The Future Impact of ICT on Environmental Sustainability

2002-2004

Commissioned by the European Commission

Institute for Prospective Technological Studies

IZT

Institute for Futures Studies and Technology Assessment Berlin

EMPA

Swiss Federal Laboratories for Materials Testing and Research

Forum for the Future

Forum for the Future London

iiiee

International Institute for Industrial Environmental Economics
University of Lund

Methods

- Literature reviews, trend extrapolation
- Scenario development with expert groups
- Causal modelling (System Dynamics)
- Sensitivity analysis, best-case / worst-case optimization
- Expert reviews of the results

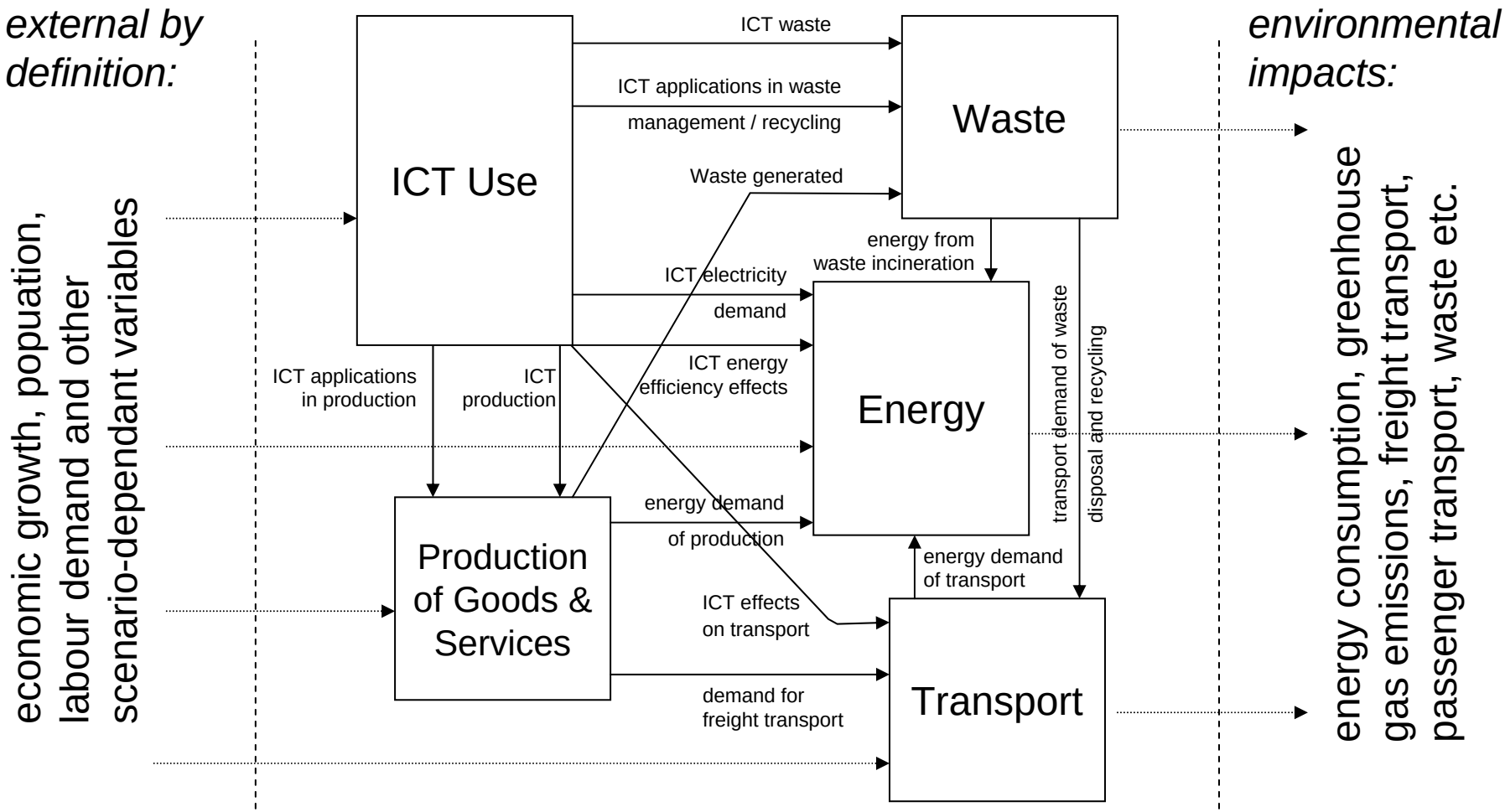
Classification of ICT Effects

- First-order effects:
  Effects of the physical existence of ICT, from cradle to grave
- Second-order effects:
  Effects of the application of ICT
- Third-order effects:
  Medium and long-term effects of the availability of ICT and the services it provides to a large number of people

Examples

- First-order:
  Producing a 23 kg desktop PC with CRT monitor requires **500-1500 kg raw materials**
- Second-order:
  Intelligent heating systems could save **3 - 6 % of total energy** consumed in 2020
- Third-order:
  Intelligent transport systems will induce **10-30 % of total freight transport** in 2020

Model structure



Scenarios (possible futures)

Scenario Frameworks	**A** **"Technocracy"**	**B** **"Government first"**	**C** **"Stakeholder Democracy"**
Technology Regulation	Incentives for innovation	Government intervention	Stakeholder approach
Attitudes to ICT	Moderate, conservative	Open and accepting	Highly accepting
ICT in business	High level of cooperation	High level of competition	Between A and B
Attitudes to the environment	Moderate / controversial	High awareness and interest	High awareness and interest

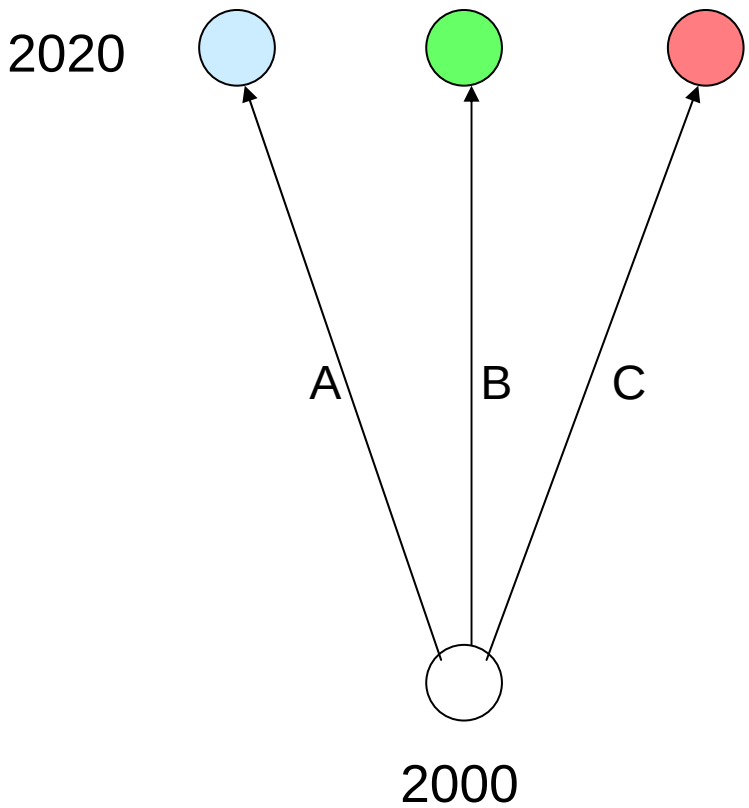
➔ detect ICT impacts that are invariant over all scenarios

Survey of results

	Total freight transport	**Total passenger transport**	**Private car transport**	**Total energy consumption**	**Share of renew-able electricity**	**Greenhouse gas emissions**	**Municipal solid waste not recycled**
Potential impact to:	reduce tkm	reduce pkm	reduce %	reduce TWh	increase %	reduce CO_2-eq. Mt	reduce Mt
First order effects of ICT	-	-	-	☹	-	☹	☹
ICT in supply chain management	☺	-	-	☺	-	☺	☺
Teleshopping	☹	☺	😐	😐	-	☺	😐
Telework & virtual meetings	-	☺	☺	☺	-	☺	-
Virtual goods	☺	-	-	☺	-	☺	☺
ICT in waste management	-	-	-	-	-	-	☺
Intelligent transport systems	☹	☹	☺	☹	-	☹	-
ICT in energy supply	-	-	-	😐	☺	☺	-
ICT in facility mgmt.	-	-	-	☺	-	☺	-
ICT in production process mgmt.	☺	-	-	☺	-	☺	☺
Mobile ICT time utilisation effect	-	☹	☺	😐	-	😐	-

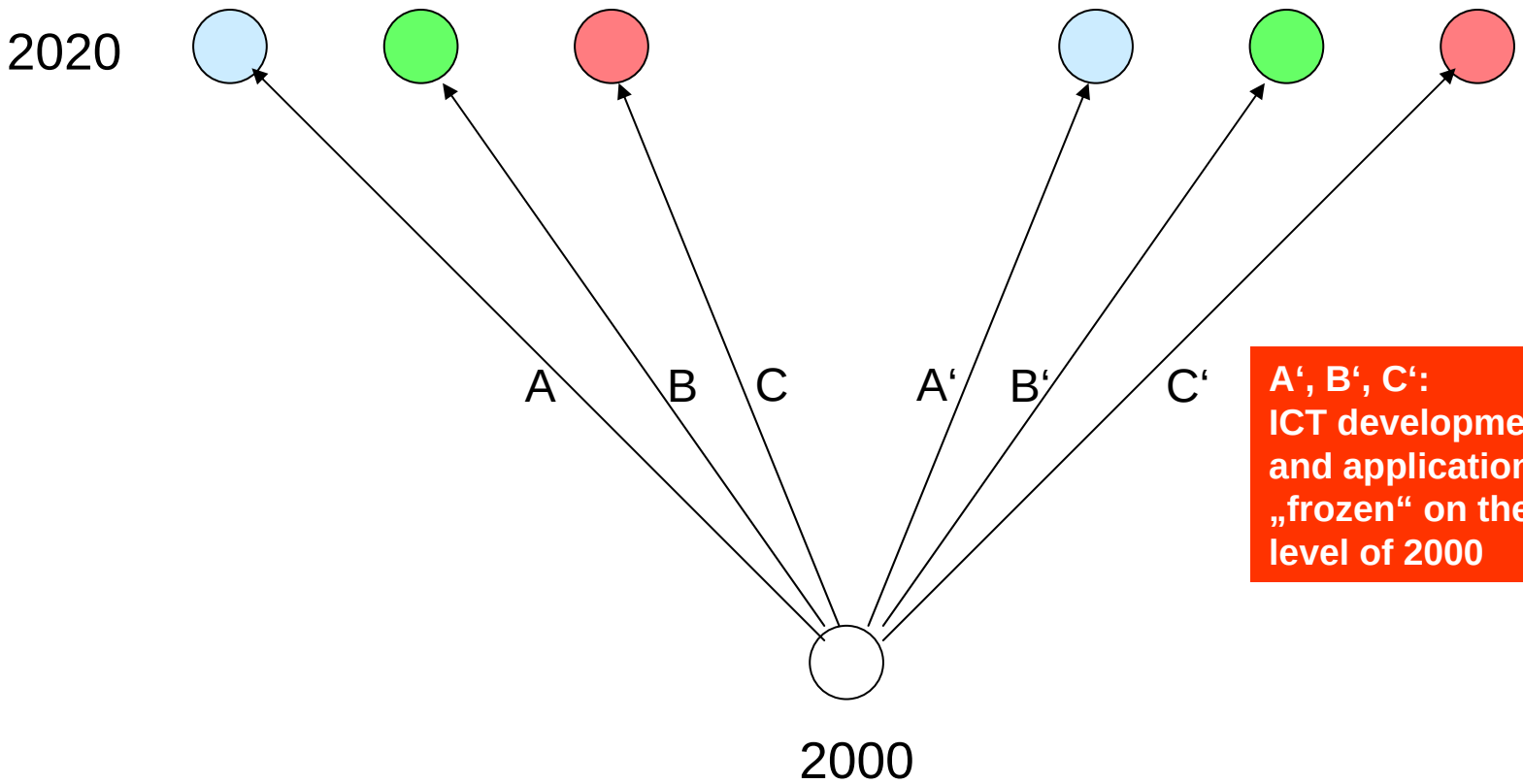
Simulation experiments

Scenarios



Simulation experiments

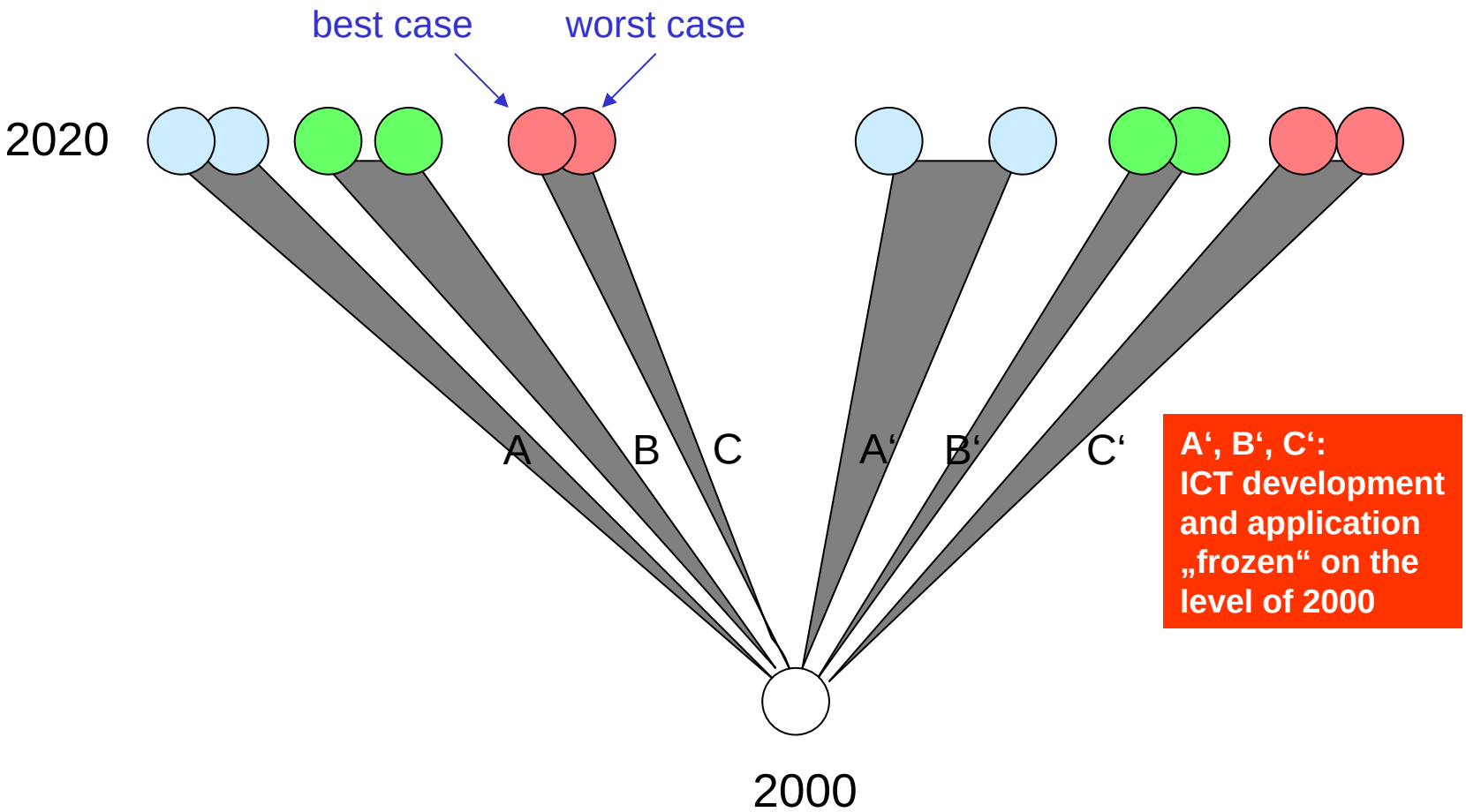
Scenarios and ICT impact



A‘, B‘, C‘: ICT development and application „frozen“ on the level of 2000

Simulation experiments

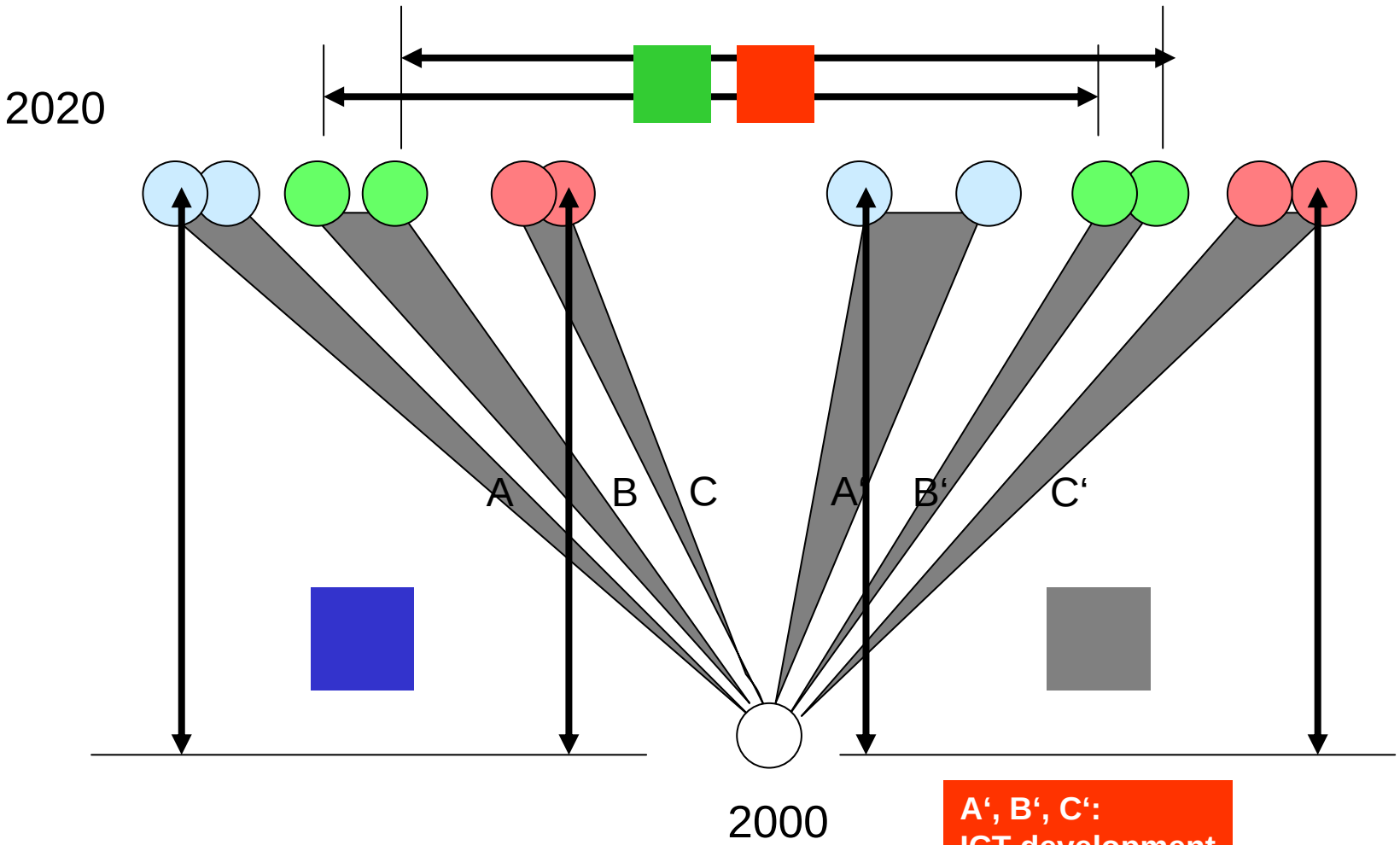
Scenarios, ICT impact and parameter uncertainty



A‘, B‘, C‘: ICT development and application „frozen“ on the level of 2000

Simulation experiments

Colors that will be used for indicating differences in the following charts



A‘, B‘, C‘: ICT development and application „frozen“ on the level of 2000

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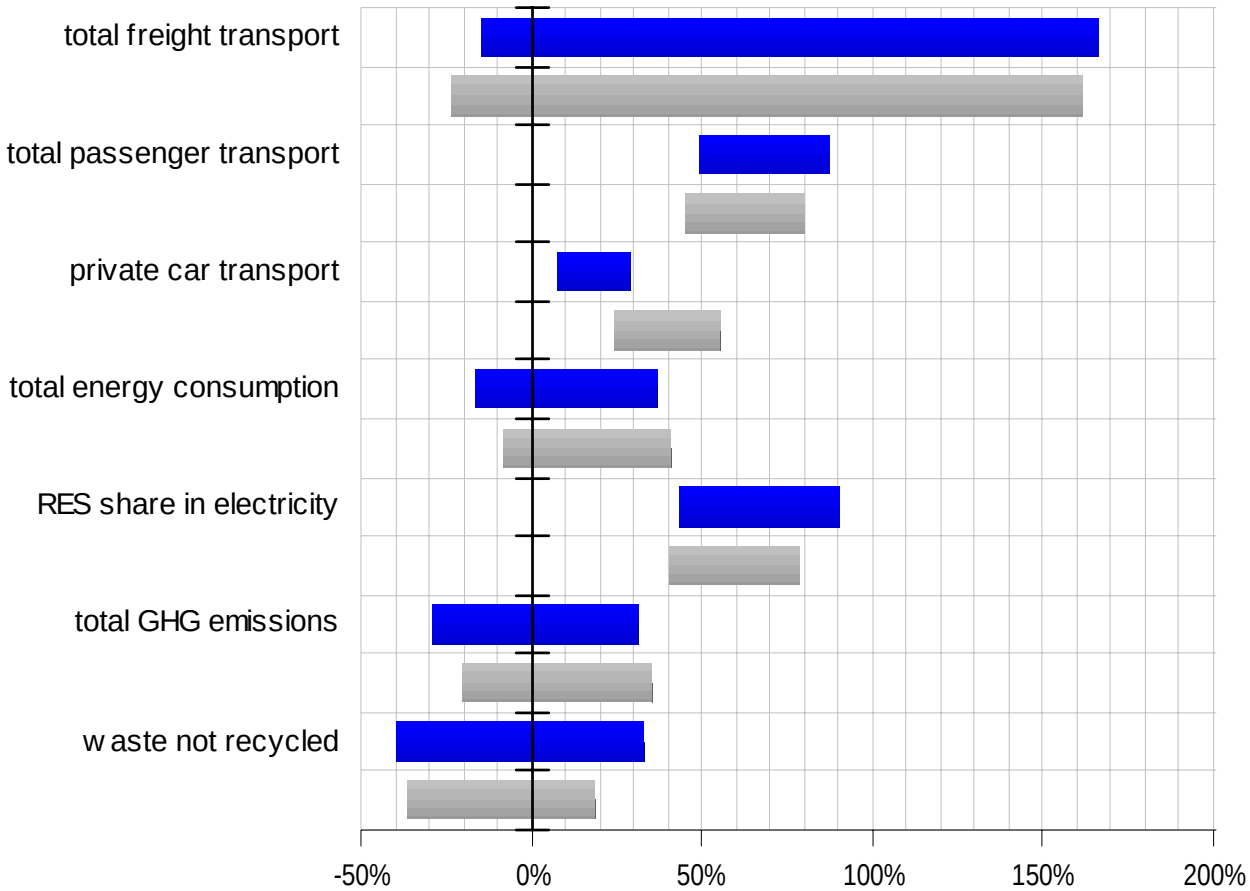
Simulated development of environmental indicators



Simulation experiments

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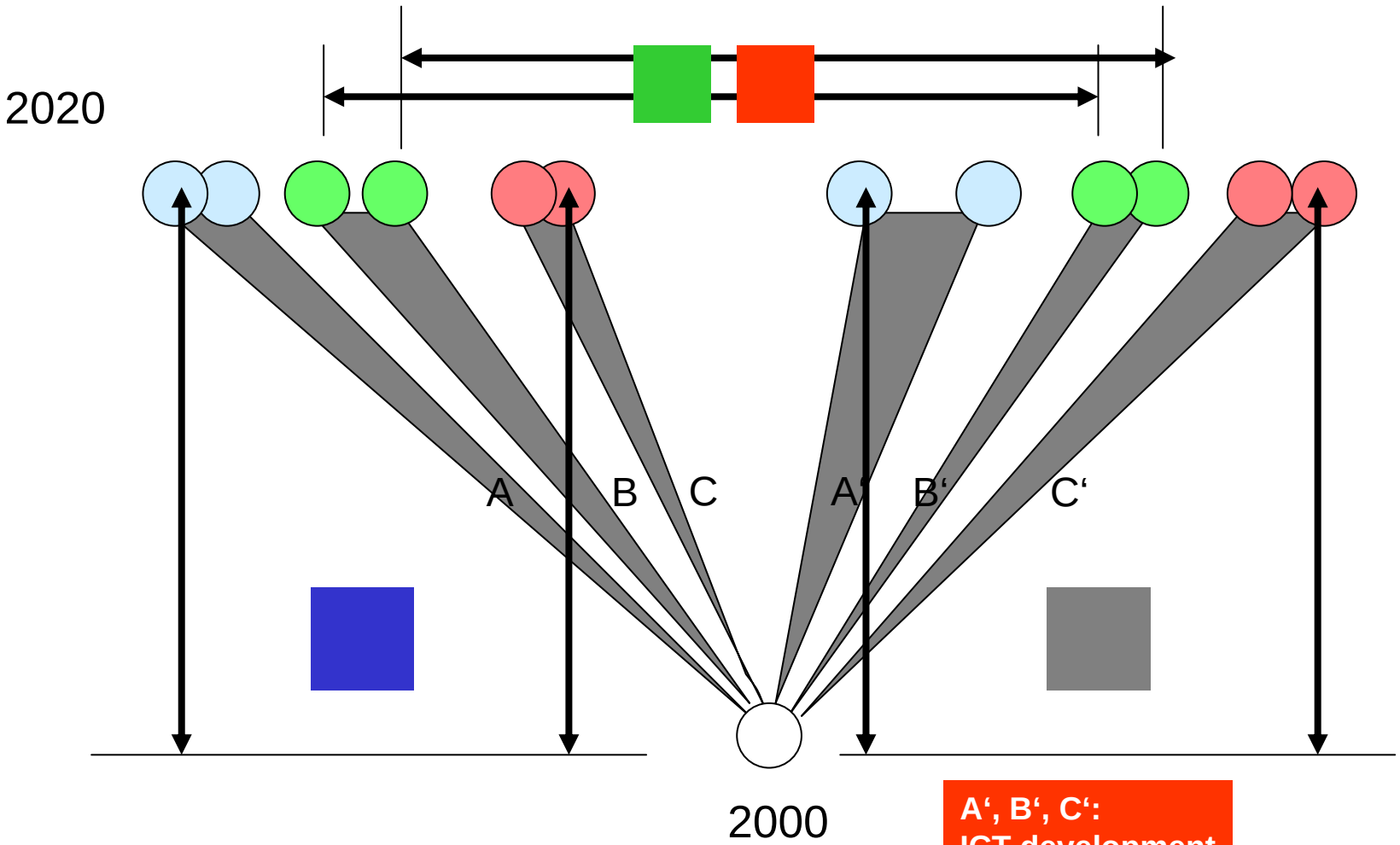

A‘, B‘, C‘: ICT development and application „frozen“ on the level of 2000

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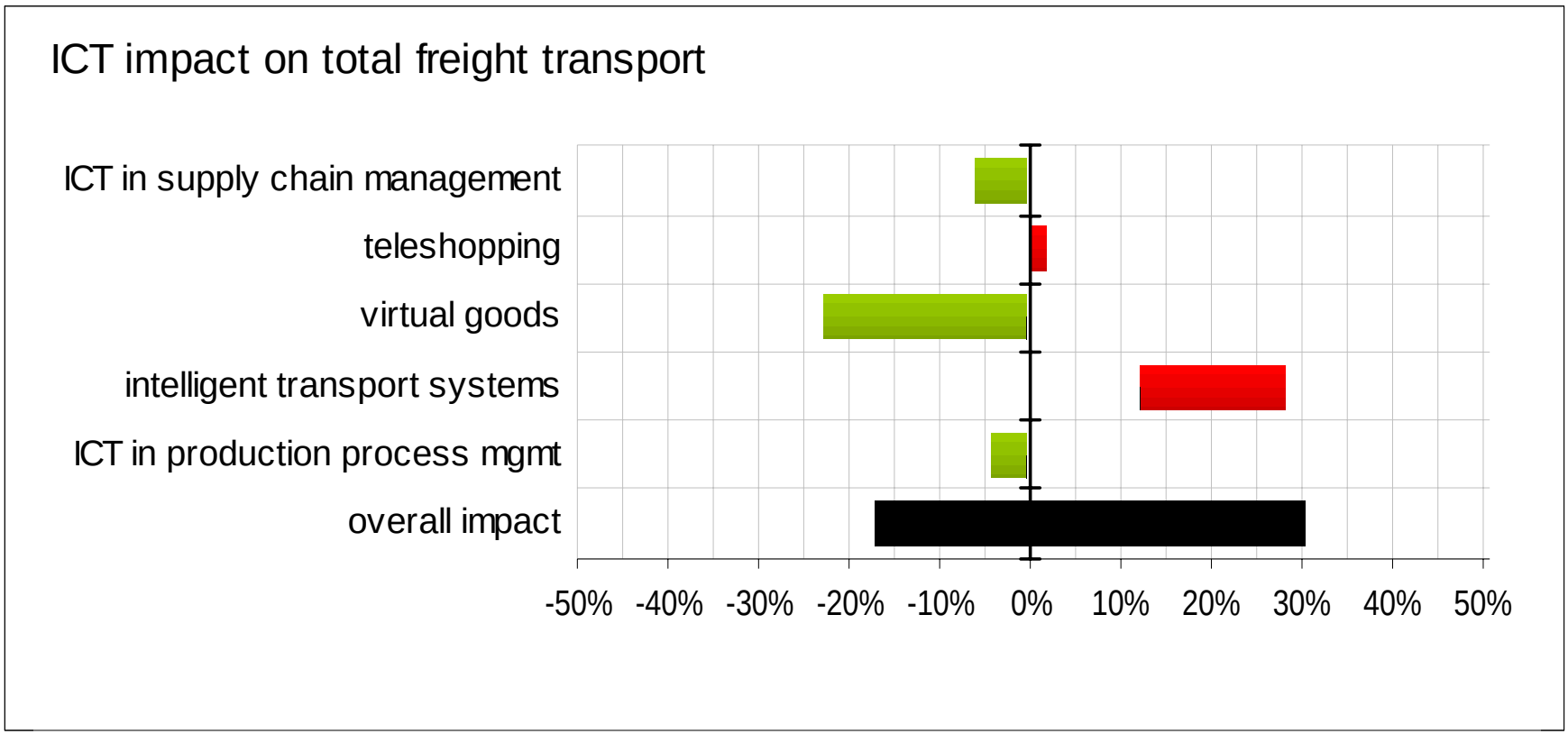
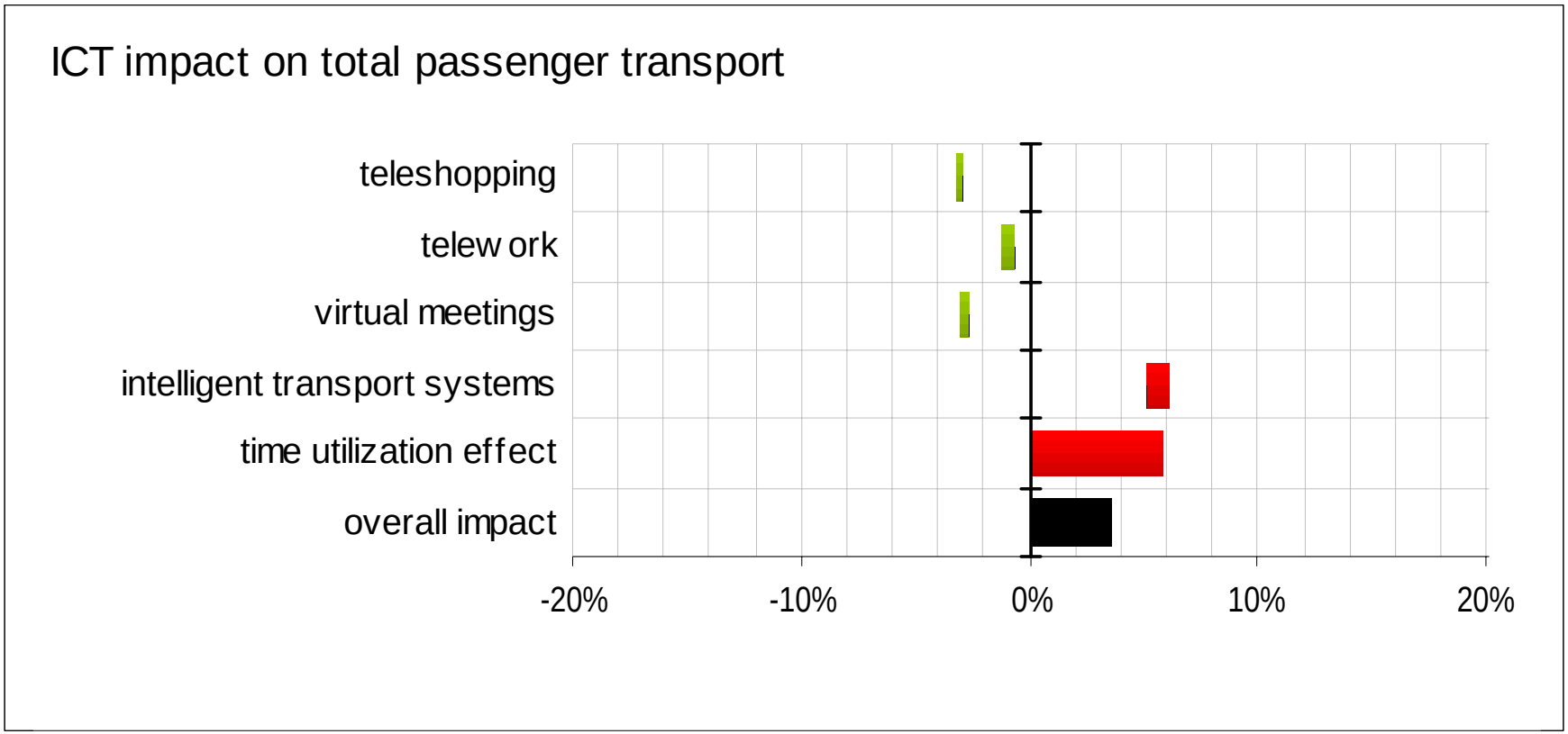
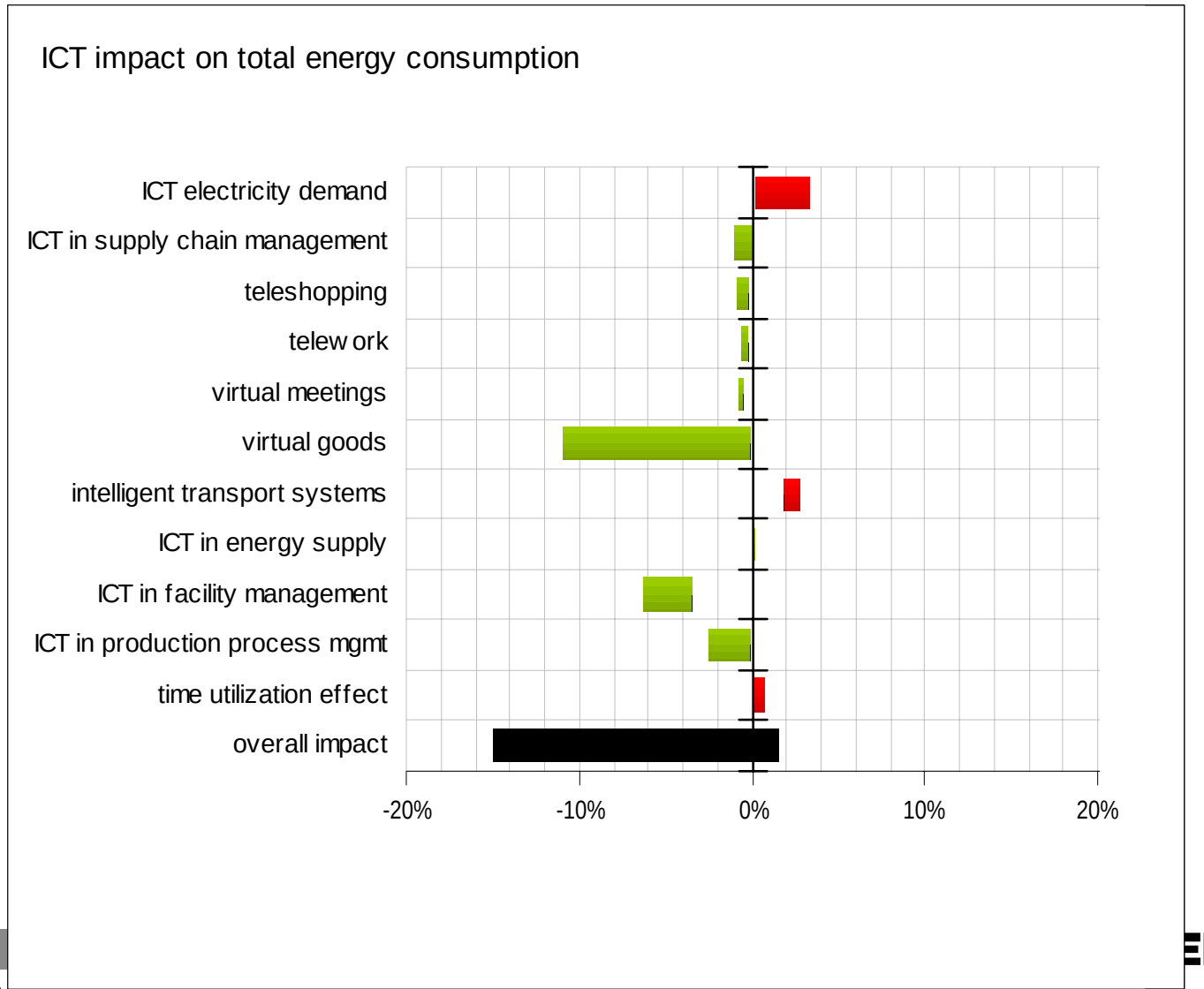
Impact of ICT on freight transport



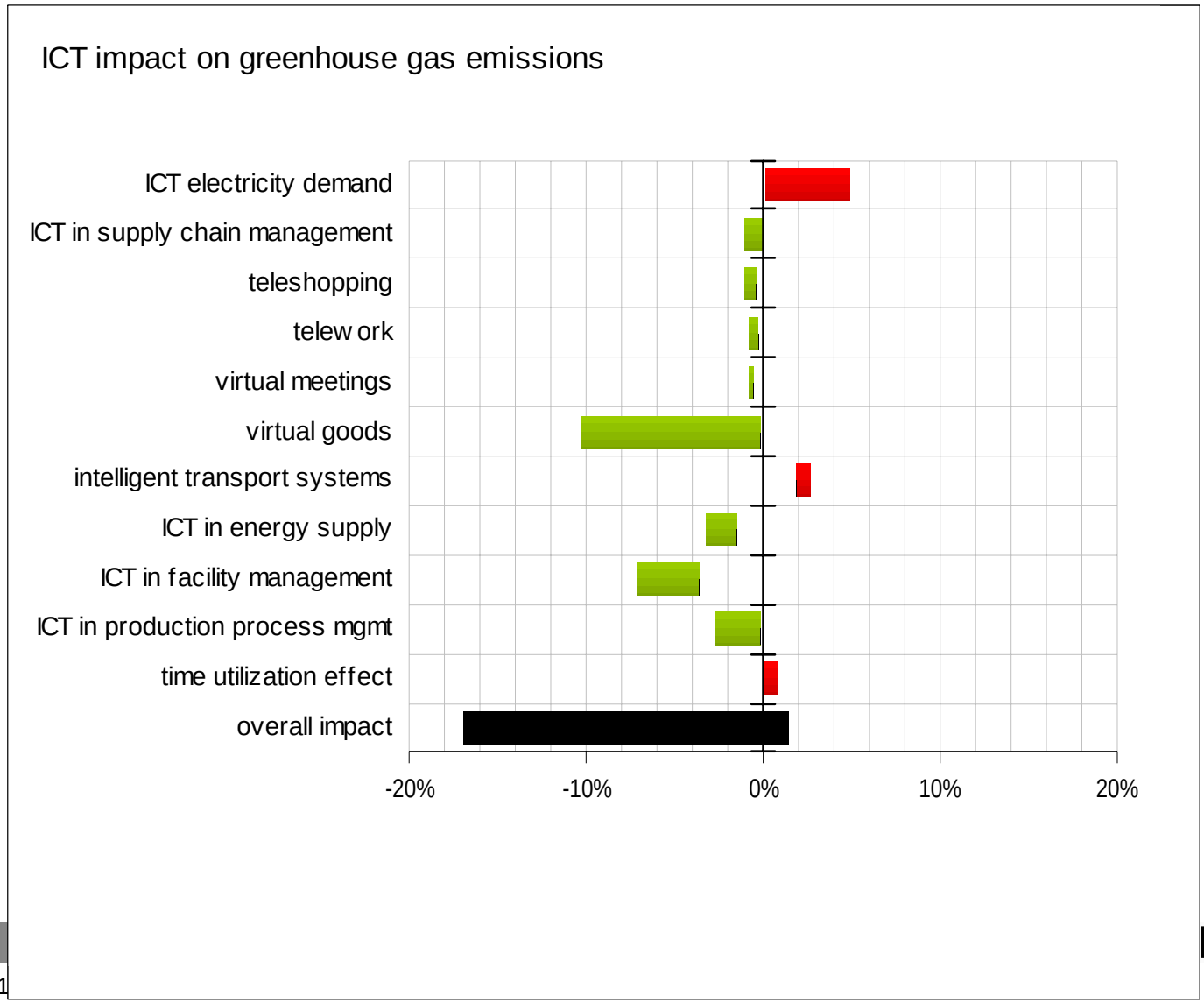
Impact of ICT on passenger transport



Impact of ICT on energy consumption



Impact of ICT on greenhous gases



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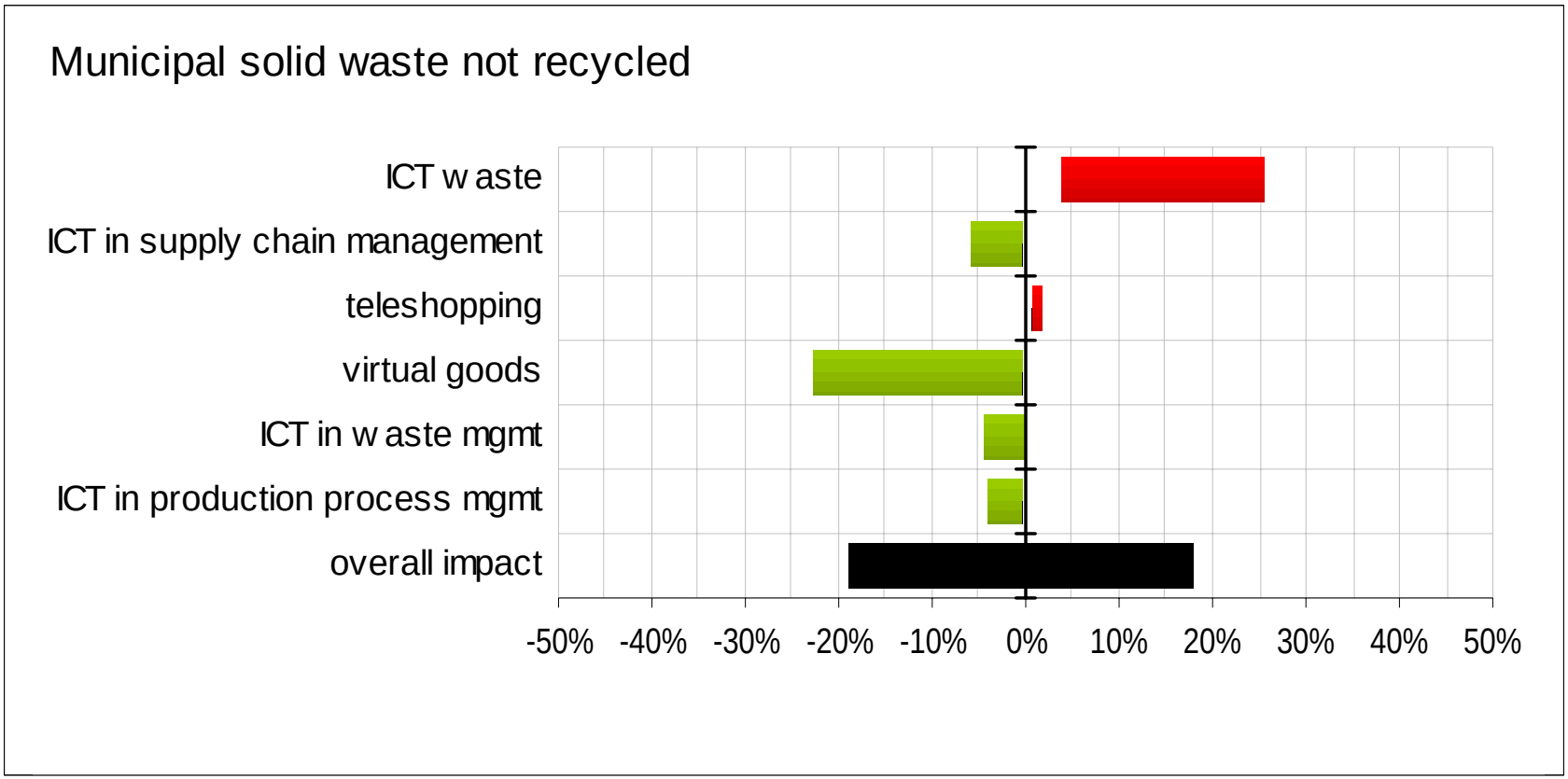
Impact of ICT on municipal waste



More results

Interim reports 1-6 and synthesis report will available **in May** at:

www.jrc.es

You can also check the News page on the homepage of the “Technology and Society Lab at EMPA”

www.empa.ch/tsl