Greenhouse gas emissions in the ICT sector

Trends and methodologies
What is the ICT sector?

ICT = information and communication technology

- Computing devices
- Data centres
- Communication networks
- Equipment for entertainment and media
The Paris Agreement and the GHG emissions gap

Source: Emissions Gap Report 2019
Contribution of the ICT sector

Source: Hilty and Aebischer (2015)
Global GHG emissions in ICT sector

- 2007 ICT's share of global GHG emissions:
  - Malmodin et al. (2010)
  - Belkhir & Elemeligi (2018)

- 2015 ICT's share of global GHG emissions:
  - Malmodin et al. (2013)
  - Andrae & Elder (2015)

- 2020 ICT's share of global GHG emissions:
  - Malmodin & Lundén (2018)
  - Belkhir & Elemeligi (2018)
  - Andrae & Elder (2015)

- ICT's share of global GHG emissions:
  - 2030: 20%
  - 2040: 25%
Relative contribution of ICT categories

Source: Belkhir and Elmeligi (2018)
Global GHG emission reduction potentials by ICT solutions in 2030

Based on data from Malmodin and Bergmark (2015)
The trends in use of ICT

Source: Internet Trends (2019)
Trends: data centres' increased efficiency

Source: Jones (2018)
Trends in connected IoT devices

Source: Gartner (2017)
# The trends in applications of ICT sector: IoT

![Priority Matrix for the Internet of Things, 2019](image)

## Priority Matrix for the Internet of Things, 2019

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Years to Mainstream Adoption</th>
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<tbody>
<tr>
<td></td>
<td>Less than 2 years</td>
</tr>
<tr>
<td>Transformational</td>
<td>Digital Business Technology Platform</td>
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<tr>
<td>High</td>
<td>Indoor Location for Assets</td>
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<tr>
<td>Moderate</td>
<td>Managed IoT Connectivity Services</td>
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<tr>
<td>Low</td>
<td></td>
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</table>

*Source: Gartner (2019)*
The trends in applications of ICT sector: smart cities

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<tr>
<td></td>
<td>Less than 2 years</td>
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<tr>
<td>Transformational</td>
<td>Blockchain</td>
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<tr>
<td></td>
<td>Chatbots</td>
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<td></td>
<td>Smart City Framework</td>
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<tr>
<td>High</td>
<td>Smart Lighting</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>Data for Good</td>
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<tr>
<td></td>
<td>Micromobility</td>
</tr>
<tr>
<td>Low</td>
<td></td>
</tr>
</tbody>
</table>

Source: Gartner (2019)
Methodologies for carbon foot-printing in ICT sector

Map of ICT Methodologies

Goods
- GHG Protocol ICT Sector Guidance - Hardware
- GHG Protocol ICT Sector Guidance - Software
- GreenGrid - Carbon Usage Effectiveness
- IEC TR 62 921
- IEC TR 62 725
- PCR & EPD (incl. PEFCR “Storage”, International EPD System)

Services
- ETSI ES 203 199
- ITU-T L.1410
- ETSI TS 103 199
- ETSI EN 50600-4
- ITU-T L1420
- ADEME - ICT Sector Guide
- GHG Protocol ICT Sector Guidance - TNS
- GHG Protocol ICT Sector Guidance - DMS
- GHG Protocol ICT Sector Guidance - Cloud Computing & Data Center Services

Organisations/Projects
- ITU-T L1330
- ITU-T L1340
- ITU-T L1440

Cities
- ISO/IEC 30134

Source: ICTfootprint.eu (2019)
## Tools for measuring carbon impacts

<table>
<thead>
<tr>
<th>Commercial or Free</th>
<th>Name of the tool</th>
<th>Objective</th>
<th>More about the tool</th>
</tr>
</thead>
<tbody>
<tr>
<td>Free</td>
<td>Ecoindex</td>
<td>Measure the carbon footprint of websites</td>
<td><a href="http://www.ecoindex.fr">www.ecoindex.fr</a></td>
</tr>
<tr>
<td>Free</td>
<td>Self-assessment tool</td>
<td>To obtain the approx. climate change and primary energy footprint of an ICT-based organization</td>
<td><a href="http://www.ictfootprint.eu">www.ictfootprint.eu</a></td>
</tr>
<tr>
<td>Commercial</td>
<td>CO2 neutral website</td>
<td>Calculate CO2 emissions from website and reduce a similar amount of CO2 through climate projects</td>
<td><a href="http://www.co2neutralwebsite.com">www.co2neutralwebsite.com</a></td>
</tr>
<tr>
<td>Commercial</td>
<td>CAST Green IT index</td>
<td>Measure software's environmental effect based on how efficiently it carry out intended actions, and how robust it is</td>
<td><a href="http://www.castsoftware.com">www.castsoftware.com</a></td>
</tr>
<tr>
<td>Commercial</td>
<td>Greenspector</td>
<td>Performance measuring tool for mobile apps</td>
<td><a href="http://www.greenspector.com">www.greenspector.com</a></td>
</tr>
<tr>
<td>Commercial</td>
<td>Ecochain</td>
<td>Activity-based footprinting at the product, company, and value chain level</td>
<td><a href="http://www.ecochain.com">www.ecochain.com</a></td>
</tr>
</tbody>
</table>
Key takeaways

• Trends in ICT sector potentially turn the sector into a significant contributor to global GHG emissions

• A call for optimizing the ICT sector for energy efficiency - UN Environment's United for Efficiency

• A call for more estimates of the GHG impacts of ICT devices and ICT solutions, with open, transparent data

• A call for prioritizing sustainable human-computer interaction: "sustainability through design", and "sustainability in design"
Thank you!