World Bank Support for Science, Technology, Innovation and Entrepreneurship

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The World Bank

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Outline

- Why Technological Innovation
- World Bank Support Instruments
- Country Examples: Turkey, India, Croatia, Vietnam
- Key Ingredients to Success

Why Technological Innovation

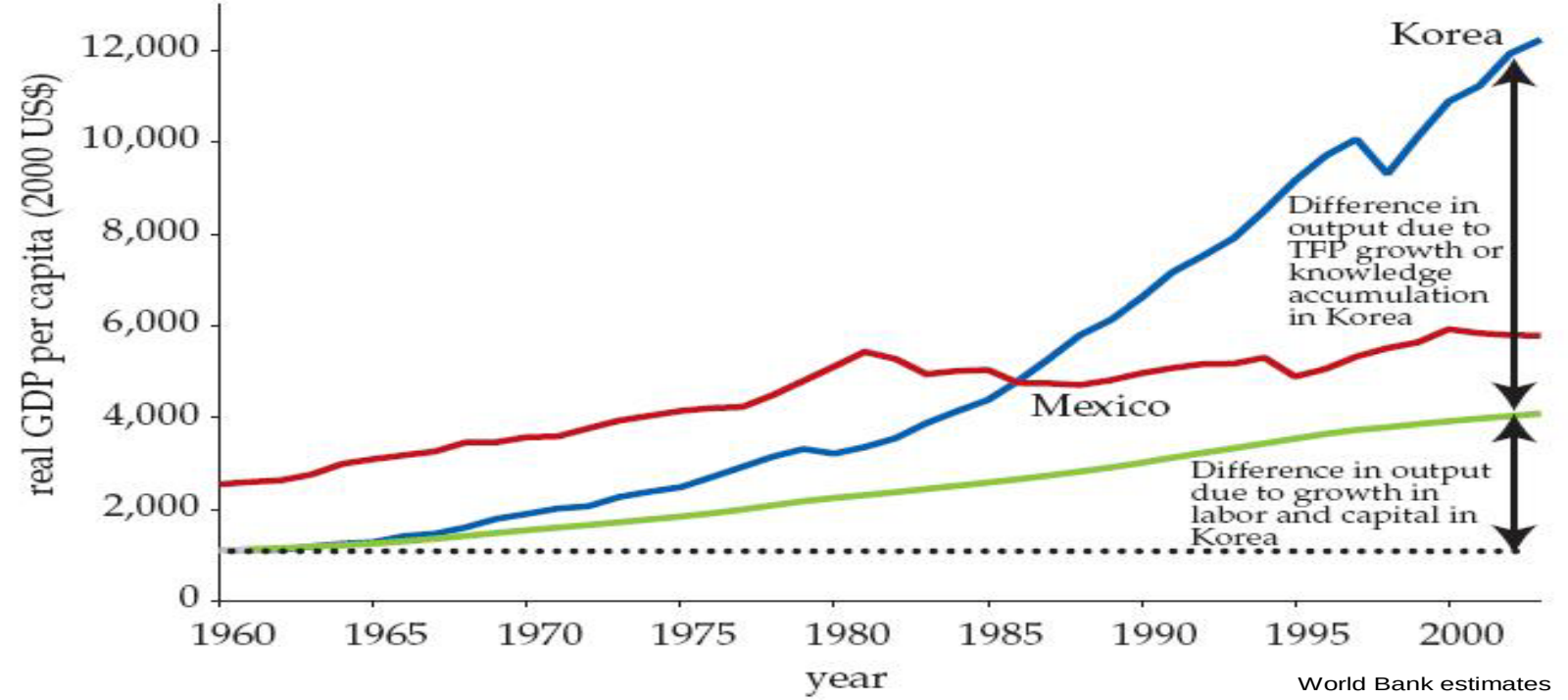
Technological Innovation

- Major driver of competitiveness and sustainable economic growth
  - For advanced and emerging economies, and for all sectors
- 21st Century: ''Century of Innovation''
  - Knowledge and innovation will drive comparative advantage of economies
- In order to shift resources from low to higher productivity activities, countries must concurrently adopt 'catch-up technology' and innovate
  - Competitiveness and economic growth
- Can also be a powerful tool in broader social development and "inclusive growth"
  - Job creation, distribution of income, improving living standards

Important for all countries, not only those at "Frontier"

Knowledge is Key to Wealth

Contribution of Knowledge to GDP Growth



World Bank Support Instruments

How Does the World Bank Help?

- Diagnostics, Policy and Strategy
- Targeted Interventions - Catalytic Effect
- Capacity Building
- Knowledge Sharing
- Investments and Technical Assistance
- Research and Benchmarking

Leverage World-Wide Experience

World BankValue-added

- World-wide experience and best practices
- Encourage public-private partnership
- Financial support and institution building
- Speed up complex reform process
- Prudent market tests and fiscal discipline
- Long term support, advice and leverage

World Bank Products

- Analytical and Advisory Services
  - Policy Advice and Strategy Formulation
  - Benchmarking, Research (KAM methodology)
  - KE Assessments (China, India, Korea, Malaysia, Russia, Lithuania, Poland, Turkey, Brazil, Chile, Sri Lanka, Rwanda……)
  - Investment Climate, eReadiness Assessments, Business Environment…
- Investment Operations
  - Policy and Sectoral Projects
  - Investment Projects
  - Technical Assistance Projects
- Policy Forums, Training, Workshops
- Full Projects, Components, TA Services

Knowledge, Finance and Capacity Building

Knowledge Economy Forums

Paris, Helsinki,

Budapest, Istanbul

Oxford, Berlin

Prague, Bologna and more

Evolving World Bank Support

Electronics, Technology Development, Engineering

Israel, Spain, Korea

Technology Development, Industrial Technology

China, Mexico, Indonesia, India, Turkey

Science & Technology, Tech Infrastructure, Telecom

China, Chile, Brazil, Mexico, Croatia, India, Turkey

Knowledge Economy

Innovation

eDevelopment & ICT

Research & Develop.

Competitiveness

1970s

1980s

1990s

2010

Korea

Electronics Technology Project (1979)

Three Technology Development Projects (1982, 1984, 1988)

Program for Science and Technical Education Project (1984)

Three Technology Advancement Projects (1989, 1990, 1991)

Universities Science and Technology Research Project (1990)

Science Education and Libraries Computerization Project (1992)

Korean Firms Assessment (2000)

Reorientation of Korea R&D Sector towards Semiconductors

1970s

1980s

1990s

2005

2010

Turkey

Technology Development Project I (1992-1997)

Industrial Technology Project (1999-2006)

Knowledge Economy Assessment (2003)

Innovation and Competitiveness Workshop (2004)

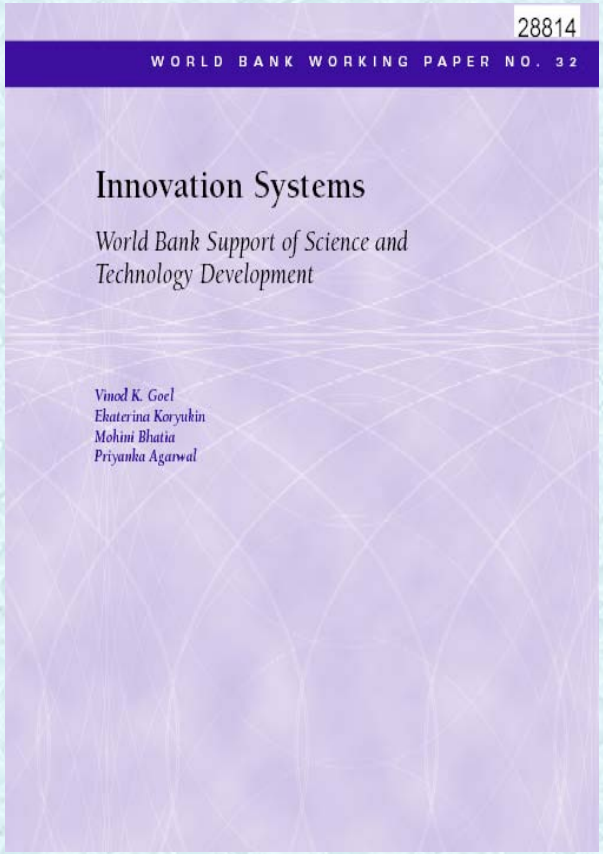
Knowledge Economy Forum (2005)

Innovation for Employment and Growth; Investment Climate; SME Innovation (2008-11)

Launched R&D Financing, VC - Innovation

Multi-Generational Development Partner

“Innovation Systems, World Bank Support of Science and Technology Development”



$8 billion in Financing *

Innovation Projects

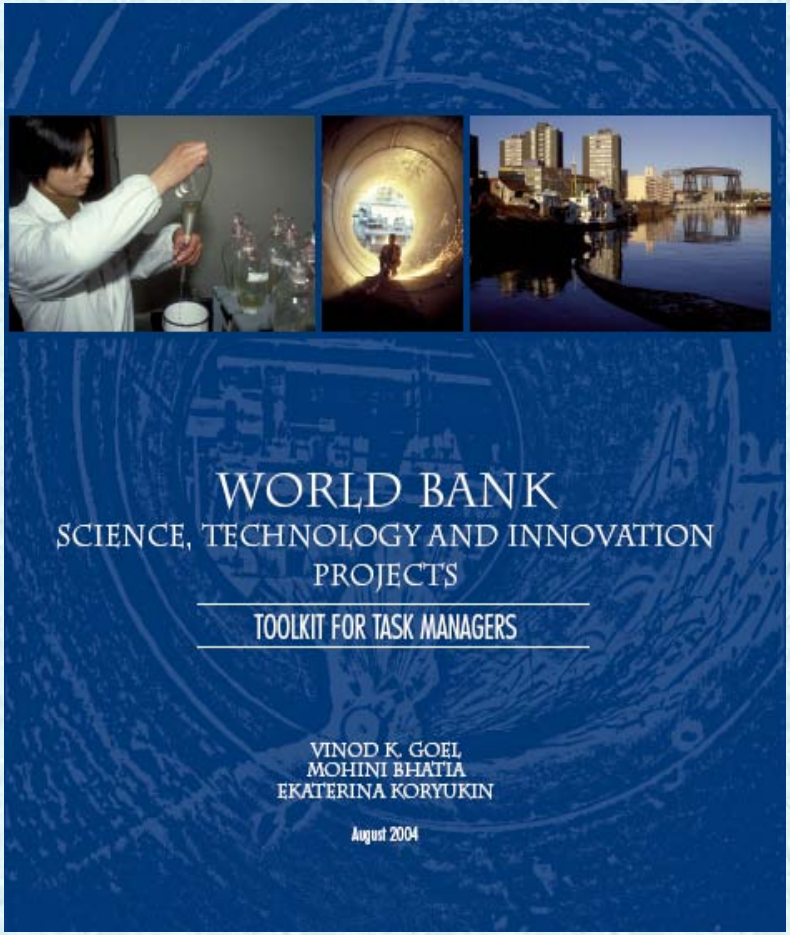
100+ Projects, 30+ years

China, India, Korea, Malaysia, Indonesia, Vietnam, Thailand, Mexico, Brazil, Chile, Honduras, Spain, Israel, Turkey, Russia, Hungary, Croatia, Armenia, Romania, Rwanda, Tanzania ….

Decades of WB Support for Innovation

* (Excludes Agriculture, Education, etc.)

“World Bank Science, Technology and Innovation Projects” Toolkit for Task Managers



- Project Design
- Institution Building
- Role of the Government
- Role of Private Sector
- Role of IFIs
- Main Lessons Learned
- Monitoring and Evaluation

Advisory and Projects Tools

- Put in place Policies, Regulations, Processes Conducive to Innovation and Entrepreneurship
- Access to Knowledge and Skills
- Upgrading of MSTQ and IPR systems
- Restructuring of Public R&D Institutions
- Enterprise level R&D and Innovation
- Promote Collaboration between Industry, Universities and R&D Institutions and Global
- Higher Education and Skills Upgrading
- Framework for R&D commercialization
- Incentives, S&T parks, Incubators, Tech Transfer Offices, Angle and VC Finance

Create an Environment Conducive to Innovation and Entrepreneurship

Country Examples -
Turkey, India, Croatia, Vietnam

Turkey: Technology Development Projects

(1992-1997, $100 million; 1999-2007, $155 million)

74 million people, Population below poverty line 17%, GDP/capita $9,941, GDP growth in past 10 years 6.6%

- Modernize MSTQ System - $100 million
  - Turkish Standards Institute - $43 million
  - National Metrology Institute- $13 million + $45 million
  - World class MSTQ system meeting 10% ➔30% ➔ 90% Turkish Industry needs
- Upgrade IPR System (to meet WTO and European Standards)- $15 million
  - Modern IPR system harmonized with EU standards
- Restructure R&D Institutional network (Industry-oriented)- $33 million
  - Techno park, serving over 600 clients, EU collaboration, self-sufficiency 10% ➔ 70%
- Upgrading Technological Capabilities of Firms - $107 million
  - Technology Development Foundation of Turkey (TTGV)
  - Technology services to 1,400 SME companies
  - $187 million in R&D support to 530 projects, majority SMEs- 80% commercialized
  - 3 techno parks, incubators, 2 VCs, early stage capital fund, and more
  - Firm Results: productivity 15%, exports 20%, R&D 34%, new products/process 80%

New Innovation Project under consideration

India: Industrial Technology Project

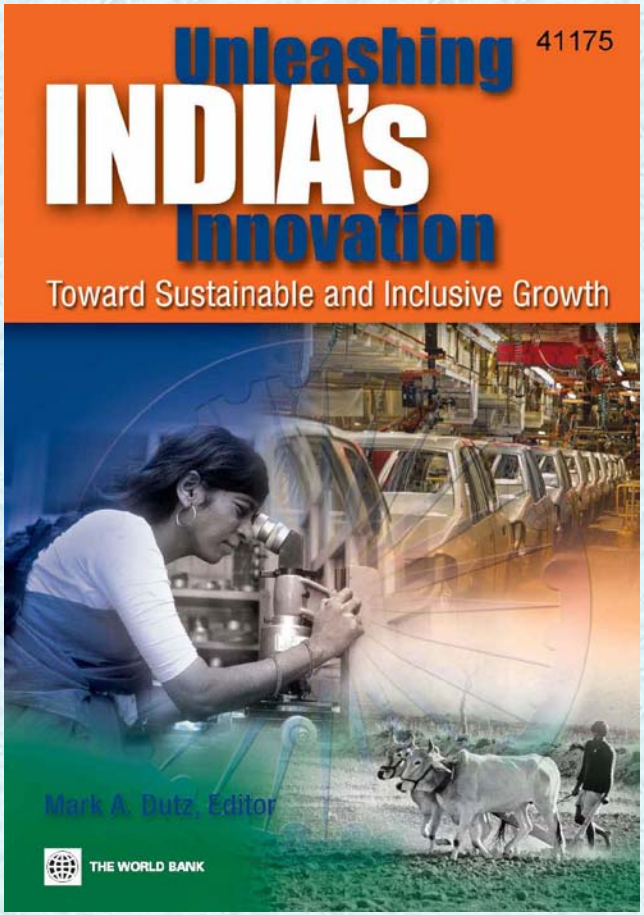
(1990-1997- $200 million)

1.1 billion people, Population below poverty line 28%, GDP/capita $1,030, GDP growth in past 10 years 7%

- **Restructured R&D Institution Network (CSIR, 40 R&D labs, 20,000 staff)-** $45 million
  - Strong orientation with needs industry, society at large and overall economy
  - 25-45% Income from Contractual R&D- clients domestic and global
- **Technology Development Fund (fast-track)-** $100 million
  - 600-800 Firms Upgraded Technological Capabilities
- **Introduced Venture Capital Industry-** $40 million
  - 9 VC Funds with Private Sector financing
  - Invested in over 300 companies - 18-20% average returns
- **SPREAD Program (ICICI Bank- private sector)- $15 million**
  - 100 joint R&D projects - SMEs and R&D institutions and start ups
  - Highly successful program- several breakthroughs, on-going to date
- **National Innovation Project (under consideration, $200 million)**
  - Inclusive Innovation Promotion and Traditional Knowledge
  - Upgrade R&D programs and promote commercialization
  - Harness global knowledge- Diaspora, technology acquisition fund
  - Scale-up and commercialize grassroots innovations

Unleashing India's Innovation- Flagship Report (2008)

India: Toward Sustainable and Inclusive Growth



"……to develop concrete actions that strengthen India's innovation environment, enhance productivity growth, and reduce poverty……"

"……covers a vast array of areas ranging from India's broader economic and institutional regime—with a priority on promoting stronger competition among enterprises to unleash innovation—to more specific areas….."

A World Bank Flagship Report on Indian Innovation (2008)

A Policy Paper-on the reform of Indian Higher Education, Technology and Innovation (by Vinod K. Goel and R.A. Mashelkar)

Croatia: Science and Technology Project

(2006- ongoing, $40 million)

4.5 million people, Population below poverty line 17%, GDP/capita $14,640, GDP growth in past 10 years 5.5%

- **Restructuring Public R&D Institutions- $14 million**
  - Brodarski Institute, Ruder Boskovic Institute
  - Increase relevance to economy and industry demand, self sufficiency from 20% > 40%

- **Upgrading Firms' Technological Capabilities - $20 million**
  - 51 RAZUM projects ($45 million) for R&D and new product development
  - 13 SPREAD projects ($1.7 million) jointly with RDIs and industry
  - 10 R&D and technology centers for start ups and SMEs
  - *Rudjer Innovations*- RBI's TTO- 20 patent applications, 8 license deals, 3 start-ups

- **Unity Through Knowledge Fund - $6 million**
  - Engaging Croatian Diaspora in the development of Croatian National Innovation System
  - 50 joint projects with Croatian scientists/industry and Diaspora

New Innovation Project or Additional Funds under consideration

Vietnam: Inclusive Innovation Project

(under preparation, $70 million)

87 million people, Population below poverty line 12%, GDP/capita $1,100, GDP growth in past 10 years 7.5%

Ambition to become Middle Income Country by 2020

- Use STI capacity to generate technologies for the BOP
  - Develop solutions for National *Development Challenges (health, food security, clean energy)*
  - Develop pilot technologies to produce products and services with
    - "high performance quality" and at "affordable prices"
- Upgrade and commercialize grassroots innovations
  - "Technology Agents" to scout areas for potential ideas suitable for commercialization
  - Engage technology institutions to improve/upgrade prototypes
    - Example India's *National Innovation Foundation*—mechanisms to support grassroots innovators— but faces challenge of commercialization
- Enhance technological capabilities of enterprises
  - Incentives for mass production of *inclusive* products and services
  - Promoting technology upgrading and adoption by SMEs

Deputy Prime Minister asked for World Bank support-
Innovation Policy Paper, FIRST Project, Global Collaboration (e.g. GRA)

Key Ingredients to Success

Changes in Innovation Culture

Innovation is about changes in Innovation Culture through:

- **Focus on Enhancing Country Competitiveness**
- **Improving Governance and Business Environment**
- **Changes in Mindset, including on Education and Learning**
- **Industry-Oriented R&D and Innovation**
- **Technology Diffusion, Acquisition and Absorption**
- **Collaboration and Partnerships- domestic and global**
- **Sustained Public and Private Support and Investments**

Regional and Global Partnerships

The Global Research Alliance (GRA)

- Virtual alliance of 9 of the world's premier R&D institutional networks
- Has more than 60,000 scientists and engineers
- Has a portfolio of 15,000+ patents
- Perform basic & applied research, technology transfer & commercialization
- Specializes in the implementation of commercially and socially viable goods and services
- Has strong networks with governments, NGOs, business community
- Collaborates with international organizations and nations to contribute to **"Global Good"** for the "Empowerment of Deprived Communities"

The World Bank and GRA are in strategic STI partnership

Leverage local, regional and global knowledge thru partnerships

Global Research Alliance Members

CSIRO	***Commonwealth Scientific and Industrial Research Organisation (CSIRO Australia)*** (established 1926)	CSIRO, a powerhouse of ideas, skills and technologies with staff of 6,400 (4,000 researchers, 4,000 granted or pending patents, 150 spin offs), is dealing with everything from the molecules of life to the molecules in space.
Battelle usiness of Innovation	***Battelle Memorial Institute (USA)*** (established 1929)	Battelle, a global S&T enterprise with 20,000 staff worldwide, explores emerging areas of science and develops technology for commercialization (50-100 patented inventions annually)-- also manages laboratories for customers.
	Council of Scientific and Industrial Research (CSIR, India) (established 1942)	CSIR India, with 4,500 scientific & technical staff (total staff 18,000) and 38 national R&D Labs (largest public R&D network in the world, with a patent portfolio of over 2250 in India and 2700 abroad.) undertakes scientific and industrial R&D to maximize economic, environmental and societal benefit with a focus on the economic growth and human welfare.
CSIR	***Council for Scientific and Industrial Research (CSIR, South Africa)*** (established 1945)	CSIR-SA performs multi-disciplinary research and technological innovation which contributes to industrial development and quality of life. It is one of the leading S&T organizations in Africa with a total staff of 2,300 and 700 researchers (35 new inventions in 2007/08).
DANISH TECHNOLOGICAL INSTITUTE	***Danish Technological Institute*** (established 1906)	Self-owned and non-profit institution with 730 research staff develops, applies and disseminates research and technologically based knowledge for the Danish and International business sector.
Fraunhofer	***Fraunhofer-Gesellschaft (Germany)*** (established 1949)	Fraunhofer, a multinational contract research organization, undertakes applied research that drives economic development and benefit to society. It has a staff of 15,000 the majority of whom are qualified scientists and engineers (650 inventions in 2007).
TNO	***Netherlands Organization for Applied Scientific Research (TNO)*** (established 1932)	TNO, with 4,000 S&T staff (1,321 patents), stands for "Innovation with Purpose" – the development of knowledge for practical application and the creation of new products that contribute to the quality of life and help companies innovate.
SIRIM	***SIRIM Berhard (Malaysia)*** (established as an institute in 1975 and as a company in 1996)	SIRIM provides support, on behalf of the Malaysian Government, to industry and the people of Malaysia and also consulting, testing and training services and has created competent technology entrepreneurs and stimulated the growth of local industries.
VTT	***Technical Research Centre (VTT Finland))*** (established 1942)	VTT with 2,700 staff (1,200 researchers and 1,200 inventions, over 1,000 domestic and 1,800 foreign patent filed)) is a globally networked multi technological contract research organization providing high-end technology solutions and innovation services.

Working With Intellectuals

Academic & R&D Sectors, Private Industry, Communities, NGOs and Government

Innovation Requires ➔ Changes in Mindset

Old Paradigm:

Research and Development

Research ➔ Publish ➔ Perish

New Paradigm:

Research for Development (Wealth Creation)

Research ➔ Patent ➔ Publish ➔ Prosper

Public Policy to Invest and Facilitate -not Control

Thank you

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