

Chapter 12

Local development strategy, green jobs and skills in the Indian context

Sunita Shanghi and Jeevan Sharma

Eco-friendly approaches for adaptation and mitigation of the impact of climate change and environmental degradation on economic growth affects the labour market. The market needs to adjust in terms of changes in the occupational structures and skill responses to be able to sustain the environment and growth at national and local levels. As a result of the transition towards a green economy, some new jobs will be created while some existing ones will be eliminated, some new occupations may emerge and there may be a need to retrain some of the existing employees to adapt to the changing conditions.

The main challenges addressed include skills identification, mapping, availability and shortages, as well as a lack of infrastructure for skill development. The role of social partners and the community is very important. This brings into focus the urgency for co-ordination at the policy planning stage, retraining of the existing workforce, developing processes for identifying skills and community mobilisation. The present chapter analyses these issues in the Indian context.

Introduction

The increasing pace of globalisation and technological changes associated with climate change have shifted the focus to sustainable development requiring appropriately trained staff for green jobs and preventing environmental degradation (ILO, 2010). The new activities in the green economy and changes in the existing occupations provide ample opportunities for the labour force. The green job report (ILO, 2008) has estimated that efforts to tackle climate change could result in the creation of millions of new green jobs requiring new skills. However, this requires change in public policies to achieve the economic sustainability for improved and decent employment opportunities. The environmental aspects need to be part of the growth and the employment policies. India's 12th Five-Year Plan also lays emphasis on sustainable development also.

A job can be green or brown depending upon the resources, technology and processes used for the job. The International Labour Organization (ILO) has defined a "green job" as one that reduces the environmental impact of enterprises and economic sectors to levels that are sustainable. This definition covers work in agriculture, industry, services and administration (ILO, 2011a). However, for green jobs to facilitate the transition to a green economy requires that an adequate number of people to be available who are trained in the desired skills. For a developing economy like India, where the level of skill training is very low and institutional capacity is limited to catering to the requirements of the exiting economy, this would require coherence in development, labour and environmental policies to meet the needs of the changing economy.

The chapter is divided into four sections. The first section discusses the key challenges and priorities for the transition to a green economy. The second section analyses the policy response to climate change, new job creation and skill response. The third sheds light on the measures for anticipating, matching and monitoring skill needs and the final section suggests a way forward for integrating skills into development strategies to create green jobs for sustainable development. This is all done within the Indian context.

Challenges and priorities for transitioning to a green economy

The transition to a green economy involves the expansion of green production and consumption, to help to reduce the depletion of natural resources and the degradation of ecosystems and the increasing reliance on low-carbon energy sources to mitigate climate change. However, the transition needs to be supported by development policies and actions that ensure sustainable and inclusive growth (UNCTAD, 2011). In a diverse developing economy like India, challenges in the economic, social, political, cultural and environmental arenas need to be addressed for a transition to a green economy.

These all merge into the dominant imperative of alleviating mass poverty reckoned in the multiple dimensions of livelihood security, healthcare, education, empowerment of the disadvantaged, etc. The sustainable development concerns in terms of enhancing human well-being have found a place in India's development process. The 12th Plan (2012-17) is guided by a vision of India that would ensure the improvement of the standards of living of all sections of the population through growth, that is faster, more inclusive and environmentally sustainable.

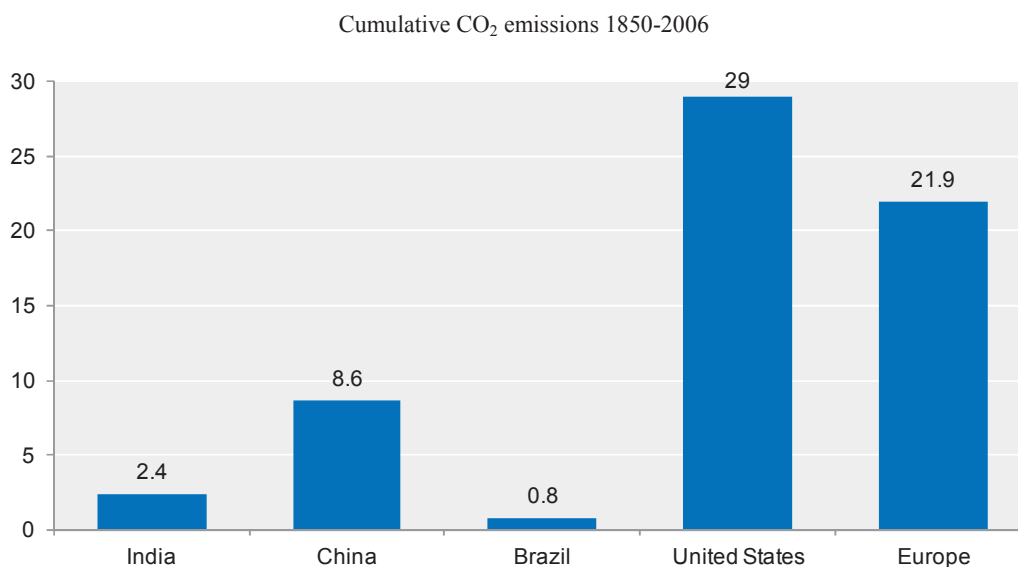
Environmental degradation

The movement towards a sustainable economy is challenged by environmental degradation in terms of pollution of water, land and air, irreversible loss of bio-diversity on the one hand, and deprivation in terms of more than 30% of the Indian population living below the poverty level on the other hand, with 94% working in the informal economy with negligible or no social security. Environmental degradation perpetuates poverty, particularly among the rural poor, where such degradation impacts soil fertility, the quantity and quality of water, air, forests, wildlife and fisheries and the weakening of employment opportunities (National Environment Policy, 2006).

In the transition to a green economy for sustainable development, the labour market plays an important role in the production, generation and distribution of income to reduce poverty. The ILO (2011a) has recognised the maintenance of the environment and gainful employment as key factors for the transition to a green economy.

India is one of the lowest greenhouse gas (GHG) emitters in the world, at 1.18 tonnes of CO₂ equivalent per capita in 2008. That is nearly one quarter of the corresponding global average of 4.38 tonnes and less than one fifth that of the United States and the People's Republic of China (Figure 12.1). India has announced its intention to reduce the emissions intensity of its GDP by 20%-25% of the 2005 levels by the year 2020 through proactive policies, while maintaining its process for inclusive growth.

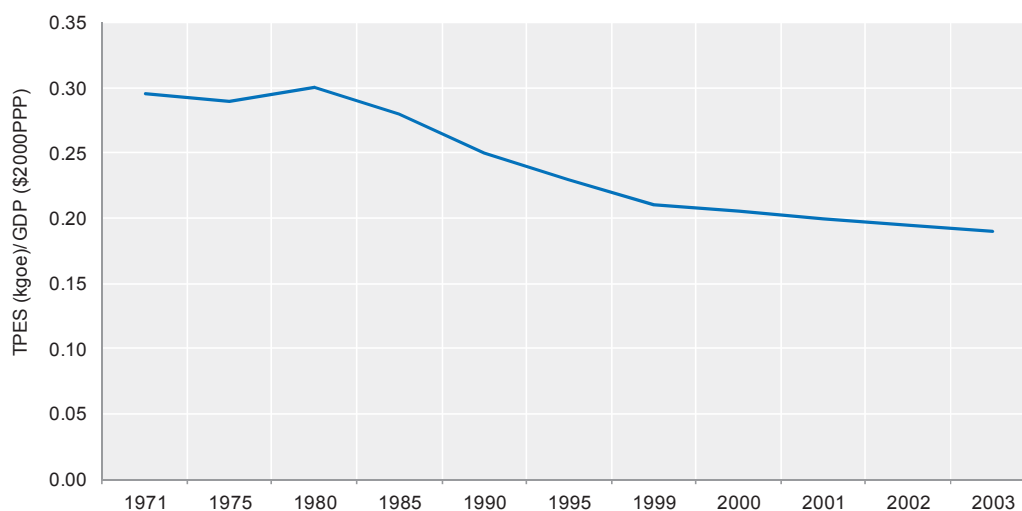
Figure 12.1. **Share of different countries in global emissions**



Source: Planning Commission (2011), 11th Five Year Plan, Government of India, New Delhi.

The need of the hour is investment in climate-friendly technologies to reduce emissions by 50%. Emission reductions need to be factored into people's quest for development (Planning Commission, 2011). A country's greenhouse gas emissions depend on many factors: level of income, living conditions, lifestyle, need for heating/cooling, population, level of economic activities, size of country, urbanisation, transport infrastructure, natural resources, etc.

Figure 12.2. Energy intensity of GDP in India



Source: Planning Commission (2011), 11th Five Year Plan, Government of India, New Delhi.

India's approach to low-carbon inclusive growth recognises that policies for climate change mitigation differentially affect development objectives, including poverty alleviation improvement in quality of life, the even distribution of justice, job creation competitiveness, industrial growth and improving the quality of the local environment. Thus, a strong adaptation and mitigation framework is required, and substantial resources in terms of finance, technology and capacity building will be needed to implement this framework.

This can be achieved through linkages between developmental and environmental policies at all levels in all sectors. Including all sectors is important in terms of greenhouse gas emissions and use of natural resources as well as in terms of their contribution to the economy and employment. To be able to analyse how these sectors can contribute to the generation of green jobs at a local level using different skills levels, it is necessary to look at the problem areas and then see how skills have been integrated for green jobs at the local level in the response strategy.

Agriculture: Soil degradation, flood, droughts, fertilisers

Agriculture, the principal source of livelihood for 58% of the population for food and nutrition security, contributes about 14.2% of India's GDP. However, it is a challenge to support 17.5% of the total world population with just 2.3% of the world's total land area and with more than three-quarters of crop production critically dependent on the southwest monsoon, for which rainfall has been erratic in four out of the last ten years.

This puts huge pressure on cultivable land and exposes farmers to many risks including droughts, floods, disease in both crops and animals, and unpredictable market irregularities. It is estimated that a 1°C increase in temperature is likely to lead to a 5%-10% reduction in the yield of some crops. In addition, the size of land holding in India is very small.

Land degradation poses the biggest threat to the sustainable livelihood security of the farming communities across India, leading to food insecurity. Therefore, there is a potential for green jobs in agriculture through the use of sustainable practices on farms, organic production and successful adaptation to climate change. Technical and infrastructural support through the Krishi Vigyan Kendras can improve the yields from small farms using crop rotation, maturing, natural pesticides and other sustainable methods that can match larger, but often more environmentally damaging, facilities (UNEP et al., 2008). The government of India has also been implementing programmes to conserve soil in order to enhance input efficiency.

Water scarcity: Contamination, shortage

India has to support 16% of the world's population and 15% of its livestock with 4% of its water resources. The per capita water availability has dropped to about one third since independence. The over-exploitation of ground water led to 14% of the assessment blocks falling into the critical and semi-critical categories. The unsustainable consumption pattern, inadequate sanitation, unregulated extraction of ground water, discharge of toxic waste, inefficient irrigation and farming practices, and overuse of chemical fertilizers and pesticides have led to contamination and overuse of water resources. There is an emergent need to address the issue of water resource management in a sustainable manner.

Deforestation: Soil degradation, conversion for agriculture

There has been significant loss of forest cover, due to the conversion of forest to agriculture, settlements, infrastructure, illegal extraction, cattle grazing, etc. resulting in soil degradation, flood, droughts, etc. Enhancing forest and tree cover mitigates climate change by absorbing carbon dioxide (CO₂) from the atmosphere and turning it into biomass. The forestry sector of India can help mitigate climate change by directly increasing the forest and tree carbon sink on the one hand, and by promoting the efficiency of fuel-wood use and by replacing energy intensive building and household products with wood substitutes, on the other hand. Needless to say, actions aimed at the sustainable supply of domestic wood products would also aid mitigation and adaptation efforts, as sustained supplies would not be possible unless forests and tree vegetation themselves are first secured at reasonable levels (Planning Commission, 2013).

The target is to increase forest cover to 33% by 2020, from its current level of 23%. Green jobs in forestry will play an increasingly important role in recharging mountain aquifers, conserving soil, thereby preventing floods and droughts, the habitat for wildlife, and ecological conditions for the maintenance and natural evolution of the diversity of the flora and fauna. The afforestation programme, the Green India campaign, and the MGNREGA Programme are enabling the regeneration of forest land on the one hand and creating decent jobs on the other, which do not require high levels of skills.

Transport: Air quality and vehicular pollution

Transport is the second largest contributor to energy-related GHG emissions in India and its share in national GHG emissions has increased, from 6.4% in 1994 to 7.5% in 2007 (Planning Commission, 2011). Air quality has been an issue of social concern in the various developmental activities. Road transport contributes about 87% of the total GHG emissions. Therefore, reducing GHG emissions from the transport sector requires a shift from road and air transport to rail and water, in addition to improving efficiency of

individual transport modes. Among the road transport system, public transport and mass rapid transport systems can reduce the effects of transport on climate change.

Waste hazard, including sanitation

The increase in population has resulted in an increase in solid waste and waste water output. India's waste generation stands at 0.2 to 0.6 kg/person/day. In most cities, waste disposal involves dumping it in a landfill. According to the Energy Research Institute, this will require 1 400 km² by 2047. The burning of waste in the open is hazardous to people's health. Further, open defecation is affecting the health of the poor and marginalised who are forced to live in overcrowded conditions with limited access to water and sanitation. Rising sea levels are also resulting in coastal population migration, thus perpetuating disease and infection due to limited sanitation facilities and access to clean water and food. Systematic collection of solid waste, recycling it to recover energy, and composting have a large potential for reducing emissions from this sector and improving production. However, in India, systematic collection and dumping of waste is only carried out in urban areas. The incineration of waste for energy has begun in one or two sites, but only on a pilot basis.

Energy management and energy efficiency

India is suffering from huge energy shortages (2008-09), approximately 11% in energy terms and 12% in peak energy, with over 400 million people without access to electricity and 90% of rural India dependent on traditional fuels for cooking (ILO, 2010). The per capita energy consumption of a developing country is likely to be high in order to keep pace with its development path. To stay in line with international commitments to keep pollution levels low, the use of alternative sources of energy and the adoption of energy efficiency measures will be needed to help to reduce GHG emissions as well create new green jobs. The use of alternative sources of energy and energy efficient technology requires intensive research and development to create technological capabilities (Vipin Kumar, 2009).

There is energy efficiency potential in all sectors, i.e. domestic and commercial where one can use energy efficient appliances or construct energy efficient buildings. In many European countries and the United States, approximately 4 million direct green jobs have been created based on improving energy efficiency in existing buildings (ILO, 2011b). The latest *Environmental Performance Index* shows that India is performing poorly on a number of environmental indicators such as environmental health, air pollution, water resources, bio-diversity and habitat. The latest *Environmental Index* released by Yale University, shows India at 125th place out of 134 countries.

The need of the hour is to have an environmentally friendly development policy which can improve the environment and generate sufficient employment. However, creating new employment opportunities requires the integration of skills in accordance with the occupation.

Response strategy at the local level for low-carbon inclusive growth

Government plays a key role in the transition to the green economy in terms of investment in innovation and the development of new technologies as well as in the education system to train people with the right skills so as to maintain the created structure. The government's policies are one of the major drivers for low-carbon

employment. The UNDP (2009) referred to environmentally friendly investment that can create employment for the poor, which provides income on the one hand and rehabilitates or conserves the environment on the other.

The key focus of the India's low-carbon strategy for inclusive growth is to improve agricultural activities, the availability of clean drinking water, a safe environment, household electricity, protecting forests to sustain the ecological balance and safeguarding the rights of the local community, land degradation and clean transport. The national low-carbon strategy needs action at the local level in order to achieve these objectives. The key sectors which have the potential for green job development include: agriculture and forestry; waste management; mass rapid transport; energy efficiency; renewable energy; micro, small and medium industries, etc.

The adoption of greener technology in these sectors would affect the labour market in terms of the creation of new jobs, the replacement of old jobs by green jobs, the elimination of certain jobs and the transformation and redefinition of skill sets and work methods of jobs. The shift to the green economy will not only affect employment but will also result in a change in the occupational structure and associated skill sets (ILO, 2011b). The quantity and quality of jobs, as well as the availability of skills to access those jobs, will affect the transformation to the green economy at the local level.

A look at the current status of the workforce in India indicates that there is a huge unorganised sector employing about 94% of the workforce, who are either unskilled or have very little skills. The workforce with formal skills only constitutes 2% with another 6% with some kind of informal training, leaving a large segment of workforce without any training (11th Five-Year Plan, 2007-08). The dropout rate is very high at primary and secondary levels. On this backdrop, in order for India to reap the demographic dividend that it enjoys, with more than 50% of its population between 15 and 29 years old, a concerted effort to upskill the workforce and train new entrants to the labour force is required to meet the job requirements of the new economy (11th Five Year Plan, 2007-08).

Strategy for environmental sustainability

To enhance ecological sustainability, India unveiled the National Action Plan on Climate Change in 2008, with eight core national missions (Table 12.1). The objective is to maintain a high economic growth rate as well as to address the effects of climate change. The Prime Minister's Council on Climate Change has approved the National Missions on Solar Energy Efficiency, Water, Agriculture and Sustainable Habitat. State governments are preparing state action plans, aimed at creating institutional and programme-oriented capacity under the advice of the central government to address climate change. These, together with the National Mission, will enhance the climate change related action plan in the public and private domain.

Besides the action plan, India has also initiated a comprehensive approach to reduce emissions from deforestation and forest degradation with a stress on conservation, afforestation and the sustainable management of forests. A network of research institutes has been set up for preparing national communication on climate change. The initiatives under these missions would create a large number of jobs. The activities under the "Solar mission" and "Energy efficiency" have already started and are generating employment either in existing occupations or in new occupations, which necessitates the development of some new skill levels.

Table 12.1. **India’s Action Plan on Climate Change and the eight national missions**

National missions	Objective	Responsible entity
Solar mission	20 000 MW of solar power by 2020	Ministry of Non-Renewable Energy Sources
Enhanced energy efficiency	10 000 MW of energy efficiency savings by 2020	Ministry of Power
Sustainable habitat	Energy efficiency in residential and commercial buildings, public transport, solid waste management	Ministry of Urban Development
Water	Water conservation, river basin management	Ministry of Water Resources
Sustaining the Himalayan ecosystem	Conservation and adaptation practices, glacial monitoring	Ministry of Science and Technology
A green India	6 million hectares of afforestation over degraded forest lands by the end of the 12th Five-Year Plan	Ministry of Environment and Forests
Sustainable agriculture	Drought proofing, risk management, agricultural research	Ministry of Agriculture
Strategic knowledge for climate change	Vulnerability assessment, research and observation, data management	Ministry of Science and Technology

Source: Ministry of Environment and Forests, GOI.

Local development strategy, green jobs and skills

The concept of a green job is not new to India. The artisans in the traditional industries in the micro, small and medium enterprises sector have been using natural resources produce to generate products for their livelihood. A number of projects initiated well before the issue of environmental sustainability caught the world’s attention such as the use of biogas, solar energy, waste recycling and composting, etc. were creating clean jobs. However, the specific emphasis on maintaining the ecosystem has been highlighted only recently. Different case studies discussed below highlight how local development strategies for low-carbon growth aimed at mitigating the negative effects of climate change have resulted in green jobs using different skill sets.

Recycling and waste management

Occupations in waste management depend on the processes being used: collection, source separation, storage, transport, transfer, processing, treatment and disposal. These processes involve the use of manpower, capital, tools, energy and water. Waste management in cities is the responsibility of the local bodies.

It is apparent that waste collection alone requires a large number of personnel. In addition, it is also a source of employment for those who are engaged in converting the waste into manure or energy and those who produce the related machines and vehicles. The jobs created are helping to maintain a clean environment.

The different waste treatment interventions are helping to keep the environment safe and are also generating high levels of employment in new occupations, additional occupations in existing jobs in terms of numbers, such as waste collectors, segregators, drivers, loaders, workers for treatment and processing, disposal, packers and different occupations in recycling and energy generation. To manage the waste and recycle it for energy generation and composting requires skilled manpower. The huge quantity of waste in the country as a whole provides ample jobs while processing and recycling provides a clean environment, organic manure and local off-grid energy to people. There is a skill gap in processing and recycling waste to energy as well as in composting. The above case studies also indicate that at the local level both the government and social partners are involved in the greening activities.

Box 12.1. Recycling and waste management in Delhi

Delhi generates a total of about 7 000 metric tonnes of waste. More than 50 000 people are employed in the collection, transport and disposal of waste. There are more than 700 trucks, private vehicles and loaders for lifting and carrying waste. The waste is collected in large bins and is used to generate energy and composting at different plants. The Municipal Corporation spends about INR 503 million for managing the municipal waste. The waste is recycled to make vermicompost and generate energy/biogas. The waste management project in Delhi is resulting in high employment levels. Projects have also been undertaken with World Bank assistance to convert kitchen waste into compost in government canteens and to educate people in co-operative societies to adopt the practice. There is a need to generate awareness among people about the ill effects of waste.

The city of Delhi has also launched the first integrated solid waste management system in India, covering door-to-door collection, transport, treatment and disposal of waste. This was jointly developed through Clinton Climate Committee initiatives and the Municipal Corporation of Delhi. It would solve the growing sanitation problem and will prevent the release of 96 000 tonnes of CO₂ equivalent into the atmosphere each year. It will process 1 000 tonnes of waste a day, converting organic waste into compost and recycling plastic and paper to create a refuse-derived fuel product. The project will generate employment for local people, including those who used to eke out a living by scavenging for saleable material in open dumps. This will not only help reduce the city's dependence on landfills, but will also help to improve health conditions and deliver critical sanitation services to citizens.

Plastic waste is recycled to make degradable bags and incentives are provided to the manufacturers. Universities are involved in research on using plastic for making nano particles. Projects have also been undertaken to process biomedical and industrial waste. The government has put in place the regulatory infrastructure as well as an awareness generation campaign.

Source: Government of Delhi, various reports.

Box 12.2. SEWA and waste pickers in the city of Ahmedabad, Gujarat

The city of Ahmedabad accounts for 40% of the urban poor and a significant number of them are engaged in waste picking activities. There are around 40 000 waste pickers in Ahmedabad, 31 505 of which were organised by SEWA. In the city of Ahmedabad, around 2 400 tonnes of waste is disposed of daily, 300 to 400 tonnes of which is collected by female waste pickers. Waste collected by women waste pickers includes: paper, plastic items, iron and steel, wood, old cloth and glass bottles.

In 2004, the co-operative of the waste picker women (promoted by SEWA) entered into a contract with the municipal body to collect waste from 46 000 households in the city of Ahmedabad. According to this contract, wet waste collected by the waste pickers would be dumped into the waste bins of the Municipal Council and dry waste collected would be recycled. In all, 366 local waste pickers made a decent livelihood and each waste picker earned around INR 2 000-INR 2 500 per month. This system of door-to-door waste collection promotes the three "Rs" (reduce, recycle, reuse), which are essential for preventing global warming and for protecting the environment. SEWA is also training these waste pickers to convert waste into useful items.

Source: SEWA.

Renewable energy: Solar, biomass, biogas

India has been placing emphasis on the generation of renewable energy in order to meet the growing demand for energy. The vision is to make India's development energy efficient and based on non-fossil sources, like solar, wind, hydro, biomass, etc. This is done through governmental intervention and by providing adequate financial resources for the requisite infrastructure. India has witnessed growth in the renewable energy sector, achieving a total installed capacity of 17 174 MW, which is 10.4% of total energy generation capacity.

The wind sector contributes a major portion of this capacity followed by small hydro facilities. However, the rapid growth in the sector requires an extensive pool of competent manpower to design, install and maintain the renewable energy system. This requires including the relevant courses at all levels of the skill pyramid to provide a skilled workforce in both new and existing occupations (CII-MNRE, 2010). It is estimated that the solar industry will employ at least 100 000 specially trained persons across the skill spectrum including management, engineering and R&D personnel.

This involves an R&D programme to enable the creation of more affordable and convenient power systems and to promote innovations that enable the storage of solar power for sustained and long-term use. Similarly, emphasis on the production of bio-fuel derived from renewable biomass resources such as *Jathropha* wasteland or deserted land would provide energy as well as livelihood security to people. This is done in co-operation with the local community through *Gram Panchayats*, *gram sabha* and intermediate *panchayats*. This would generate direct employment not only to local people but in value chain employment to the large number of people engaged in the research, processing and marketing of such fuel.

Jobs in renewable energy cut across a wide spectrum of specialists along with some generic skills. The generic skills occupations include communication, engineers, community outreach, marketing, planning, finance, accounts and IT (CII-MNRE, 2010). The specialist occupations include particular energy specific knowledge for engineers. The key occupations in the renewable energy sector include a range of high-, medium- and low-skilled occupations. The high-skilled occupations include project designers, architects, atmospheric scientists, resource assessment specialists, environmental consultants, lawyers, facilitators, land development advisors, NGOs, public relations officers, etc. However, in the Indian context, illiterate or semi-illiterate women are trained to take up activities such as those provided by the Barefoot College, to assemble solar lamps, lanterns and charge controllers; test and fabricate these parts; unit installation and maintenance. A large number of technicians are trained in these sectors.

There are both generic and specific skill gaps in the sector. The generic gaps include planning and co-ordination, project management, erection, commissioning and grid integration of large-scale renewable energy projects, installation and commissioning skills and technological marketing skills. The specific skills gaps include design and fabrication of bio-mass gasifier, erection and commissioning of large-scale bio-mass plants, feed stock planning and management of bio-mass plants, design and installation of BIPV systems, grid integration of MW scale, solar PV, etc.

The skills required for development and deployment of cost-effective renewables need inter-disciplinary approaches, innovative financing and marketing. In 2010, the sector was estimated to employ about 350 000 people, in both direct and indirect employment. The main functional areas include manufacturing, fabrication, installation,

operations and maintenance, project development and marketing. It is estimated that the employment opportunities in India will increase manifold by 2015, when it is estimated that in a high growth scenario, employment would be in the order of 700 000 and in the long term 14 000 000 (CII-MNRE, 2010) This has given rise to new occupations, such as managers and operators of renewable energy systems, and hybrid or cross-sectoral occupations, such as energy auditing and efficiency services.

Box 12.3. Rice husks for energy: A case study from Bihar

The Husk Power System (HPS) initiative was launched in 2007 to provide affordable, reliable and environmentally sustainable energy to rural populations by using rice husks as fuel. Today, HPS has 57 plants across 250 villages of Bihar and Uttar Pradesh impacting 200 000 lives. It provides electricity to about 10 villages every week and plans to install 6 000 plants by 2014, which would provide electricity to around 6 million people.

These villages fall under the Indian rice belt and previously had no access to electricity, which had adverse effects on the development of these villages. HPS builds, owns and operates 35, 100 KW “mini power plants” that use waste rice husks to deliver electricity to off-grid villages in the “Indian Rice Belt”. After paddy rice is processed, a huge quantity of bio-mass is left as a residue in the form of rice husks. This rice husk, when used in efficient gasification or combustion systems, has a considerable potential to generate energy. HPS initiatives save 42 000 litres of kerosene and 18 000 litres of diesel per year.

About 300 kilograms of rice husks are required as raw material to provide 40 kilowatts of energy, which in turn is sufficient to supply energy to 500 households for 6-12 hours per day. For each megawatt of power generated, about 5 800 tonnes of CO₂ emissions reduction can be achieved every year. HPS also provides training to unemployed literate and neo-literate local villagers on the operation and maintenance of the power plants.

Source: Information provided by ICAR (2013).

Box 12.4. Barefoot College of Tilonia, Rajasthan – Solar Energy

The Barefoot College works to improve the living conditions in remote and disadvantaged village communities across India. One of its main objectives is to secure durable access to clean energy. With this aim, it has been encouraging rural people in Rajasthan to gain practical knowledge and skills leading to work as barefoot solar engineers to install and maintain solar photovoltaic lighting systems in their communities.

The project works on a community basis and at the beginning an energy and environment community is formed, with at least 30% female representation. The committee determines the monthly payment each family must make for their solar lighting system, which includes costs for maintaining the systems. The committee chooses men and women from the poorest families to train as barefoot solar engineers who are trained for three to four months at the Barefoot College, Tilonia at Rajasthan in the fields of installation, maintenance and repair of home solar lighting systems, solar water heaters, solar vegetable dryers and solar cookers.

By 2009, a total of 472 barefoot solar engineers had been trained in India and other parts of Asia and Africa and about 20 000 solar lighting systems and 65 solar water heating systems had been installed. With the introduction of the solar lighting/heating system, there is less reliance on kerosene, which reduces air pollution and CO₂ emissions.

Source: Information provided by Bare Foot Engineers (2013).

Managing drinking water and sanitation using clean technologies

The availability of safe drinking water and a safe environment is a must for a healthy life. The government of India has initiated a large number of programmes using the community model. Community mobilisation has not only helped achieve this objective but also helped generate local employment. Village communities and NGOs play an important role in achieving these objectives.

Box 12.5. Migrant brick kiln workers and rural sanitation movement in West Bengal

The Rama Krishna Mission Lok Sikha Parishad initiated sanitation promotion activities in 1981 as part of integrated child development activities in some villages in West Bengal, and later designed a demand-driven sanitation project jointly with UNICEF. It implemented the same project in the district with the help of Midnapur Zila Parishad. It associated and affiliated the village youth club and cluster organisations as grass root partners and provided facilities. The model was replicated in ITAMOGROW Gram Panchayat to construct common toilets for brick kiln workers by persuading and convincing the brick kiln owners of the need to build sanitation facilities.

Today all the brick kiln works in ITAMOGROW provide toilets for their workers and open defecation has become history. The faith-based NGO has achieved this major work in sanitation by mobilising people and in setting standards of rural sanitation by training and employing local people, many of them women. The Midnapur Model involves building community awareness through folk media and ICT to generate awareness. A delivery network has also been established in Midnapur District which has played an important role in making the distribution of toilets easy and cost effective.

Source: based on information from Rama Krishna Mission Lok Sikha Parishad.

Water and sanitation related activities can be grouped into three categories: hardware operation, maintenance and monitoring, and social mobilisation. It requires master masons, village masons, mechanical fitters, caretakers, trainers and motivators. It was found that as regards hardware operations for safe drinking water, women could be engaged with the help of trained village masons. Operation, maintenance and monitoring have been the responsibility of the village community, trainers and caretakers.

The village people had no previous experience of performing these jobs but acquiring the masonry skills was not difficult. A high emphasis was placed on intensive, area-specific and time-bound social mobilisation activities for demand generation involving different skills sets. Training was provided by the village mason to women involved in hardware management and operation and maintenance training was provided by the NGOs (Vipin Kumar, 2010).

Maintaining environmental sustainability through afforestation: Production forestry (medicinal plants), social forestry

Afforestation helps in socio-economic development, employment generation, ending migration and the development of infrastructure. The total forest cover in India is about 23% of the land area. It is proposed to increase this to 33% by 2030. The Prime Minister of India has announced a Green India Campaign for the forestation of 6 million hectares. This would result in the protection and conservation of natural resources through the active involvement of people and provide ample employment opportunities to rural communities, including disadvantaged populations, using the traditional skills of planting.

However, it would also result in skill enhancement, improving the employability of rural people in terms of knowledge about different plants and in occupations that may emerge using these plants.

The NREGA is an example of how public policy can facilitate environmental protection public employment. Intervention of the NREGA like water harvesting, recycling, installation of solar water heaters, tree plantations, composting, sustainable harvest of forest produce not only have direct employment benefits, but in the process can create green jobs. These activities have significant socio-economic benefits as they employ poor, unskilled and semi-skilled workers who would generally be able to do this type of work with minimal or limited training.

Under this programme, the plantation of Jathropha and Pongamia are encouraged, which is helping with biofuel, substituting diesel and ethanol, thus reducing GHG emissions. This is creating direct and indirect employment on the one hand and protecting the environment on the other.

Energy efficiency and green building

Meeting increasing energy demands through energy conservation is one of the objectives of the government's policy for increasing energy efficiency. The consumer and local government are the key players in promoting and implementing energy conservation technologies. The Energy Conservation Act, the Energy Conservation Building Code and the Bureau of Energy Efficiency have been put in place. They facilitate the optimisation of energy consumption. A study by the Ministry of Environment and the Ministry of Power, Bureau of Energy Efficiency entitled "India: Addressing Energy Security and Climate Change in 2007" indicated that application of the energy conservation building code has reduced the energy demand by more than 50% in new buildings constructed in the New Delhi area. The emphasis is placed on the construction of new green buildings or converting existing buildings. A green building encompasses features such as sustainable site planning, optimum energy efficiency, use of renewable forms of energy, water and waste management strategies, use of fly ash bricks, etc.

Box 12.6. Green Building Initiative at Pune for Energy Conservation

The Pimpri-Chinchwad Municipal Corporation (PCMC) is the first municipal corporation in India to introduce energy efficient buildings by giving incentives to builders and property tax incentives to residents. Through this initiative, there is a saving in potable water use, waste water treatment and solid waste management. The developer gets a discount in premiums for building permission charges and discounts in property tax for end users after taking possession from the developer. The property owners of green buildings benefit from a reduction in pollution related to air, noise, soil and water.

The PCMC is making a conscious effort towards its responsibility to natural resources and the impact on society by incentivising the Green Rating for Integrated Habitat Assessment System, which is suitable for all types of buildings in different climatic zones in India. This rating system not only takes care of energy conservation but also looks into water and waste management, minimum destruction of natural resources and various other aspects in an integrated way.

The Green Building Movement in India is progressing quickly and has already covered 1 billion square feet in area. Green building involves a number of professionals. As of 7 October 2011, more than 25 000 people were directly involved in green building projects. By 2015, India will be a world leader in green building.

Source: based on information from Pimpri Chinchwad Municipal Corporation (2012).

The employment of new technologies and a management system gave rise to new skills as a result of green restructuring and also to new occupations, such as energy auditing and efficiency services.

**Box 12.7. Promoting energy efficiency in existing buildings:
Sir J.J. Hospital, Mumbai**

The Maharashtra Public Works Department implemented energy conservation initiatives at the Sir J.J. Hospital in Mumbai. The hospital functions on a non-stop basis and operation theatres, high-usage medical equipment, HVA lighting systems, water heaters, elevators and water pumps are responsible for energy consumption. The awareness campaign initiated helped to substantially reduce energy consumption. It was recognised that staff lacked awareness, which resulted in wasting of electricity. In addition, there were inefficiencies due to deferred maintenance and replacement, suboptimal operating schedules, and reduced emphasis on operation and maintenance. The Sir J.J. Hospital adopted a multifaceted energy conservation strategy identifying effective methods and techniques to improve energy efficiency and reduce wastage.

The main measures taken to conserve energy included:

- maximising the use of natural light during the day in corridors
- turning off office equipment, fans and air conditioners during unoccupied hours
- educating people about reasonable and efficient use of water heaters and other electrical appliances
- plugging air leakages in air conditioner rooms
- turning off water pumps when tanks filled up.

The project used the quality circle concept wherein a small group of 6-12 employees from similar work groups meet on a regular basis to identify areas of improvement in their respective work areas. A quality circle team consisting of 11 members is implementing the schemes. It conducts several brainstorming sessions using cause and effect to assign responsibility and delegate to team members. The tool helped in identifying the factors responsible for energy use and developing an effective strategy to use energy efficiently, minimising energy consumption. It has been estimated that the project has resulted in overall savings of USD 90 000 over a 3-year period and resulting energy savings of up to 8.12 kwh.

Source: Maharashtra Public Works Department (2012).

Management of environmental pollution through mass rapid transport and adoption of cleaner technology – CNG, Delhi Metro

India is poised for rapid economic growth which, according to the 12th Five-Year Plan, will largely come from the manufacturing and service sectors. Since economic activities in these sectors are largely concentrated in urban areas, the environmental conditions of these towns and cities are important for India's growth. For cities and towns to be able to support the required level of activities, they must provide for an easy and sustainable flow of goods and people. Appropriate transport systems, which are both fuel efficient and lower in emissions, are thus the current priorities.

Vehicular pollution levels are hazardous to people's health and need to be addressed by adopting suitable modes of transport using energy efficient clean technology, for example CNG and mass rapid transport programmes.

Box 12.8. Towards clean air: Delhi Compressed Natural Gas Programme

Delhi, the capital of India, consistently has levels of total suspended particulates that are above the standard level, and which sometimes reach 5-12 times above the recommended level. Air pollution sources are: transport, industry and domestic waste/emissions. The government of Delhi, with the aim of addressing this vehicular pollution problem, made it compulsory for all public transport vehicles to shift to compressed natural gas (CNG) in a phased manner for vehicles that are more than 15 years old. It therefore introduced Bharat Stages II, III and IV to replace the Euros II, III and IV.

The introduction of CNG buses has resulted in a substantial reduction in PM emissions, as they are 50 times lower than a Euro II bus. As a result of these reductions in toxic emissions, 3 629 lives have been saved per year (World Bank, 2005). The introduction of CNG has resulted in the creation of job opportunities for drivers, mechanics, CNG filling station employees, etc. There is a need for trained mechanics to handle and repair the CNG tools and machineries, which requires an immediate increase in the number of training institutes providing these resources.

Source: Delhi government reports.

Box 12.9. Mass transport through clean technologies: Delhi Metro

India's first modern metropolitan rail transport project, Delhi Metro, was initiated in 2001 to cover a total distance of 413.83 kilometres in a phased manner. The Delhi Metro has made travelling easy and comfortable and has also had significant environmental and social impacts. A study conducted by the Central Roads Research Institute reveals that Metro railway has helped save 33 000 tonnes of fuel and prevented the creation of over 2 275 tonnes of poisonous gases.

It has also helped commuters in Delhi save 66 minutes per day, on average, commute time, and reduced road accidents and congestion. The Delhi Metro has become the first rail-based methodology to garner 90 000 voluntary carbon credits for improving the efficiency of power transmissions in the system. The introduction of the metro has resulted in the creation of a large number of jobs for engineers, drivers, station attendants, signal staff, ticketing, construction workers and maintenance staff, among others.

Source: CRRI.

The introduction of CNG and the Delhi Metro has resulted in greening existing occupations and created new occupations as well. The IIT, Delhi has initiated a course for Delhi Metro.

Skills sustainability: Skill needs, skill response and skill gaps

The above analyses indicate that different regions are responding to the climate change agenda in existing or newly emerging jobs using existing or new skills. It is also evident from the above case studies that local development initiatives undertaken in conjunction with low-carbon strategies have influenced employment generation particularly for young people, women, farmers, rural populations and slum dwellers. In other words, social sustainability and environmental sustainability are associated. The skill response varied from sector to sector.

It was further obvious from the studies that the community mobilisation, participation of the civil society, awareness generation, social dialogue, active government intervention in certain sectors (evident from government expenditure in some of the key areas) and

policy coherence are necessary to accelerate the transition to a low-carbon economy. This places focus on the commitment to innovation, research, investment both in physical and human infrastructure as well as social cohesion and partnerships. It also emerges that the national goals of sustainable development can be achieved effectively with the involvement of all stakeholders, including state governments.

While the lower level skills sets such as masons, segregators, drivers, loaders, collectors, general mechanics, etc. were available locally, skills in relation to new green occupations, such as processors and managers, were not available. In certain sectors like energy efficiency in buildings, the Indian Green Building Council and the Bureau of Energy Efficiency are conducting training programmes for energy managers and a national certification examination for energy auditors.

The Bureau of Energy Efficiency provides energy efficiency related information regarding buildings, appliances, agriculture, industries, and small and medium enterprises, and is creating awareness among users about energy saving appliances and techniques. The Ministry of Road, Surface and Transport is also organising training programmes for drivers and conductors of the CNG buses. In addition, courses have been introduced to train mechanics for CNG buses. Training is also provided to the attendants at the CNG filling stations.

The national missions under the National Programme for Climate Change clearly specify the training requirements for capacity building in the energy sector. A large number of agricultural universities are offering degree courses in different agricultural-related disciplines. There is training institute that provides training on plant protection, pest management and locust controls, etc. These types of skills are required for improving agricultural productivity and managing agricultural land and crops. The Indian Council of Agricultural Research arranges needs-based training programmes in new and emerging areas, such as organic farming. In addition, Kisan Call Centres, Kisan Channels and Krishi Vigyan Kendras are providing timely information and advice to Indian farmers. Weather and weather-based agricultural management plans are also available.

In the renewable energy sector, there are also a large number of sector-based training and research institutes, including in solar energy (Solar Energy Centre for Development of Solar Energy Technologies); wind (Centre for Wind Energy Technology); the National Institute of Renewable Energy; the Alternate Hydro Energy Centre, among others. These institutions promote power generation and provide some training facilities. In addition, the government has set up an Indian Renewable Energy Development Agency which provides term loans for renewable energy and energy efficiency projects.

A Co-ordinated Action on Skill Development with a vision to create the infrastructure necessary to improve availability of a trained workforce for the growing economy has been put in place. The National Skill Development Policy envisions the creation of 500 million skilled workers by 2022. The focus is on developing skills so that the demographic dividend that India enjoys can be converted to the advantage of the economy. About 18 central ministries and departments are running various skill training programmes, some of which are specific to the requirements of the individual areas. Many of the ministries are covering the challenges of growth.

There are over 8 000 industrial training institutes and more than 3 500 polytechnics in addition to the engineering and other degree institutions (8 000) which provide training to different skill levels. The course curricula in ITIs are generally designed to provide basic

skills in about 200 trades. Through World Bank assistance, the government of India has created 500 centres of excellence in specific trades. Efforts are also being made to improve the training and development of university faculties to increase the placement of trained graduates and to arrange on-the-job training. To address the skill needs of some of the activities, i.e. footwear, garments, electrical appliances and the automotive industry, in the unorganised sector, the Micro Small and Medium Enterprise Ministry is running training courses.

The private sector has also been involved in training efforts through the National Skill Development Corporation to train people according to the market's needs. The industry is thus directly involved in the creation of skilled manpower. The current training capacity (about 4.5 million per annum) is not sufficient to meet the skill requirements of the growing economy. The skill shortages in general, and for green jobs in particular, in India have emerged as a result of inadequate training capacity as well as estimates about the proposed growth of the various sectors linked to the green economy. In a country like India, where the dropout rate at secondary level is very high, the availability of skilled people in adequate supply is a big challenge. There is a need to co-ordinate between environmental, developmental and skill strategies.

Although India has developed a National Skill Development Strategy and a Co-ordinated Action Plan on Skill Development has been initiated, there is still no particular comprehensive strategy for promoting skills in green jobs. In fact, industry linkages with the training institutes for all skills are at a very nascent stage. Efforts are on to upscale the initiatives by setting up sector skills councils. The education and training system faces a number of challenges in meeting the skill requirements of the green economy, for example, important aspects include: the system needs to be flexible to respond to the changing market environment, have an adequate supply of quality teachers, continuously revise curriculum and upgrade teacher's skills.

Mechanisms for anticipation, matching and monitoring of skills needs

The transition to a green economy has a differing impact on the different occupations and skills required in different sectors. The shortage of required skills impedes the growth of the sector. The employment effects of the transition to a green economy can be gauged in terms of the creation of new jobs, the emergence of new occupations in the existing jobs, the need for new skill sets in the same occupations to handle new technologies necessitating training/retraining of the workforce to meet the emerging demand. Training requires the creation of adequate training capacities. However, capacity building requires a sound knowledge base of the types of occupations, jobs and skill requirement. This is a big challenge (ILO, 2011a).

The information on skill requirements helps policy planners to design appropriate policies, provide resources and frame qualification standards and enables training providers to modify course curriculum. However, it is not easy to identify and anticipate the skill requirements in a developing economy like India, where more than 94% of the workforce is in the unorganised sector, whose boundaries cannot be identified. The change in the technology/production process or demand pattern would change the occupations and skill contents. This may or may not be reflected in the national occupational classifications.

In a growing economy, anticipation of skill needs is a continuous process and requires a system for identifying skills. The Labour Market Information System is a handy tool but the problem lies in assessing the needs of a low-carbon economy. In India, data about

employment, the workforce and the labour force is available through the National Sample Survey Organisation, the Annual Survey of Industry and *ad hoc* services. However, these sources of information about the labour market do not give a holistic view. India neither has a labour market information nor national occupational standards for all jobs. There is a National Classification of Occupations, but it does not provide detail on all of the occupations of the green economy.

The government of India has initiated a Co-ordinated Action on Skill Development to create 500 million skilled workers by 2022 to turn the demographic dividend to the advantage of India. The median age of the working population in India was 25.3 in 2009. However, only 2% of the workforce has formal training and about 8% some training as per NSS 2004-05 estimates.

This leaves about 92% of population engaged in the unorganised sector, with little or no formal training. Furthermore, the dropout rate in India (as per midterm appraisal of the 11th Five-Year Plan) makes it difficult to implement a vocational skills development programme. Perusal of the skill training programmes indicates that most of the courses are available for middle/secondary school graduates. The Ministry of Labour and Employment has made a start through the Modular Employable programme to recognise the existing skills of unorganised sector workers irrespective of their education profile. The existing training infrastructure in terms of 8 000 industrial training institutes and more than 3 500 polytechnics by and large cater to the requirements of the “brown economy”. The lack of anticipation in skill requirements for the green economy is hampering the creation of adequate training capacity.

The anticipation of skill needs requires effective interaction between industry and training institutes. The National Mission on Strategic Knowledge for Climate Change has emphasised the need for identification of skill gaps, capacity building in dedicated centres, international co-operation and the promotion of R&D, among others. The key Ministries of Labour and Employment and Human Resource Development are expanding training capacity in terms of opening new institutes in uncovered areas and taking up new course modules. The Ministry of HRD has also revamped its policies for vocationalisation of education to enhance training capacity. In addition, the Ministry of Agriculture and the Ministry of Micro, Small and Medium Enterprises, which have bearing on the green economy, are also expanding their training capacities’ on the basis of sectoral surveys.

Policy implications for the way forward

India’s low-carbon growth strategy envisaged in terms of promotion of energy efficiency, use of renewable energy, afforestation, mass rapid transport, etc. is likely to result in a climate friendly growth path on the one hand and the creation of millions of green jobs on the other. These positions cut across different sectors and require different skill sets and competency levels that may or may not be available in the current skill structure. For example, in the renewable energy sector, there are skill shortages in wind power. Mechanics or technicians with the required skill sets may not be available. The greening of the economy is generating a demand for new skills as new activities and new markets emerge. This also raises the demand for new competencies.

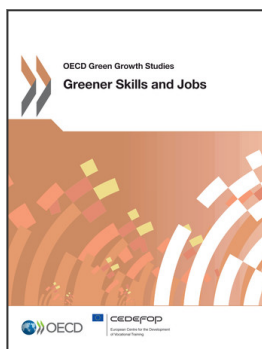
There are currently 17 central ministries working in the area of skill development, and some of them are making efforts towards greening the economy. However, although their initiatives have impact on each other, they are all working in silos. The transition to a

green economy requires co-ordination among different stakeholders. This would not only result in efficiency in expenditure but it would also bridge the skill gaps. The key recommendations are:

- Effective co-ordination among different central ministries/departments at all levels. This will involve planning, project preparation, implementation, monitoring and evaluation and the engagement of state governments. This co-operation would help to properly assess the potential of green jobs and the associated competency level, thereby meeting the skill requirements appropriately. This requires complete policy coherence at all levels.
- Setting up a robust labour market information system at national and state levels so as to have a clear picture about the skill requirements. The two should be linked for better monitoring skills. This would facilitate creation of adequate capacity for training in relevant sectors.
- Creating awareness and sensitivity towards environmental concerns in different spheres of economic activities among different stakeholders. Educating workers, employers, civil society and policy planners would help in protecting the environment. Awareness generation can be created through media campaigns, street plays, artwork, school curricula, etc.
- Along with creating awareness, it is also necessary that all social partners are actively involved in the transition to the green economy. India has a sound tripartite system wherein workers, employers and the government discuss proposed changes in labour-related regulations. However, this needs to be strengthened, particularly in the unorganised sector, where the work processes and related issues are not well defined and the likelihood of violating the regulations related to green processes is very high. A large number of activities in the transition to a green economy are likely to be carried out in the unorganised sector. Therefore, effective dialogue at all levels to mobilise all stakeholders for a smooth transition and integrated policy response is urgently needed.
- Restructuring of syllabi and curricula in training institutes to suit the green economy. A start has been made with the implementation of the Modular Employable Skills. However, in the absence of detailed database on skill requirements, it has not been possible to design the curriculum for the skills required for green jobs.
- The administrative and legal framework should be strictly enforced.
- Investment in clean development and green jobs has been growing rapidly in India in recent years as is evident from the government expenditure in some of the key ministries responsible for promoting the green economy. Such investment in clean technology has also created employment in green jobs. However, there is a need to increase the scale of such investment.
- Strengthen the ability of local enterprises and local training providers to develop innovative solutions for filling skill gaps.

References

- CII-MNRE (2010), *Study on Renewable Sources of Energy*.
- Government of India (2011a), *Mid-Term Appraisal – 11th Five Year Plan*, Government of India, New Delhi.
- Government of India (2011b), *Expert Group on Low Carbon Strategy on Inclusive Growth*, Planning Commission, Government of India, New Delhi.
- International Labour Organization (ILO) (2011a), *Skills for Green Jobs. A Global View*, ILO, Geneva.
- International Labour Organization (ILO) (2011b), *Skills for Green Jobs: Towards Decent Work in a Sustainable and Low Carbon World*, ILO, Geneva.
- International Labour Organization (ILO) (2010), *National Conference on Green Jobs*, ILO, Geneva.
- Kumar, V. (2009), *Energy Imperative for Developing World: Case Study Brazil, China and India*.
- Kumar, V., M. Kasturi, K. Naresh and B. Taposik (2011), *Green Jobs*, ILO Skills and Employability Department, ILO, Geneva.
- Ministry of Agriculture (2011), *Annual Report of Ministry of Agriculture and Co-operation*, Government of India, New Delhi.
- Ministry of New and Renewable Energy (2011), *Annual Reports of Ministry of New and Renewable Energy*, Government of India, New Delhi.
- Planning Commission (2013), “Draft 12th Year Plan”, Government of India, New Delhi, January.
- Planning Commission (2011), 11th Five-Year Plan, Government of India, New Delhi.
- UNCSD (2008), *Sustainable Tourism: A Non-Governmental Organisation Perspective*, UNCSD NGO Steering Committee.
- UNCTAD (2011), “Building a development led green economy”, *UNCTAD Policy Briefs*, No. 23, June.
- UNDP (2009), *Comparative Experience, Examples of Inclusive Green Economy Approaches in UNDP Support to Countries*, UNDP.
- UNEP/ILO/IOE/ITUC (2008), *Green Jobs: Towards Decent Work in a Sustainable, Low-Carbon World. Policy Messages and Main Findings for Decision Makers*, United Nations, Nairobi.
- World Bank (2005), *For a breath of fresh air: Ten years of progress and challenges in urban air quality management in India, 1993-2002*. Washington, DC: World Bank. <http://documents.worldbank.org/curated/en/2005/06/6561544/breath-fresh-air-ten-years-progress-challenges-urban-air-quality-management-india-1993-2002>



From:
Greener Skills and Jobs

Access the complete publication at:
<https://doi.org/10.1787/9789264208704-en>

Please cite this chapter as:

Shanghi, Sunita and Jeevan Sharma (2014), "Local development strategy, green jobs and skills in the Indian context", in OECD/European Centre for the Development of Vocational Training, *Greener Skills and Jobs*, OECD Publishing, Paris.

DOI: <https://doi.org/10.1787/9789264208704-15-en>

This work is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of OECD member countries.

This document and any map included herein are without prejudice to the status of or sovereignty over any territory, to the delimitation of international frontiers and boundaries and to the name of any territory, city or area.

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgment of OECD as source and copyright owner is given. All requests for public or commercial use and translation rights should be submitted to rights@oecd.org. Requests for permission to photocopy portions of this material for public or commercial use shall be addressed directly to the Copyright Clearance Center (CCC) at info@copyright.com or the Centre français d'exploitation du droit de copie (CFC) at contact@cfcopies.com.