ICTs for abating climate change and e-environment readiness index

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Definition: e-Environment

- Using ICTs for environmental protection and sustainable use of natural resources;

- Action for sustainable production and consumption and environmentally safe disposal and recycling of discarded hardware and components used in ICTs;

- Establishment of monitoring systems, using ICTs, to forecast and monitor the impact of natural and man-made disasters, particularly in developing countries, LDCs and small economies.

Source: Derived from Geneva Plan of Action (2003), World Summit on the Information Society (WSIS) Action Line C7: E-environment
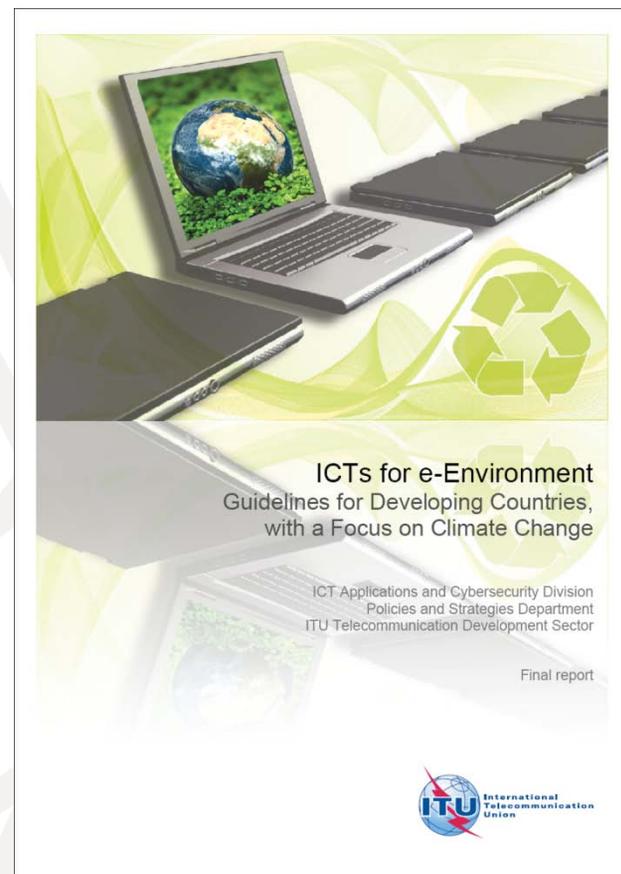
Role for ITU-D

- ITU mandate on ICT applications & strategies
  - Co-facilitator of WSIS Action Line C7 on e-Environment
  - Develop guidelines, training materials & toolkits on technology & policy aspects of e-Environment applications
  - Assist developing countries in implementing relevant ICT applications for environment & sustainable development
- Challenges & opportunities
  - Awareness promotion
  - Work with int'l partners for capacity building & coordinated initiatives
  - Support developing countries for pilot project implementation
  - Monitor & evaluate results, & expand to other countries

... with highest priority to climate change

Mandate: Resolution 35, ITU Plenipotentiary Conference (Kyoto, 1994) & Resolution 54, ITU World Telecommunication Development Conference (Doha, 2006)

ICT for e-Environment Study

- To provide guidelines for developing countries on how to use ICTs for better management & protection of the environment as a key part of their development process, with particular focus on **climate change**

- Target groups:

  ➢ Decision-makers in developing countries

  ➢ Donor agencies

  ➢ International development community

  ➢ Private industry

  ➢ Research & development institutions & academia

  ➢ Civil society

ICTs for e-Environment
Guidelines for Developing Countries, with a Focus on Climate Change

ICT Applications and Cybersecurity Division
Policies and Strategies Department
ITU Telecommunication Development Sector

Final report

Methodology

- Extensive data collection via internet, literature reviews & interviews

- Analysis ranking e-Environment applications
  - ➤ Ease of adoption by developing countries
  - ➤ Environmental scope, technology, transferability, and impact

- Analysis of organizational domain
  - ➤ Linkages of agencies & administrations for specific e-Environment programmes

- Categories of e-Environment applications

ICTs for the Environment: Facts and Trends

- Massive amounts of digital data including imagery available online to support research and decision-making

- Better understanding of the environment and environmental change
  - Environmental/climate models are more accurate and predictive

e-Environment categories

Report examines ICT use in 6 areas of environmental action

Lists > 150 ICT environmental applications

Capacity Building
Public Awareness
Education
Sustainable Development

Analysis
GIS Systems
System Modelling
Grid computing

Planning
Data correlation (e.g., georeferencing)
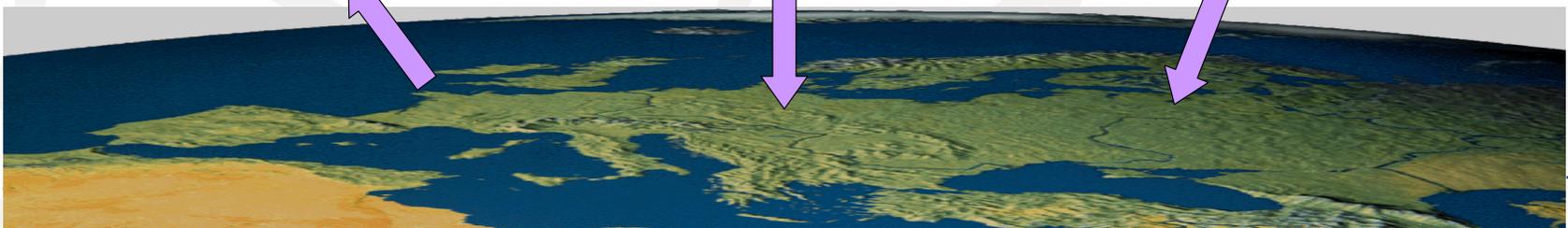Forecasting
Policy Formulation

Observation
Satellite Observation (air, water soil)
Human observation
Data archives

ICT Mitigation
ICT Operation
Telecommuting
Collaborative Tools

Management & Protection
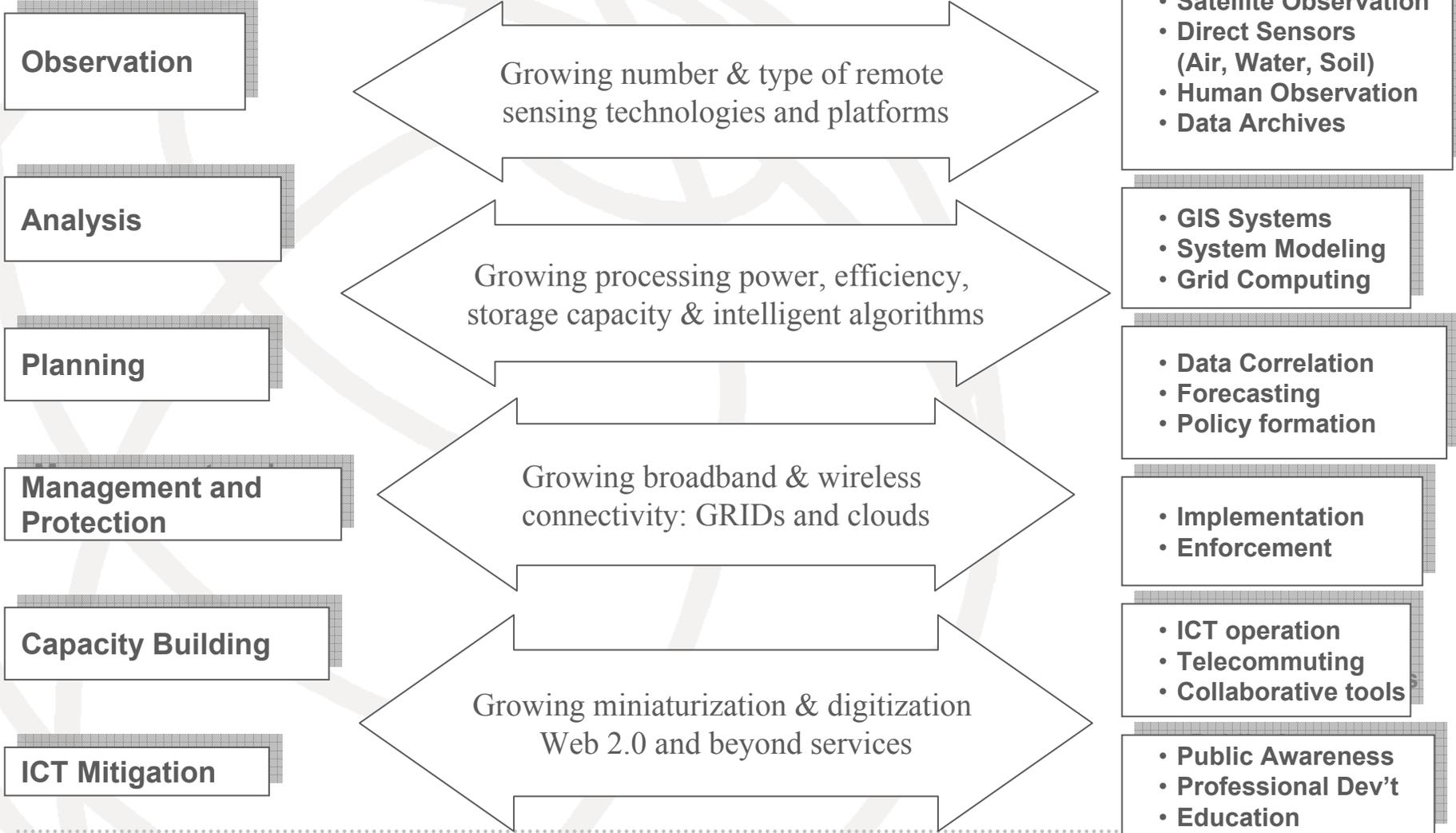Implementation
Enforcement

Key ICT capabilities

- Increasingly powerful micro processors:
  - Computational power as well as increasingly intelligent algorithms for modeling of environmental systems;

- Geographic information systems (GIS):
  - For visualization and interpretation of the datasets from observation systems;

- Increasing bandwidth and networked communications, processing and storage capabilities:
  - Facilitate data sharing and undertaking computationally-intensive tasks through the use of Grid and Cloud computing.

- Satellite and direct sensor technology applications:
  - For recording and storing massive amounts of geographical and historical information with increasing resolution and geographic coverage .

ICTs for managing the environment

- To help observe, understand and learn about the environment

- To share information and data as well as processing power:
  - ➢ Data warehouses, clearing houses and data/information servers; environmental networks and grids; etc.

- To facilitate and help coordinate environmental decision-making and management:
  - ➢ including environmental early warning, risk assessment, mitigation and management, etc.

- To help mitigate environmental impact.

ICT Applications

Observation

Growing number & type of remote sensing technologies and platforms

- **Satellite Observation**
- **Direct Sensors (Air, Water, Soil)**
- **Human Observation**
- **Data Archives**

Analysis

Growing processing power, efficiency, storage capacity & intelligent algorithms

- **GIS Systems**
- **System Modeling**
- **Grid Computing**

Planning

- **Data Correlation**
- **Forecasting**
- **Policy formation**

Management and Protection

Growing broadband & wireless connectivity: GRIDs and clouds

- **Implementation**
- **Enforcement**

Capacity Building

- **ICT operation**
- **Telecommuting**
- **Collaborative tools**

ICT Mitigation

Growing miniaturization & digitization Web 2.0 and beyond services

- **Public Awareness**
- **Professional Dev't**
- **Education**

e-Environment – using ICTs to tackle climate change

1) Monitoring & better understanding climate change
2) Improving energy-efficiency & reducing GHG emissions of ICTs themselves
3) Improving energy-efficiency & reducing GHG emissions in other sectors
   - ➢ Production efficiency
   - ➢ Logistics & transportation efficiency
   - ➢ Efficiency in work practices (telecommuting, videoconferencing, dematerialisation)
4) Early warning & response to disasters caused by climate change

Need to...
- Carry out further research
- Change business & consumer behaviour
- Have effective government policies & priorities

Effects of ICTs

1st Order

- The direct environmental impact of ICT product cycles
  - ➤ Trend: newer and more energy efficient technologies

2nd Order

- ⬆ in energy & process efficiency as a result of using ICTs for business and everyday uses: e-business – e-commerce, e-government
  - ➤ ⬆ in energy efficiency has potential for greatest impact

3rd Order

- Behavioural adaptations / System wide effects

Challenges

- A lack of awareness of the potential that ICTs have to mitigate climate change
  - 2% ICT related emissions vs. 98 %
  - Not a priority
- Lack of knowledge
  - What standards? ITU SG5 (Environment & climate change)
- Cost
  - High initial cost
  - Increased CO_2 emissions initially
- The nature of economic activity that powers the economy
  - Impact of developing countries? Rural dwellers?

Opportunities

- Better designed ICT devices and components
- Dematerialization
- Increased process efficiency
- Smart motor systems
- Smart logistics
- Smart transportation systems
- Smart buildings
- Efficiency in electricity generation and management (Smart Grids)
- Smart human ecosystems

Implications for developing countries

- All countries can respond to climate change by a process of *adaptation* to its impacts and by reducing GHG emissions (*mitigation*), thereby reducing the rate and magnitude of climate change

- The capacity to adapt and mitigate is dependent on socio-economic and environmental circumstances and availability of ICTs

- Many countries have limited capacity to make beneficial use of ICTs for environmental action:
  - Limited access to affordable infrastructure & internet
  - Limited human capacity to analyze & interpret climate change data
  - Limited capacity to integrate scientific data into decision- and policy-making
  - Limited capacity to undertake adaptation, mitigation, R & D

Recommendations

1) Raise awareness
2) Further research (life cycle assessment) to determine costs/benefits of ICT use
3) Capacity building of developing countries
   - Strengthen national analysis, planning & implementation
   - Foster technology transfer
   - Use existing & new financial mechanisms
   - Promote best practices
   - Promote PPPs

Approaches & tools

1) National strategic planning framework (e-Environment Action Plan)

- Assessment (of requirements & capabilities)
- Consultation and awareness promotion
- Vision statement & goals
- Strategy:
  - ➢ Policies
  - ➢ Immediate & longer-term objectives
- Action plan
- Performance indicators (RBM → PRSP indicators)
- Monitoring and evaluation

Approaches & tools (cont'd)

2) Faster option: Rapid e-Environment assessment

- Assessment phase (as per nat'l action plan)
- Recommendations, priorities with cost & benefits

3) Need to develop an e-Environment toolkit
  – to support e-Environment assessments

Next Steps

- Strategic planning framework (e-Environment master Plan)
  - ➢ Assessment
  - ➢ Vision statement & goals
  - ➢ elaboration of the strategy and related implementation plan
  - ➢ elaboration of performance indicators
  - ➢ monitoring and adjusting
- E-Environment toolkit
  - ➢ To support and consolidate the identified strategy
  - ➢ To provide countries a concrete tool to start with

The e-environment toolkit

The e-environment Toolkit identifies factors that influence the readiness of countries to use ICTs as a tool for abating environmental change in general and climate change in particular

- Readiness assessment

- Measure / estimate actual and potential contribution of specific ICT technologies and applications

- Comparative analysis: identify and track indicators

- The e-Environment Readiness Index (EERI)

Prepared in collaboration with Ralph Rodschat of Nortel, draft under review.

E-Environment Toolkit

- Practical tool for **rapid assessment** of a country's potential for using ICTs to help mitigate and adapt to environmental change

- Identifies **key indicators** reflecting country readiness to use ICTs for fighting environmental change

- Conceived as part of a **comprehensive e-sustainability strategy**

Components of the e-Environment Toolkit

■ The Toolkit includes:

➢ A list of first tier and secondary **indicators**

➢ The **e-Environment Readiness Index** (**EERI**): Methodology and calculations for assessing e-environment readiness

➢ **Guidance** for developing an e-sustainability strategy

➢ Online and other **resources** regarding e-environment indicators

The EERI

- The EERI is a **composite index** of factors that contribute to e-Environment readiness at a **country level**

- Is a relative measure of potential contributions, both positive and negative, that ICTs make to:
  - ➢ GHG emissions
  - ➢ Energy use
  - ➢ Waste reduction
  - ➢ The conservation of the environment and of natural resources

- Is a relative number (score), computed using a select number of published indicators available in a time series (first tier indicators)

Structure of the EERI

- Tiered structure:

  ➤ **ICT Indicators** (Infrastructure, use of ICTs for e-environment, ICT applications, energy quality, human capacity)

  ➤ **Environmental indicators** (Biodiversity, GHG emissions, long-term preparedness, policy and public awareness)

  ➤ **First level EERI** (composite result)

Example of indicators and data sources

- ICT Infrastructure indicators:

  - **Total number of telephone subscribers (fixed + mobile) per 100 inhabitants**

  - **Broadband subscribers per 100 inhabitants**

  - **Internet users per 100 inhabitants**

  - **International Internet bandwidth per inhabitant (bits/s)**

Source: ITU

Example of indicators and data sources (*cont.*)

- ICT Applications:
  - ➢ **Network Readiness Index (NRI)**
  - ➢ **e-Government readiness index**
  - ➢ **Number of secure servers as a measure of the extent of e-commerce**
- Sources: World Economic Forum, UNPAN/DESA, SSL Servers

EERI's Indicator Selection

- The proposed first level indicators have been selected according to the following criteria:

  - Ease of access

  - Global coverage

  - Frequently updated

  - Numerical, or standardized range of values

  - Relevance to the specific segment of the EERI

Methodology

- Each of the two tiers is **normalized** on a scale of zero to ten

- **10= best-in-class** or **worst-in-class** performance (for negative indicators such as GHG emissions) in relation to that segment of indicators

- Weighting is associated with each indicator according to the relative number of indicators in that segment

- In addition, weighting is balanced between the ICT and Environmental segments

- This methodology permits both assessment and prioritization of the areas that are most lacking

Interpreting the EERI

- Interpretation should be performed at all three levels of the tiered indicators, in order to identify:
  - Country weaknesses or strengths
  - Specific areas that can be tackled to create gains in either the ICT or environment domains
  - Areas of specific interest that can be isolated and analyzed further
- The EERI results can facilitate also
  - Multi-year analysis to identify trends
  - Cross-comparison with other countries

Indicators used

ICT indicators	Environmental indicators
Infrastructure	Biodiversity measures
Applications	Greenhouse gases emissions
e-Environment	Long term preparedness
Energy quality	Policy and public awareness
Human capacity	

Sample of EERI Country Results

	First Level EERI	Normalized ICT Summary Indicator	Applications	e-Environment	Energy Quality	Human Capacity	Infrastructure	Normalized Environmental Summary Indicator	Biodiversity	Green-house gases	Long-term preparedness	Policy & Public Awareness
Mongolia	4.6	3.0	4.0	3.1	2.6	3.6	1.9	6.2	3.5	8.7	6.4	5.7
Ethiopia	4.0	2.3	1.4	4.7	3.7	0.9	0.4	5.6	4.4	10.0	5.9	1.2
Chad	3.4	1.4	1.1	3.1	...	...	0.0	5.4	2.3	10.0	6.6	0.0
Kyrgyzstan	4.3	3.5	3.0	4.7	2.2	6.0	1.7	5.0	0.8	9.6	4.3	5.7
Chile	6.5	5.9	6.1	8.4	5.1	5.0	4.9	7.2	4.7	8.5	7.4	7.5
Guatemala	5.6	3.8	4.4	4.7	4.7	2.0	3.2	7.3	8.2	9.6	7.3	4.1
Trinidad and Tobago	7.1	5.3	4.7	4.7	7.9	3.6	5.0	8.9	9.7	10.0	7.8	9.9
Sweden	7.9	8.5	9.3	8.4	7.7	9.5	7.5	7.4	1.8	7.9	8.3	10.0
Canada	7.1	8.4	8.8	10.0	7.5	7.6	8.4	5.7	2.1	2.0	8.2	7.5
Korea, Republic of	6.7	7.7	8.6	8.4	5.9	7.8	7.9	5.8	1.1	6.1	6.6	8.3

Latin America Details

	First Level EERI	Normalized ICT Summary Indicator	Applications	e-Environment	Energy Quality	Human Capacity	Infrastructure	Normalized Environmental Summary Indicator	Biodiversity	Green-house gases	Long-term preparedness	Policy & Public Awareness
Argentina	6.0	5.5	5.6	8.4	4.8	3.9	4.7	6.6	1.625	8.5	6.4	10.0
Bolivia	5.5	3.2	3.8	4.7	3.3	2.4	1.7	7.8	5.3	9.7	8.8	5.3
Brazil	7.4	5.5	6.4	8.4	5.4	4.3	3.4	9.2	7.4	9.3	9.8	9.4
Chile	6.5	5.9	6.1	8.4	5.1	5.0	4.9	7.2	4.7	8.5	7.4	7.5
Colombia	6.5	4.3	5.4	4.7	4.3	3.7	3.4	8.8	6.6	9.5	9.1	9.4
Costa Rica	6.9	5.8	5.5	10.0	5.6	5.1	3.1	7.9	7.8	9.4	7.4	7.5
Ecuador	5.4	3.7	4.2	4.7	4.2	2.2	3.0	7.2	6.4	9.1	7.4	5.3
Guatemala	5.6	3.8	4.4	4.7	4.7	2.0	3.2	7.3	8.2	9.6	7.3	4.1
Guyana	5.4	3.4	3.0	4.7	...	3.6	2.3	7.4	0.6	9.2	9.2	7.5
Honduras	6.1	4.2	3.8	8.4	3.8	2.1	2.7	8.1	5.3	9.5	8.1	9.2
Jamaica	5.6	4.3	4.8	4.7	4.1	3.2	4.7	6.9	5.2	8.4	6.7	7.5
Mexico	6.1	5.4	6.1	10.0	2.0	6.4	3.1	6.8	2.0	8.3	6.7	10.0
Nicaragua	5.2	3.4	3.3	4.7	4.6	2.6	1.8	7.0	4.2	9.7	8.2	3.8
Paraguay	6.3	4.6	3.6	8.4	5.4	3.0	2.3	8.0	1.5	9.7	9.1	10.0
Peru	6.1	4.7	5.0	8.4	3.6	3.7	2.8	7.5	3.5	9.5	8.8	5.7
Uruguay	4.9	4.3	5.2	3.1	4.7	4.2	4.1	5.5	0.1	9.3	5.8	5.7
Venezuela	6.7	4.1	4.8	4.7	4.8	2.9	3.5	9.2	10.0	7.4	9.6	9.8

Latin America Map and Ranking

Brazil	7.4
Costa Rica	6.9
Venezuela	6.7
Colombia	6.5
Chile	6.5
Paraguay	6.3
Honduras	6.1
Mexico	6.1
Peru	6.1
Argentina	6.0
Jamaica	5.6
Guatemala	5.6
Bolivia	5.5
Ecuador	5.4
Guyana	5.4
Nicaragua	5.2
Uruguay	4.9

First Level EERI

2.2 — 8

First level EERI
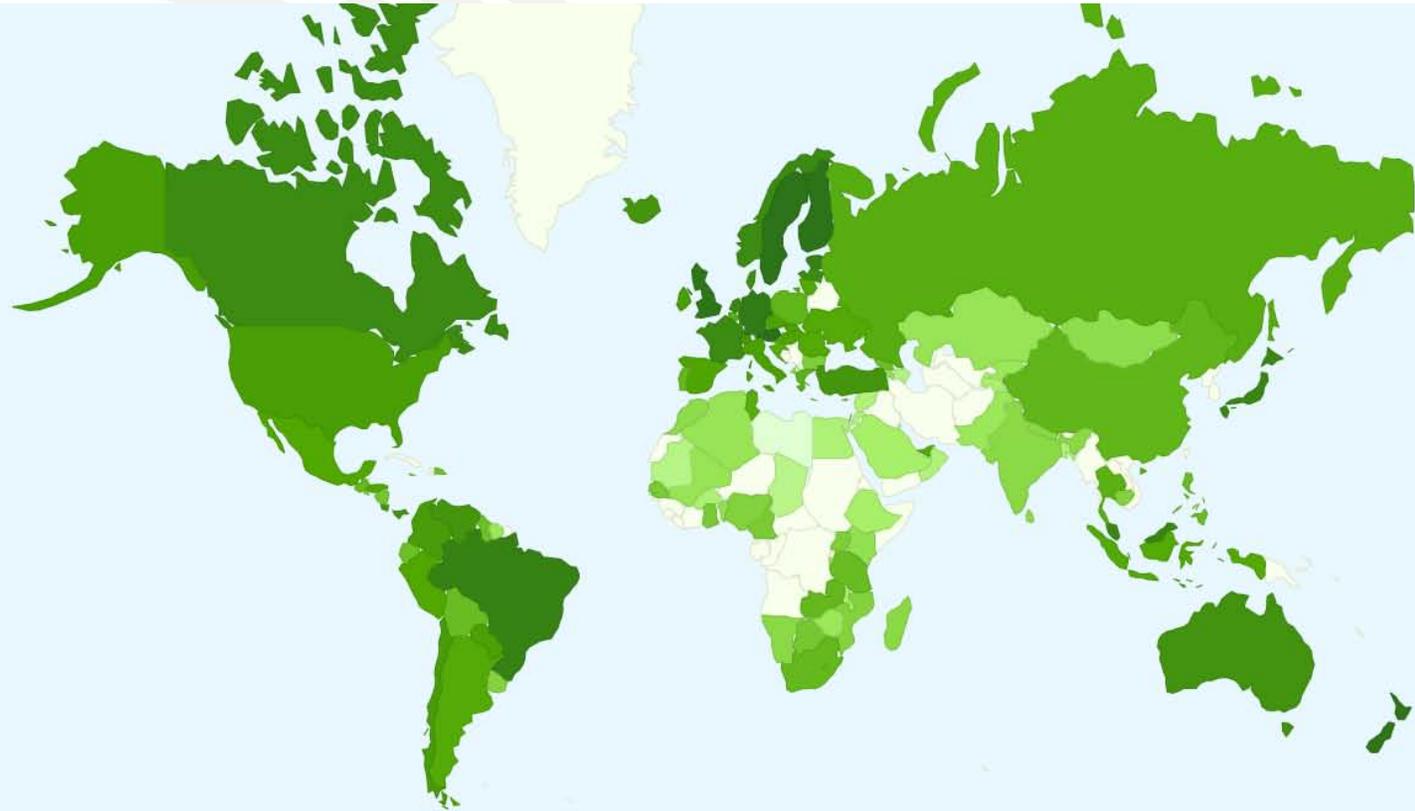
Next Steps

- Circulate the Toolkit draft report and the EERI and obtain feedback
- Support developing countries in conducting e-Environment readiness assessments
- Aid selected countries in developing e-Environment strategies and action plans, in collaboration with partners (see Annex)
- Monitor and evaluate results
- Share best practices with other countries

More Information

- ITU Climate Change
  - ➤ www.itu.int/climate
- ITU-D e-Environment home page
  - ➤ www.itu.int/ITU-D/cyb/app/e-env.html

email: kerstin.ludwig@itu.int

Thank you

Thank you

ITU Climate Change
www.itu.int/climate

ITU-D e-Environment home page
www.itu.int/ITU-D/cyb/app/e-env.html

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Annex: Key Partners for e-Environment Activities

- ITU Member States, WMO, UNEP (UNEP-WCMC, UNEP-GRID, Convention Secretariats), FAO, UNESCO, WHO, UNIDO, UNDP, other UN specialized agencies and programmes, UN Regional Commissions, GEF, WSIS partners, World Bank, etc.

- Regional environmental centres/groups: AOSIS, REC (Budapest), Bogor (Biotrop, etc.), IICA/CATIE (Costa Rica), IDRC, IISD

- Key private sector partners: ICT industry (e.g. GeSI), business associations (WBCSD)

Annex: Key Partners for e-Environment Activities

- Environmental / agriculture organizations:
  - ➢ IUCN, WWF, FOE, IIED & other stakeholders
  - ➢ CGIAR & NARS (National agriculture research services)
- Researchers:
  - ➢ IPCC, ICSU, GEO/GEOSS, etc.
  - ➢ Research associations, networks and centres, etc.