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Senior International Associate Report (Ambuj Sagar)

Meeting Multiple Energy Challenges: Lessons from India

Ambuj Sagar

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SENIOR INTERNATIONAL ASSOCIATE REPORT (AMBUJ SAGAR) MEETING MULTIPLE ENERGY CHALLENGES: LESSONS FROM INDIA

Ambuj Sagar

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1 Introduction

The Rising Powers in International Development (RPID) programme includes a provision for drawing on the experience of senior policymakers and policy advisers. This 'Senior International Associates' scheme is an effective way of injecting policy experience from the Rising Powers directly into the work of the RPID. One of the key lines of work of the RPID is concerned with climate change policies in China, India, Brazil and South Africa. The BRICS (Brazil, Russia, India, China and South Africa) Summit and the BRICS Academic Forum held this year in Brazil are particularly concerned with such sustainability issues. This report shows how the RPID contributed to these debates and tapped the rich experience of Professor Ambuj Sagar, a senior international associate from India. Professor Sagar was invited to serve as a senior international associate because of his long and detailed involvement in policy processes both at national (Indian) and global levels.

The Rising Powers enhance the policy learning and choices of poor countries. This proposition was discussed at an event called 'BRICS and the Green Transformation: Mutual Learning for Sustainability', held in Rio de Janeiro on 20 March 2014 and organised by the RPID programme of IDS and the Rio+ Centre. Here Professor Hubert Schmitz, Fellow of IDS, describes what this event was about and highlights how the Senior International Associate Professor Ambuj Sagar contributed to it.

The purpose of this event was to bring together positive lessons that arise from the BRICS' own experience in furthering the green transformation. This is an important and urgent topic for several reasons. Most Western countries are politically paralysed and have little financial room to manoeuvre. They cannot carry out their expected role of leading the green transformation. In contrast, the BRICS countries, in particular China and India, have stepped up their low-carbon investment. China has become the global lead investor in renewable energy and India has seen the highest recent growth rate. The problem is that these countries have also become the main contributors to the recent increases in carbon emissions. So there is no easy answer to the question of how the BRICS countries have affected the green transformation. We do however know that:

- The BRICS countries have become the default movers and shakers in the global economy, including the green economy;
- Alliances within and across countries are critical for accelerating the green transformation;
- Positive examples (rather than repeated warnings of climate catastrophes) are needed to inspire policies and actions.

Bringing out such real-world examples was the purpose of the 'BRICS and the Green Transformation: Mutual Learning for Sustainability' event. It was chaired by Rômulo Paes de Sousa, Head of the Rio+ Centre, and included the following presentations.

- Meeting multiple energy challenges – lessons from India (Ambuj Sagar)
- Who drives low-carbon policies – lessons from China (Hubert Schmitz)
- Low-carbon policies in Brazil (Emilio Lèbre La Rovere)
- What does it mean for Africa? (Nozipho Mabebe Wright)
- Diversity of low-carbon pathways (Adrian Ely).

A particularly comprehensive set of lessons was presented by Ambuj Sagar, Professor of Policy Studies at the Indian Institute of Technology Delhi and Senior International Associate of the RPID programme of IDS. He emphasised that energy services underpin a range of activities that are critical to the human condition; in fact, there is a clear correlation between energy use and human (and economic) development. Ensuring provision of adequate

energy, therefore, is a major issue for all countries, including India. At the same time, the environmental and social impacts from the energy sector are significant and multi-variegated in scale and scope. How to best manage these needs and challenges remains one of the defining questions for many developing countries.

Experiences with some key Indian programmes suggest a number of lessons that may be important for other developing countries also seeking to address multiple challenges in their energy sector. These lessons can be summed up under the following headings and are explained in Section 2:

- Broadening of policy objectives; efforts to co-optimise amongst multiple objectives
- Systematic and comprehensive approach to technology
- Learning and policy evolution
- Stakeholder involvement and partnership development
- Design and implementation of novel instruments and programmes
- Development of longer-term strategy and roadmaps, including coordination across policy objectives
- Strengthen upstream technological innovation capabilities
- Sharper focus on energy access
- Strengthening of policy – analytical capacity and systematic linkage to policymaking.

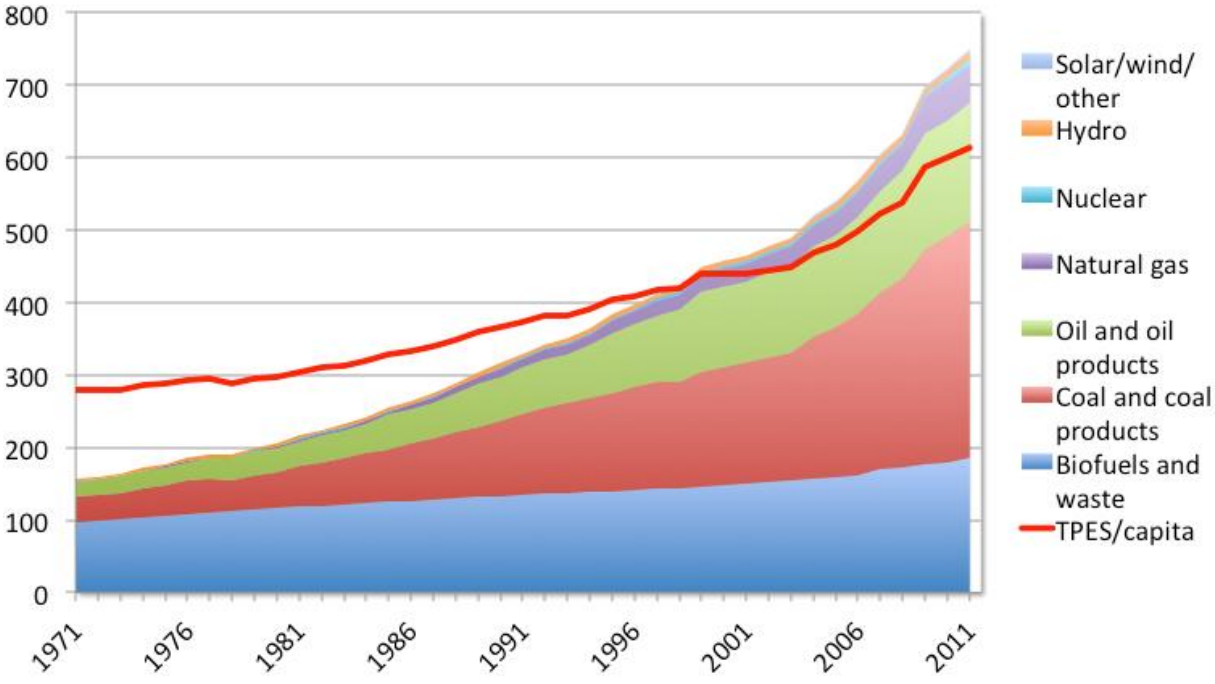
2 Meeting multiple energy challenges: Lessons from India

Energy services underpin a range of activities that are critical to the human condition; in fact, there is a clear correlation between energy use and human (and economic) development. Ensuring provision of adequate energy, therefore, is a major issue for all countries, including India. At the same time, the environmental and social impacts from the energy sector are significant and multi-variegated in scale and scope. How to best manage these needs and challenges remains one of the defining questions for many developing countries, including India, and this issue also plays an important role in any discussion about the 'green transformation'.

2.1 The Indian energy landscape: Status and challenges

The Indian energy landscape is characterised by the dominance of fossil fuels (consonant with the global picture) (see Figure 2.1). In fact, the growth in the Indian energy system over the last few decades has been based on an increase in the use of modern fossil energy – based on coal, oil, and natural gas – and, accordingly, the role of fossil fuels has become far more prominent over the years. In 1971, for example, they contributed about 37 per cent of the national energy supply and 57 per cent in 1991 but by 2011, they contributed over 70 per cent of the total primary energy supply (TPES). At the same time, biomass use has stayed almost constant over the years, although with the addition of large amounts of fossil supplies, its contribution has reduced to about 25 per cent of the TPES. For over 700 million people in the country, biomass remains the primary source of household cooking energy, with attendant health and other implications for this group.

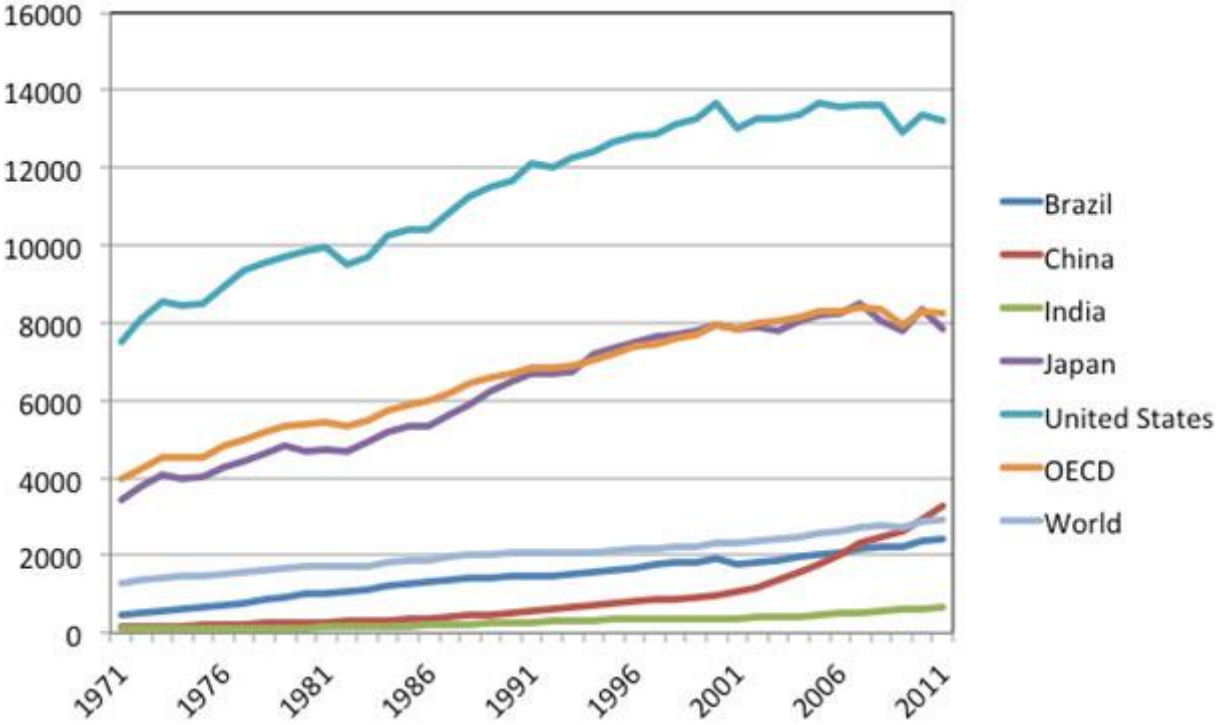
Figure 2.1 Indian energy supply (million tons of oil equivalent) and TPES/capita (million kilograms of oil equivalent)



Source: Based on International Energy Agency (2013).

Even with the significant expansion of energy supply in the country (TPES increased almost fivefold between 1971 and 2011, while TPES per capita more than doubled – see Figure 2.1), energy shortages remain a way of life. At present energy shortages and peak deficit values are in the 4–5 per cent range. These are not insignificant but are less than half the deficit levels that prevailed until even a few years ago. The per capita consumption of electricity in the country – seen as a critical measure of human development, given the central role of this clean and versatile energy carrier in providing a range of energy services – lags far behind global averages, to say nothing of major OECD (Organisation for Economic Co-operation and Development) countries and even China. And almost 300 million people are estimated to have no or very limited access to electricity.

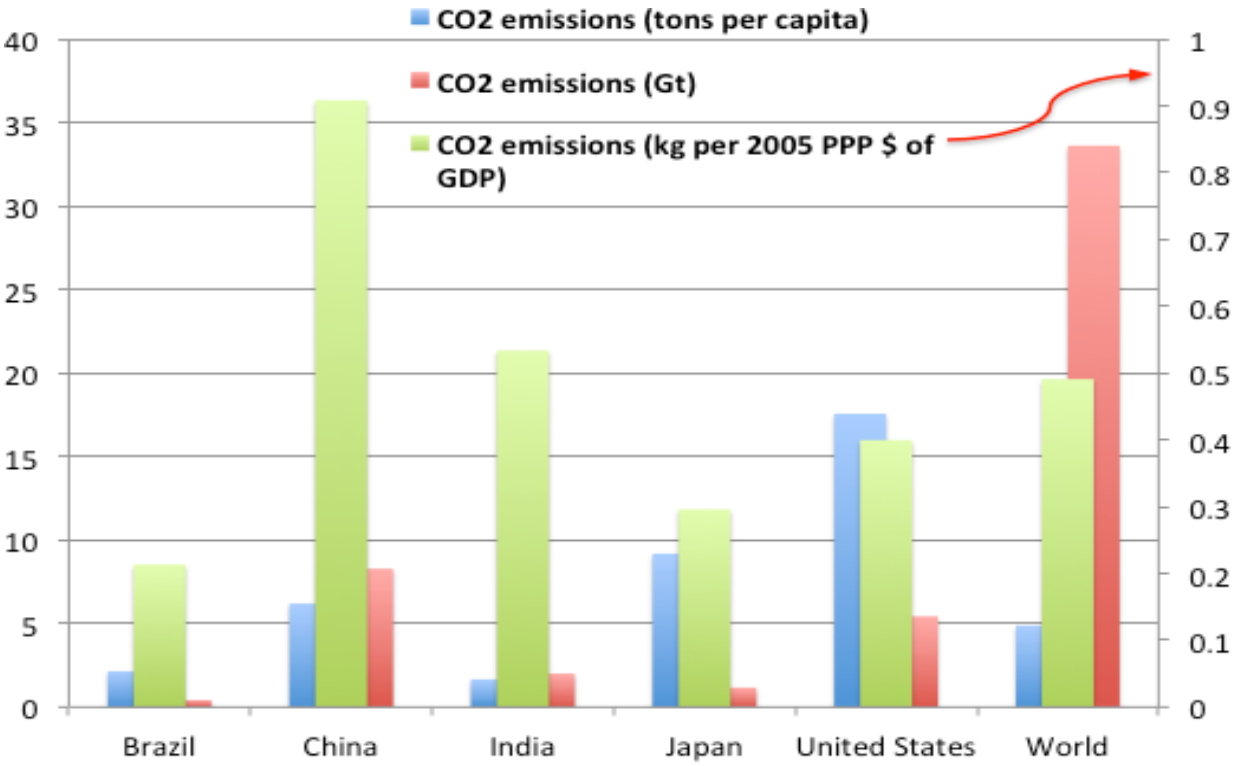
Figure 2.2 Electricity consumption per capita (kWh) for selected countries and groups



Source: Based on World Bank (2014).

In India, emissions of carbon dioxide – the major contributor to greenhouse warming – have increased more than ninefold between 1970 and 2010, largely due to the fact that fossil fuels have contributed the overwhelming preponderance of the additions to the energy supply in the country over this period. Furthermore, in the same period, India went from being responsible for about 1.3 per cent of the global carbon emissions to almost 6 per cent of the global total. As a consequence, even though India's per capita emissions are relatively very low, it is incumbent upon the country to manage the growth in its emissions, as well as the carbon intensity of its economy, which is higher than the global average (Figure 2.3).

Figure 2.3 Carbon emission indicators for selected countries (2010)



Source: Based on World Bank (2014).

This backdrop then serves to highlight the main challenges facing the Indian energy system as it grapples with the green transformation:

1. Adequacy: A significant expansion of energy supply is a key imperative for India, given the role of energy in allowing positive advances in human, social, and economic development.
2. Affordability: Energy supplies also have to be affordable in order to provide access for all citizens. This is particularly crucial for the rural and urban poor.
3. Security: Given India's limited conventional energy resources – coal, petroleum, and natural gas – as well as social and environmental limitations on other resources such large-scale hydropower and biomass (and, indeed, the extraction of fossil fuels), energy security has emerged as an important issue for the country's energy policy.
4. Sustainability: The sustainable dimensions of energy use – with environmental implications ranging from the household to the global level – are also an important challenge for the country. The main issues here are the reduction of household air pollution that is a consequence of traditional biomass burning for cooking, outdoor air pollution from a variety of sources (especially biomass burning, coal power, and automobiles), and emissions of greenhouse pollutants.

The *rate* at which these challenges are addressed is important, both for enhancing energy access and mitigating negative (local and global) impacts, and given the urgency of these issues, accelerating the rate of the expansion and the transformation of the energy sector is key.

At the same time, it must be understood that in order to ensure that both human and environmental dimensions relating to the energy sector are addressed adequately, the transformation must take place at *scale*.

To complicate matters further, India has to meet these challenges with rather limited resources, given that its per capita income in 2010 was PPP$3,430, with 69 per cent of its population earning less than PPP$2/day.[1]

2.2 Lessons learned

Experiences with some key programmes[2] suggest a number of lessons that may be important for other developing countries also seeking to address multiple challenges in their energy sectors (or more broadly, attempt to manage a green transformation).

2.2.1 Broadening of policy objectives; efforts to co-optimise amongst multiple objectives

Previously, the main objectives of India's energy policy were often seen as addressing energy sufficiency and energy security. For example, the National Program on Improved Chulhas (NPIC) that was launched in the early 1980s had resource conservation as a main objective (and this was true not just in India, but also in other countries, driven by concerns that biomass use for cooking could lead to deforestation). With a fuller understanding of the health and climate impacts of energy use, there has been a concerted effort to integrate these objectives into energy programmes. Therefore, the Jawaharlal Nehru National Solar Mission (JNNSM) explicitly lists as its objectives energy security, climate mitigation, and building of industrial capabilities. Similarly, the National Biomass Cookstove Initiative (NBCI) launched in 2009 has both health and energy access objectives.

2.2.2 Systematic and comprehensive approach to technology

The Bureau of Energy Efficiency's (BEE) success derives in large part from its systematic and comprehensive approach to technology development and deployment. Many of its programmes were based on a careful technological options analysis, which allowed it to prioritise its activities accordingly. It also then played an important role in advancing the development and deployment of technologies through appropriate incentives and other mechanisms to facilitate market development. Notably these approaches were tailored specifically to the technology and to the nature of the actors. For example, given that there is a large spread in the energy efficiency performance of firms within many industrial sectors, the industrial energy efficiency programme design was based on benchmarks developed in bands rather than a common benchmark across the sector.

2.2.3 Learning and policy evolution

Not surprisingly, learning from domestic and international policy experiences (the latter sometimes facilitated by bilateral and multilateral actors) played a major role in the development and refinement of policies. Over time, market-based mechanisms, such as renewable and energy efficiency tradeable certificates, have become more integrated into various programmes. There has also been the development of new institutional models that are designed to advance specific programmes. Examples include the National Thermal Power Corporation (NTPC) Vidyut Vyapar Nigam (NVVN) that underpinned the JNNSM and the Facility for Low-Carbon Technology Development (FLCTD), currently under discussion, for advancing climate innovation.

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[1] PPP is purchasing power parity dollars. It is a measure that takes into account purchasing power to make international comparisons easier.

[2] This section is based on an analysis of three major energy-centred programmes of the Indian Government: the Jawaharlal Nehru National Solar Mission, the National Biomass Cookstove Initiative, and the Bureau of Energy Efficiency's activities/programmes.

2.2.4 Stakeholder involvement and partnership development

India's energy policymaking is often characterised by fragmentation since there are a large number of ministries and agencies involved in energy decision-making. But in many cases, close working relationships and partnerships between various ministries and agencies have played a critical role in developing successful programmes. For example, in the JNNSM, the Prime Minister's Office, the Planning Commission, the Ministries of Power and New & Renewable Energy, and the NTPC all coordinated to design and implement Phase 1. Similarly the BEE has also worked with various ministries, as needed, and also with a range of other stakeholders from the private sector and civil society; in addition, it also built partnerships with a number of other actors (bilateral and multilateral aid agencies as well as private foundations).

2.2.5 Design and implementation of novel instruments and programmes

A variety of novel policy instruments and programmes have been utilised in order to help achieve various energy policy objectives, often with remarkable success. In the case of the JNNSM, for example, the reverse auction helped in the price discovery for solar photovoltaic (PV) projects (see Table 2.1) and significantly brought down the feed-in tariff in relation to earlier estimates. (This, of course, leveraged the significant reduction in global PV module prices due to the enormous investments in China in module production.)

Table 2.1 Results of JNNSM Phase 1 bidding

	CERC-approved tariff (normal depreciation) (Rs./kWh)	**Final tariff after discount (Rs./kWh)**
Solar PV	17.91	10.95–12.76
Solar Thermal	15.31	10.49–12.24

Note: CERC: Central Electricity Regulatory Commission
Source: Based on Ministry of New & Renewable Energy (2012).

The BEE's Perform, Achieve, and Trade programme, intended to enhance industrial energy efficiency, launched a scheme of tradeable energy efficiency certificates that could help firms achieve their energy efficiency targets in a more cost-efficient manner. And more recently, its Super Efficient Equipment Program (SEEP) is providing a novel mechanism to provide incentives to manufacturers to develop the next generation of efficient appliances, with significant positive interest from manufacturers.

At the same time, it also is apparent that several areas need attention in order to further enhance the potential of leveraging technology to meet India's multiple energy challenges. These include:

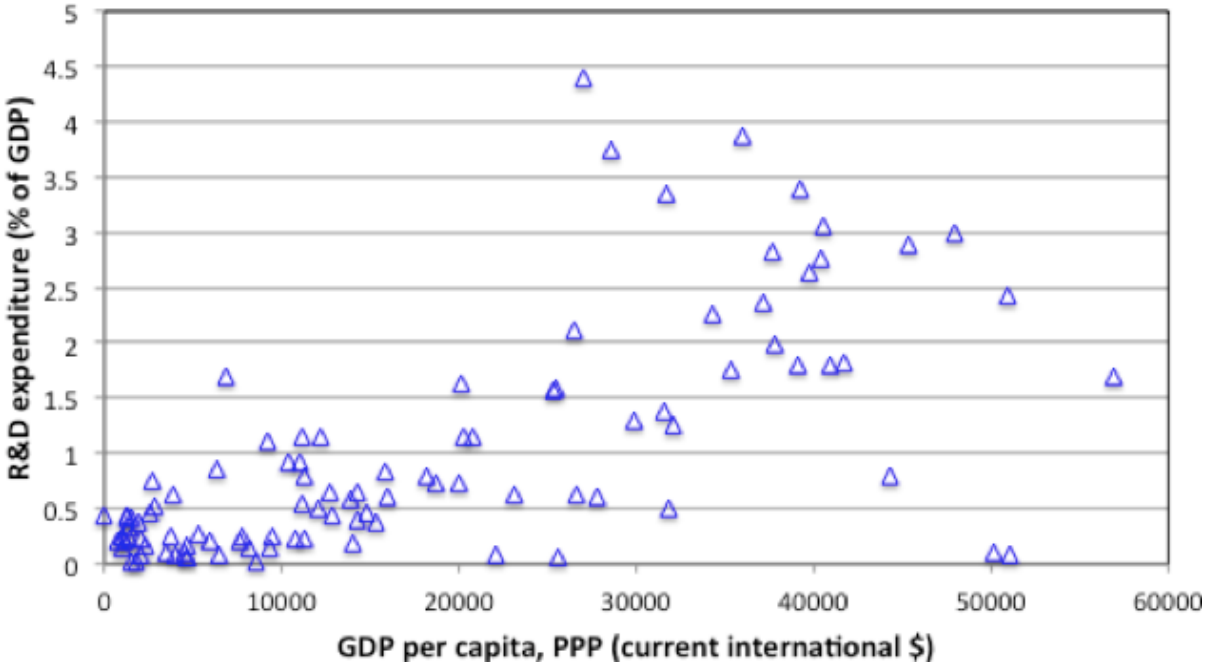
2.2.6 Development of longer-term strategy and roadmaps, including coordination across policy objectives

While there have been significant policy efforts in recent years to help India address its energy challenges, the development and integration of a longer-term strategy and roadmaps into these activities is still relatively limited. For example, while the JNNSM proposes a capacity-addition roadmap until 2020, it does not go into much detail about what a technology or industrial sector roadmap over that period might look like. Similarly, how to best integrate the various policy objectives under this mission – energy access, climate mitigation, and industrial development – remains an open question, although it is now beginning to be explored as the mission is under way.

2.2.7 Strengthen upstream technological innovation capabilities

India has often relied on adaptation of imported energy technology, although Indian firms are increasingly playing a role in incremental innovations of technologies and there also are programmatic efforts such as SEEP of the BEE that aim to provide incentives to develop new technologies. In order to be able to develop or better improve on existing technologies, India will need to enhance its upstream technological innovation capabilities. Indian science, technology, and innovation (STI), while responsible for a number of impressive achievements, remains relatively weak in scale, scope, and coordination in relation to many of its industrial country counterparts. (This, of course, is an issue not just for India but for many developing countries, as indicated by trends of perhaps the single-clearest indicator of STI capabilities – R&D investments; see Figure 2.4.)

Figure 2.4 R&D expenditure vs GDP – a global snapshot



Source: Based on World Bank (2014).

At the same time, Indian energy R&D budgets also need better alignment with India's energy challenges – for example, the expenditures on cookstoves R&D are minuscule, even though it is a major energy access, air pollution, and health issue. Similarly, there also have been only limited R&D investments in solar energy technologies, although the JNNSM aims to strengthen R&D in these areas.

2.2.8 Sharper focus on energy access

The nature and scale of the energy access challenge is particularly problematic for India. Therefore, addressing various dimensions of this challenge, especially providing cooking energy and electricity access, will require a concerted effort and programmes to make sure that the appropriate technologies are both available and deployed at scale in as short a time frame as possible. In the area of clean cooking energy, for example, the Ministry of Health has also recognised the health consequences of household air pollution and therefore started a process of exploring it own engagement in this area to complement the existing NPIC.

2.2.9 Strengthening of policy – analytical capacity and systematic linkage to policymaking

Given the complexity of many of the challenges facing Indian energy policy, it is clear that analytical capacity to develop appropriate policy solutions, to assess the efficacy of implemented policies, to refine and redesign policies, and to synthesise learning from these experiences will become increasingly important. While there exist some individual and institutional efforts to carry out such analyses, there is a lack of focused and systematic utilisation of these capabilities in addressing these challenges. For example, while there has been significant and increasing effort by individual researchers to analyse India's renewable energy programmes, almost none of these studies has been commissioned by the appropriate government agencies. And there is a lack of comparable effort to analyse energy efficiency programmes. Better linkages between policy analysts and the policymaking community could go a long way in enhancing India's energy policies.

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Brighton BN1 9RE

T +44 (0)1273 606261
F +44 (0)1273 621202
E ids@ids.ac.uk
www.ids.ac.uk