Environment in the Context of Integrated Regional Development: Role of EST and 3Rs

UNCRD Expert Group Meeting on Integrated Regional Development Planning

UNCRD, Nagoya
28-30 May 2013, Nagoya

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Environmental change affects human development options, with poor people being the most vulnerable.

Broadly, while addressing environment for development –

⇒ need to address environmental implications of the socio-economic development

⇒ socio-economic implications of the environmental degradation

Addressing environment for Integrated Regional Development (RD) –

=> encompass above two dimensions on the basis of sub-national, sub-region, inter-region, intra-region, specific geographic region (e.g., GMS), watershed (e.g., Ganges basin / Mekong River), political/financial blocks (e.g., ASEAN, SAARC), bridging regional disparities, multi-scalar planning, horizontal & vertical cooperation among actors/relevant stakeholders, integrated strategies across multi-sectors, etc.
Environment for Development

Between Stockholm Conference on the Human Environment-1972 and Rio+20:

- growing scientific understanding, technological progress, filling in the knowledge gaps (e.g. impacts of globalization, modernizations and industrialization, international finance, climate mitigation and adaptation measures, CDM, TDM, resource efficiency, WtE, EfD, etc.)

- series of international conventions, treaties and MEAs covering issues as the trade in endangered species, the protection of the ozone layer, climate change, biodiversity loss, CCD, the banning of POPs, and Mercury Convention, etc.

- Multi-sectoral international development goals/plans/framework/processes - MDG, JPOI, Green Economy Initiative, Rio+20 Outcomes - The Future We Want, etc.


- ascertaining the environmental impacts of proposed public spending, identifying sectoral and inter-sectoral environmental targets, promoting best practices, and monitoring long term achievements;
Some of the key messages of 4th Regional 3R Forum in Asia, 18-20 March 2013:

- Sustainable resource use will be instrumental for Asia to ensure socio-economic development in a world in which resources are more constrained and the absorptive capacity of ecosystems is decreasing rapidly.

- The region is faced with a number of critical challenges when it comes to integration of resource efficiency in overall policy, planning, and development.

- Many countries have become net importers of raw materials (fossil fuel, metals, timber, and other natural resources), the rapidly increasing volume, changing characteristics of urban and industrial waste, rising population, increasing consumption and per capita waste generation have posed serious challenges for the sustainability of the region.

- Challenge for public policy to achieve a transition to a Green Economy enabled by resource efficiency and systems innovation.

- Change will not occur spontaneously but will require well designed policies.

- 3Rs, as recognized in CSD-18/19 and Rio+20, are powerful tools to enable resource efficiency in regional development.

- 3Rs and resource efficiency measures provide employment and green job opportunities.
3Rs offer an environmentally friendly alternatives for moving towards zero waste society and to deal with impact of growing wastes on human health, economy and natural ecosystem.

First: Reduction
Reduce waste, by-products, etc.

Second: Reuse
Use items repeatedly.

Third: Material Recycling
Recycle items which cannot be reused as raw materials.

Fourth: Thermal Recycling
Recover heat from items which have no alternatives but incineration and which cannot be recycled materially.

Fifth: Proper Disposal
Dispose of items which cannot be used by any means.

(Source: Adapted from MoE-Japan)
3Rs and Resource Efficiency in a Green Economy

**Green Economy**
- Low carbon
- Green economy substitutes renewable energy and low carbon technologies for fossil fuels
- Resource Efficient
- Green economy promotes enhanced energy efficiency, material efficiency, closed loop manufacturing and better waste management, etc.
- Socially inclusive
- Green economy is central to poverty alleviation and seeks to provide diverse opportunities for economic development and poverty alleviation without eroding a country’s natural assets; contribute to create green jobs to offset job losses; address health and labor standards for informal waste sector, among others.

While there is no unique, internationally agreed definition of the concept of “green economy,” some recent statements and definitions by the UN include the following: the concept of green economy focuses primarily on the intersection between environment and economy (2nd Prep Com of UNCSD/Rio+20, 2010); green economy is “an economy that not only improves human well-being and social equity but also significantly reduces environmental risks and ecological scarcities,” i.e., an economy that is “low carbon, resource efficient and socially inclusive” (UNEP 2011).
Why should 3Rs/resource efficiency be considered in IRDP?

1. One-way Economy

2. More resource efficient economy

3. Closed Loop Economy

Resource efficiency => minimize per unit product or services

- Raw material input ↓
- Water input ↓
- Energy input ↓
- Emission, pollution, waste generation ↓
Moving from Resource Efficient Economy (2) towards Closed Loop Economy (3)
In high-income countries, per capita waste generation can be as high as 0.8 kg per capita per day, whereas in the low-income countries, the figure can be a quarter of this level, or around 0.2 kg per capita per day.

Question:
As the countries develop, do they have to follow the same wrong path? – grow now and clean up later?
Can the countries develop while decoupling (or reducing) waste generation ~ towards resource efficient economy?

Environment for Development - Legislative Framework to Establish a Sound Material-Cycle Society in Japan

Fundamental Environmental Law

Fundamental Law for Establishing a Sound Material-Cycle Society

(Waste Management and Public Cleansing Law)

Law for Promotion of Effective Utilization of Resources

(Regulations according to the Characteristics of Individual Items)

Container and Packaging

Home Appliances

Construction Materials

Food Wastes

End-of-life Vehicles

Law on Promoting Green Purchasing

Targets of Fundamental Plan for 2000-2015:

Resource productivity (GDP/direct material input): 60% improvement; Cyclical use rate (total used & recycled material input / material input): 40-50% improvement; amount of final disposal: 60% reduction

(Source: MoE-J, 2008b)
Kitakyushu Eco-Town Project
(Largest recycling society model in Japan)

The first “Eco-Town” project in Japan for building a recycling society has contributed to environmental preservation and industrial development.

Outline: Research facilities: 16; Business facilities: 29
Project achievement: Environmental preservation and economic development

Environment: Reduction of environmental load, resource saving and energy saving
Economic: Invested amount: approx. 66 billion yen (City: Nation, etc.: Private = 1:2:7)
No. of persons employed: approx. 1,300 (including part time workers)

Courtesy of: Kitakyushu-City, Presented at the Fourth 3R Conference for Asian Local Governments, 30-31 January 2012, Tokyo, Japan
Framework Act on Low Carbon and Green Growth 2009:
• formulate & implement a National Green Growth Strategy
• establish a Green Growth Committee under the President’s Office
• require measures to cultivate and support green economy & industries
• establish eco-friendly taxation and pricing system
• respond to climate change and develop Energy Basic Plan
• establish a cap and trade system for carbon emissions
• support companies to promote investments in green industries
• educate and support public activities for practicing a green life

Five Year plan for Green Growth (2009-2013): Investment of 2% of annual gross GDP to cover
• cleaner energy program, green building, green transportation

(Source: MoE-Korea, 2010)
Relative decoupling has begun in OECD countries


What can the developing and emerging economies do to decouple waste generation from economic development?

KEY FACTORS
- Political will/a vision towards zero waste
- Awareness/Change in lifestyles
From One Way Economy (1) ----> Resource Efficient Economy (2)
An alternative economic model that offers a long-term plan for transformation that seeks to integrate economic, environmental, and social objectives to achieve very high resource efficiency as a way of sustaining improvement in quality of life within natural and economic constraints. The basic approach is to integrate industrial firms, eco-industrial parks, regional infrastructure in a broad system to support resource optimization.

The Law Specifies responsibility for:

a) Government of all levels
   - formulate the national and local plans
   - support research, science, and technology development
   - green consumption (green procurement)

b) Industries and businesses
   - establish sound management system & implement 3Rs
   - industry associations to develop sectoral 3Rs guidelines

c) Consumers and citizens
   - resource conservation and sustainable consumption

Source: ADB, 2008 & UNEP and CSIRO, 2011
Economic growth in India 1990-2008 ... at the sacrifice of natural capital

• GDP per capita grew by 120% between 1990 and 2008 in India, while the Inclusive Wealth Index increased by mere 9%.

• Natural capital (i.e., ecological assets) declined by 31% during the same period.

Note: Inclusive wealth consists of three main components: human, manufactured, and natural capital.

Implications of One Way Economy
- Pollution
- Health
- Resource Depletion
- Poverty
People living in a place 20 times above safe level of lead, arsenic, nitrogen.....

Conventional waste management and the consequences.....

Highly contaminated leachate seeps untreated into groundwater, a source of drinking water....

Water availability is an emerging issue in many countries and some are already heading towards water stress, but water quality deterioration because of industrial discharges and municipal sewage, agrochemicals will further accelerate the issue!

By the year 2025, as much as two-thirds of the world population may be subject to moderate to high water stress.

Direct exposure of children to emission from open burning
Source: Annepu, 2011, *Sustainable Solid Waste Management in India.*

Source: http://crunkish.com/top-10-pollution-causes/

Source: http://surfingindia.net/

Many serious issues associated with informal sector – child labour, health impacts...

Health risks for informal sector workers, local communities living near dumpsites, etc.

Informal waste pickers most often operate without any protective measures -

- hospital waste -> HIV
- jagged metal -> tetanus
- smoke (PCBs)
- lead -> neural damage
- violence (knife cuts)
- adult behaviour (premature drinking)
- stress
- skin, gastric, respiratory problems

Waste dumps potentially serve as breeding ground for Malaria, thus having implications in achieving MDGs.

Source: Adapted from ILO (2009), presented at the Inaugural Meeting of the Regional 3R Forum in Asia in November 2009 in Tokyo.
Plastics in Coastal and Marine Environment


Source: http://surfingindia.net/
The way we manage wastes has implications on quality of life, health, local economy and natural ecosystem.
Increased volume of wastes (solid & liquid) generation

Illegal dumping or discharge of wastes in water bodies due to lack of efficient waste management programmes

Eutrophication caused by organic waste / depletion of dissolved oxygen level in water bodies (rivers, lakes, etc.)

Health impact (specifically among poor and slum dwellers, waste pickers, mostly children)

Contamination of land & surface as well as ground water (by toxic & hazardous wastes)

Depletion of fish stock / aquatic resources

Affect livelihood security and income of local or neighborhood fishermen living downstream

Limited access to safe drinking water

Growing urbanization

Integrated waste management and 3Rs actions or policies at national level have regional (development) implications (as top down) – e.g, effective waste management policies/regulations and 3R programmes at national or sub-national level will have direct impact on human health, land, water, aquatic resources, and livelihood security – vital elements of regional development. At the same time, awareness or responses at regional level will have implications at national level (as bottom up).
These issues will be further compounded by the growing urbanization....

Facts and figures

✓ Half of humanity – 3.5 billion people – live in cities today.

✓ By 2030, almost 60 per cent of the world’s population will live in urban areas.

✓ 95 per cent of urban expansion in the next decades will take place in developing world.

✓ 828 million people live in slums today and the number keeps rising.

✓ The world’s cities occupy just 2 per cent of the Earth’s land, but account for 60-80 per cent of energy consumption, 75 per cent of carbon emissions, approximately 70% of global GDP, and consume 70% of all resources.

✓ Rapid urbanization is exerting pressure on fresh water supplies, sewage, the living environment, and public health.

Source: United Nations 2012

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Composition of waste becomes more complicated as the economically & industrially grow, which is also compounding the issues ...

Figure 2: Composition of MSW by national income
Source: Chalmin and Gaillotier (2009) and averaged

- New emerging waste streams such as e-waste, and industrial wastes (including hazardous waste construction and demolition waste, end-of-life vehicles, healthcare waste, etc.) further compound the pressure to the local environment
Many critical roadblocks in developing countries:

- competing priorities, in particular economic development.
- lack of capacity at local and national level.
- competing points of view in building consensus among stakeholders and absence of representatives from major sectors or groups (e.g., youth, women, the private sector, indigenous people, NGOs) on national multistakeholder bodies.
- confusion and lack of general awareness over various aspects of sustainability.
- lack of adequate institutional coordination (in particular among planning, finance and environmental institutions) and absence of integrated institutional framework.
Opportunities in 3Rs
Business opportunities on e-waste

- Global e-waste recovery market holds enormous revenue potential and is expected to reach $21 billion by 2020, growing from $6.9 billion in 2009. In China alone, the volume of e-waste is expected to reach 5.1 million metric tons in 2020, an increase of more than 150% from 2005. (GBI Research, 2010)

- The revenue generated from the e-waste management market is expected to grow from $9.15 billion in 2011 to $20.25 billion in 2016 at a compound annual growth rate (CAGR) of 17.22% from 2011 to 2016. (marketsandmarkets.com, 2011)

Pictures: (Top) http://environmentalgeography.wordpress.com/2012/02/ (Bottom) http://www.wastemanagementrecycling.net/e-waste.html
Nokia Global Consumer Survey on Recycling (2008)*

- Overall, 74% said they do not think about recycling their mobile phones.
- Half of those surveyed didn’t know phones could be recycled.

Precious metals left unutilized – mobile phones

For every 1 million cell phones recycled, we can recover 75 pounds (34kg) of gold, 772 pounds (350kg) of silver, 33 pounds (15kg) of palladium, and 35,274 pounds (16 ton) of copper.


Example of effective utilization of waste and byproduct leveraging a cement factory – calls for industrial symbiosis, city-city / regional cooperation

Automobile industry
- Waste tire, molding sand
- Paint residue
- Blast-furnace slag, steelmaking slag
  - Fly ash
- Paper industry
  - Paper-making sludge, incineration ash
- Electricity industry
  - Coal ash, flue-gas gypsum
- Waste disposal industry
  - Incineration ash, waste plastic
- Refining industry
  - Nonferrous slag
- Housing industry
  - Waste tatami mat

Cement factory

Local government
- Sewage sludge, water purification sludge
  - Municipal waste incineration ash
- Distilled liquor residue, waste glass
- Meat and bone meal, plastic
  - Soil put out in construction
  - Construction and demolition waste
  - Waste oil, waste catalyst
    - Sludge
  - Waste solvent, waste catalyst
    - Waste plastic
  - Incineration ash, waste solvent
    - Waste plastic

Food industry

Construction industry

Petroleum industry

Chemical industry

Printing industry

Agriculture

Source: Adapted from Sameshima (2009), presented at the Inaugural Meeting of the Regional 3R Forum in Asia in November 2009 in Tokyo.
Decentralized Community Based Composting in Bangladesh – An ideal model of multi-stakeholders partnership

UNFCCC

CDM Board

BOI

DCC

UNFCCC

CDM Board

BOI

DCC

International Market

Rural Farmers

Urban Population

Organic Waste

Compost

CER (carbon credits)

Till 2012 attracted 25 Million Euro Foreign Direct Investment as carbon finance

• Direct Collection from Vegetable markets
• Waste Collected from Households
• Paying CBOs/NGOs/Municipality for waste delivery
• Promoting source separation and community participation
• Engagement of informal Sector

Source: Waste Concern
Major stakeholders who can play an important role in integrating resource efficiency/3Rs - both vertical & horizontal cooperation

<table>
<thead>
<tr>
<th>National Government</th>
<th>Develop policies, programs, and institutions, innovative financing for resource efficiency / 3R infrastructures (eco-towns, eco-industrial parks, R&amp;D facilities (Environment, 3Rs, Nano-Technology, IT, Biotechnology) etc.), create conducive policy framework to encourage PPPs, capacity building programs/facilities for SMEs, awareness programme for citizens, green procurement, develop and institute EPR system, foster triangular cooperation (government-private/industry-R&amp;D/Universities) for, circular economic approach, green growth, technology transfer, information clearing house, etc.</th>
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<tr>
<td>Local Government</td>
<td>Integrate resource efficiency in urban development policy and strategy (energy, transport, water, industry), innovative financing for resource efficient infrastructure (eco-towns, eco-industrial parks, R&amp;D facilities, etc.), realize PPPs, awareness programs for citizens, green procurement</td>
</tr>
<tr>
<td>Private / Industry Sector</td>
<td>Develop strategies to commercialize 3Rs, Environmental performance reporting, R&amp;D (3R technologies, green products, waste recycling, waste exchange, green purchasing, PPP, in-house capacity building programs, CSR,</td>
</tr>
<tr>
<td>Banks / Financial institutions</td>
<td>Investment/loan schemes for eco-town projects and green industries</td>
</tr>
<tr>
<td>Scientific and Research Institutions / Universities</td>
<td>Provide back up for science based policy making at government level, develop dedicated R&amp;D projects on resource efficiency/3Rs in collaboration with government and business/industry sector, create human resources and experts in the field of resource efficiency/3Rs, look for international collaboration (University-University, University-Multi-national corporation), catalyst for decision makers, technology evaluation.</td>
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<tr>
<td>Citizens / NGOs</td>
<td>Promote green consumerism, community awareness raising on house-hold waste segregation and its contribution to resource efficiency/3Rs, knowledge dissemination (Source: C.R.C. Mohanty, 2012)</td>
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• **Tackling local environmental problems** → in efficient use of resources lead to environmental burdens;

• **Addressing climate change** → resource efficiency is key strategy for low carbon path by reducing GHG emissions from energy generation and use, material extraction, processing, transportation, and waste disposal;

• **Ensuring energy security** → through energy efficiency measures, WtE;

• **Preserving natural capital and avoiding resource conflicts**

• **Improving economic competitiveness of firms and nations** → better respond to volatility of oil prices, metal prices, etc; improvement of production process brings financial benefits to the producer as well as improvement of product quality;

• **Minimizing disposal costs by minimizing wastes** → land fills and incinerators are very expensive methods; end-of-pipe disposal is a sunk cost with no financial return;

• **Developing new business opportunities** → resource recovery, recycling, WtE schemes can create green jobs; biotechnology, nanotechnology, renewable energy;

• **Pursuing social benefits** → environment industry as potential source of employment and long term natural asset protection; reducing environmental impacts from harmful wastes;

**Conclusion:** (1) Pursuing resource efficiency will help countries..
Opening of the Bike Ride 8 June 2012
Environment for Development - EST

Some of the key messages of 7th Regional EST Forum in Asia, 23-25 April 2013 which have implications on IRDP:

- Asian countries continue to face vast challenges in realizing safe, secure, people and environment friendly, affordable, and climate resilient transport systems. Rapid urbanization throughout the region further compounds these challenges.

- Transport infrastructure is vulnerable to extreme weather events associated with climate change as well as natural disasters. Significant investment/financing requirement for resilient transport system. Damage caused by 2011 flooding in Thailand amounted to US$46.5 billion, while the recovery and reconstruction costs are expected to reach at least US$50 billion according to the Government of Thailand and U.N.

- Investments in people and environmentally friendly transport system, including safe and dedicated walkways and bicycle lanes, in Asia have not kept pace with the still growing needs for environmentally sustainable transport in the region.

- The Forum recognized the essential contribution of EST towards realizing not just the transport related objectives from The Future We Want but also other key thematic and cross cutting issues including but not limited to: poverty alleviation, sustainable cities and human settlement, energy, food security and sustainable agriculture, as well as health and education.

- Strengthening rural-urban connectivity is key to overall economic development in the countries. At the same time improved intercity connectivity is important to accommodate the rise in transport demand. These can help address the need to connect effectively, farm gate to consumer, manufacturer to customer, and personal mobility needs of people.

- Connectivity is not just about land transport but also about shipping and the role of ports and ocean shipping. Regional connectivity of inter-island shipping needs to be strengthened. Inland and coastal waterways have great potential to support more environmentally sustainable transport as does the greater use of rail transport with double tracking and electrification.

- Full and seamless integration of public transport modes (physical, information, network and fare integration) will be an essential characteristic of next generation transport systems. This can be achieved by forming transit alliances between local government organisations and the private sector at provincial or regional level.
Some of the key messages of 7th Regional EST Forum in Asia, 23-25 April 2013 which have implications on IRDP:

- **Green Freight is essential for Asian countries in the 21st century** to respond to high logistics costs, disproportionate environmental social impacts from freight movement and market pressures to improve efficiency. The Forum recommended the following core-elements to be considered as part of a possible regional agreement, but not limited to: (a) Green Freight Programs at the national or sub-regional level, (b) set of plans and policies for a socially inclusive green freight, (c) standard set of indicators for green freight, and (d) regional collaboration framework on green freight.

- **Railways play a key role to serve urban and economic development in Asian countries**, while at the same time offering opportunities to mitigate emissions, reduce traffic congestion, enhance traffic safety, and improve accessibility and connectivity.

- **Many countries have a huge infrastructure deficit at the current level of urbanization**. As the urban population doubles in the next 20 years the pressure to build infrastructure is huge. For instance, India has estimated the finance need to be $70 billion in the next 5 years, $450 billion over the next 20 years and the government is planning to support cities through the next round of the Jawaharlal Nehru Urban Renewal Mission (JnNURM) investments.

- **Intelligent Transportation Systems (ITS)** could significantly contribute to improved safety, higher efficiency, better service and reduced pollution and greenhouse gas emissions, thereby these can enable next-generation Vision Three Zero transport systems. They may also play a key role in integrating transport systems for **both passenger and freight, across modes and localities**.
Premature deaths due to PM$_{10}$ exposure > 0.5 million worldwide

Attributable deaths (1000 people)

(Source: GEO-4, UNEP)
Global Distribution of Sulphur level in Diesel Fuel (2007)

High sulphur levels in fuels → problems with small particulates; cardio and respiratory illness; carcinogenic

(Source: GEO-4, UNEP)
Growing BRT system worldwide as the most cost effective option

“BRT provides a sophisticated metro-quality transit service at a cost that most cities, even developing cities, can afford”

- GTZ BRT Sourcebook
Impact of Guangzhou BRT System

Main features:
- 29 stations and 23km dedicated busways
- free transfer in the same direction (smart card with discount)
- direct physical connections between BRT and metro stations
- integration between BRT and bicycle parking & bicycle sharing
- the world’s longest BRT stations

Impacts:
- saves commuting time (1 hour shorter in daily journey)
- daily passenger ridership : 800,000 boardings per day
- the cost of the BRT system infrastructure has been estimated to be equivalent to building around 800 meters of underground metro.

Learning Objectives:
- BRT is one of the most cost-effective transit systems for cities to provide fast, comfortable and high quality public transport service
- Integration with rail-based metro has proven to be an indispensable feature of the BRT and the mass transit network of the city
Main features:
- a special 88 km² environmental zone has been created to decrease the excessively high levels of PM\textsubscript{10} and NO\textsubscript{2}
- only vehicles meeting certain exhaust gas standards are allowed into the zone.
- vehicles are categorized into four groups
- all registered vehicles receive a sticker certifying their emission level

Source: Martin Lutz, “The LEZ in Berlin – Results of a first Impact Assessment” (Presented at the Workshop on “NO\textsubscript{x}: Time for Compliance”, Birmingham, Nov 2009). (Unpublished)
Impacts:

- Net reduction of 24% of exhaust particulate emissions and 14% lower NOx emissions from Berlin’s motor traffic
- Impact on annual PM10 (fine particulates) pollution is about a 3% reduction
- SO2-concentrations have fallen to 5% of the levels 20 years ago
- Decrease of traffic by 4% inside the zone and 6% in surrounding areas
- 70% of high polluting passenger cars and more than 50% of old commercial vehicles have disappeared from the city center
- Reduction of 73% of “no sticker” (class 1) passenger cars and 53% of commercial vehicles when comparing 2006-2008. (Lutz, 2009; City of Berlin 2010).

Learning Objectives:

- LEZ must be properly planned and progressively implemented
- LEZ can have specific and immediate benefits - air pollution, GHG emissions, traffic congestion, health
- Support from higher levels of government can be crucial
- Various components - Emission classes, issuance of stickers, Enforcement, LEZ area
- Users perspective - may be willing to take part in the LEZ; need support from the government in retrofitting/acquiring vehicles

Transport Connectivity in Asia

- Two aspects of sustainability
  - Contribution of connectivity to sustainable development
  - Making transport connectivity sustainable

- Regional connectivity
  - Regional transport networks: Asian Highway, Trans-Asian railway, Logistics centres and dry ports

- Subregional and Inter-subregional connectivity
  - ASEAN, SAARC, GMS, ECO, CAREC, SASEC
  - ASEAN-China
  - ASEAN- South Asia
  - North East Asia - Central Asia
  - South Asia-China

- Intercity connectivity
  - Roads, rails, high speed rails

- Rural connectivity
  - Farm to market roads, rural roads

Source: UNESCAP, 7th Regional EST Forum in Asia, 23-25 March 2013, Bali, Indonesia
Intercity connectivity

- Intercity highways, expressways, railways
  - NHDP, China
- High speed rail gaining popularity
  - Thailand-intercity connectivity
  - China- connecting major cities – 9,300 km
  - Singapore- Malaysia
  - China-Lao PDR
  - Lao PDR-Viet Nam
- Nepal -East-west railway development plan
- India- Dedicated freight corridors
- Use of coastal shipping and inland waterways

Source: UNESCAP, 7th Regional EST Forum in Asia, 23-25 March 2013, Bali, Indonesia
Rural connectivity

- Rural roads
  - Contributes to employment generation, poverty reduction and sustainability,
  - Improve access to market, health services and education
- Mostly unpaved road
- Explore low cost pavement options
- Many rural roads - poorly engineered and maintained
- High operation and rehabilitation cost
- Policies for maintenance of roads and rural roads
- Involve communities

Source: UNESCAP, 7th Regional EST Forum in Asia, 23-25 March 2013, Bali, Indonesia
Many forms of barriers to cross-border transport

- Inconsistent and time consuming, costly border crossing formalities and procedures;
- Restriction/limitation on entry of vehicles;
- Transshipment needed at the border;
- Difficult and different process for transit traffic;
- Differential/reciprocal tariffs/charges;
- Incompatible working hours at borders;
- Coordination among various stake holders; and
- Excessive security checks

Source: UNESCAP, 7th Regional EST Forum in Asia, 23-25 March 2013, Bali, Indonesia
Resilient Transport Connectivity

- Frequent disasters, extreme climate events, sea level rise - Thailand Flood, Japan earthquake
- Damage to transport infrastructure and affect services
- Planning for resiliency of critical infrastructure
- Higher design standards and review of guidelines
  - Height of bridges, embankments, drains
  - Coastal transport infrastructure
  - Vulnerable location and high risk areas
- Life cycle costing
- Transport network redundancy - for disaster relief operation
- Reliance on one mode to the concept of multi-modal transport
- Network hierarchy - prioritization

Source: UNESCAP, 7th Regional EST Forum in Asia, 23-25 March 2013, Bali, Indonesia
Long haul intermodal transport

- Optimal use of road, rail, maritime transport, logistics centres and dry ports
- Integration of different modes
- Farm to market, manufacturing center connectivity
- Rail based intermodal transport can relieve road congestion
- Potential emissions reduction
  - Consolidation – reduce less than truck loads runs and reduce number of trucks
  - Improved logistics can reduce 10-20% emissions (OECD, 2010)
  - Consolidation and distribution centres in UK have combined 25.7% emissions reduction (Zanni and Bristow, 2009).
  - Replacement of trucks by freight train from port to dry port in Sweden led to 25% CO₂ emission reduction (Roso, 2007).
  - 43% of freight modal shift to railways, 30% less CO₂ emission (Laos-Thailand corridor)
- Regional economic development: industrial centres, free trade areas

Source: UNESCAP, 7th Regional EST Forum in Asia, 23-25 March 2013, Bali, Indonesia
Regional Collaboration on Green Freight

- Freight sector > 50% of road transport related GHG
- Common strategy: sustainable freight growth taking into account road safety, social impact, environment and public health, and working condition of drivers, etc.
- Harmonization of certain policies and standards (e.g., fuel economy standards) across Asian countries
- Economic development through reduced costs and level playing field for companies
- Collaboration on improved freight infrastructure that spans across borders: increased trade
THANK YOU