Sustainability Services

#SMARTer2030 Business Case for KPN and the Netherlands

High performance. Delivered.

Strategy | Consulting | Digital | Technology | Operations
KPN has set sustainability targets for its own operations and its enabling impact and operates in a Dutch context with concrete climate targets

KPN’s sustainability strategy and the Netherlands’ context

**KPN’s sustainability strategy**

“*We believe ICT is the key to unlocking a better future planet and its people.*”

**KPN’s sustainability agenda**

- Environmental, climate neutral operations
- Economic, connected anytime anywhere
- Social, smarter living and working

**Select sustainability targets**

- Own operations: 25% absolute energy reduction in 2020 compared to 2010
- Enabling impact: In 2020 KPN services enable customers to save as much energy as consumed by KPN

**The Netherlands’ sustainability context**

**The Netherlands’ climate targets**

At the global Climate meeting in Paris in December 2015, the Netherlands have publicly committed to reduce Greenhouse Gas emissions:

- -40% by 2030 (compared to 1990)
- -80% to -95% by 2050 (compared to 1990)

Current emissions (2014) of the Netherlands amount up to ca. 187 Million tons of CO₂e.

**Main sustainability issues in the Netherlands**

- Climate change mitigation
- Sustainable mobility
- Renewable energy and energy conservation
- Agriculture productivity
- Energy performance of buildings

Sources: KPN; UNFCCC; Statistics Netherlands; Dutch Ministry of Infrastructure and the Environment; Accenture Strategy Analysis
The global #SMARTer2030 study shows that ICT can decrease CO₂ emissions, stimulate the economy and deliver benefits to society

#SMARTer2030 main findings

**Environmental benefits**
- ICT has the potential to maintain global CO₂ emissions at 2015 levels, with business as usual
- At the same time, ICT can reduce the consumption of scarce resources, e.g. -25 bn. barrels of oil

**Economic benefits**
- ICT is good for growth and efficiency, enabling over US$ 11 trillion in business value from sustainability
- $6.5 trillion in new revenues in 2030 (of this, $2.0 trillion for the ICT sector)
- $4.9 trillion in cost savings

**Social benefits**
- ICT could connect 2.5bn previously unconnected people to ICT services by 2030, enabling a total of
  - 1.6 billion people connected to e-health
  - 0.5 billion e-learning participants

1 For additional information on global #SMARTer2030 results, pls refer to appendix 3
Source: GeSI / Accenture Strategy #SMARTer2030 study

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#SMARTer2030 use cases demonstrate the positive role of ICT and create quantitative evidence for the company-specific analysis

Twelve #SMARTer2030 use cases

 thief #SMARTer2030 ICT use cases

✓ Quantified sustainability benefits

<table>
<thead>
<tr>
<th>Connected Private Transportation</th>
<th>Smart Agriculture</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-Banking</td>
<td>Smart Building</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>Smart Energy</td>
</tr>
<tr>
<td>E-Health</td>
<td>Smart Logistics</td>
</tr>
<tr>
<td>E-Learning</td>
<td>Smart Manufacturing</td>
</tr>
<tr>
<td>E-Work</td>
<td>Traffic Control &amp; Optimization</td>
</tr>
</tbody>
</table>

ICT use case = innovative application of ICT that can deliver substantial sustainability benefit(s) compared to traditional approaches

Metrics for company-specific analysis

#SMARTer2030 use-case sustainability benefits demonstrate ICT’s positive role and are provided with quantitative metrics.

The company-specific analysis includes:

- Environmental benefits as Greenhouse Gas emissions savings, Fuel, Energy, Barrels of Oil and Water savings, Yield increases
- Economic benefits as ICT revenues, stakeholder revenues and cost savings
- Social benefits as the number of E-Health beneficiaries and E-Learning degrees

1 Technologies are included in use cases definitions, e.g. Big Data Analytics, Cloud, M2M / Internet of Things, Smartphone-enabled Mobile Access, Social Media, pls refer to appendix 1 for use-case specific technologies and applications

Source: Accenture Strategy; GeSI
In the Netherlands, ICT can enable a reduction of Greenhouse Gas Emissions of ca. 74 million tons of CO$_2$e$^1$ in 2030

Greenhouse Gas emissions savings in the Netherlands in 2030

#SMARTer2030 use cases – GHG emissions savings in million t CO$_2$e in 2030

<table>
<thead>
<tr>
<th>Use Case</th>
<th>GHG Emissions Savings (million t CO$_2$e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Manufacturing</td>
<td>15</td>
</tr>
<tr>
<td>Smart Logistics</td>
<td>14</td>
</tr>
<tr>
<td>Smart Building</td>
<td>13</td>
</tr>
<tr>
<td>Smart Energy</td>
<td>12</td>
</tr>
<tr>
<td>Smart Agriculture</td>
<td>7</td>
</tr>
<tr>
<td>Traffic Control &amp; Optim.</td>
<td>5</td>
</tr>
<tr>
<td>E-Work</td>
<td>4</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>2</td>
</tr>
<tr>
<td>Conn. Private Transp.</td>
<td>1</td>
</tr>
<tr>
<td>E-Learning</td>
<td>&lt;1</td>
</tr>
<tr>
<td>E-Health</td>
<td>&lt;1</td>
</tr>
<tr>
<td>E-Banking</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

$\sum$: 74 million t CO$_2$e

ICT solutions with sustainability benefits have a high potential to enable Greenhouse Gas emissions reduction, e.g. via the following levers:

- **Smart Manufacturing**: Processes automation and engine optimization
- **Smart Logistics**: Reduction in ground, air, maritime and air freight due to more efficient logistics management
- **Smart Building**: Reduction in the energy consumption of households and commercial buildings
- **Smart Energy**: Reduction in energy production due to improved demand management, improved renewable energy integration, more efficient distribution grids

1 CO$_2$e = Carbon Dioxide Equivalents; combines all emitted greenhouse gas (GHG) emissions into one metric

Sources: GeSI SMARTer2030; Accenture Analysis

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123 million MWh of energy and 5.6 billion liters of fuel can be saved in the Netherlands by 2030

Energy saved in the Netherlands by 2030
#SMARTer2030 use cases – energy savings in million MWh by 2030

- Smart Energy: 59
- Smart Building: 39
- Smart Manufacturing: 22
- Smart Agriculture: 3

Σ: 123 million MWh

Fuel saved in the Netherlands by 2030
#SMARTer2030 use cases – fuel savings in billion liters by 2030

- Traffic Control & Optim.: 1.6
- E-Work: 1.6
- E-Commerce: 1.1
- Smart Logistics: 0.7
- Conn. Priv. Transp.: 0.6
- E-Learning: <0.1
- E-Health: <0.1
- E-Banking: <0.1

Σ: 5.6 billion liters

Most important lever for energy savings is reduced energy production, due to more efficient grids and a smarter energy supply/demand management.

Most important levers for fuel saved are reduced private and business transportation, more efficient routes, more efficient vehicles.

Sources: GeSI SMARTer2030; Accenture Analysis
Ca. 870 billion liters of water can be saved in 2030 and agricultural yield can increase by ca. 1 ton/hectare.

**Water savings in the Netherlands in 2030**

SMARTer2030 use cases – water savings in billion liters in 2030

- **Smart Manufacturing**: 437 billion liters
- **Smart Agriculture**: 433 billion liters
- **Smart Building**: <1 billion liters

**Yield increase in the Netherlands in 2030**

- **Ca. 1 ton/hectare** in additional agricultural yield via Smart Agriculture solutions in 2030, leading to, e.g.,
  - Better management of soil conditions
  - Improved knowledge of the requirements to help maximize production
  - Better control of pests and diseases

Water savings and yield increase are enabled by increased efficiencies as a result of the applied ICT solutions in 2030.

Sources: GeSI SMARTer2030; Accenture Analysis
In the Netherlands, ICT solutions with sustainability benefits can deliver a total of €74 billion of economic benefits in 2030.

Overview economic benefits in the Netherlands in 2030

Ca. €12 billion revenues for the ICT sector, e.g. from E-Commerce, E-Work and Smart Building solutions.

Ca. €37 billion enabled stakeholder revenues, e.g. for farmers via incrementing land yield and for online retailers from increased demand and revenues for renewable energy companies.

Ca. €25 billion stakeholder cost savings, e.g. from tuition savings, reduced office space and fuel savings.

Economic benefits enabled by ICT solutions with sustainability benefits – in € billion, in 2030

- €74 total economic impulses
- €12 revenues for the ICT sector
- €37 enabled stakeholder revenues
- €25 stakeholder cost savings

Sources: GeSI SMARTer2030; Accenture Analysis
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The ICT sector could generate € 12 billion in revenues providing services that deliver sustainability benefits

ICT revenue potential in the Netherlands in 2030

#SMARTer2030 use cases – ICT revenues in € million in 2030

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Revenue (€ million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-Commerce</td>
<td>7,918</td>
</tr>
<tr>
<td>E-Work</td>
<td>2,142</td>
</tr>
<tr>
<td>Smart Building</td>
<td>864</td>
</tr>
<tr>
<td>E-Learning</td>
<td>396</td>
</tr>
<tr>
<td>Smart Agriculture</td>
<td>381</td>
</tr>
<tr>
<td>E-Health</td>
<td>224</td>
</tr>
<tr>
<td>Smart Logistics</td>
<td>202</td>
</tr>
<tr>
<td>Smart Energy</td>
<td>19</td>
</tr>
<tr>
<td>Smart Manufacturing</td>
<td>14</td>
</tr>
<tr>
<td>Conn. Private Transp.</td>
<td>7</td>
</tr>
<tr>
<td>Traffic Control &amp; Optim.</td>
<td>1</td>
</tr>
<tr>
<td>E-Banking</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

**Σ: € 12 billion**

ICT revenue streams include
- Platform solutions, e.g. online shopping, E-Work platforms or E-Learning platforms
- Sensor and data analytics solutions, e.g. smart home solutions or precision agriculture

Sources: GeSI SMARTer2030; Accenture Analysis
Stakeholder revenues enabled by the application of ICT solutions with sustainability benefits can amount up to € 37 billion

Stakeholder revenue potential in the Netherlands in 2030

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Revenue (€ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smart Agriculture</td>
<td>12</td>
</tr>
<tr>
<td>E-Commerce</td>
<td>11</td>
</tr>
<tr>
<td>Smart Energy</td>
<td>8</td>
</tr>
<tr>
<td>E-Health</td>
<td>3</td>
</tr>
<tr>
<td>E-Learning</td>
<td>2</td>
</tr>
<tr>
<td>Smart Building</td>
<td>1</td>
</tr>
<tr>
<td>E-Banking</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Traffic Control &amp; Optim.</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Conn. Private Transp.</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

Σ: € 37 billion

Stakeholder revenues can stem from:

- Productivity gains, e.g. yield increase per hectare increasing farmers’ revenues
- Market growth, e.g. revenue increases for online retailers and renewable energy companies

Sources: GeSI SMARTer2030; Accenture Analysis
The grand total of stakeholder cost savings can be €25 billion in 2030

Stakeholder cost savings potential in the Netherlands in 2030

#SMARTer2030 use cases – stakeholder cost savings in € billion in 2030

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Cost Savings (€ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E-Learning</td>
<td>7</td>
</tr>
<tr>
<td>E-Work</td>
<td>5</td>
</tr>
<tr>
<td>Conn. Private Transp.</td>
<td>3</td>
</tr>
<tr>
<td>Traffic Control &amp; Optim.</td>
<td>3</td>
</tr>
<tr>
<td>Smart Building</td>
<td>2</td>
</tr>
<tr>
<td>Smart Manufacturing</td>
<td>2</td>
</tr>
<tr>
<td>Smart Logistics</td>
<td>2</td>
</tr>
<tr>
<td>Smart Agriculture</td>
<td>1</td>
</tr>
<tr>
<td>E-Health</td>
<td>&lt;1</td>
</tr>
<tr>
<td>E-Banking</td>
<td>&lt;1</td>
</tr>
</tbody>
</table>

**Σ: €25 billion**

Stakeholder cost savings can stem from:

- Substitution of traditional services, e.g. reduced tuition fees from E-Learning
- Avoided costs, e.g. avoided transportation needs from E-Work
- Decrease in costs, e.g., reduce the expenses on individual cars owned

Sources: GeSI SMARTer2030; Accenture Analysis

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Over 3.8 million people could benefit from E-Health and over 1.6 million additional E-Learning degrees could be enabled in the Netherlands

Social benefits of ICT in 2030 in the Netherlands: E-Health and E-Learning

Improved access to more affordable healthcare:

>3.8 million E-Health beneficiaries in the Netherlands in 2030

Enabled by “The doctor in your pocket“, comprising:

- Remote access from any connected smart device
- More affordable healthcare services
- More effective treatment through personalized medicine
- Empowered and informed decision-making

Improved access to and more affordable Learning opportunities:

>1.6 million E-Learning degrees in the Netherlands in 2030

Enabled by the transition of knowledge delivery from “static classroom” to “anytime anywhere”, comprising:

- Remote access from any connected smart device
- More affordable tuition fees
- More available learning offers
- Lifelong learning process controlled from your smart device

Sources: GeSI SMARTer2030; Accenture Analysis
In the Netherlands, ICT could enable time savings of ca. 1.6 billion hours in 2030

**Time savings in the Netherlands in 2030**

#SMARTer2030 use cases – time savings in million hours in 2030

- **E-Commerce**: 956 million hours
- **E-Work**: 481 million hours
- **Traffic Control & Optimization**: 125 million hours
- **E-Banking**: 2 million hours

\[ \sum: 1.6 \text{ billion hours saved} \]

ICT solutions with sustainability benefits have a high potential to enable time savings, e.g. via the following levers:

- **E-Commerce**: People will be able to buy online, avoiding the trip to the store and saving time on the road.
- **E-Work**: People will be able to work wherever they are, avoiding the trip to the office and saving time.
- **Traffic Control & Optimization**: Efficiency in transport will reduce traffic jams, reducing the time spent on the road.
- **E-Banking**: People will be able to be attended to wherever they are, whatever they need, avoiding the trip to the bank and saving time.

Sources: GeSI SMARTer2030; Accenture Analysis

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Smart Manufacturing technologies in 2030 can enable various quantifiable economic and environmental benefits in the NED

Deep-dive on Smart Manufacturing use case

**Technology vision 2030**
- Augmented reality devices
- Cyber-physical systems (CPS)
- Data analytics & cloud computing
- Drones & Robotics
- Embedded system production technology
- Global network
- Industrial Internet of Things (IoT) and Machine-to-Machine (M2M)
- 3-D printing

**#SMARTer2030 quantitative evidence for benefits**

<table>
<thead>
<tr>
<th>Category</th>
<th>Metric</th>
<th>In NED in 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>ICT revenues</td>
<td>€ 14 million</td>
</tr>
<tr>
<td></td>
<td>Stakeholder cost savings</td>
<td>€ 2 billion</td>
</tr>
<tr>
<td>Environmental</td>
<td>GHG saved</td>
<td>15 million t of CO\textsubscript{2}e</td>
</tr>
<tr>
<td></td>
<td>Barrels of oil saved</td>
<td>14 million barrels</td>
</tr>
<tr>
<td></td>
<td>Energy saved</td>
<td>22 million MWh</td>
</tr>
<tr>
<td></td>
<td>Water saved</td>
<td>437 billion liters</td>
</tr>
</tbody>
</table>

**Enabled benefits (qualitative)**
- Virtual Manufacturing
- Customer Centric Production
- Circular Supply Chain
- Smart Services

Sources: GeSI SMARTer2030; Accenture Analysis

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Deep-dive on Smart Logistics use case

Technology vision 2030
• Augmented reality and wearable technologies
• Commercial Unmanned Aerial Vehicles (UAV)
• Connected commercial vehicles, load units, products and machines
• Digital warehouses
• Fleet management and optimized routes
• Operational agility systems

#SMARTer2030 quantitative evidence for benefits

<table>
<thead>
<tr>
<th>Category</th>
<th>Metric</th>
<th>In NED in 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>ICT revenues</td>
<td>€ 202 million</td>
</tr>
<tr>
<td></td>
<td>Stakeholder cost savings</td>
<td>€ 1.8 billion</td>
</tr>
<tr>
<td>Environmental</td>
<td>GHG saved</td>
<td>14 million t of CO₂e</td>
</tr>
<tr>
<td></td>
<td>Barrels of oil saved</td>
<td>6 million barrels</td>
</tr>
<tr>
<td></td>
<td>Fuel saved</td>
<td>712 million liters</td>
</tr>
</tbody>
</table>

Enabled benefits (qualitative)

- Fall in transport as a result of a reduction in road freight due to route optimization, maximization of vehicle capacity, logistic sharing and eco drive
- Fall in transport as a result of a reduction of air, maritime and train freight due to maximization of vehicle capacity and logistic sharing

Sources: GeSI SMARTer2030; Accenture Analysis
Smart Building technologies in 2030 can enable various quantifiable economic and environmental benefits in the Netherlands

Deep-dive on Smart Building use case

Technology vision 2030

- Monitoring, detection and diagnosis technologies, e.g.
  - Data analytics and cloud computing
  - Internet of Things
- Alarm management and automation
- Energy management technologies, e.g. smart metering and steering apps
- Information and communication platforms

#SMARTer2030 quantitative evidence for benefits

<table>
<thead>
<tr>
<th>Category</th>
<th>Metric</th>
<th>In NED in 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>ICT revenues</td>
<td>€ 960 million</td>
</tr>
<tr>
<td></td>
<td>Stakeholder cost savings</td>
<td>€ 2.8 billion</td>
</tr>
<tr>
<td></td>
<td>Stakeholder revenues</td>
<td>€ 965 million</td>
</tr>
<tr>
<td>Environmental</td>
<td>GHG saved</td>
<td>13 million t of CO₂e</td>
</tr>
<tr>
<td></td>
<td>Barrels of oil saved</td>
<td>24 million barrels</td>
</tr>
<tr>
<td></td>
<td>Energy saved</td>
<td>39 million MWh</td>
</tr>
<tr>
<td></td>
<td>Water saved</td>
<td>542 million liters</td>
</tr>
</tbody>
</table>

Enabled benefits (qualitative)

- Energy & resource efficiency
- Improved process efficiency
- Reduction in energy consumption
- Enhanced living & working

Sources: GeSI SMARTer2030; Accenture Analysis
Smart Energy technologies in 2030 can enable various quantifiable economic and environmental benefits in the Netherlands

Deep-dive on Smart Energy use case

**Technology vision 2030**
- Advanced analytics
- Convergence of Information Technology and of Operations Technology
- Demand response technologies (B2B, B2C)
- Distribution management system
- Energy storage technology
- Internet of Things (IoT) and Machine-to-Machine (M2M) technology
- Sensor technologies

**#SMARTer2030 quantitative evidence for benefits**

<table>
<thead>
<tr>
<th>Category</th>
<th>Metric</th>
<th>In NED in 2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Economic</td>
<td>ICT revenues</td>
<td>€ 19 million</td>
</tr>
<tr>
<td></td>
<td>Stakeholder revenues</td>
<td>€ 7.9 billion</td>
</tr>
<tr>
<td>Environmental</td>
<td>GHG saved</td>
<td>12 million t of CO$_2$e</td>
</tr>
<tr>
<td></td>
<td>Barrels of oil saved</td>
<td>36 million barrels</td>
</tr>
<tr>
<td></td>
<td>Energy saved</td>
<td>59 million MWh</td>
</tr>
</tbody>
</table>

**Enabled benefits (qualitative)**
- Improved load management + enablement of renewables
- Grid efficiency
- Resilient energy infrastructure

Sources: GeSI SMARTer2030; Accenture Analysis
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Appendix 1: Explanation of #SMARTer2030 use cases
# Overview #SMARTer2030 use cases (1/6)

## Use case definition

<table>
<thead>
<tr>
<th>#SMARTer2030 use case</th>
<th>Main technologies and applications considered in 2030 vision of use case</th>
</tr>
</thead>
</table>
| **Connected Private Transport** | • Board computer system  
• Car/route sharing  
• Connected private and public vehicles  
• GPS/GEO location based services  
• Intermodal transport  
• Remote diagnosis for maintenance  
• RFID (radio frequency identification)/NFC (near-field communication) technologies  
• Smartphone enabled car-sharing or car-pool platforms  
• Social Media technology & apps |
| **E-Banking** | • Digital assistants/consults  
• Digital currencies (e.g. BITCoin)  
• Faster and 24/7 access  
• Financial market insight and investment platforms  
• Online banking apps  
• Videoconferencing |

## Overview of #SMARTer2030 results for use case

<table>
<thead>
<tr>
<th>Expected use case benefits (qualitative, ordered per estimated relevance)</th>
<th>Main #SMARTer 2030 calculated benefits metrics and results</th>
</tr>
</thead>
</table>
| • Reduced emissions, pollution, noise, resource consumption, traffic jams, accidents  
• Reduced car ownership, transportation and infrastructure costs  
• Freed up space in cities  
• Increased mobility regardless of age, mental or physical capabilities | • ICT revenues ($): 2 bn  
• Stakeholder revenues ($) : 550 m  
• Stakeholder cost savings ($) : 610 bn  
• Carbon emissions saved (GtCO2 eq) globally: 0.766  
• Fuel saved (L) globally: 220 bn  
• Time saved (h): 42.3 bn |
| • Reduced use of resources (wood, water, energy)  
• Reduced infrastructure needs (branch offices)  
• Reduced amount of coin production and cash transports  
• Immediate access to banking services regardless of location | • ICT revenues ($): 77 m  
• Stakeholder revenues ($) : 15.3 bn  
• Stakeholder cost savings ($) : 2 bn  
• Carbon emissions saved (GtCO2 eq) globally: 0.003  
• Fuel saved (L) globally: 1.3 bn  
• Time saved (h): 915 m |

Source: Accenture Strategy; #SMARTer2030
# Overview #SMARTer2030 use cases (2/6)

## Use case definition

<table>
<thead>
<tr>
<th>#SMARTer2030 use case</th>
<th>Main technologies and applications considered in 2030 vision of use case</th>
</tr>
</thead>
</table>
| **E-Commerce**       | • Advanced data analytics  
                        • Apps for retail mobile shopping  
                        • Delivery on demand  
                        • Integrated multichannel infrastructures/mobile shopping  
                        • Location based services  
                        • Retail 3D printing  
                        • Videoconferencing/augmented reality |
| **E-Health**         | • Augmented reality (e.g. medical training)  
                        • Data generation and big data analytics  
                        • Data storage in electronic form  
                        • DNA sequencing  
                        • Remote access  
                        • Remote diagnostics (capture and communicate health data)  
                        • Videoconferencing (between service seekers and providers)  
                        • Wearable health-monitoring watches or mobile phones |

## Overview of #SMARTer2030 results for use case

### Expected use case benefits (qualitative, ordered per estimated relevance)

<table>
<thead>
<tr>
<th><strong>E-Commerce</strong></th>
<th><strong>E-Health</strong></th>
</tr>
</thead>
</table>
| • Reduced private transportation  
  • Reduced transportation of goods to stores, but more to homes  
  • Reduced infrastructure needs (stores)  
  • Customer-centricity  
  • Product & service comparison  
  • Immediate access to goods regardless of location | • Improved access to and quality of public health services  
  • Informed and empowered patients  
  • Efficient monitoring and distribution of information  
  • Personalized medicine  
  • Value-based reimbursement, e.g. incentives for preventative behavior |

### Main #SMARTer 2030 calculated benefits metrics and results

<table>
<thead>
<tr>
<th><strong>E-Commerce</strong></th>
<th><strong>E-Health</strong></th>
</tr>
</thead>
</table>
| • ICT revenues ($): 580 bn  
  • Stakeholder revenues ($): 1,144.7 bn  
  • Carbon emissions saved (GtCO2 eq) globally: 0.3  
  • Fuel saved (L) globally: 165.5 bn  
  • Time saved (h): 105 bn | • ICT revenues ($): 63 bn  
  • Stakeholder revenues ($): 208.8 bn  
  • Stakeholder cost savings ($): 63 bn  
  • Carbon emissions saved (GtCO2 eq) globally: 0.2  
  • Fuel saved (L) globally: 1.7 bn  
  • E-Health beneficiaries (#): 1.6 bn |
## Overview #SMARTer2030 use cases (3/6)

### Use case definition

<table>
<thead>
<tr>
<th>#SMARTer2030 use case</th>
<th>Main technologies and applications considered in 2030 vision of use case</th>
</tr>
</thead>
</table>
| **E-Learning**         | • Advanced data analytics  
                         |   • E-Learning apps  
                         |   • Gamification, virtualization, access to computing  
                         |   • Massive Open Online Courses (MOOC)  
                         |   • Online community platforms  
                         |   • Smart systems portfolio (Personalized and competency-based platforms that track what, how, and when you learn)  
                         |   • Videoconferencing |
| **E-Work**             | • Augmented reality  
                         |   • Cloud-based platforms (e.g. “platform as a service”)  
                         |   • Connections and smart devices  
                         |   • Telecommuting/collaboration tools  
                         |   • Telework (“mobile workspace”)  
                         |   • Videoconferencing  
                         |   • Virtual business meetings  
                         |   • Voice over IP |

### Overview of #SMARTer2030 results for use case

<table>
<thead>
<tr>
<th>Expected use case benefits (qualitative, ordered per estimated relevance)</th>
<th>Main #SMARTer 2030 calculated benefits metrics and results</th>
</tr>
</thead>
</table>
| • Improved access and quality will raise earning potential and quality of life | • ICT revenues ($) : 75 bn  
                         |   • Stakeholder revenues ($) : 412.9 bn  
                         |   • Stakeholder cost savings ($) : 1,211 bn  
                         |   • Carbon emissions saved (GtCO2 eq) globally : 0.07  
                         |   • Fuel saved (L) globally : 5.0 bn  
                         |   • E-learning degrees (#) : 450 m |
| • Lifelong, personalized, affordable, engaging learning  
                         | • Reduced emissions, pollution, noise, resource consumption, traffic jams, and accidents through virtual commuting  
                         |   • Better work-life balance  
                         |   • Reduced amount of work-related accidents, stress-related diseases | • ICT revenues ($) : 536 bn  
                         |   • Stakeholder cost savings ($) : 680 bn  
                         |   • Carbon emissions saved (GtCO2 eq) globally : 0.4  
                         |   • Fuel saved (L) globally : 165 bn  
                         |   • Time saved (h) : 105.0 bn |

**Source:** Accenture Strategy; #SMARTer2030
## Overview #SMARTer2030 use cases (4/6)

### Use case definition

<table>
<thead>
<tr>
<th>#SMARTer2030 use case</th>
<th>Main technologies and applications considered in 2030 vision of use case</th>
</tr>
</thead>
</table>
| **Smart Agriculture**  | • Automation and optimization of farm management technologies
|                       | • Online platforms and apps
|                       | • Precision agriculture, comprising e.g.
|                       |   - M2M / IoT, sensors and satellites
|                       |   - Advanced data analytics
|                       |   - Processing of genomic sequencing of livestock, seeds and plants
|                       | • Traceability and tracking systems, incl. Smart logistics (RFID1, GPS) |
| **Smart Building**     | • Alarm management & automation
|                       |   - Data analytics tools
|                       | • Energy management technologies
|                       |   - Smart metering & sensors
|                       | • Information & communication platforms
|                       | • Monitoring, detection and diagnosis technologies
|                       |   - Data analytics & cloud computing
|                       |   - Sensor technologies |

### Overview of #SMARTer2030 results for use case

<table>
<thead>
<tr>
<th>Expected use case benefits (qualitative, ordered per estimated relevance)</th>
<th>Main #SMARTer 2030 calculated benefits metrics and results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Reduced hunger &amp; famine</td>
<td>• ICT revenues ($) : 53 bn</td>
</tr>
<tr>
<td>• Improved food distribution, productivity</td>
<td>• Stakeholder revenues ($) : 1,762 bn</td>
</tr>
<tr>
<td>• Resilience towards climate change, pests</td>
<td>• Stakeholder cost savings ($) : 404 bn</td>
</tr>
<tr>
<td>• Reduced emissions, pollution, land degradation, water consumption</td>
<td>• Carbon emissions saved (GtCO2 eq) globally: 2,018</td>
</tr>
<tr>
<td>• Increased biodiversity</td>
<td>• Energy saved (MWh): 1 bn</td>
</tr>
<tr>
<td>• Large gains in energy &amp; resource efficiency</td>
<td>• Water saved (L) globally: 251 tr</td>
</tr>
<tr>
<td>• Enhanced living &amp; working</td>
<td>• Yield increase (kg/ha growth) globally: 897</td>
</tr>
<tr>
<td>• Proactive fire, gas, structural failure detection increases safety</td>
<td>• ICT revenues ($) : 200 bn</td>
</tr>
<tr>
<td>• Higher real estate valuation</td>
<td>• Stakeholder revenues ($) : 184.9 bn</td>
</tr>
<tr>
<td>• Lower maintenance, operational costs</td>
<td>• Stakeholder cost savings ($) : 361 bn</td>
</tr>
<tr>
<td>• Carbon emissions saved (GtCO2 eq) globally: 0.79</td>
<td>• Energy saved (MWh): 5 bn</td>
</tr>
<tr>
<td>• Energy saved (MWh): 5 bn</td>
<td>• Water saved (L) globally: 261 bn</td>
</tr>
<tr>
<td>• Water saved (L) globally: 261 bn</td>
<td></td>
</tr>
</tbody>
</table>

Source: Accenture Strategy; #SMARTer2030
## Overview #SMARTer2030 use cases (5/6)

### Use case definition

<table>
<thead>
<tr>
<th>#SMARTer2030 use case</th>
<th>Main technologies and applications considered in 2030 vision of use case</th>
</tr>
</thead>
</table>
| **Smart Energy**      | • Advanced analytics  
                        | • Convergence of Information Technology and of Operations Technology  
                        | • Demand response technologies (B2B, B2C)  
                        | • Distribution management system  
                        | • Energy storage technology  
                        | • Internet of Things (IoT) and Machine-to-Machine (M2M) technology  
                        | • Sensor technologies |
| **Smart Logistics**   | • Augmented reality and wearable technologies  
                        | • Commercial Unmanned Aerial Vehicles (UAV)  
                        | • Connected commercial vehicles, load units, products and machines  
                        | • Digital warehouses  
                        | • Fleet management and optimized routes  
                        | • Operational agility systems |

### Overview of #SMARTer2030 results for use case

<table>
<thead>
<tr>
<th>Expected use case benefits (qualitative, ordered per estimated relevance)</th>
<th>Main #SMARTer 2030 calculated benefits metrics and results</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Decarbonization through broad deployment of renewables</td>
<td>• ICT revenues ($): 2 bn</td>
</tr>
<tr>
<td>• Energy and cost savings</td>
<td>• Stakeholder revenues ($): 811.3 bn</td>
</tr>
<tr>
<td>• Energy security</td>
<td>• Carbon emissions saved (GtCO₂eq) globally: 3.4</td>
</tr>
<tr>
<td>• Energy independence</td>
<td>• Energy saved (MWh): 6.3 bn</td>
</tr>
<tr>
<td>• Diversification to reduce risk of system failure (blackout)</td>
<td></td>
</tr>
<tr>
<td>• Universal access to energy</td>
<td></td>
</tr>
<tr>
<td>• Social cohesion through shared energy systems</td>
<td></td>
</tr>
<tr>
<td>• Consumers become producers</td>
<td></td>
</tr>
<tr>
<td>• Reduced emissions, pollution, noise, resource consumption, traffic jams, accidents</td>
<td>• ICT revenues ($): 60 bn</td>
</tr>
<tr>
<td>• New revenue streams for logistics providers</td>
<td>• Stakeholder cost savings ($): 462 bn</td>
</tr>
<tr>
<td>• Operational efficiency gains (distance driven, capacity utilization, reduced risks)</td>
<td>• Carbon emissions saved (GtCO2 eq) globally: 1.3 bn</td>
</tr>
<tr>
<td>• Energy saved (MWh): 1.1bn</td>
<td>• Energy saved (MWh): 1.1bn</td>
</tr>
<tr>
<td>• Fuel saved (L) globally: 266.7 bn</td>
<td></td>
</tr>
</tbody>
</table>

Source: Accenture Strategy; #SMARTer2030
### Overview #SMARTer2030 use cases (6/6)

#### Use case definition

<table>
<thead>
<tr>
<th>#SMARTer2030 use case</th>
<th>Main technologies and applications considered in 2030 vision of use case</th>
</tr>
</thead>
</table>
| Smart Manufacturing    | • Augmented reality devices  
                        • Cyber-physical systems (CPS)  
                        • Data analytics & cloud computing  
                        • Drones & Robotics  
                        • Embedded system production technology  
                        • Global network  
                        • Industrial Internet of Things (IoT) and Machine-to-Machine (M2M)  
                        • 3-D printing |
| Traffic Control & Optimization (TCO) | • Automated driving  
                        • Autonomous vehicles  
                        • “Car to x communication”  
                        • Connected smart sensors  
                        • Driverless cars  
                        • Driving support technologies  
                        • GPS/GEO location-based applications  
                        • Information Technologies  
                        • Intelligent infrastructure  
                        • Real-time information gathering and data analytics  
                        • Traffic management platform |

#### Overview of #SMARTer2030 results for use case

<table>
<thead>
<tr>
<th>Expected use case benefits (qualitative, ordered per estimated relevance)</th>
<th>Main #SMARTer 2030 calculated benefits metrics and results</th>
</tr>
</thead>
</table>
| • Rapid manufacturing of new products  
• Remote monitoring, early issue identification  
• Higher productivity, quality, flexibility, resource efficiency  
• Worker safety  
• Mass customization | • ICT revenues ($): 3 bn  
• Stakeholder cost savings ($): 420 bn  
• Carbon emissions saved (GtCO2 eq) globally: 2.7 bn  
• Energy saved (MWh): 4.2 bn  
• Water saved (L): 81.2 tr |
| • Reduced emissions, costs, pollution, noise, resource consumption, traffic jams, accidents  
• Higher productivity, efficiency  
• Improved health & safety, mobility | • ICT revenues ($): 95 m  
• Stakeholder revenues ($): 0.7 bn  
• Stakeholder cost savings ($): 377.7 bn  
• Carbon emissions saved (GtCO2 eq) globally: 0.8 bn  
• Fuel saved (L): 236.1 bn |

Source: Accenture Strategy; #SMARTer2030

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Appendix 2: Additional information on global #SMARTer2030 results
The world is not on track: Under business as usual CO$_{2e}$ emissions will continue to grow

CO$_{2e}$ emissions forecast (Gt CO$_{2e}$)

Historically each 1% of growth in GDP equated to a 0.5% increase in CO$_{2e}$ emissions

Source: WRI, IPCC, World Bank, GeSI, Accenture analysis & CO2 models

#SMARTer2030
SMARTer2030 main findings

• ICT has the potential to maintain global CO$_2$e emissions at 2015 levels
• At the same time, ICT can reduce the consumption of scarce resources

• ICT is good for growth
  - Over 6 trillion USD in new revenues in 2030
  - Close to 5 trillion USD in cost savings in 2030, including 2.3 trillion USD from energy efficiency

• ICT could connect 2.5 billion previously unconnected people to ICT services by 2030, enabling a total of
  - 1.6 billion people connected to e-health
  - 0.5 billion e-learning participants

Source: GeSI, Accenture Strategy
ICT could realize a benefit 9.7 times higher than its own emissions in 2030, while its footprint is expected to fall.

**ICT benefits factor in 2020 and 2030 (Gt CO₂e)**

**SMARTer 2030**
- **ICT-enabled** footprint: 12.08 Gt CO₂e
- **ICT-footprint** factor: 9.7x

**SMARTer 2020 (2012 report)**
- **ICT-enabled** footprint: 9.10 Gt CO₂e
- **ICT-footprint** factor: 7.2x

**SMART 2020 (2008 report)**
- **ICT-enabled** footprint: 7.80 Gt CO₂e
- **ICT-footprint** factor: 5.5x

Source: WRI, IPCC, GeSI, SMARTer2020, Accenture analysis & CO2 models

#SMARTer2030
ICT enables improved customer centricity and new business models building on increased digital density

Context 2015 – Main changes compared to SMARTer2020 in 2012

**Improved user centricity**
ICT is now genuinely putting people at the center, allowing for more compelling service offerings that “deliver it all”: better experience, reduced cost, improved sustainability

**New business models**
The business case for ICT-enabled business is now stronger than ever. Digital disruptors have grown into multibillion dollar businesses, far beyond what seemed possible 2012

**Increased digital density**
Internet access and smartphone ownership are at much higher levels and the number of connected devices is expected to grow to 100 billion by 2030

Smart solutions to mobility, manufacturing, agriculture, building and energy deliver ICT’s potential of 12Gt CO$_2$e

CO$_2$e abatement potential by sector (Gt CO$_2$e)

<table>
<thead>
<tr>
<th>Sector</th>
<th>CO$_2$e Abatement (Gt CO$_2$e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mobility$^1$</td>
<td>3.6</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>2.7</td>
</tr>
<tr>
<td>Agriculture</td>
<td>2.0</td>
</tr>
<tr>
<td>Building</td>
<td>1.8</td>
</tr>
<tr>
<td>Energy</td>
<td>2.0</td>
</tr>
<tr>
<td>ICT-enabled savings$^2$</td>
<td>12.1</td>
</tr>
</tbody>
</table>

ICT has the potential to maintain global CO$_2$e emissions at 2015 levels, decoupling economic growth from emissions growth

$^1$ Smart mobility solutions consider improved driving efficiency but also the reduced need to travel from various sectors, including health, learning, commerce, etc.

$^2$ 12 Gt CO2e reduction in 2030 enabled by ICT include 2 Gt CO2e abatement from integration of renewable energy production into the grid. In its business as usual emissions forecast for 2030 the Intergovernmental Panel on Climate Change (IPCC) already considers the CO2e abatement potential from renewable energy. Therefore, the additional ICT-enabled CO2e reduction against the IPCC emissions forecast for 2030 is 10 Gt CO2e

Source: WRI, IPCC, World Bank, GeSI, Accenture analysis & CO2 models

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ICT offers further environmental benefits, from better yields to reduced consumption of scarce resources

ICT-enabled environmental benefits across sectors beyond CO$_{2e}$

- **+900 kg crop yield** increase per hectare from Smart Agriculture
- **-25 billion oil barrels** saved across all sectors analyzed
- **-135 million cars** reduced from total installed base
- **-300 trillion liters of water** saved across all sectors analyzed

Source: WRI, IPCC, Gartner, FAO, GeSI, Accenture analysis & CO2 models

#SMARTer2030
ICT will connect 2.5 billion more people to ICT thereby making a broad range of benefits available

New ICT connections 2015-2030 (billion connections)

- Total new connections: 2.5 billion
- E-health beneficiaries: 1.6 billion
- E-learning participants: 0.5 billion

Source: Gartner, Yankee, EIF, Accenture analysis
#SMARTer2030
ICT is good for growth and could deliver over $6 trillion in revenues and close to $5 trillion USD in cost savings

ICT-enabled revenues and cost savings p.a. (2030, USD trillion)

Source: WRI, IPCC, Gartner, FAO, GeSI, Accenture analysis & CO2 models

#SMARTer2030
To fully realize ICT’s potential stakeholder action is required with policy action as a key priority

Prioritized policy action areas

**National CO2 targets**
Set national CO2 targets and recognize ICT solutions as an effective and necessary tool to decrease carbon emissions while enabling continued economic growth and sustainable living

**Investment incentives in infrastructure deployment**
Create investment incentives in infrastructure deployment to connect the unconnected and enable broad segments of the population access to ICT solutions

**Fair, balanced & consistent regulatory approach**
Establish a fair, balanced and consistent regulatory approach to ICT solutions that promotes innovation and investment, protects intellectual property rights and ensures consumer privacy and security

Source: WBSD, We mean business coalition, UN, GeSI

#SMARTer2030
Infographics provide illustrative evidence of the #SMARTer2030 results, e.g. on CO₂ emissions savings

Overview results CO₂e savings from ICT solutions with sustainability benefits

More information on #SMARTer2030 results can be found in different formats

Links to more information on #SMARTer2030

Link to #SMARTer2030 full report:
GeSI # SMARTer2030 full report

Link to #SMARTer2030 executive summary:
GeSI #SMARTer2030 executive summary

Link to #SMARTer2030 business playbook (10 pages results with key messages to business leaders):
GeSI #SMARTer2030 business playbook

Link to #SMARTer2030 video:
SMARTer2030: Creating a More Sustainable Future with ICT Solutions

Source: GeSI / Accenture Strategy #SMARTer2030
Appendix 3: Extrapolation metrics to calculate use case benefits for other than the nine SMARTer2030 focus countries
High-level overview of how the results for The Netherlands are obtained from the results calculated for the nine focus countries

**STEP 1**
Calculated results for all use cases for nine focus countries:
- USA
- Canada
- Australia
- UK
- Germany
- China
- Brazil
- India
- Kenya

**STEP 2**
Grouping of worldwide countries with the ones assessed, according to macroeconomic similarities, e.g. GDP/capita and internet users

Illustrative example for one World Bank Data metric: GHG emissions for Smart Energy with “Energy Use” metric

**STEP 3**
Selection of use case specific extrapolation metrics from World Data Bank
1. a) Two or more metrics\(^1\) are selected for each use case to enhance extrapolation accuracy (results not depending on a single extrapolation)
   b) Assessment of share of the nine countries per metric and all other countries according to each select metric (per group)

**STEP 4**
Extrapolation calculation based on the weight of the country with the other countries in the group

Illustrative example:

<table>
<thead>
<tr>
<th>Group</th>
<th>USA</th>
<th>Canada</th>
<th>Australia</th>
<th>The Netherlands</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>0.5 Gt CO(_2)</td>
<td>0.25 Gt CO(_2)</td>
<td>0.2 Gt CO(_2)</td>
<td>The Netherlands: 7 kt</td>
</tr>
<tr>
<td>USA: 30%</td>
<td>Canada: 12%</td>
<td>Australia: 10%</td>
<td>The Netherlands: 7%</td>
<td></td>
</tr>
</tbody>
</table>

1. \(^1\)Pls refer to following slide for list of used World Bank Data Bank extrapolation metrics per use case

Source: GeSI; Accenture Strategy

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#SMARTer2030
Extrapolation metrics to calculate use case benefits for other than the nine SMARTer2030 focus countries

### Specific extrapolation metrics per use case

Extrapolation of the results of each use case, calculated for nine focus countries, are made using tailor-made metrics from World Development Indicators Database:

<table>
<thead>
<tr>
<th>Use Case</th>
<th>Metrics</th>
</tr>
</thead>
</table>
| Connected Private Transportation | - CO₂ intensity  
                              - GDP  
                              - Road sector gasoline and diesel consumption |
| Smart Agriculture  | - Arable Land  
                              - Cereal Yield  
                              - CO₂ intensity  
                              - Fertilizer consumption |
| E-Banking          | - CO₂ intensity  
                              - Stocks traded  
                              - Credit provided by FS  
                              - GDP  
                              - Gross capital formation |
| Smart Building     | - CO₂ intensity  
                              - Urban population |
| E-Commerce         | - CO₂ intensity  
                              - Exports from GDP  
                              - Imports from GDP  
                              - Population |
| Smart Energy       | - CO₂ intensity  
                              - Energy Production  
                              - Energy Use  
                              - GDP |
| E-Health           | - CO₂ intensity  
                              - Healthcare expenditure  
                              - Improved sanitation facilities |
| Smart Logistics    | - CO₂ intensity  
                              - Exports from GDP  
                              - Imports from GDP  
                              - Merchandise trade |
| E-Learning         | - CO₂ intensity  
                              - Expenditure on education  
                              - Primary education pupils |
| Smart Manufacturing| - CO₂ intensity  
                              - Industry Value Added from GDP |
| E-Work             | - CO₂ intensity  
                              - Employment to population/Labor force |
| Traffic Control & Optimization | - CO₂ intensity  
                              - GDP  
                              - Urban population |

Source: Accenture Strategy models for GeSI SMARTer2030
Each sector impact is based on a bottom-up analysis of the main drivers per sector for nine focus countries.

**CO2e emissions abatement potential per sector – Agriculture (Gt CO$_2$e)**

Extrapolation to rest of world

Other countries including Canada, Australia

United States

1. Emission abatement not related to energy use
   
   - 0.09 GtCO$_2$eq

2. Emissions related to energy use
   
   - 0.02 GtCO$_2$eq

3. Emissions related to food waste
   
   - 0.04 GtCO$_2$eq

- a. Emissions from enteric fermentation
   
   - Reduction from Smart Agriculture

- b. Emissions from fertilizers used
   
   - Reduction from Smart Agriculture

- c. Emissions from manure unmanaged
   
   - Reduction from Smart Agriculture

- d. Emissions from rice cultivation
   
   - Reduction from Smart Agriculture

- e. Emissions from agriculture energy
   
   - Reduction from Smart Agriculture

- f. Emissions from pre-consumption food waste
   
   - Reduction from Smart Agriculture

- g. Emissions from post-consumption food waste
   
   - Reduction from Smart Agriculture

Emissions related to energy use

0.2 GtCO$_2$eq

Emissions related to food waste

0.11 GtCO$_2$eq

Emission abatement not related to energy use

0.15 GtCO$_2$eq

Source: Gartner, FAO, US census, USDA, Accenture Analysis

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