Sustainable Development

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Jaipur
Structure of the lecture

Part I: Theoretical understanding of sustainable development and related concepts

Part II: Case study
PART I: SUSTAINABLE DEVELOPMENT: CONCEPTS AND EVOLUTION
QUESTION

What do you understand by sustainable development?
Sustainable Development: Global Genesis

DEFINITION

*Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts:*

- *the concept of needs*, in particular the essential needs of the world's poor, to which overriding priority should be given; and

- *the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs.*

Sustainable Development

A timeline

United Nations Conference on Environment and Development (UNCED), Rio-de-Janiero; Convention on Biodiversity (CBD); United Nations Framework Convention on Climate Change (UNFCCC) was opened for signature; establishment of Commission on Sustainable Development (CSD)

United Nations Convention to Combat Desertification (UNCCD); Global Environment Facility (GEF) restructured

Kyoto Protocol

Signing of Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade

Establishment of Global Ministerial Environment Forum (GMEF) and Environment Management Group (EMG) under UNEP

The UN Millennium Summit, New York and introducing of The Millennium Development Goals

2010 MDG Summit requested the Secretary-General to initiate thinking on the global development agenda beyond 2015

United Nations Conference on Sustainable Development (UNCSD), Rio de Janeiro; End of the first commitment period (2008-2012) under the Kyoto Protocol

India's Prime Minister Indira Gandhi at the UN Conference on Human Environment. She was the only foreign head of state to attend the Conference apart from the host, the Swedish Prime Minister Olof Palme.

World Summit on Sustainable Development (WSSD), Johannesburg

Bali Strategic Plan for Technology Support and Capacity-building at the 23rd UNEP GC/GMEF

Post-2015 UN Development Agenda; Post 2015 Climate Agenda?
## Sustainable Development: Indian Context

### Seventh Five Year Plan (1985-1990)

- “If the gains in productivity are to be sustained, resources must also continue to be available over time. This requires that, while providing for current needs, the resources base be managed so as to enable sustainable development.” (Volume 2, Chapter 18)

### The Constitution of India

- Article 21 conferring the Right to Life encompasses right to clean environment, right to livelihood, right to live with dignity and a number of other associated rights
- The Directive Principles of State Policy often referred to as the ‘conscience’ of the Constitution are intended to ensure ‘distributive justice’ and that political democracy in India is accompanied side by side with social and economic democracy

### The National Environment Policy

- “only such development is sustainable, which respects ecological constraints and the imperatives of social justice”
Sustainable Development: Indian Context

• The ideology of sustainable development was a part of Seventh Five Year Plan and predates the United Nations Conference on Environment and Development (UNCED) in 1992.

• National Environment Policy, 2006 of India articulates that sustainable development should respect ecological constraints while harmonize the imperatives of social justice.

• In the context of sustainable development and India, it is evident that sustainable development has been much more than a narrative and is deeply embedded in Indian culture and in the ideology of development; tradition in India has always embraced sustainability.

• For developing countries sustainable development and related concepts like green economy will be linked to social pillar and inclusivity.
Components of Sustainable Development: Dominant View

Figure: Three pillars of sustainable development

- Three pillars of sustainable development
  - Economic
  - Social
  - Environmental

- Achievements
  - Policy mainstreaming and consensus building
  - Responsible corporate conduct
  - Formal and informal institutions working together

- Criticisms
  - Compartmentalized – leading to isolated actions
  - An oxymoron
  - Fuzziness

Inspired by Our Common Future, 1987; World Summit, 2005
Components of Sustainable Development: Emerging View

Figure: Interfaces of the components of sustainable development

- Also focuses on interfaces around components of sustainable development
- Social ecology (social and environment)
- Green economy (economic and environment)
- Social equity (social and economic)

Source: GoI (2010), official submission to UNCSD second preparatory committee meeting, pg 30
Sustainable Development in Practice

- Stewardship (doers, donors, practitioners)
- Government initiatives
- Enterprises
- Design
- Standards
- Corporate responsibility
- Audits
- Day-to-day life
Institutions and stakeholders

<table>
<thead>
<tr>
<th>Women groups</th>
<th>Youth groups</th>
<th>Indigenous people</th>
<th>NGOs</th>
<th>Local Authorities</th>
<th>Trade unions</th>
<th>Business &amp; Industry</th>
<th>Scientific &amp; Technological Community</th>
<th>Farmer groups</th>
<th>Government</th>
<th>UN and other international organizations</th>
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<tr>
<td>Innovations in MG-NREGS</td>
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<td>Waste Minimization Circles</td>
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<td>National Knowledge Network</td>
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<td>Women Empowerment under IID</td>
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<td>Lighting a Billion Lives campaign</td>
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<td>Joint Forest Management</td>
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Source: MoEF-TERI (2011)
Global Policy: Some developments

United Nations General Assembly to agree on Post-2015 Sustainable Development Goals

The Outcome Document of the United Nations Open Working Group on the Post-2015 Development Agenda including Sustainable Development Goals (SDGs) will form the basis.

SDGs are supposed to be action oriented, global in nature and universally applicable to all countries, while taking into account different national realities, capacities and levels of development and respecting national policies and priorities.

Source: http://sustainabledevelopment.un.org/focussdgs.html
List of Proposed Sustainable Development Goals to be attained by 2030

1. End poverty everywhere
2. End hunger, improve nutrition and promote sustainable agriculture
3. Attain healthy lives for all
4. Provide quality education and life-long learning opportunities for all
5. Attain gender equality, empower women and girls everywhere
6. Ensure availability and sustainable use of water and sanitation for all
7. Ensure sustainable energy for all
8. Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
9. Promote sustainable infrastructure and industrialization and foster innovation
10. Reduce inequality within and between countries
11. Make cities and human settlements inclusive, safe and sustainable
12. Promote sustainable consumption and production patterns
13. Tackle climate change and its impacts
14. Conserve and promote sustainable use of oceans, seas and marine resources
15. Protect and promote sustainable use of terrestrial ecosystems, halt desertification, land degradation and biodiversity loss
16. Achieve peaceful and inclusive societies, access to justice for all, and effective and capable institutions
17. Strengthen the means of implementation and the global partnership for sustainable development

Source: http://sustainabledevelopment.un.org/focussdgs.html
QUESTION

Why sustainable development?
CLIMATE SUMMIT

WHAT IF IT'S A BIG HOAX AND WE CREATE A BETTER WORLD FOR NOTHING?

- Energy independence
- Preserve rainforests
- Sustainability
- Green jobs
- Livable cities
- Renewables
- Clean water, air
- Healthy children
- etc. etc.

Joel Pett
Drivers

- Global environment issues
  - Climate change
  - Biodiversity loss
  - Land degradation
- Traditional security
  - Conflicts and wars
- Non-traditional security
  - Energy
  - Food
  - Water
  - Others
- Global integration
- Inequity
  - intra-generational inequity
  - Inter-regional inequity
  - Inter-generational inequity
  - The question of fairness
- Financial crises
What comes to your mind when you hear Climate Change?
What is Climate Change?

Climate Change is the change in the long-term average weather conditions of a place. Today, climate change is widely used to refer to anthropogenic global warming.

IPCC definition: A statistically significant variation in either the mean state of the climate or in its variability, persisting for an extended period (typically decades or longer).
Earth’s Radiation Budget

• Earth’s climate & weather driven by radiative energy from sun
  – Earth receives shortwave solar radiation: Heats the atmosphere and surface
  – Earth emits longwave radiation to space: cools the planet

• Radiation budget
  – Planetary budget at top of atmosphere (TOA) is zero over the long term
  – Climate (temperature) is in equilibrium in long term
  – But components can change over range of timescales, causing climate change
Earth’s Radiation Budget

- Reflected Solar Radiation: 107 Wm⁻²
- Reflected by Clouds, Aerosol and Atmospheric Gases: 77
- Reflected by Surface: 30
- Absorbed by Surface: 168
- Absorbed by Surface: 30
- Incoming Solar Radiation: 342 Wm⁻²
- Emitted by Atmosphere: 67
- Emitted by Clouds: 67
- Latent Heat: 78
- Evapotranspiration: 78
- Thermals: 24
- Absorbed by Surface: 24
- Surface Radiation: 390
- Greenhouse Gases: 324
- Back Radiation: 324
- Atmospheric Window: 40
- Longwave Radiation: 235 Wm⁻²

Total incoming radiation: 342 Wm⁻²
Total outgoing radiation: 235 Wm⁻²
Net radiation: 107 Wm⁻²
Principles of enhanced greenhouse effect

Over long term; conservation of energy ensures that:

- Radiation in = Radiation out
- Any change to components of radiation budget results in an adjustment (change in climate) to restore equilibrium
- E.g.
  - Increase CO2 $\rightarrow$ decreased outgoing radiation $\rightarrow$ temperature increase to raise outgoing radiation
Radiative forcing: a leaking bucket analogy

Water in

Energy in

Water level equilibrium

Equilibrium temperature

Water out

Energy out
Radiative forcing: a leaking bucket analogy

Water in

Water level

New equilibrium

Water out

Energy in

temperature

Energy out
Global average annual temperature change relative to 1980-1999 (°C)

**WATER**
- Increased water availability in moist tropics and high latitudes
- Decreasing water availability and increasing drought in mid-latitudes and semi-arid low latitudes
- Hundreds of millions of people exposed to increased water stress

**ECOSYSTEMS**
- Up to 30% of species at increasing risk of extinction
- Most corals bleached
- Widespread coral mortality
- Terrestrial biosphere tends toward a net carbon source as: ~15%
- ~40% of ecosystems affected
- Ecosystem changes due to weakening of the meridional overturning circulation

**FOOD**
- Complex, localised negative impacts on smallholders, subsistence farmers and fishers
- Tendencies for cereal productivity to decrease in low latitudes
- Tendencies for some cereal productivity to increase at mid- to high latitudes
- Productivity of all cereals decreases in low latitudes
- Cereal productivity to decrease in some regions

**COASTS**
- Increased damage from floods and storms
- About 30% of global coastal wetlands lost
- Millions more people could experience coastal flooding each year

**HEALTH**
- Increasing burden from malnutrition, diarrhoeal, cardio-respiratory and infectious diseases
- Increased morbidity and mortality from heat waves, floods and droughts
- Changed distribution of some disease vectors
- Substantial burden on health services

† Significant is defined here as more than 40%.
‡ Based on average rate of sea level rise of 4.2 mm/year from 2000 to 2080.
SOUTH ASIA
EXTREMES OF WATER SCARCITY AND EXCESS

Under climate change, South Asia faces impacts to food production and seasonal water availability and variability in the monsoon patterns. Coastal/deltaic areas (such as in Bangladesh) will be vulnerable to extreme river floods, tropical cyclones, rising sea-level and very high temperatures. These multiple impacts pose major development challenges to infrastructure and access to reliable energy.

PROJECTED WARMING, WITHOUT CONCERTED ACTION

<table>
<thead>
<tr>
<th>Year</th>
<th>Temperature</th>
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<tbody>
<tr>
<td>2030s</td>
<td>1.5°C</td>
</tr>
<tr>
<td>2040s</td>
<td>2°C</td>
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<tr>
<td>2060s</td>
<td>3°C</td>
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<tr>
<td>2080s</td>
<td>4°C</td>
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</tbody>
</table>

RESULTING IN:

UNUSUAL SUMMER HEAT EXTREMES
(percentage of land that will experience)

- 1.5°C: 15%
- 2°C: 20%
- 3°C: Greater than 50%
- 4°C+ Greater than 70%

INCREASE IN GANGES RIVER RUNOFF FROM PRE-INDUSTRIAL TIME (1850), AFFECTING AGRICULTURE

- 2°C: 20%
- 4°C+: 50%

Under 2°C warming, 33% of the Kolkata metropolitan area is projected to be exposed to flooding of more than 25cm in the event of extreme rainfall patterns by 2050.

Under 2°C warming, water availability in Pakistan and Nepal is projected to be too low for self-sufficiency in food production by 2050.

World Bank 2013
Planetary Boundaries

Rockström et al. 2009
Social Foundation Donut
The safe and just space for humanity

Critical natural thresholds

Critical human deprivations

Oxfam 2012
QUESTION

Can we measure sustainable development?
Framework

• Social
• Economic
• Environmental
• Institutional
## Social

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-theme</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>Equity</td>
<td></td>
<td>Percent of population living below poverty line</td>
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<td></td>
<td>Poverty</td>
<td>Gini index of income inequality</td>
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<td>Unemployment rate</td>
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<td>Gender equality</td>
<td>Ratio of average female wage to male wage</td>
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<td></td>
<td>Nutritional status</td>
<td>Nutritional status of children</td>
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<td>Mortality</td>
<td>Mortality rate under 5 years old</td>
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<td>Infant mortality rate</td>
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<td>Life expectancy at birth</td>
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<td>Health</td>
<td>Sanitation</td>
<td>Percent of population with adequate sewage disposal facilities</td>
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<td></td>
<td>Drinking water</td>
<td>Population with access to safe drinking water</td>
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<td>Percent of population with access to primary health care facilities</td>
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<td>Healthcare delivery</td>
<td>Immunization against infectious childhood diseases</td>
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<td>Contraceptive prevalence rate</td>
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<td>Education</td>
<td>Education level</td>
<td>Children reaching grade 5 of primary education</td>
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<td>Adult secondary education achievement level</td>
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<td>Theme</td>
<td>Sub-theme</td>
<td>Indicator</td>
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<tr>
<td>Economic structure</td>
<td>Economic performance</td>
<td>per capita</td>
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<td></td>
<td>Trade</td>
<td>Investment share in</td>
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<td></td>
<td>Financial status</td>
<td>Balance of trade in goods and services</td>
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<td>Debt to GNP ratio</td>
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<td>Total ODA given or received as a percent of GNP</td>
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<td>Fiscal Deficit</td>
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<td>Consumption and production patterns</td>
<td>Material consumption</td>
<td>Intensity of material use</td>
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<td>Annual energy consumption per capita</td>
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<td>Share of consumption of renewable energy resources</td>
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<td>Energy use</td>
<td>Energy use per unit of</td>
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<td>Energy use per unit of by sector</td>
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<td>Intensity of energy use:</td>
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<td>Transportation</td>
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<td>Energy Imports</td>
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# Environmental

<table>
<thead>
<tr>
<th>Theme</th>
<th>Sub-theme</th>
<th>Indicator</th>
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<tbody>
<tr>
<td>Atmosphere</td>
<td><em>Climate change</em></td>
<td>Emissions of greenhouse gases</td>
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<td>Ozone layer depletion</td>
<td>Consumption of ozone depleting substances</td>
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<td><em>Air quality</em></td>
<td>Ambient concentration of air pollutants in urban areas</td>
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<tr>
<td>Land</td>
<td>Agriculture</td>
<td>Arable and permanent crop land area</td>
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<td>Per hectare food grain production</td>
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<td>Percentage of gross cropped area irrigated</td>
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<td>Use of fertilizers</td>
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<tr>
<td>Institutional</td>
<td>Strategic implementation of SD</td>
<td>National sustainable development strategy</td>
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<td>framework</td>
<td>International cooperation</td>
<td>Implementation of ratified global agreements</td>
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<td>Science and technology</td>
<td>Expenditure on research and development as a percent of</td>
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<td>Disaster preparedness and response</td>
<td>Economic and human loss due to natural disasters</td>
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<td>Communication Infrastructure</td>
<td>Main telephone lines per 1000 inhabitants</td>
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<td>Information Access</td>
<td>Number of internet subscribers per 1000 inhabitants</td>
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### EU Eco-Management and Audit Scheme (EMAS): Some indicators

<table>
<thead>
<tr>
<th>Environmental key area</th>
<th>Input/Impact</th>
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</table>
| **Energy efficiency**            | Total direct energy use: total annual energy consumption, expressed in MWh or GJ
|                                  | Total renewable energy use: percentage of total annual consumption of energy (electricity and heat) produced by the organisation from renewable energy sources |
| **Material efficiency**          | Annual mass-flow of different materials used (excluding energy carriers and water): in tonnes                                              |
| **Water**                        | Total annual water consumption: in m³                                                                                                       |
| **Waste**                        | Total annual generation of waste: in tonnes
|                                  | Total annual generation of hazardous waste: in kilograms or tonnes                                                                         |
| **Biodiversity**                 | Use of land: in m² of built-up area                                                                                                         |
| **Emissions**                    | Total annual emission of greenhouse gases (incl. at least emissions of CO₂, CH₄, N₂O, HFCs, PFCs and SF₆): in tonnes of CO₂ equivalent |
|                                  | Total annual air emission (incl. at least emissions of SO₂, NOₓ and PM): in kilograms or tonnes                                             |
Life Cycle Assessment

• Aims to consider all processes from “cradle to grave”

• Need data for each stage of life cycle
  – Energy
  – Materials
  – Emissions

• Popular and standardized
PART II: CASE STUDY
**Project on mega-events and sustainable development in developing countries: India, Brazil and South Africa**

- Project conducted by TERI in partnership with SEA (South Africa) and GiTEC (Brazil); supported by Konrad Adenaur Stiftung (KAS)

- Common framework by three partner research organization

- Broad framework (SD)
  - Economic (including fiscal)
  - Social
  - Environmental
  - Institutional

### Phase 1: Finalizing the report framework
- Interaction with Konrad Adenaur Stiftung (KAS)
- Finalizing research framework for three cities
- Commencement of parallel studies by partners

### Phase 2: India case-study

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<tr>
<th>Primary data including government statistics</th>
<th>Government reports</th>
<th>Stakeholder consultation</th>
<th>GIS analysis</th>
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<tr>
<td>Literature review</td>
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<td>Data collection</td>
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- Internal brainstorming session
- External brainstorming
- Report writing
- Internal review
- Submission of report to KAS

### Phase 3: Publication and dissemination
- Final publication of the multi-country study
- Dissemination at policy forums
## Some observations: *Agenda 21 framework*

<table>
<thead>
<tr>
<th><strong>Agenda 21 programme areas</strong></th>
<th><strong>Delhi experience</strong></th>
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<tbody>
<tr>
<td>Adequate shelter</td>
<td>DDA, SJJD (MCD) and slum rehabilitation activities?</td>
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<tr>
<td>improving human settlement management</td>
<td>Funds under JNNURM could have been better utilized towards improving settlements</td>
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<tr>
<td>Sustainable land-use planning and management</td>
<td>Ecology and case of Yamuna banks</td>
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<tr>
<td>Integrated provision of environmental infrastructure: water, sanitation, drainage and solid-waste management</td>
<td>Funds under JNNURM could have been better utilized towards improving settlements</td>
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<tr>
<td>Sustainable energy and transport systems in human settlements</td>
<td>Major long-term boost to East Delhi</td>
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<tr>
<td>Human settlement and disaster management</td>
<td>CWG village quake faultline that runs along riverbed</td>
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<tr>
<td>Sustainable construction industry</td>
<td>Green buildings and awareness</td>
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<td>Human resource development and capacity-building</td>
<td>Not much allocated to MCD and NDMC; which in turn could have led to better rehabilitation activities</td>
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Land-use and sustainability

- Delhi and changing land-use and land cover (LULC) dynamics
- Development of urban agglomerations
Expansion of built-up area in Delhi

Source: Sudhira, HS (2011)
Case of Games Village on Yamuna river banks

• Residential complex for athletes to be developed on land in Yamuna river banks.

• Games Village was developed on an area of 59.28 hectares on the banks of river Yamuna.

• The first step towards regularization of the site for development of the Games Village was in the form of ‘change of land use’ of the earmarked area.

• According to public notification in 2006, the land use of area measuring 42.5 hectares (105.0 acres) was sought to be changed from ‘agricultural and water body’ to ‘public and semi-public facilities’.

• Further, the land use of an area of 16.5 hectares was changed to ‘Residential’ for 11 hectares and 5.5 hectares to ‘Commercial/Hotel’.
Common Wealth Village (2011)
Civil society voices

Civil society and the Yamuna case

Source: TERI study

Comptroller and Auditor General key reports

- July 2009
- August 2011
Land-use: Case of CWG village on Yamuna floodplain

CWG Village area Oct., 2000

Source: TERI study
Land-use: Case of CWG village on Yamuna floodplain

CWG Village area Oct., 2010

Source: TERI study
Pictures of site

Source: TERI study
CWG Village area in Feb 2001 and Nov 2010

Source: TERI study (based on satellite imagery available with google)
Findings of the 2011 Comptroller and Auditor General’s Report

• Mentions environmental clearances and monitoring by expert committees
• Risk mitigative and abatement measures identified by CWPRS in its report were:
  – Raising and strengthening embankments.
  – Strengthening existing embankments
  – One layers of stone and nets to protect bunds and bridges.
  – Protection of existing bridges
  – Arrangements to protect flooding area due to back flow of water
• The developers took action only on one aspect viz. strengthening of Akshardham bund.
How can environment audits help address the reality of our times?

How do you envision your role in influencing the decision-making process?
Our GDP is progressing at a good speed

Speed is irrelevant if you are going in the wrong direction