ease of implementation.

To estimate the effectiveness and potential negative impact of the measures, there is a need to have in place effective mechanisms for collecting and synthesizing resource efficiency information – including life-cycle and material flow data and case studies. These mechanisms could be supported by the institution along with acting as a storehouse of best practices from across the world and successful business models.

The institutional mechanism could draw learning from India’s Bureau of Energy Efficiency (BEE) and could also think of creating a commercial entity (similar to Energy Efficiency Services Limited (EESL)) that facilitates technology adoption, capacity building, awareness creation and leads market-related actions.

2.3 Development of Indicators, Data and Analysis

A RE strategy can only be successful if proper indicators are developed and progress is backed by comprehensive data and rigorous analysis. For India, based on the recommendations developed by the InRP, the definition of a goal and an ascribed value can be devised towards the development of indicators by following the two steps mentioned below:
1. Monitor resource use and resource efficiency regularly on national level

2. Decide on the most appropriate indicators and set an ambitious but realistic goal for India.

As a first step, India can follow the international accounting methods, particularly the conventions of System of Environmental-Economic Accounting (SEEAA)\(^\text{13}\), in order to measure Domestic Extraction, Imports and Exports as well as derived indicators such as Direct Material Input (DMI) and Domestic Material Consumption (DMC). In the initial phase, like UNEP and other countries, it can use GDP per DMC for measuring RE. India has the potential to improve the measurements of wastes in different material streams along with recycling rates as these form central components of resource efficiency programmes on an international level.

As the second step, the InRP may decide and suggest a specific goal for the development of Indian Resource Efficiency Programme (IREP) specific to India’s needs. In the industrialised countries the focus is on achieving economy-wide resource efficiency linked to a decrease of absolute material consumption. For India, in contrast, the focus of resource efficiency needs to take into account its development needs characterized by progressively increasing resource demand, especially for infrastructure and other related activities. In the short to mid-term, this may even be linked to a temporary decrease of resource efficiency in spite of medium or high GDP growth. However, measures need to be put in place now so that resource efficiency and productivity improves in the long-term.

Furthermore, in order to deal with resource-efficiency challenges and explore related options that India will face in the years ahead, more comprehensive qualitative and quantitative data are needed on the basis of which future scenarios and trends can be predicted. Therefore, data will be needed for monitoring of emerging trends (e.g., in technology) that may impact resource efficiency efforts and innovative business models (e.g., that can change demand, especially for infrastructure and other related activities). In the short to mid-term, this may even be linked to a temporary decrease of resource efficiency in spite of medium or high GDP growth. However, measures need to be put in place now so that resource efficiency and productivity improves in the long-term.

2.4 Fiscal Instruments

It is widely recognized across the world that fiscal instruments play a significant role in helping transform economies to become greener. Fiscal instruments in the form of taxes, charges, subsidies, incentives and budget allocations can also help generate revenue for environmental and social purposes besides shifting behaviour towards resource efficient activities and stimulating investment in cleaner and resource efficient technologies by pricing environmental externalities.

In India, the government had initiated a tax - Clean Energy Cess (@ INR 50 per metric tonne in 2010 for both domestic and imported coal, which has been increased in the 2016 budget to INR 400 per metric tonne). The tax, now known as the Clean Environment Cess, was levied to promote and finance clean energy by setting up National Clean Energy Fund.

For the waste sector, the commonly prevalent incentives to address the critical problem of waste management in India includes: 1) taxes and fees; 2) recycling credit and other forms of subsidies; 3) deposit-refund; and 4) standards and performance bond or environmental guarantee fund. Volumetric landfill taxes can encourage the reduction of waste and are easy to implement. Their effectiveness, however, depends on the tax rate per tonne of waste and on the existence of adequate monitoring and enforcement measures providing control on types and volumes of waste streams. It is also important to ensure that the tax does not result in increased illegal dumping rather than encouraging 3Rs (reduce, reuse, recycle). Pay-as-you-throw (PAYT) is another way of discouraging waste generation. Precaution against illegal waste dumping or misuse of recycling facilities is therefore needed. Full financing of the waste-management infrastructure has to be assured and sufficient awareness-raising is necessary. PAYT has been shown to have a positive impact on recycling.

If we see the case of lead acid batteries (which generate hazardous lead waste with environmental and health implications) in India, there is a deposit-refund system for recycling in Delhi which provides a discount to consumers on purchasing new batteries and returning used batteries to retailers for recycling.

For promoting use of cleaner technologies, the Technology Acquisition and Development Fund (TADF) under the National Manufacturing Policy

being implemented by the Department of Industrial Policy & Promotion (DIPP) is helping Micro, Small & Medium Enterprises (MSMEs) to acquire clean and green technology at affordable cost across their sector. The fund will support manufacturing of pollution control equipment and reducing energy and water consumption through subsidies.

2.5 Promotion of Business Models

RE business models must lead to value creation or profit for enterprises so that more and more companies are motivated to get involved. There are different types of business models related to RE and there is a need to convey relevant information to the right audience for promotion of RE business models.

While some business models may be viable based on market prices there could be a need for government support through direct subsidies, mandatory public procurement, public support for consultation, networking and dissemination of solutions as well as regulation to accelerate adoption of certain technologies and/or practices. Governments can provide support through hard measures like financial incentives, tax rebates, subsidy, and low interest rate loans or through soft measures including mandatory green public procurement, generating consumer pressure through awareness campaigns by the government, through rewards and recognitions for implementing desired measures related to RE or public support by information services and promotion of exchange of stakeholders. Also, provisions like Viability Gap Funding (VGF) can help businesses meet the high initial cost in their attempt to overcome the barriers and become competitive over time by building scale and upgrading of technology. Additionally, business models that are based on sharing services as opposed to owning resources can further aid the shift towards a RE economy.

2.6 Development and Adoption of Standards and Benchmarks

Standards, developed by specialized standard setting organisations, have been widely used to promote quality in manufacture and performance of products. However, standards to promote environmental goals, especially resource efficiency, are relatively new. Standards for recycled materials now exist in many countries; but it is being recognized that there are opportunities to expand the use of standards in the upstream stages of the lifecycle, e.g. at the design phase. Prominent examples include the EU EcoDesign Directive of 2009 which allows for setting eco-design requirements for various product groups, and the Association of German Engineers VDI 4800 series of standards on resource efficiency. The International Organization for Standardization (ISO), which has been at the forefront of efforts to harmonize standards worldwide, also has existing (ISO 14040 on Life Cycle Assessment) and under-development (“eco-efficiency assessment” and “material flow cost accounting”) standards that will contribute to promoting resource efficiency strategies.

The principal advantage of these standards is that because they are voluntary and aim at gradual market transformation through widespread adoption, they are a politically acceptable instrument. Companies often have strong incentive to adopt standards even without any mandate, to showcase their leadership and excellence and/or to meet requirements of supply chain partners or export markets. However, setting standards can be a resource intensive and time consuming task requiring a high degree of technical expertise.

In India, the Bureau of Indian Standards (BIS) has been the universally recognized and trusted professional standard setting organization with a wide range of standards for quality and performance of manufactured products. In recent years, BIS standards have been developed for recycled products that can be used to promote resource efficiency in the economy. Some of the most prominent examples include standards for use of fly ash in concrete (IS 3812) and bricks (IS 12894). In 2016, BIS also amended the IS 383 standard to allow for the use of recycled aggregates from construction and demolition waste in concrete production. The fly ash standards have been instrumental in promoting the use of fly ash; in 2014, 57.6% of fly ash produced in India was utilized.

It is expected that the standard permitting use of recycled aggregates in concrete will have a similarly significant impact.

BIS standards can have an immediate impact on market acceptance of new resource efficient products. In addition to taking up standard development for resource efficiency on a priority basis, in coordination with stakeholders like the Indian Resource Panel, BIS can consider ways to speed up the lengthy standard setting process. One option would be to look for standards developed internationally and adapt them to the Indian context that address local challenges. Another option, as seen in the recycled aggregates example, would be to amend existing standards rather than creating new ones, since this can be a much shorter and simpler process. Initially, simpler standards for the use of secondary materials may be prioritised, while more complex standards targeting resource efficiency in the design phase may be taken up gradually over time. Where formal standards do not exist or may be developed in the future, industry-wide benchmarks can play a similar role and industry associations, together with other stakeholders, can play a key role in developing and propagating their adoption.

2.7 Eco-labelling and Certification

Eco-labelling is a useful information-based policy instrument that harnesses the buying power of conscious consumers, including public and institutional purchasers, to promote greener products. Eco-labelling has been a widely used policy instrument in numerous countries for several decades, the German Blue Angel scheme being among the most prominent ones. Since the success of eco-labelling depends on the degree of consumer consciousness and motivation, experience has shown that eco-labelling initiatives work best when coupled with policy instruments that multiply its effectiveness, such as public procurement programs. With the proliferation of eco-labels creating consumer confusion, government recognition of trusted eco-labelling schemes that are based on rigorous and transparent standards with certification by accredited independent third-parties can help to improve the credibility and effectiveness of eco-labels.

In 1991, India launched its own eco-labelling scheme called “EcoMark”, overseen by the Ministry of Environment and Forests (now MoEFCC). This scheme is unique because it considers both environmental and quality criteria. Criteria have been developed for 16 product categories, with the approved products being awarded the “earthen pot” EcoMark label. However, the EcoMark scheme has not become very popular even after two decades with only a few dozen products being certified so far. Experts have cited several reasons for this lack of success including low public awareness and complicated certification process.

Completely voluntary eco-labels like EcoMark are unlikely to be successful on their own without supportive policies such as public procurement mandates, at least in the initial stages. Very importantly, a long term commitment and strategy should be developed for a sustained public awareness campaign to promote the EcoMark, perhaps with contributions divided between the government and private sector. Lessons can be taken from the relatively successful eco-labels already existing in India, such as the Bureau of Energy Efficiency (BEE) star label and the GRIHA rating system for green buildings, both of which were supported by effective public education campaigns and government mandates in some form.

The EcoMark scheme should be rejuvenated with a reorganized structure comprising of multiple stakeholders. The scheme should expand into new product categories, especially focusing on products that use secondary resources. The standard setting and criteria development should take into account international best practices and guidance from ISO standards.

The certification process should be simplified and streamlined, possibly with the involvement of third-party accreditation agencies. Testing and certification capacities are often lacking for many environmental attributes and these need to be made available across the country. A rejuvenated EcoMark scheme can focus on a few chosen categories initially for which the criteria, market, and testing facilities already exist and gradually expand into other categories.

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23 Green Rating for Integrated Habitat Assessment
2.8 Green Public Procurement

Since governments are typically among the largest consumers in an economy, preferential public procurement can have a significant impact on market transformation towards desirable products and services. Sustainable Public Procurement (SPP), also referred to as Green Public Procurement (GPP), has been extensively used, especially in OECD countries, to support green production and bring about market transformation towards environmentally preferable products through large scale purchases.24

Public procurement accounts for almost 20% of GDP in India, wielding substantial purchasing power to the government. In India, public procurement is currently governed by rules and instructions contained in the General Financial Rules (GFR) and the Delegation of Financial Powers Rules (DFPR), apart from ministry/department specific purchase procedures for specific ministries and the Directorate General of Supplies and Disposal (DGS&D). Historically, preferential procurement in India has sought to achieve social goals such as protection of vulnerable industries (e.g., jute), or promotion of handicrafts from disadvantaged areas/communities, etc.25

The Indian Public Procurement Bill introduced in Parliament in 2012 intended to enhance transparency, accountability, efficiency, and fairness in public procurement. The bill, which did not become a law, did not specifically include GPP. Therefore, a single law governing public procurement at the central government level still does not exist. The government has attempted to promote GPP through the EcoMark eco-labelling scheme; however, the market uptake was not satisfactory. Some public sector organisations such as the Indian Railways have engaged in GPP schemes independently, with a major focus on energy conserving equipment.26

India has produced a few notable successes in GPP schemes in recent years. To overcome the high cost of energy efficient LED lights, the Bureau of Energy Efficiency (BEE) devised a business model based on bulk purchases that drove down the price by nearly 80% within a couple of years.27 The Fly Ash Notification (S.O. 763 (E)), originally issued by the MoEFCC in 1999, mandated the use of fly ash in brick and cement making in areas nearby power plants, and was made more ambitious over time. As a result of this policy, the utilisation of fly ash increased from 13.5% in 1999 to 57.6% in 2014.28

The successful examples above demonstrate that carefully designed interventions can have a significant positive impact. However, in addition to the lack of a comprehensive policy on GPP, there are many challenges that need to be overcome. These include limited awareness among producers and consumers, limited capacity and motivation of government agencies to take on additional responsibility, lack of clearly defined criteria for “green” products, limited experience in using life-cycle assessment tools, perceived higher costs of green products, real or perceived quality issues with green products, etc.

A comprehensive and well-designed GPP policy can be a key instrument to promote resource efficiency in the economy. Therefore, it is important to start with a small range of products first, for which the market is already reasonably well established, and then gradually expand as the program matures.

Experience from other countries shows that an independent entity should develop criteria and standards and oversee certification and eco-labelling of products. In addition, a list of products and manufacturers of approved green products of adequate quality must be maintained by such an entity. This makes it simpler for each government agency to engage in green procurement without the need to undertake complex assessments with inadequate expertise. Finally, mandatory targets for green procurement help to achieve the desired level of performance; these targets can be graduated and made more ambitious over time depending on the maturity of the program and the market for green products.

2.9 Consumer Awareness

Consumers are key actors who also have a shared responsibility in charting a path towards more efficient and sustainable resource use. Indian consumer attitude surveys provide a mixed picture. Some surveys have ranked Indian consumers very high in environmental ethos due to a traditional preference

26 Ibid.
for reuse. However, other surveys have found a shift towards using disposable goods in other segments; consumers remain suspicious of claims advanced by green manufacturers and are unwilling to pay higher prices for green goods.

Overall, the understanding of what qualifies as environmentally-friendly, and by extension resource efficient product, especially from a life-cycle perspective, is low. In order to increase demand and consumption of green products, four factors need to be addressed:

- Strengthen awareness regarding green products
- Improve availability of green products in the markets
- Clear certification for green claims made by producers
- Lowering costs of green products

A stronger regime of standards, certifications and labels is imperative as a first step towards engendering greater trust in the claims of the green products. It will aid consumers to assess the authenticity of claims by manufacturers. At the same time, a robust awareness generation campaign and marketing strategy must be developed by involving consumer bodies, government and manufacturers. Such campaigns should be carried across different media like television, radio, newspaper, internet and social networking websites. For example, awareness regarding consumer rights through consumer courts is regularly promoted through advertisements in television, radios and newspapers. The success of BEE in promoting ‘star’ rating for household appliances can be attributed to its marketing strategy along with the simplicity and comprehensibility of the label itself, although notably the attractiveness of energy efficient appliances is partly due to their near-immediate cost savings to the consumer. On the other hand, the Indian EcoMark scheme had not had much success due to lack of awareness among consumers which acted as a dis-incentive for producers. This clearly shows that creation of standards and labels alone is not sufficient to impact purchasing decisions. Information dissemination and awareness generation play a significant part in driving consumer behaviour. However, if the price differential between “green” and conventional products is too great, consumer motivation alone may not be enough and other policies that improve the competitiveness of green products may be needed.

Further, consumers must also be sensitised and made aware of their responsibility towards waste disposal. More aware and proactive consumers will aid in greater recovery of secondary raw materials.

**2.10 Industrial Park / Clusters and Symbiosis**

National Manufacturing Policy of India (2012) has introduced the concept of National Investment and Manufacturing Zones (NIMZs) which are greenfield industrial corridors. In addition, there are five industrial corridors under development including Delhi Mumbai Industrial Corridor (DMIC), Bengaluru Mumbai Economic Corridor (BMEC), Amritsar Kolkata Industrial Corridor (AKIC), etc. However, there is a need to plan industrial parks and clusters so that they not only focus on economic viability and profits but are also geared towards increasing resource symbiosis and closing the resource loop by enabling utilisation of waste of one sector or industry as secondary raw material in another, which is likely to result in cost savings as well. In addition, there is a need to provide subsidized land and other support for setting up recycling units in all industrial areas near large towns and cities to prevent dangerous recycling in cities or in far-off isolated areas that limit access to waste as well as recovered materials. China has developed 94 Eco-Industrial Parks focused on minimizing waste generation and improving the overall eco-efficiency of the park by applying principles such as industrial symbiosis, clean production, green supply chain management and centralized pollution abatement. There is a need to set-up such Eco-Industrial Parks and Recycling Industrial Parks in India as well. As a step towards it, pilot projects may be taken up where feasible in existing industrial parks that already promote some degree of collaboration between industries, for example, parks with Common Effluent Treatment Plants (CETPs).

**2.11 Upgrading of Informal Sector**

Informal sector makes a significant contribution to the overall economy and society by reducing consumption of green products, four factors need to be addressed: for reuse. However, other surveys have found a shift towards using disposable goods in other segments; consumers remain suspicious of claims advanced by green manufacturers and are unwilling to pay higher prices for green goods.

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**2.11 Upgrading of Informal Sector**

Informal sector makes a significant contribution to the overall economy and society by reducing
the cost of waste management and recycling. They constitute nearly 1% of urban population and belong to the lowest social strata. With substantial increase in volume of waste across dispersed streams, a RE strategy should recognize their role and build upon the comparative advantages of the informal sector (in collection, segregation and dismantling) with an aim to mainstreaming and formalising it.

Towards this end, the informal sector could be organised into cooperatives, jointly owned private enterprises to aid their access to technology and funding for improving their operations, ensuring safe working environment and health for the workers employed in the sector. This will enable them to participate formally in waste management related tenders while ensuring that benefits from SRM accrue to the workers resulting in increased earning potential. From a material recovery perspective, the loss of value and quality of metals and critical mineral resources due to inefficient and unskilled handling could be minimised. Quality metal scrap would be more in demand, especially as resources become more scarce, and this will enable them to fetch better prices and augment livelihood options. Other kinds of business models could also be developed that build on the positive aspects and overcome inefficiencies. For instance, the informal sector’s expertise and ability in terms of collecting e-waste or other wastes directly from households and segregation can be supported through a web-platform which could be operated by a formal sector enterprise. Therefore, integration of informal sector towards efficient and quality raw material recovery should be made an important element for an Indian RE and SRM strategy.

2.12 Capacity Development of all Stakeholders

It is not uncommon that many visionary policies and targets set for the country are envisioned at the national level but fail to trickle down to local levels for implementation or lead to inadequate adoption by industry. This discrepancy clearly is indicative of the lack of awareness and inadequate implementation capacities of actors at local levels. This problem is especially true with respect to recycling of resources which happens mostly at the local municipal level and is undertaken by MSMEs. Capacity development should be targeted at these “weak links” and include technological, financial as well as managerial components. State government agencies such as Pollution Control Boards or Departments of Urban Developments can take up the responsibility for capacity development of local governments while that for MSMEs should be vested with industry associations. Technical or Administrative Training Institutes can act as hubs for such capacity development, and Centres of Excellence/Innovation may be created for this purpose in existing institutions.

Successful examples of such capacity development efforts include training of municipal officials as well as MSMEs on electronic-waste (e-waste) recycling, construction and demolition (C&D) waste recycling, etc. through Indo-German collaboration under MoEFCC. There is a need for replication of such training models and implementation in other sectors and in all parts of the country.

2.13 Targeted Sectoral Policies

While a National Resource Policy that emphasises RE is highly desirable, sectoral policies can also play a key role in promoting RE in important ways. In some cases, existing policies may need to be updated to better reflect RE, in other cases, new sectoral policies may be needed. For example, the MoEFCC has put in place well defined rules for management and material recovery from key waste streams such as municipal solid waste, electronic waste, plastic waste, construction and demolition waste, etc.: the focus needs to move towards effective implementation for these. However, RE perspective is inadequate in key sectoral policies such National Minerals Policy, National Manufacturing Policy, Housing for All, Make in India, etc., and a Metals Recycling Policy does not exist. Such targeted policies should include a needs assessment, supportive framework and resources for implementation and monitoring. Certain Ministries that oversee resource intensive sectors may also consider devising and adopting medium-to-long term strategic plans to promote RE. According industry status to the recycling sector will also be of benefit in promoting a greater reuse of secondary materials.

2.14 Monitoring and Further Development

After addressing, measuring, analysing and shaping measures for RE in India, a translation into practice is needed. Policy can provide sectoral, even process-specific information and support to convince businesses that conscious resource management does not only reduce the burden on the environment, but that it can bring down cost of production by reducing material and energy cost and thus create competitive advantages for the company. Companies or organisations can use business models which can either focus on helping others to reduce their
resource consumption (e.g. machinery, service, etc.) or increasing internal efficiency to reduce resource consumption of a company or sector. Another option for companies to acquire economic benefits while reducing the pressure on the environment stemming from a specific product is to design, develop, produce and sell products that use less resource for their production as well as in their use phase, and also allow for optimised recycling after end-of-life.

The Indian Resource Efficiency Programme is a policy framework which needs constant stakeholder guidance and support to ensure its political relevance. Stakeholders have tremendous knowledge about the specific situation, the context and inter-relationships in their field of activity. Targeted access to practical expert knowledge can help to overcome such barriers to optimal governance by providing decision-makers with information that allows them to formulate and implement policies in the best possible way. This ensures a broader acceptance and legitimacy of political activity. Policy coordination among various branches of government to reinforce resource efficiency throughout the economy can only be strengthened over the medium-to-long term through constant effort. The program may be reviewed after a period of 3-5 years for refinement and readjustment based on implementation experience.

2.15 Conclusion

In conclusion, it can be said that there is a wide array of opportunities for businesses, governmental institutions and society to benefit from resource efficiency. The message that needs to be conveyed as an incentive for change to enterprises introducing sound resource management and those who innovate in green product segments and sell them on the market is that they can obtain significant economic gains.

While this first Indian Resource Efficiency Programme limits itself to improving resource efficiency and management of secondary raw materials for high-priority abiotic resources, especially in selected sectors, future versions may consider other types of abiotic as well as biotic resources. The implications of trends and patterns of resource use on social welfare (e.g. on food production, drinking water, access to energy, housing and healthcare) also need to be studied in order to devise a holistic and equitable resource efficiency strategy.

The resource problematique of India, given its development trajectory, needs to at all points be geared towards goals of resource equity, access and productivity.
Major Action Points for a Resource Efficiency Strategy for India

Development of a first India-specific RE programme aims at mainstreaming a Resource Efficiency (RE) & Secondary Raw Materials (SRM) strategy which is based on life-cycle approach targeting reduced abiotic resource use, especially of high priority materials in selected sectors, and addressing issues that cut across life-cycle, materials and sectors. To accomplish the same, in the initial phase, the following major action points for the RE Strategy could be emphasised:

1) Recommendation to develop suitable standards (including product design standards) through a consultative process involving stakeholders including ULBs, industry, civil society, registered consumer forums and academia, and with a timely review mechanism to analyse the applicability and success of standards by an independent body of scientific experts.

2) Enabling Viability Gap Funding for RE interventions in a competitive manner with an objective to encourage players to come to the market, build up scale, upgrade technology, and enabling competition in the longer run.

3) Promotion of green public procurement of RE & SRM products.

4) Development of certification and eco-labelling with emphasis on RE & SRM addressing product reuse, durability as well as secondary resource usage.

5) Development of a system to specify, monitor and control waste streams leading to data base for volumes and types of waste and their feasibility for the production of secondary raw materials and thus substituting primary resources.

6) Aiding formation of decentralised industry clusters of MSMEs and OEMs for encouraging systematic exchange of secondary raw materials across industries.

7) Development of consumer awareness especially for communicating standards, labels and rules to aid the acceptance of green purchasing and products from waste recovery.

8) A comprehensive effort towards capacity development of key actors responsible for undertaking or overseeing RE/SRM strategies, including ULBs, MSMEs, as well as the informal sector.

9) Include RE/SRM principles in India’s (I)NDC’s commitments.

10) In order to enable Action Points listed above, the creation of an institution with a strong mandate similar to the Bureau of Energy Efficiency (BEE) is recommended that works in coordination with BIS and other related government bodies. The functions of this institution could include the following:

   a. Development of RE measures across the lifecycle to avoid burden shifting across stages, sectors and resources (including on biotic resources) keeping in mind ease of implementation.

   b. Assessment of RE measures for their effectiveness and potential negative impacts along with providing regular bulletins of findings for stakeholders.

   c. Serving as storehouse of best practices and business models.

   d. Development of indicators to measure the RE progress in India. Proposed initial suitable indicator: GDP/DMC\(^31\) (later changed to GDP/RMC\(^32\)).

   e. Development of statistical models for data generation, analysis and interpretation reflecting on indicator values for environmental, social and economic development. Regularly bringing out reports discussing the state of affairs, and ensuring their wider dissemination.

This institution could be supported by a commercial entity (on lines similar to Energy Efficiency Services Limited (EESL)) that could enable financing technology adoption, capacity building and awareness. Further, it would also be responsible for coordinating research and providing policy advice in coordination with the Indian Resource Panel (InRP).

31 DMC: Domestic Material Consumption
32 RMC: Raw Material Consumption