

INDIA

Hot STI issues

- Developing clean and green technologies to combat climate change.
- Designing an innovation system to stimulate industry R&D.
- Implementing Inclusive Innovation initiatives to enhance productivity in agriculture and the informal sector.

General features of the STI system: India is an open market economy and the world's second most populous country. GDP increased by 8.4% a year during 2005-10 and the country weathered the global crisis remarkably. India has a large domestic market and a large and young labour force. An emerging middle class ensures strong demand for consumer goods. Local manufacturing industries (e.g. electronics) complement traditional labour-intensive industries (e.g. textiles). A pool of low-cost, highly skilled, English-speaking workers has attracted massive inflows of FDI. The outsourcing of knowledge-intensive activities to India has contributed to make the services sector the largest contributor to GDP (55%) and the presence of multinationals' R&D centres has accelerated India's integration in the global research system (Panel 1^(t)). India hosts several top corporate R&D investors in automotive, industrial machinery and IT industries (1^(e)). The contribution of Indian firms to R&D is small but expanding rapidly: they accounted for 34% of GERD in 2007 and 0.26% of GDP (1^(d)) (up from 19% and 0.14% five years earlier). Research output (patents) and non-technological innovation (trademark counts) are still limited (1^{(f)(g)}). India's RTA in biotechnologies compares advantageously with that of other BRIICS (Panel 2). Framework conditions for entrepreneurship are weak (1⁽ⁱ⁾). Trade and FDI restrictions, along with

administrative red tape, hinder investments. The financial sector is insufficiently developed to meet the needs for capital. ICT infrastructures are limited (1^{(k)(m)}). Low graduation rates and poor quality of education hamper the development of human resources for innovation. HRST account for only 7% of employment (1^(v)) and the researcher population is relatively small (fewer than one researcher per 1 000 employment in 2005).

Recent changes in STI expenditures: India's GERD was 0.76% of GDP in 2007, essentially unchanged since 2000. But R&D expenditure grew by 8% a year in constant prices, rising from USD 13.8 billion to USD 22.9 billion, a level similar to that of the Netherlands and Sweden. At 66%, government remains the main R&D funder although the public contribution has decreased in relative terms from 82% since 2000. Forecasts of economic growth suggest that further growth in S&T can be expected.

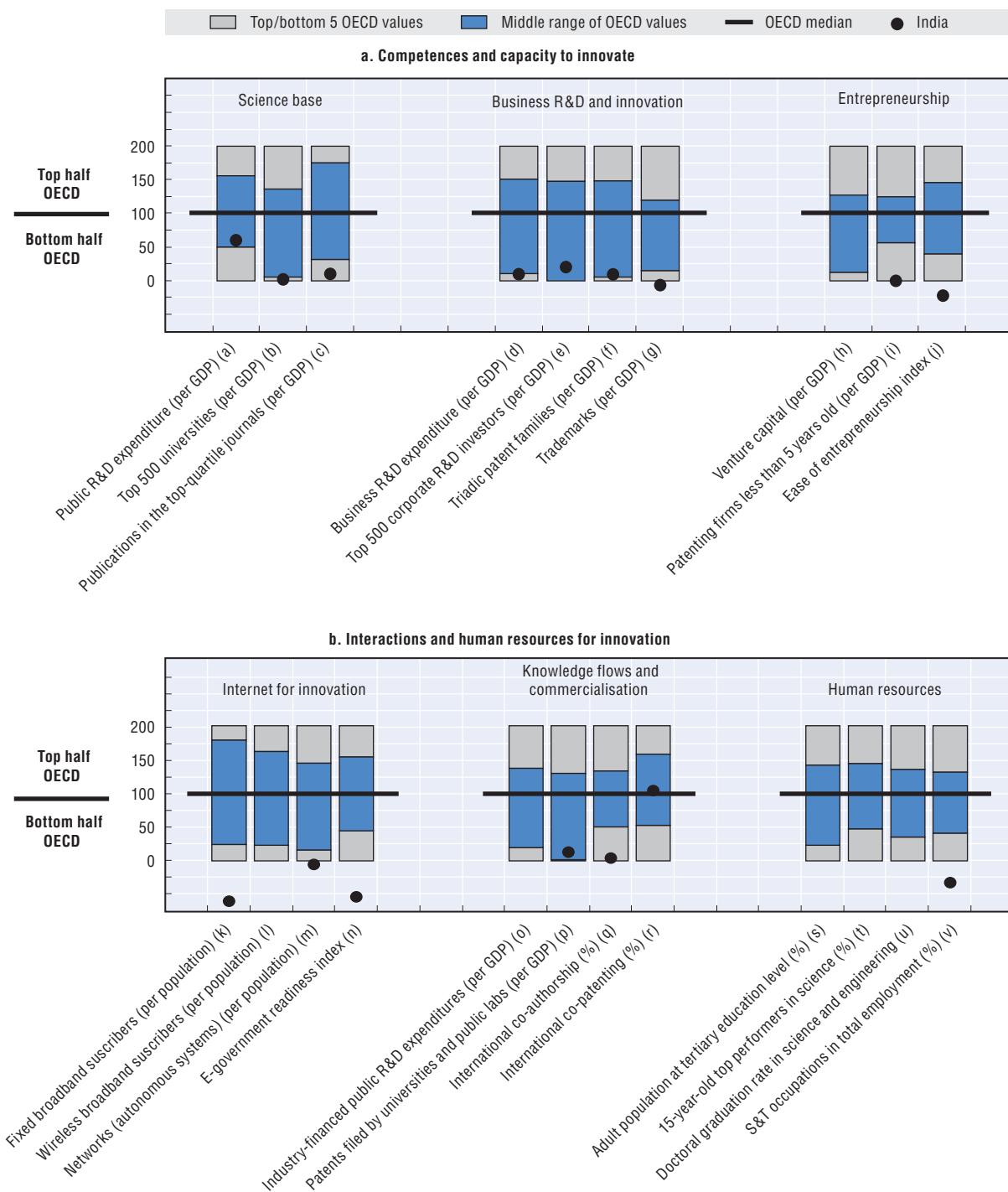
Overall STI strategy: India has adopted an indigeneous development model that features "inclusive growth" and low-cost frugal innovation. The government announced a Decade of Innovations 2010-20 and committed to strengthen S&T capacities, with GERD to reach 2% of GDP and the contribution of business to double. Priorities are space, nuclear and defence, ICT software, biotechnology and pharmaceuticals.

Key figures

Labour productivity, GDP per hour worked in USD, 2010 (annual growth rate, 2005-10)	n.a. n.a.	GERD, as % of GDP, 2007 (annual growth rate, 2005-07)	0.76 (+8.0)
Environmental productivity, GDP per unit of CO₂ emitted in USD, 2009 (annual growth rate, 2005-09)	2.29 (+0.0)	GERD publicly financed, as % of GDP, 2007 (annual growth rate, 2005-07)	n.a. n.a.

Figure 10.20. **Science and innovation in India**

Panel 1. Comparative performance of national science and innovation systems, 2011



Note: Normalised index of performance relative to the median values in the OECD area (Index median = 100).

STI policy governance: The National Innovation Council (NInC) was created in 2010 to define a new roadmap for research and innovation. State and sector innovation councils were set up. The capacities of the recently established Science and Engineering Research Board, a funding agency, were reinforced.

Science base: India's innovation system is dominated by universities and PRIs. Government R&D expenditures accounted for 0.47% of GDP in 2007 (1^(a)). India has one world-class university (1^(b)) and a weak publication record in top academic journals (1^(c)). The volume of scientific publications has doubled over five years. Some 73% of public research is funded by block grants which are allocated on the basis of national research priorities.

Business R&D and innovation: With 95% of business R&D activities funded by firms themselves, public financial support is negligible.

Entrepreneurship: The government plans to strengthen the S&T potential of micro enterprises and SMEs in semi-urban and rural areas. Various awards and incentives are offered by the Ministry of Small-Scale Industries and the Council for Scientific and Industrial Research to encourage entrepreneurship and in-house R&D or to support target groups (e.g. National Award for Performance). The Ministry of Finance will launch the India Inclusive Innovation Fund in 2012-13 to focus on the needs of those in the lower echelons of society. The Science and Technology Entrepreneurs Park Programme stimulates networking.

ICT and scientific infrastructures: The Promotion of University and Scientific Excellence (PURSE), the Consolidation of University Research Innovation and Excellence (CURIE) for universities for women, and the Fund for Improvement of S&T Infrastructure in Higher Educational Institutions (FIST) all aim to develop S&T infrastructure. In 2011, the government approved a rural broadband plan and the NInC project to connect self-governing villages through optic fibre.

Clusters and regional policies: The NInC drives cluster development throughout the country through cluster innovation centres. The Network of ICT Entrepreneurs and Enterprises provides

mentoring and advice. A number of technology business incubators, biotechnology and software technology parks, and a bio-IT park are operational.

Knowledge flows and commercialisation: The latest 12th Five-Year-Plan gives renewed attention to public-private partnerships. The Global Technology and Innovation Alliance and the Small Business Innovation and Research Initiative support commercialisation through strategic and public-private partnerships. The National Innovation Foundation (a private non-profit initiative) promotes the commercialisation of grassroots innovations. The Property and Utilisation of Public Funded Intellectual Property Bill 2008 governs IPR.

Globalisation: India is increasingly part of global knowledge flows. It has a number of bilateral R&D agreements, e.g. with the United States (clean energy research), the United Kingdom (next-generation telecommunication), the EU (energy and water technologies), and Australia (strategic research).

Human resources: The 11th Plan (2007-12) gave top priority to elementary, school and higher education by significantly raising education budgets. The Higher Education and Research Bill 2011 proposes a National Commission to improve regulation of university education and vocational and technical training. The Innovation in Science Pursuit for Inspired Research Programme (INSPIRE) promotes science, while the Assured Opportunity for Research Careers supports researchers. The Scholarship for Higher Education targets the study of science in the 17-22 age group. The national Fast Track Scheme for Young Scientists stimulates excellence in science.

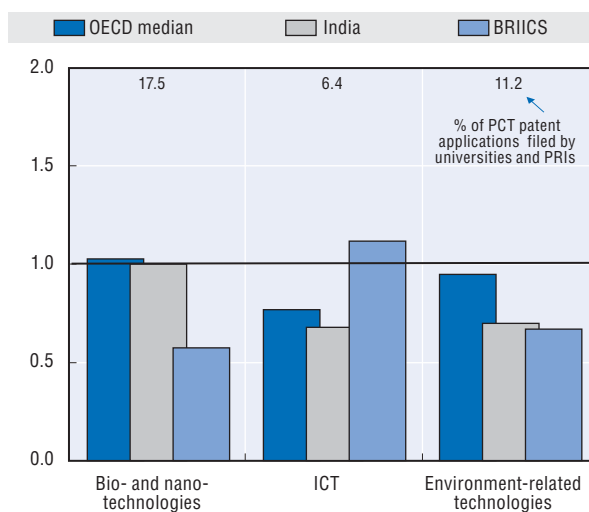
Green innovation: India's demographic and economic growth, new modern lifestyles and higher electrification rates put energy supply security at risk since India depends heavily on imported coal to meet its needs. Current trends will drive up imports of fossil fuels, local pollution and greenhouse gas emissions. India experiences also recurring droughts that have serious impact on food security and population settlement. In 2008 India developed a National Plan on Climate Change to address solar energy, energy efficiency, water

and strategic knowledge on climate change. The new Renewable Energy for Urban Industrial and Commercial Applications Programme emphasises

green innovation. The Winning Augmentation and Renovation Programme aims to solve India's water problems through R&D solutions.

Panel 2. Revealed technology advantage in selected fields, 2007-09

Index based on PCT patent applications



Source: See reader's guide and methodological annex.

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