Survey of Global Best Practices in Green Technology

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Overview

- **Introduction**
- **Global Green Practices**
  - Agriculture
  - Forestry
  - Transport
  - Energy
  - Construction/Building
  - Manufacturing
  - Waste Management/Treatment
  - Mining
  - ICT Technology
  - Health
- **Trends in Green Technology**
- **Global Challenges and Opportunities**
- **Conclusion**
Introduction

- Green technology - also known
  - Environmental technology
  - Clean technology
  - Sustainable technology

- Application of science, knowledge or technology to
  - Reduce our *impact* on environment and natural resources

- Green technology reduces
  - Greenhouse effect
  - Global warming

- Accelerated carbon emissions is a threat to climate change
Introduction …

• Green technology reduces impact on the planet by
  • Create new technologies
  • Adapt the existing ones

• Green technology applications areas
  • Energy and transportation
  • Agriculture and forestry
  • Process industries and manufacturing
  • Building and construction
  • ICT
  • Health and pharmaceuticals
  • Mining
  • …..
Introduction …

- Green technology takes into account
  1. Sustainability
    - Meeting *society needs* without damaging natural resources
  2. Recyclability
    - Create products that can be fully reclaimed or *re-used*
  3. Waste reduction
    - Change production & consumption pattern
  4. Innovation
    - Developing alternative technology
    - Improve efficiency of existing technology
  5. Viability/*practicality*
    - Promote green technology and products
    - Speed their implementation and create new careers
Introduction …

- Green economy/growth
  - Results in increased human well-being and social equity
  - Reduce environmental risks
- Green growth is becoming attractive for
  - Poverty reduction
  - Environmental protection
  - Resource efficiency
  - ….

- Strategies are required to generate policies & programs
  - Accelerate investment in resource efficient technologies & new industries
  - Managing costs and risks to domestic taxpayers, businesses, communities and consumers
- Transforming economic activity is vital to the stability and sustainability of the future economy – a green economy
Introduction ...

- Examples of governments adopting green growth strategies

1. China
   - Invest in natural resource management
   - Creating one million new forestry jobs and reducing rural poverty

2. Germany
   - Focusing on environmental innovation, development of an internationally competitive environmental goods and services sector
   - Particularly focused on renewable energy

3. Korea
   - Adopted a green growth strategy to drive economic competitiveness through development and use of advanced technologies
   - Investing in innovation and deployment programs for 27 priority technologies
4. Mozambique
   - Launched the Green Economy Roadmap with the vision to become an inclusive, middle income country by 2030

5. Rwanda
   - Released the Green Growth and Climate Resilience National Strategy for Climate Change and Low Carbon Development in October 2011
   - Aims to be a developed climate-resilient, low carbon economy by 2050
   - Three key strategic objectives
     - Energy security and a low carbon energy supply
     - Sustainable land use and water resource management
     - Social protection and disaster risk reduction
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Green Agriculture

- Agriculture accounts 13-15% of world GHG emissions
- Green agriculture
  - Limit or eliminate toxic substance footprints to the soil, air, water and environment
  - Conserves resources, energy and improve land through reduced chemical usages
  - Reduces soil erosion and improve water use
  - Help other green technology-based sectors
    - E.g., renewable energy and agro tourism
- **Best practice**: Pyrethrum as pesticide in *Kenya*
Forestry

• Green forestry
  • Reduces carbon emission
  • Source of raw material
  • Sustain health & diversity of ecosystems
• Best practices
  • Sweden owns 1% of the world’s commercial forest but provides 10% of the world’s sawn timber, pulp and paper
  • Brazil recorded the biggest reductions in deforestation and emissions
Biofuels

- Production of bio-renewable energy from biomass or wastes
- Biofuels are considered CO$_2$ neutral
- Best practice
  - *Brazil* uses biofuel as much as 70% to meet their energy needs from sugarcane
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Global energy consumption is increasing by 1.5% annually in recent years.
From 2007–2012,

- Renewable power generation grew at an average rate of 5.9% per year.
- Global electricity consumption increased by an annual average rate of 2.7%
Green Energy

- Renewable energy is being used in power, heating and cooling sectors

### Solar PV
- Germany: 38GW
- China: 28 GW
- Japan: 23GW
- China, Japan and USA leading solar PV market
- Average solar PV price reduced to record $0.6/watt
- 177GW, Global installed capacity by 2014

### Wind Power
- China: 115 GW
- USA: 66GW
- Germany: 39GW
- Asia, EU and North America regions leading global market
- least-cost option for power Generation
- 370GW, Global installed capacity by 2014

### CSP
- Spain: 2.3GW
- USA: 1.6GW
- Rest of the world: 0.5GW
- Market less established than most other renewable energy markets.
- 4.4GW, Global capacity by 2014

### Hydropower
- China: 280GW
- Brazil: 89GW
- USA: 79 GW
- China, Brazil, USA, Canada, Russia & India accounted for 60% of global installed capacity
- 1055GW, Global capacity by 2014

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Green Energy

Heater

- In 2014 survey, 50% of the total energy consumption accounted for heating.
- Among this figure renewable energy contribution is about 25%.
- Half of renewable heat consumption occurs in:
  - Buildings for space heating,
  - Water heating, and cooking,
  - [Primarily derived from biomass, solar and Geothermal]

Best Experience

Asia: China dominate the global solar heating market in 2014 and to lead the world in the direct use of geothermal and biogas for heat.

Europe: EU leading in modern renewable energy for heating, Iceland, Norway, and Sweden have a record of (over 50%) in the world.

Latin America: Brazil has experienced strong growth in solar water heating.

Africa: sugarcane industries in Ethiopia, Kenya and Mauritius fueling cogeneration plants with bagasse.

Middle East: Israel leads for total capacity of solar water collectors, followed by the Palestinian Territories, Jordan, and Lebanon.
Green Transport

- Transport accounts 23% GHG emissions
- Green transport
  - Allows basic transport needs of societies
  - Limits emissions and waste
  - Affordable, operates efficiently, offers choice of transport mode
  - Alternative transportation modes

- Benefits include
  - Fuel/energy efficiency
  - Lower-carbon transportation energy sources
  - Capturing contaminants
  - System efficiency/optimization

- Best practice
  - Holland, Brazil, Singapore, Germany (Low Emission Zone)
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Green Building/Construction

- Green building reduces impact on the environment and human health

- How to achieve green buildings?
  - Good building design and use of space
  - Energy-efficient lighting and appliances
  - Using alternate sources, e.g., solar or wind power
  - Water-saving plumbing fixtures
  - Adaptive reuse of older buildings

- Advantages
  - Reduced energy and water consumption
  - Lower Greenhouse Gas Emission
  - Improved indoor air quality
  - Decreased operating cost
  - Increased building value
  - ...
Green Cities

• **Facts**
  - 50% of the world’s population live in cities and to increase to 70% by 2050
  - Source of 70% of the world’s GHG emissions
  - Growing cities put pressure on energy and water resources, waste management, sewer systems, and transport networks

• **How to achieve Green Cities?**
  - Effective land use
  - Energy consumption and Co2 emission
  - Effective public transport system
  - Sustainable waste treatment and sanitation
  - Clean Air policy
  - Good Environmental Governance
Green Cities …

- **Steps for Greener Cities**
  - Good governance and leadership at the city level
  - At early stage right policies matter more than Wealth
  - Civic engagement
  - The right technology
  - Tackle informal settlements

- **Model Cities** *Singapore, Copenhagen & Cape Town*
Green Manufacturing

- **Using renewable materials**
- **Using fewer materials** that are non-hazardous
- **Modifying production processes** to reduce less resource and waste
- **Less packaging**, lowering product weight, efficient logistics, ...
- **Designing your product to be** reusable, recyclable, or bio-degradeable
- **Expand life of product**, make it easier to repair & use fewer resources
- **Reduce environmental impact** of sales and distribution

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Green Manufacturing

Best practices in Green Manufacturing

- **Sugar industry**
  - Waste products are used as
    - Soil conditioners and fertilizers
    - Paper production & animal feed
    - Chemical, yeast, alcohol, fuel and Electricity production

- Best practice: **Brazil**

- **Leather industry**
  - Use of cleaner and less water
  - Alternative energy from waste products
  - Hair into organic fertilizers
  - Improving air quality by implementing new technology

- Best practice: **Romania** by enforcing polices
Green Manufacturing

• Cement industry
  • Adopting latest technologies
  • Utilizing alternative raw material
  • Utilization of industrial waste like fly ash
  • Increasing renewable energy usage
    • Biomass and industrial waste
  • Implementing waste heat recovery system
  • Shifting towards bulk transportation

• Best practice India
  • Mandatory environmental standards and accreditation
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Waste Management/Treatment

- Involves collecting, transporting, processing, recycling or disposal and monitoring of wastes
- Types of waste constitute
  - Municipal solid waste
  - Industrial waste
  - Agricultural waste
  - Mining waste
  - Bio waste
  - Kitchen waste
  - Hazardous waste
- Best practice: **Sweden**
  - Recover energy from waste for heating and electricity generation
  - Global leader
Green Mining

- Mining has environmental impacts like air pollution, water pollution, solid waste, and abandoned mine sites
- Green mining
  - Promotes materials and energy efficiency
  - Ensures availability of minerals for future needs
  - Minimizes environmental and social impacts
  - Ensures sustainable land use following mine closure
- Best practice: Finland is working to be world #1 in sustainable mineral exploration by 2050
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Green ICT

- Has great influence on shaping a more sustainable world
- Study the practices of environmentally sustainable computer or IT

Green ICT is used for
1. Managing ICT sector’s own activity
   - Efficient PCs, datacenters, telecom service and network
2. ICT Solutions to manage other sector's activity
   - Smart manufacturing
   - Smart Grid and Metering
   - Smart transportation
   - Smart Infrastructure
Managing the ICT Sector’s own Activity

PE, Data centers and network 2% of total carbon footprint (2007)

If uncurbed 6% in 2020 [Gartner]

ICT Emissions

Reduce power consumption of

- PCs and monitors
- Software & service
- Data Centers (air conditioning, ups, lighting)
- Telecommunication services (Indian Mobile and China Mobile)

Sharing of resources and usage of a common Data center (reduction in 68-87% of energy) [Google]
ICT Solutions to Manage other Sector’s Activity

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Green Health

- Health sector is major source of GHG
  - E.g. in US it contributes 8% of the nation’s total GHG emissions
- Green health
  - Prevents, reduces, or generates less waste
  - Reduces energy and water usage
  - Uses green construction
  - Avoids hazardous substances and toxic chemicals
  - Uses organic food from green agriculture
  - Uses green chemicals
- Best practice: Scotland
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Trends in Green Technology

- Green pharmacy
- Energy storage
- Advanced robotics
- Next-Generation Genomics

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Trends in Green Technology

- Autonomous and Near-Autonomous Vehicles
- 3D Printing
- Advanced Materials
- Advanced Oil and Gas Exploration
- The Internet of Things
- Carbon Dioxide Conversion and Use
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Global Challenges

- **Limited knowledge** on availability and benefits of green technology solutions
  - End users often see green technology as an incremental cost rather than a potential benefit
- Green technology solutions are not **customized** to meet global environmental and market requirements
- Not many **policy incentives** around the world to push private sector to highly get involved in green projects

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Global Opportunities

- Helps on the fight against
  - Global warming and climate change
  - Depleting energy resources
- Conserves ecosystem
- Creates opportunities for
  - New business in green industries
  - High market in retrofitting existing projects
  - Social, political and economical sustainability
Conclusion

- Green growth offers considerable environmental, cultural, social and economic welfares
- Systematic planning, analysis, implementation and monitoring are key for green growth success
- Comprehensive assistance for green transformation is a necessity
- Continuous efforts to investigate, assess and validate long-term green transformational benefits of green growth strategies is an obligation