



A Good Disruption – Redefining growth in the 21st century

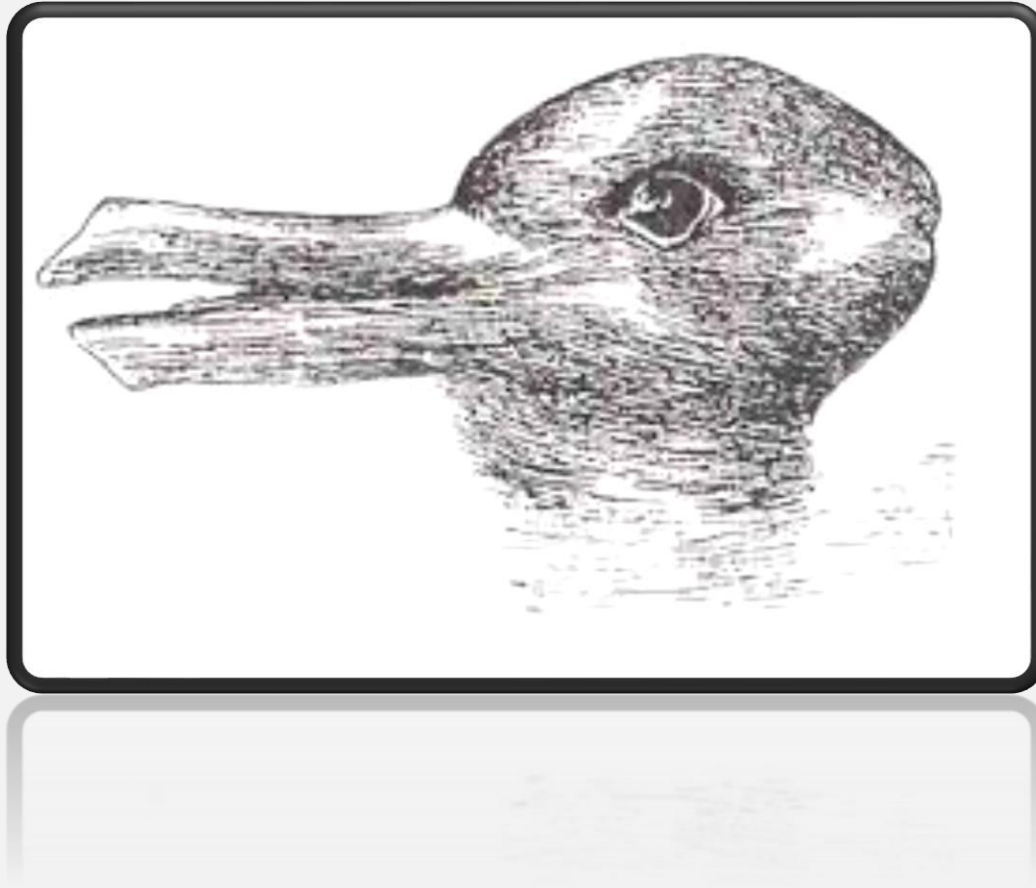
MÜNCHNER FINANCE FORUM E.V.

14. JAHRESTAGUNG DES MÜNCHNER FINANCE FORUM E.V. –
„DIGITALE TRANSFORMATION: NEUE GESCHÄFTSMODELLE IN DER
FINANZINDUSTRIE?“

Prof. Dr. Martin R. Stuchtey
AudiMax, TU München, September 18th 2018

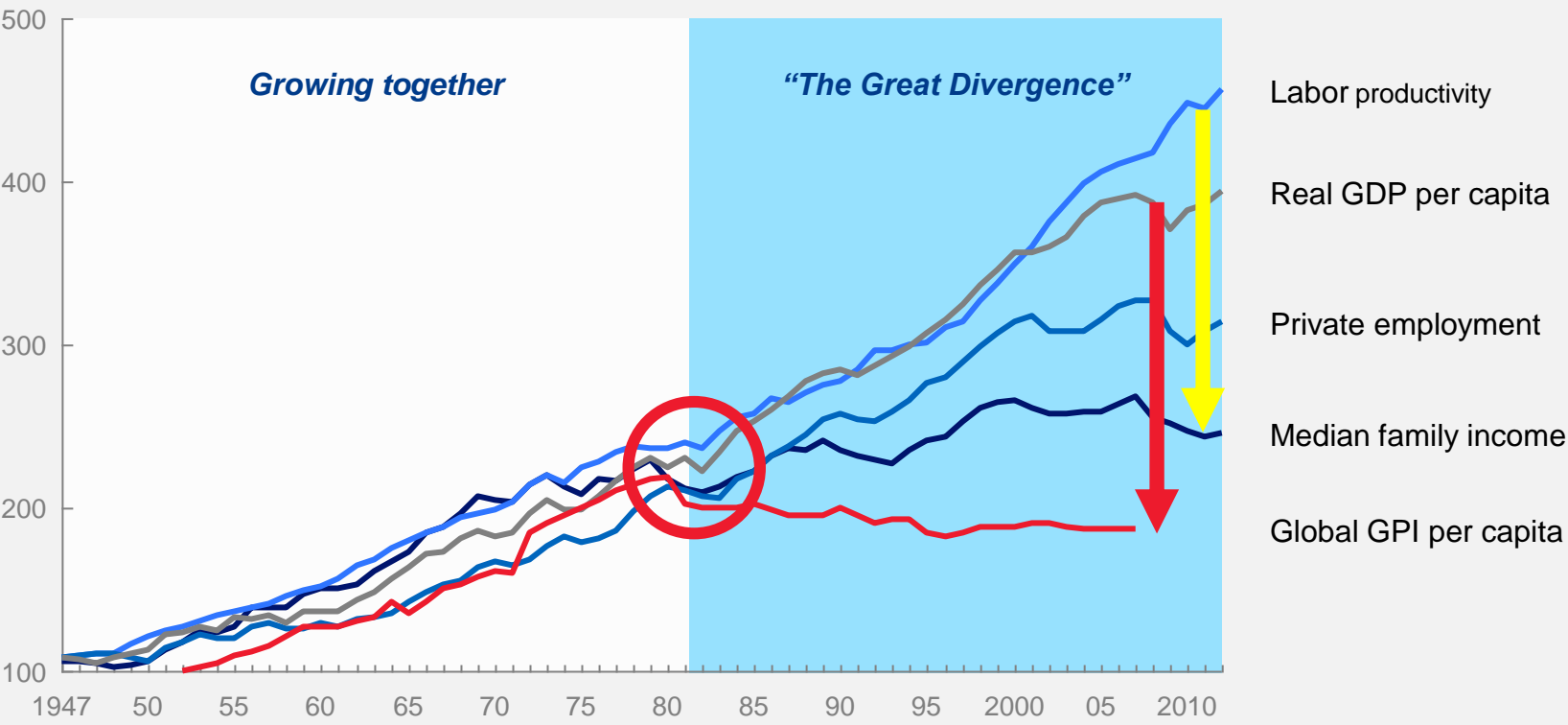
S Y S T E M I Q

Congruence, anomaly, or new paradigm?



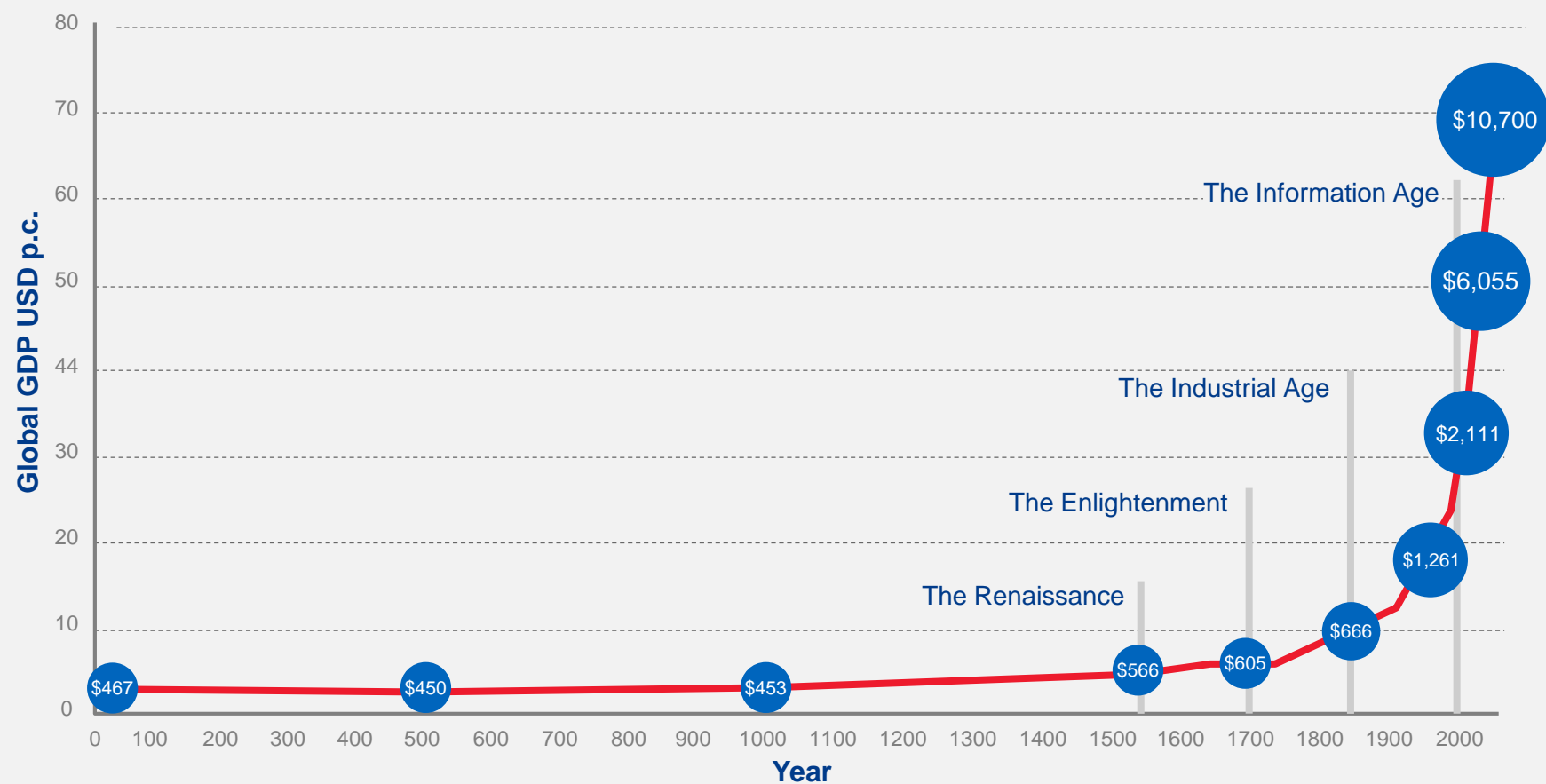
We are seeing a “great divergence”

U.S. labor productivity, GDP per capita, employment, median income, and Global GPI per capita
Indexed to 1947



SOURCE: Stuchtey, et al (2015), Federal Reserve Bank of St. Louis, Brynjolfsson and McAfee , Kubiszewski et al. (2013)

A global Wirtschaftswunder



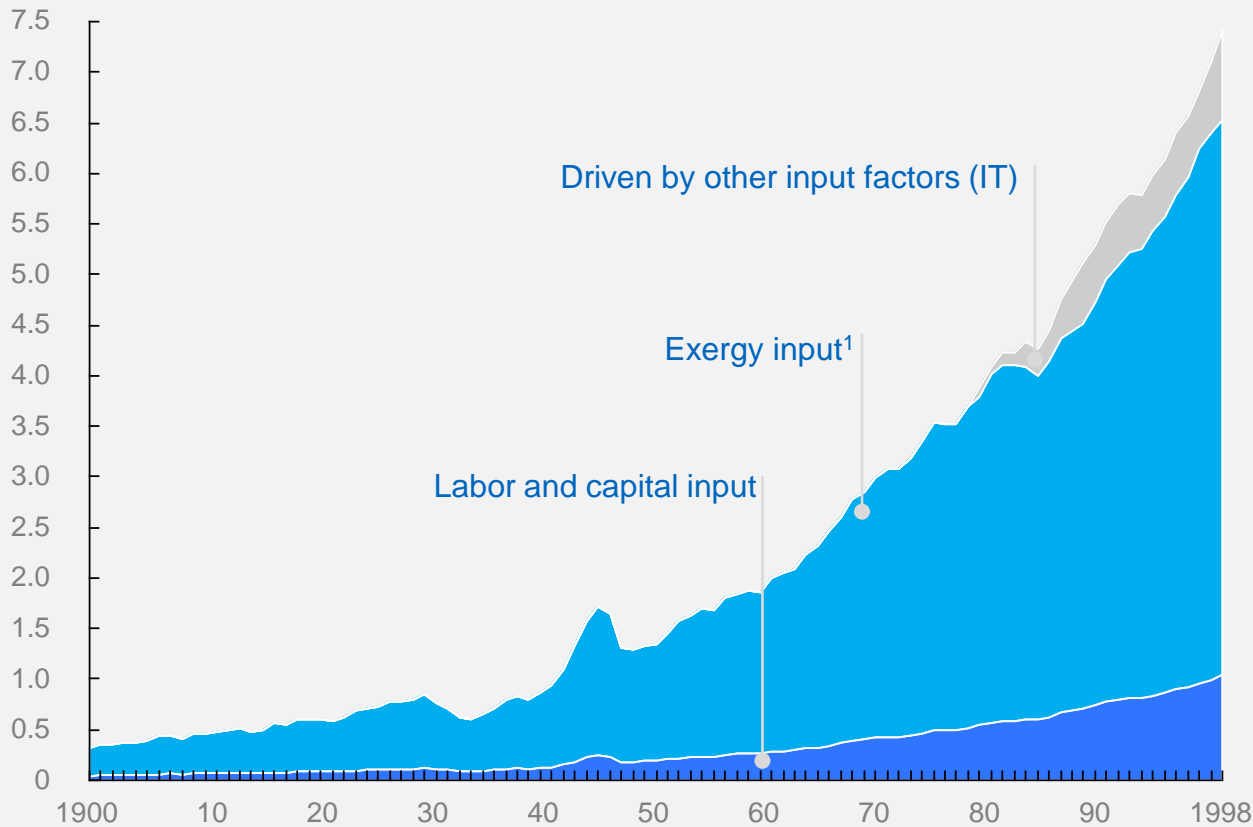
Resources – the missing link in Solow’s puzzle

Example US, year 1900-2000

US economy

US GDP

Trillion 1990 International Geary-Khamis dollars



Average share

1900-1984

1985-1998

~0%

~10%

~85%

~75%

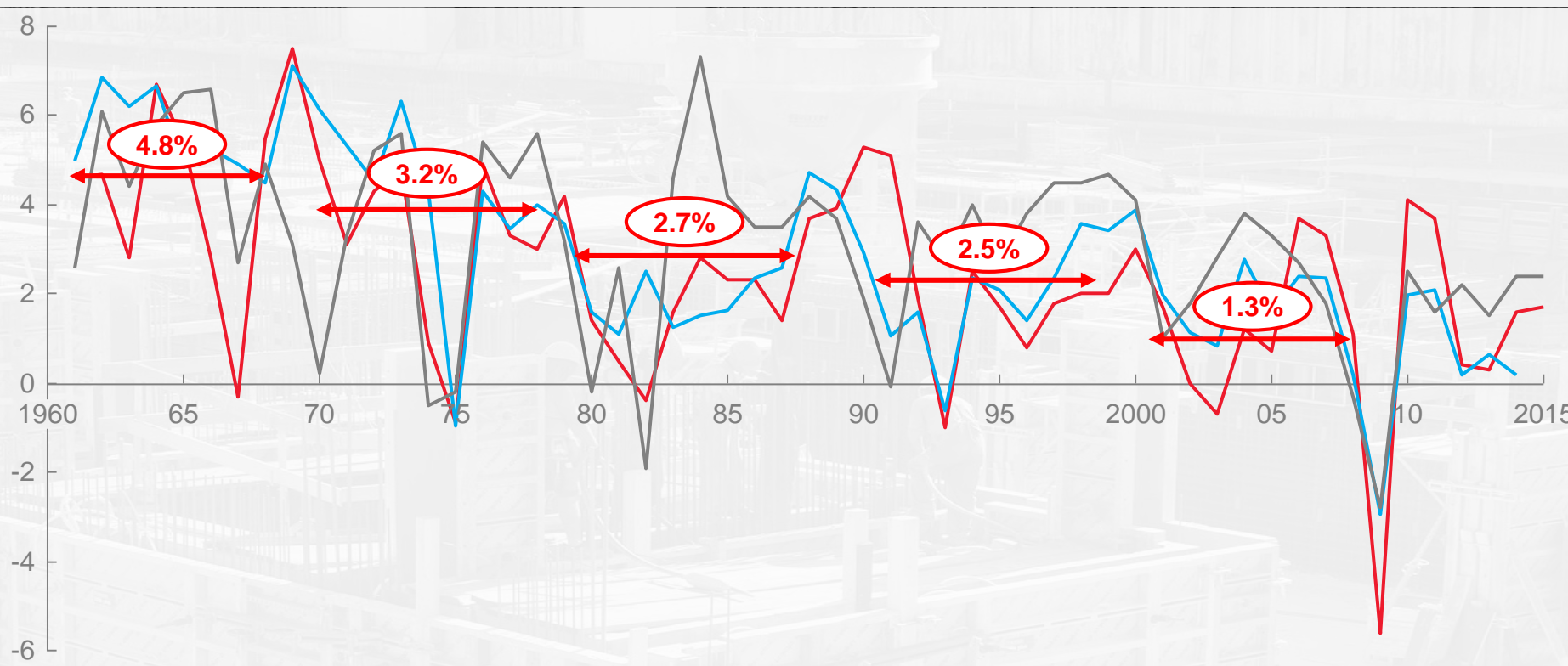
~15%

~15%

1 Is defined as available energy and includes: fossil fuels, phytomass, mineral and metals, renewables, other

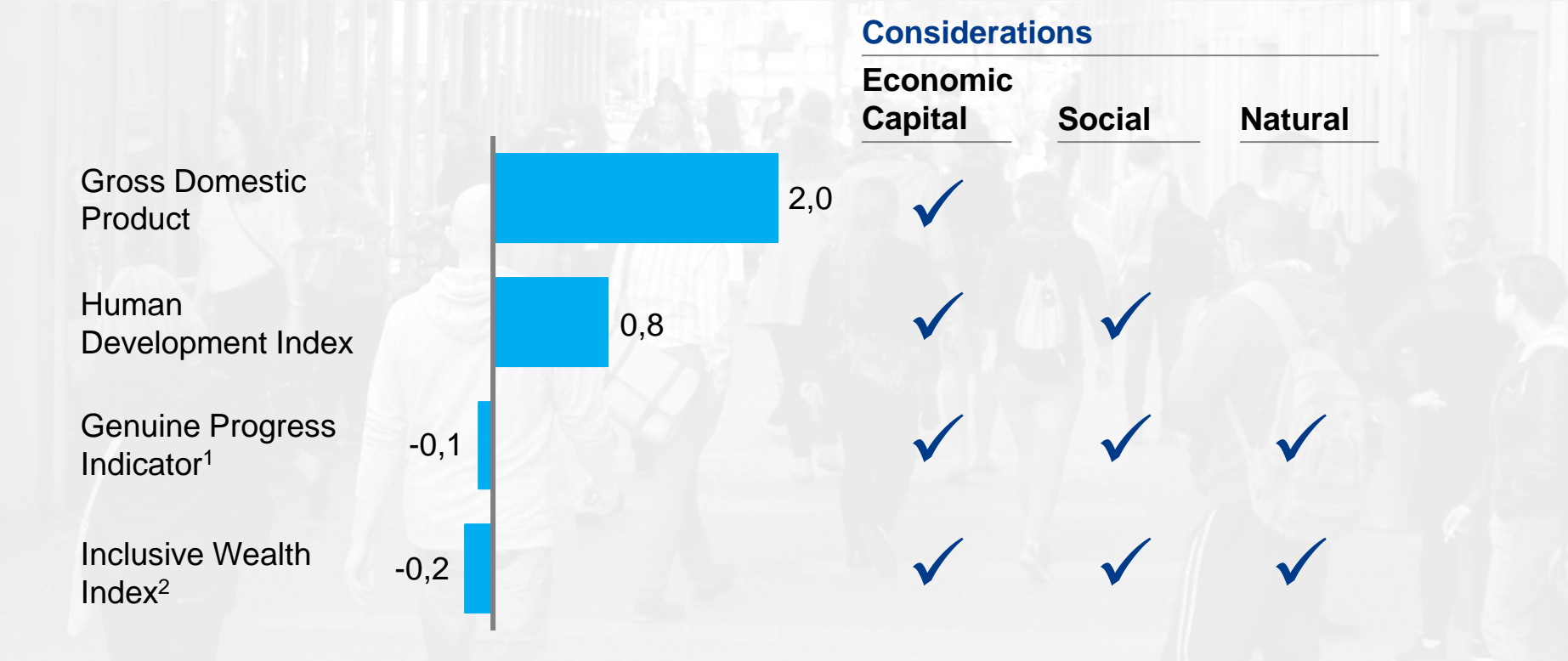
Annual GDP Growth rates in Germany, France, and the USA

- Germany
- France
- USA



Measures of societal development that include natural capital depletion grow much slower than GDP

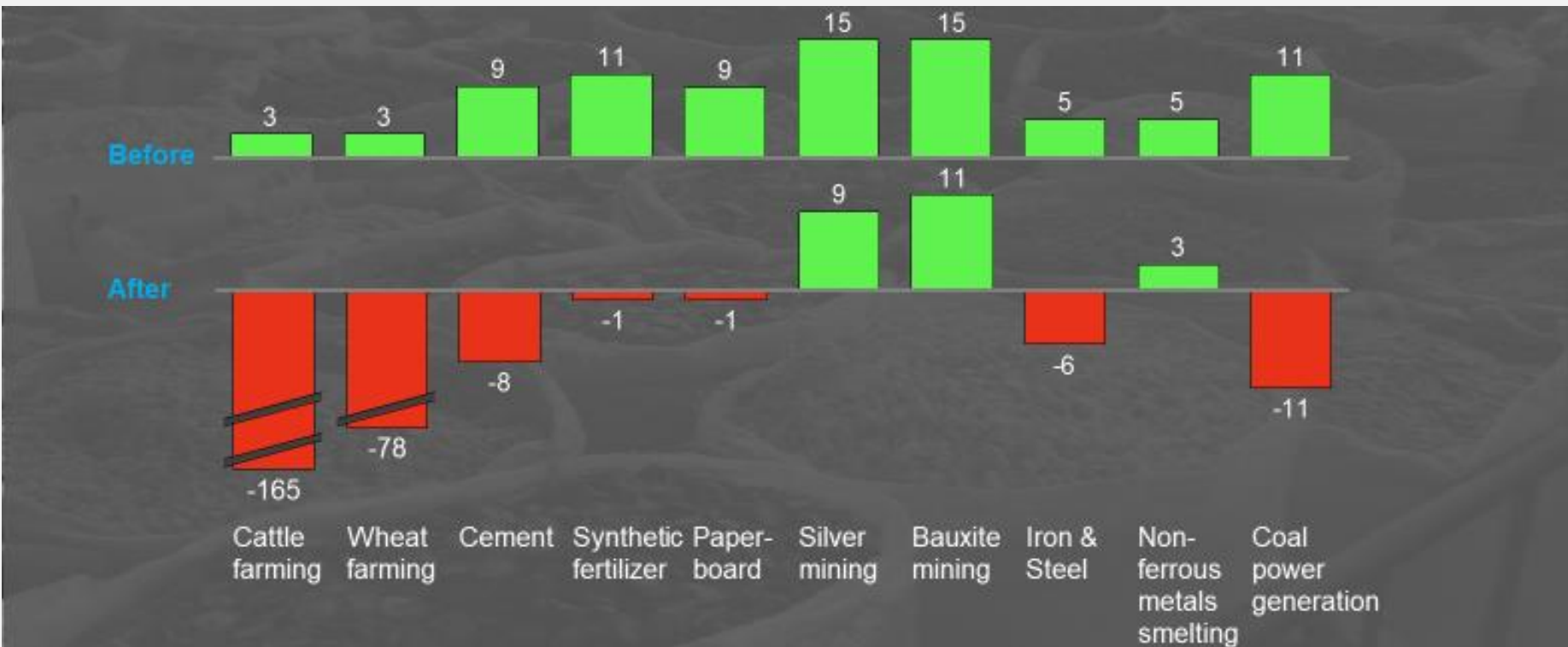
Progress per capita³, globally, 1990-2010, real terms



1 1990-2005, as later data not available globally,
2 IWI exists in two versions, one unadjusted, and one where adjustments are made for environmental damage, oil capital gains, and total factor productivity. The adjusted version is shown here,
3 Global population growth was 1.6 percent per year during the period

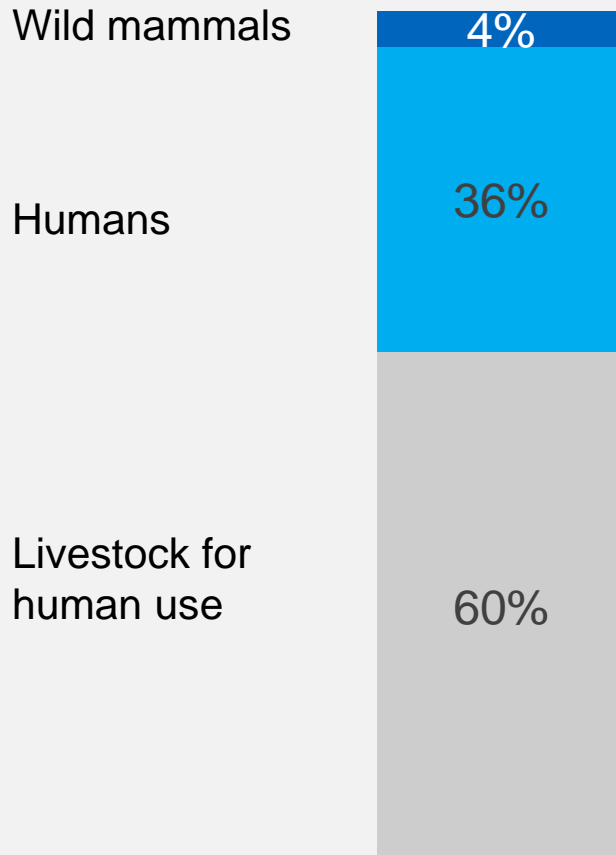
Paradigm shift: Most of the world's resource-using industries are negative

Profit margin (EBIT) before and after natural capital costs, based on top-2 companies in each Morgan Stanley Composite Index category, Percent, 2012



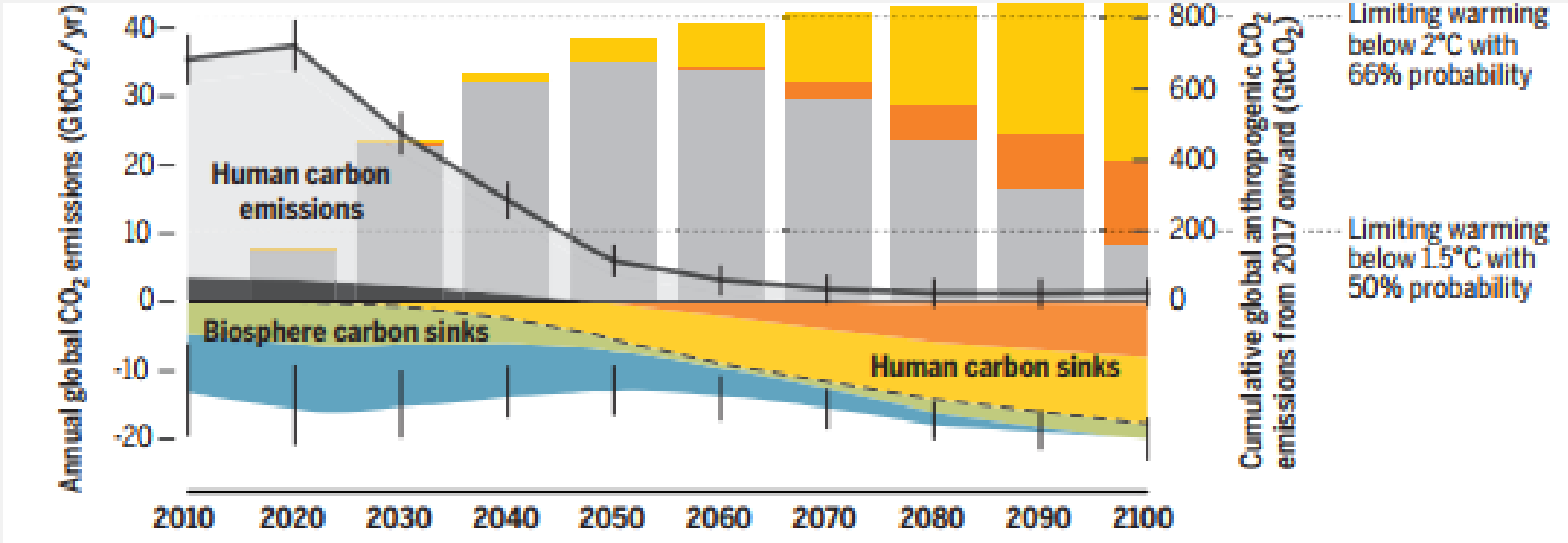
Paradigm shift: Wild vertebrates are the reduced to 3%

Biomass weight of vertebrate population 2016



- Mass of humans and livestock **23 times** that of wild mammals
- Livestock outweighs wild mammals and birds by **factor 11**
- Biomass of wild marine/ terrestrial mammals reduced **six times**
- Wild plant biomass reduced by **half**
- Cows are the world **key predator**: 90% of small fish catch is ground up for animal feed

Paradigm shift: 15 GT CO2 removal required to stay on Paris track



Anthropogenic CO₂ emissions (gross)

- Fossil fuel and industry
- Land use and land-use change

Anthropogenic CO₂ removals

- Land use and land-use change
- Engineering CO₂ sink (BECCS)

Biosphere carbon sink

- Land carbon sink
- Ocean carbon sink

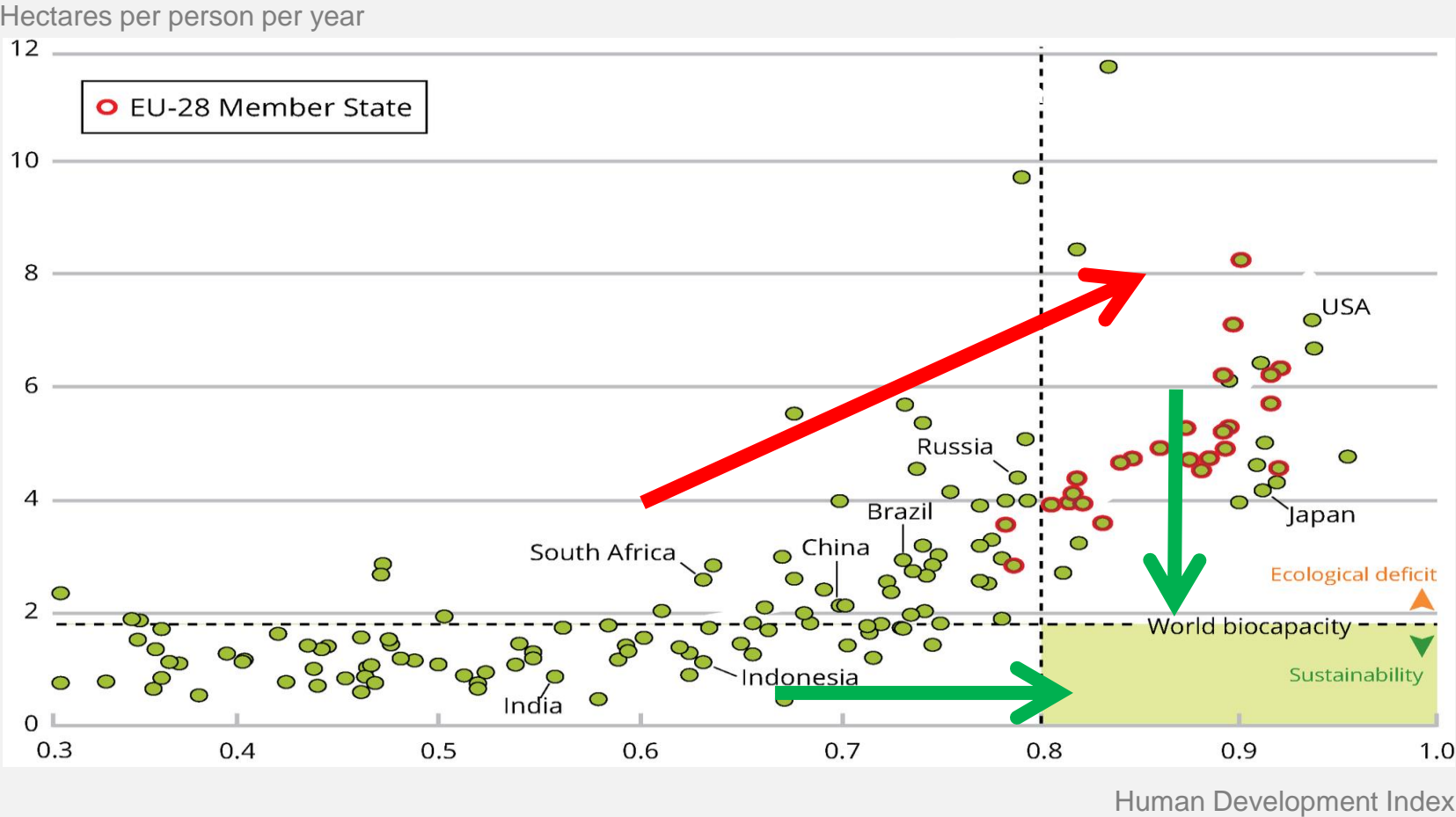
Whiskers on total natural sinks:
the 90% range of
modeled uncertainties.

Paradigm shift: 1 kg of plastic for 1 kg of fish in 2042



Bali West Coast

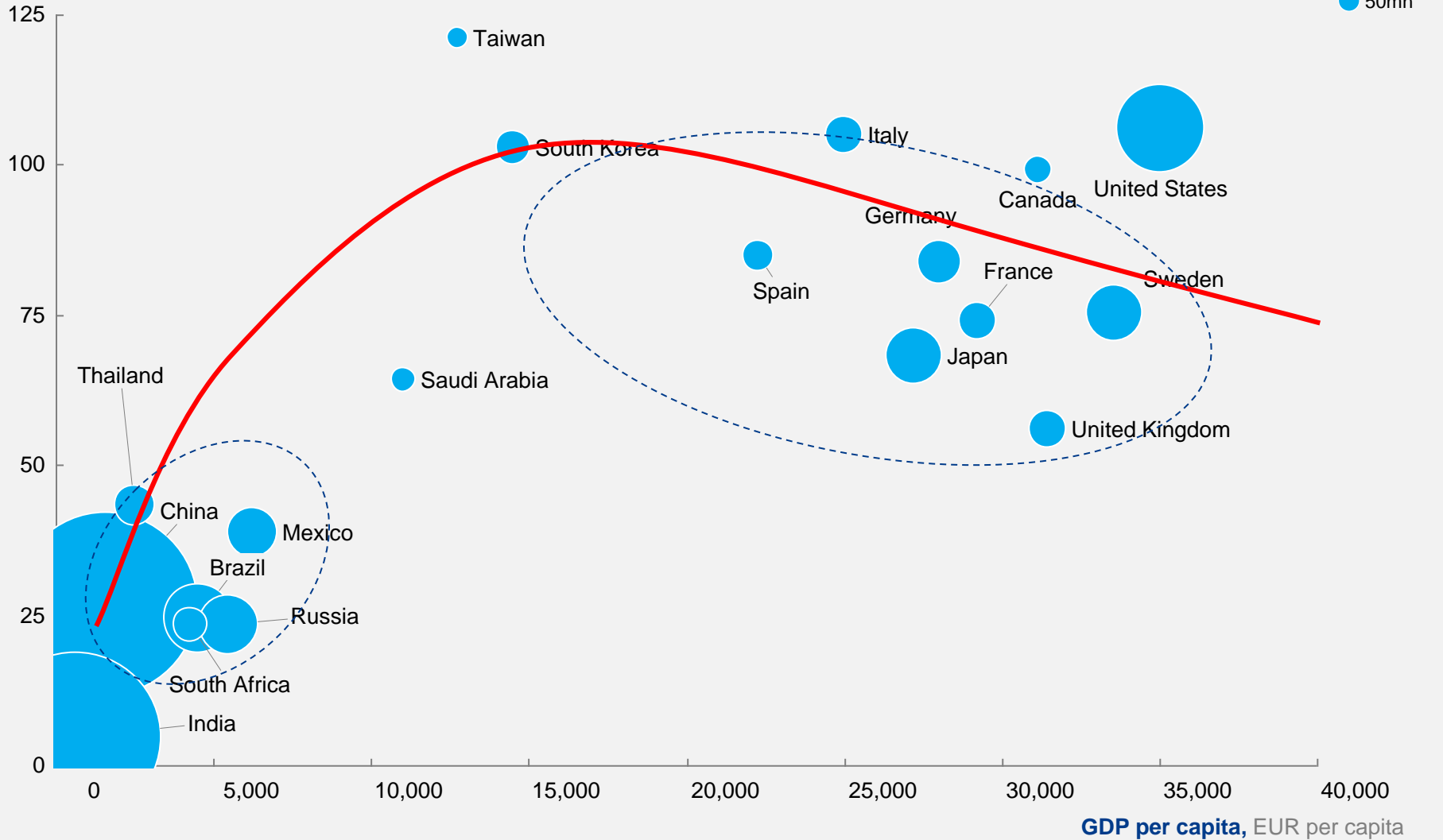
Our future operating space – uncharted



Waiting for Kuznets – example commodity plastics

COMMODITY PLASTICS

Plastic consumption, Kg per capita



1 Includes EPS, HDPE, LDPE, LLDPE, PET Resins, PP, PS, and PVC

The vision of a decoupled, net positive industry model

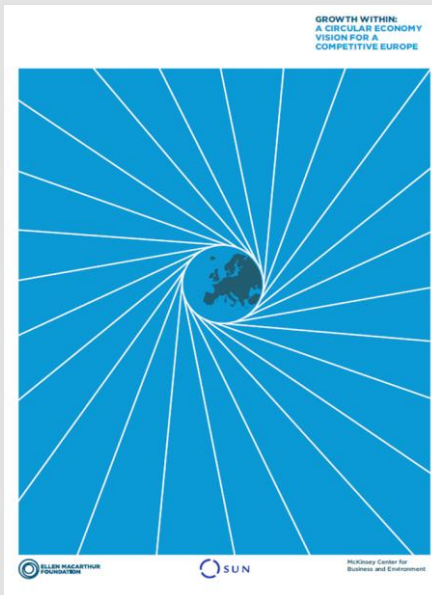


2016, at the European Commission in Brussels



"Circular economy will be a similar mega trend in economy as globalisation. I'm convinced that the circular economy can enable a triple win: economic, environmental and social."

Jyrki Katainen - EU Vice President Jobs, Growth, Investment and Competitiveness



"I am very impressed by the findings of Growth Within report, looking forward to developing our shared agenda"

Karmenu Vella, EU Commissioner Environment, Maritime Affairs and Fisheries

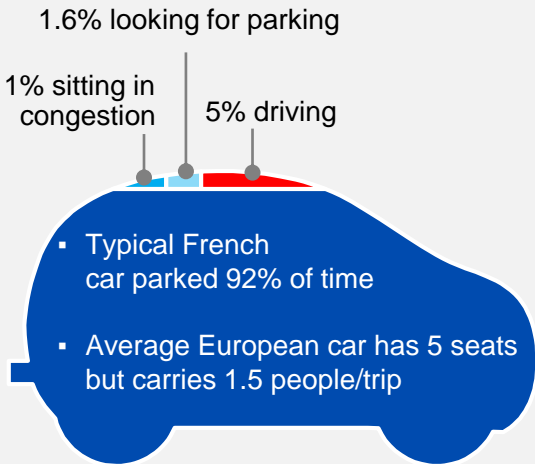


"I passionately believe in the opportunities of the circular economy. The future is not making things with finite components."

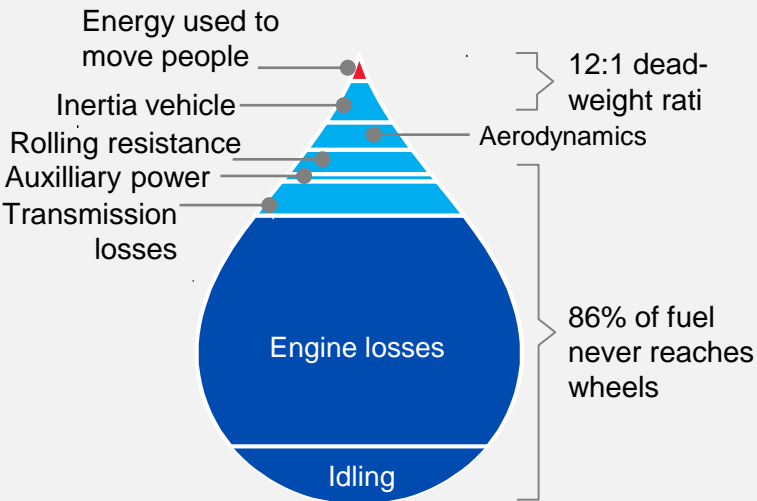
Frans Timmermans, EU Commission First Vice President

Major structural waste in the mobility system

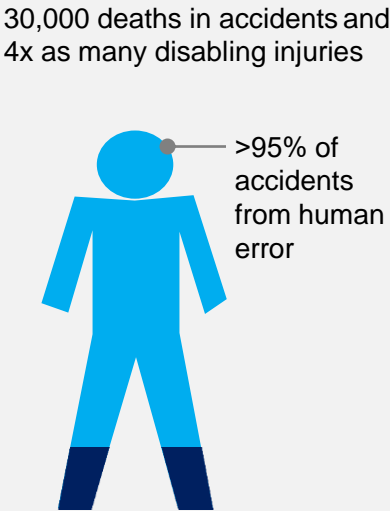
Car utilisation



Tank-to-wheel energy flow - gasoline



Deaths and injuries/year on road

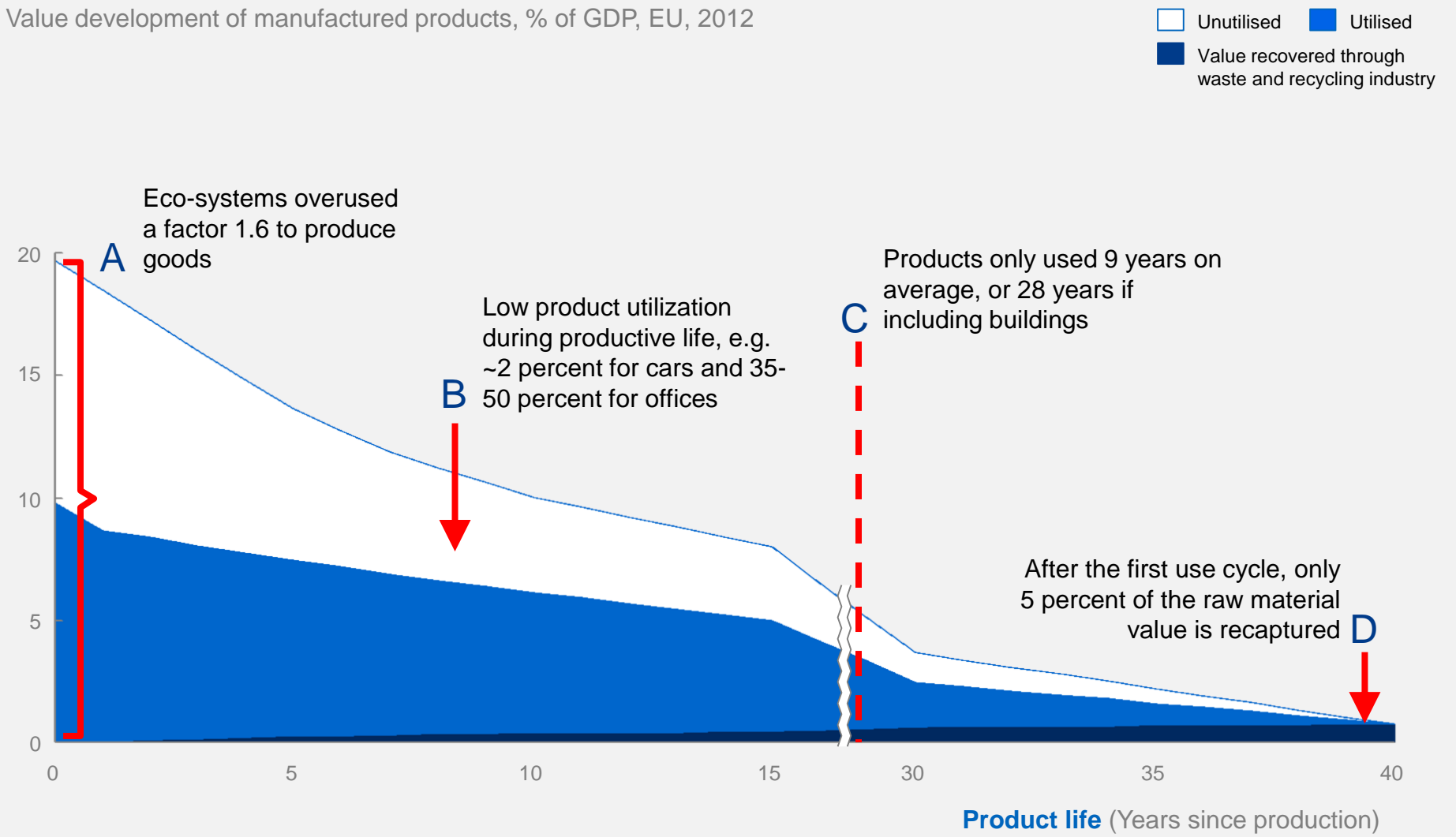


Land utilisation

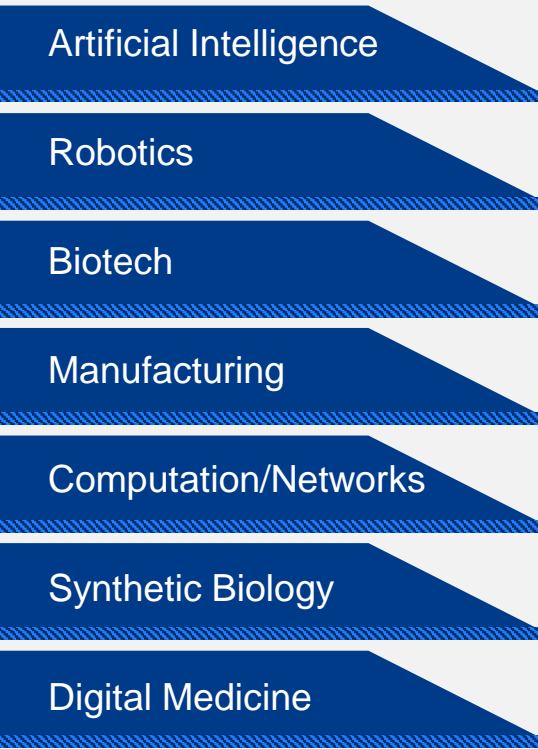
- Road reaches peak throughput only 5% of time and only 10% covered with cars then
- 50% of most city land dedicated to streets and roads, parking, service stations, driveways, signals, and traffic signs

Waste, waste, everywhere – example Europe

Value development of manufactured products, % of GDP, EU, 2012



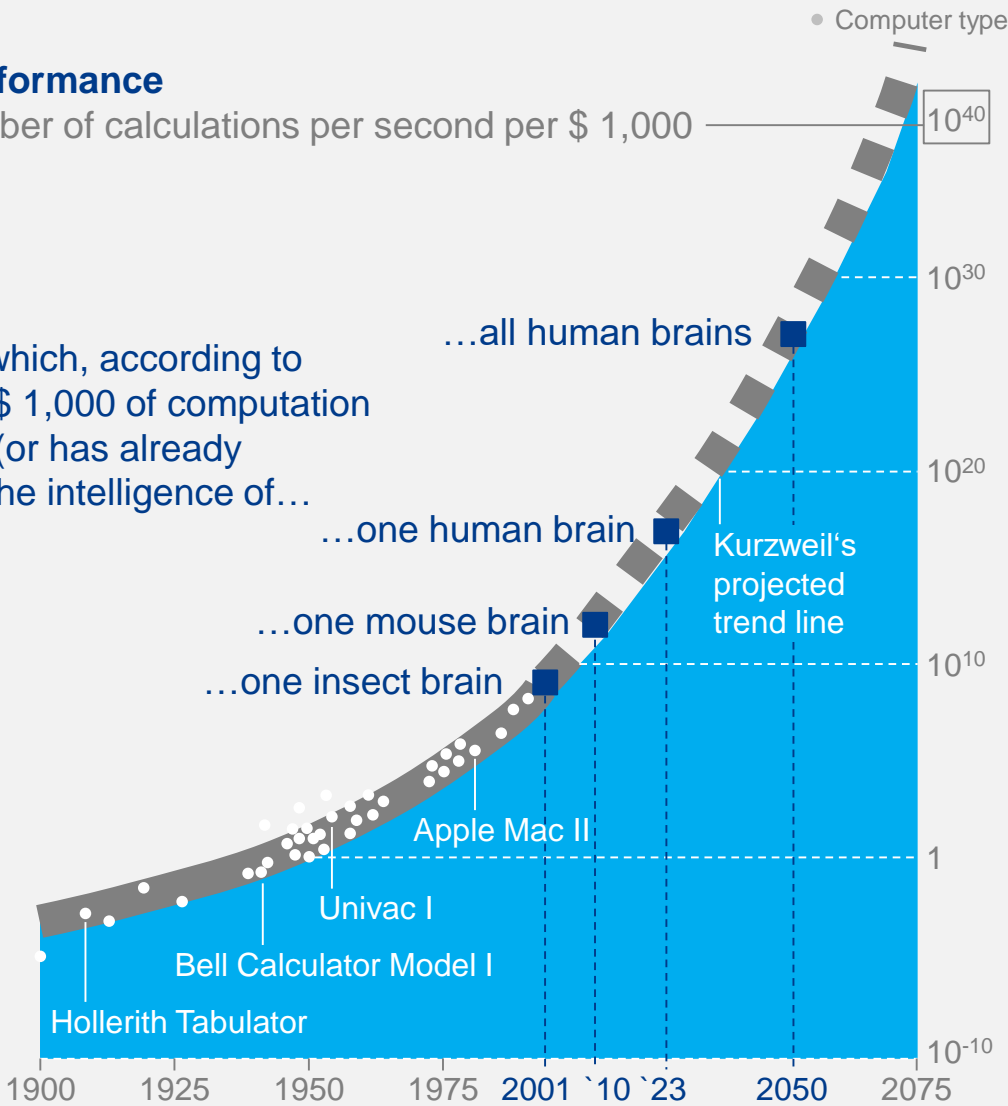
Entering, exponential technology



Computer performance

Plotted by number of calculations per second per \$ 1,000

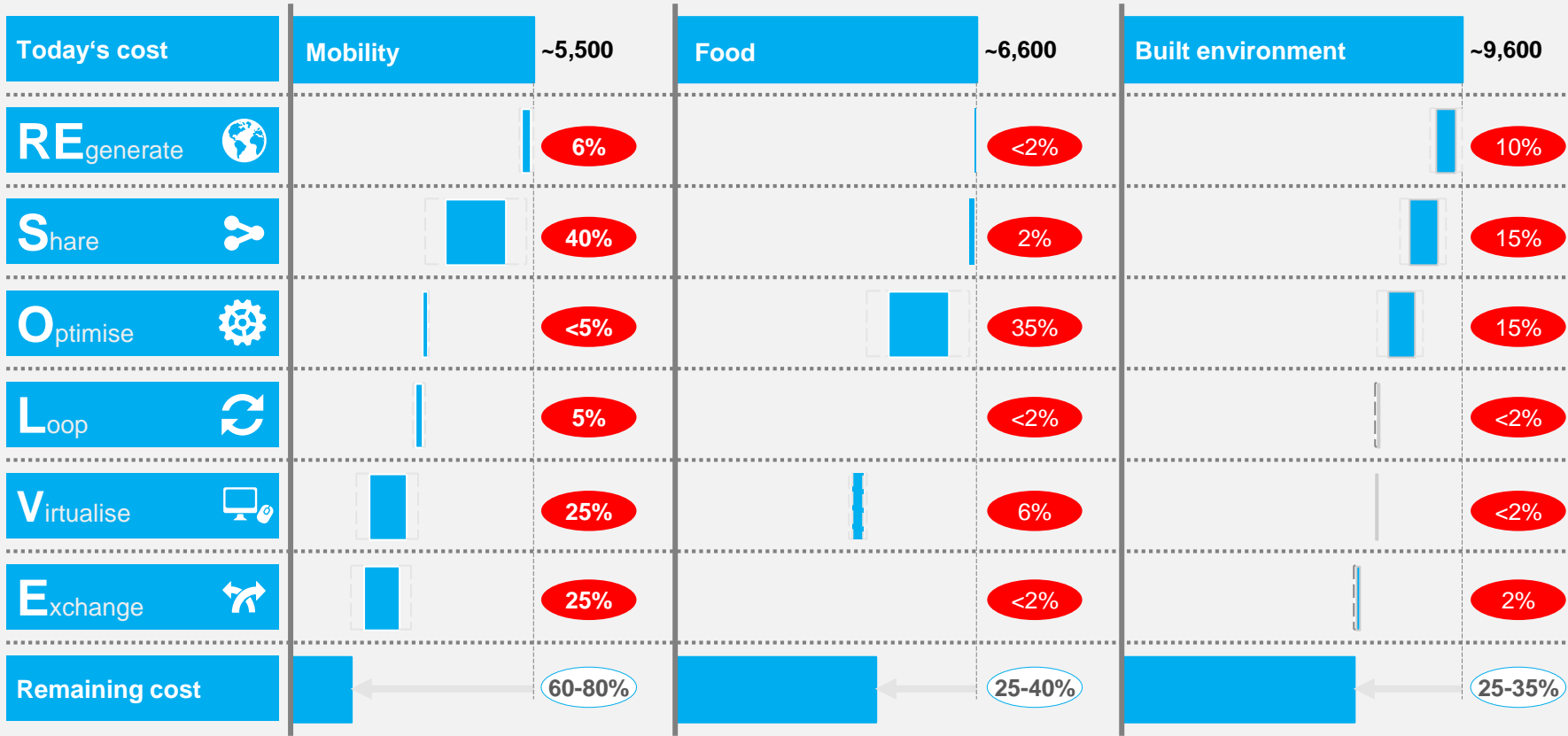
Years by which, according to Kurzweil, \$ 1,000 of computation will equal (or has already equaled) the intelligence of...



Cost-reduction potential in the three real life systems

Total annual cash-out costs per household; EU average 2012, EUR
Improvement potential for 2050

X Total savings



ReSOLVE – a menu of business actions for a better economy

Examples

REgenerate



- Shift to renewable energy and materials
- Reclaim, retain, and restore health of ecosystems
- Return recovered biological resources to the biosphere

NESPRESSO

SLM



Share



- Share assets (e.g. cars, rooms, appliances)
- Reuse/secondhand
- Prolong life through maintenance, design for durability, upgradability, etc.



Optimise



- Increase performance/efficiency of product
- Remove waste in production and supply chain
- Leverage big data, automation, remote sensing and steering



Loop



- Remanufacture products or components
- Recycle materials
- Digest anaerobic
- Extract biochemicals from organic waste



Virtualise



- Books, music, travel, online shopping, autonomous vehicles etc.



Exchange



- Replace old with advanced non-renewable materials
- Apply new technologies (e.g. 3D printing)
- Choose new product/service (e.g. multimodal transport)



In search of a superior design - outline of a circular economy system (75 million downloads)

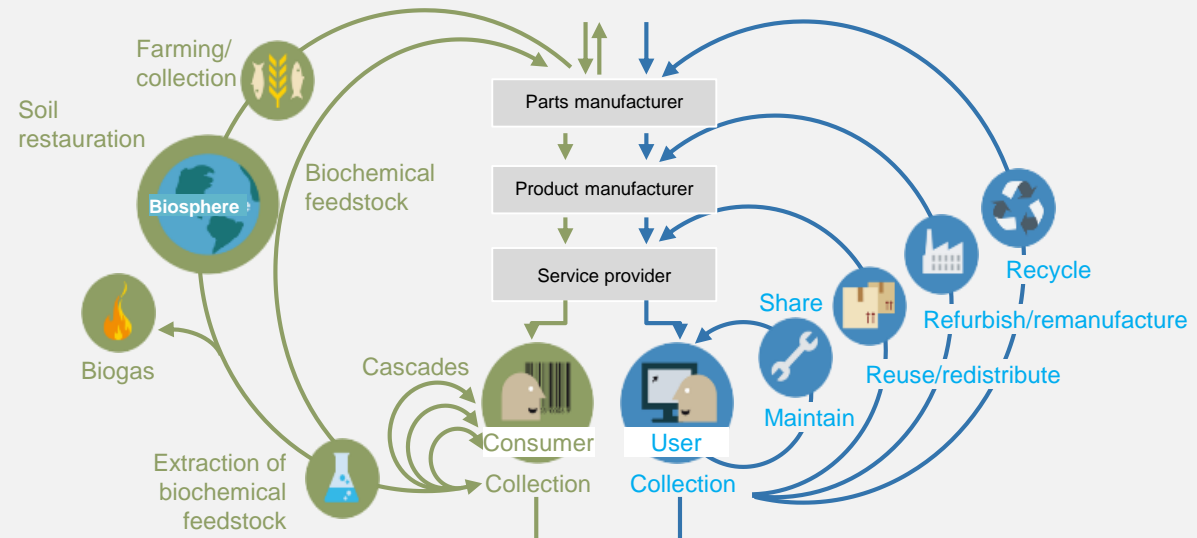
Principle 1

Preserve and enhance natural capital by controlling finite stocks and balancing renewable resource flows



Principle 2

Optimise resource yields by circulating products, components and materials in use at the highest utility at all times in both technical and biological cycles



Principle 3

Foster system effectiveness by revealing and designing out negative externalities

Minimise systematic leakage and negative externalities

Better economic and environmental outcomes

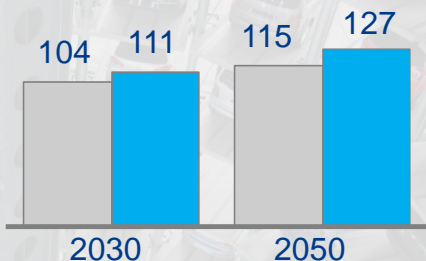
Indexed (2012 = 100)

■ Current development scenario
■ Circular scenario



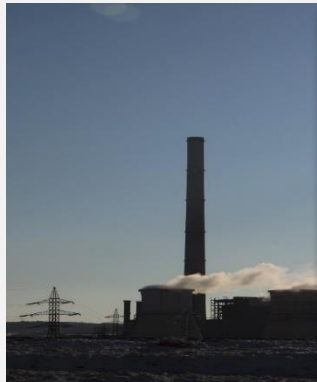
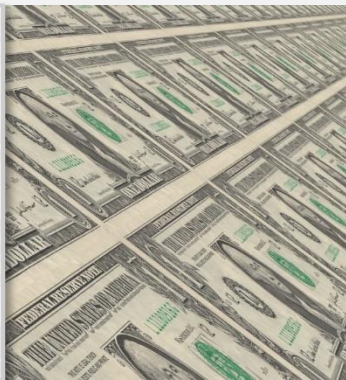
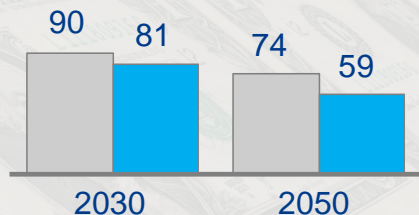
GDP

EU-27, indexed (2012 = 100)



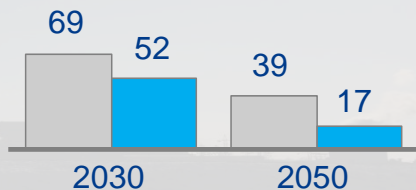
Direct user cash out costs

EU-27, indexed (2012 = 100)



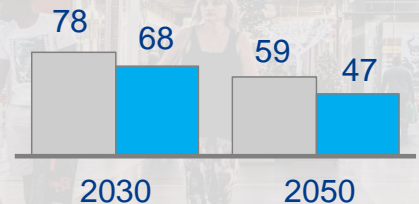
CO2 emissions

EU-27, indexed (2012 = 100)

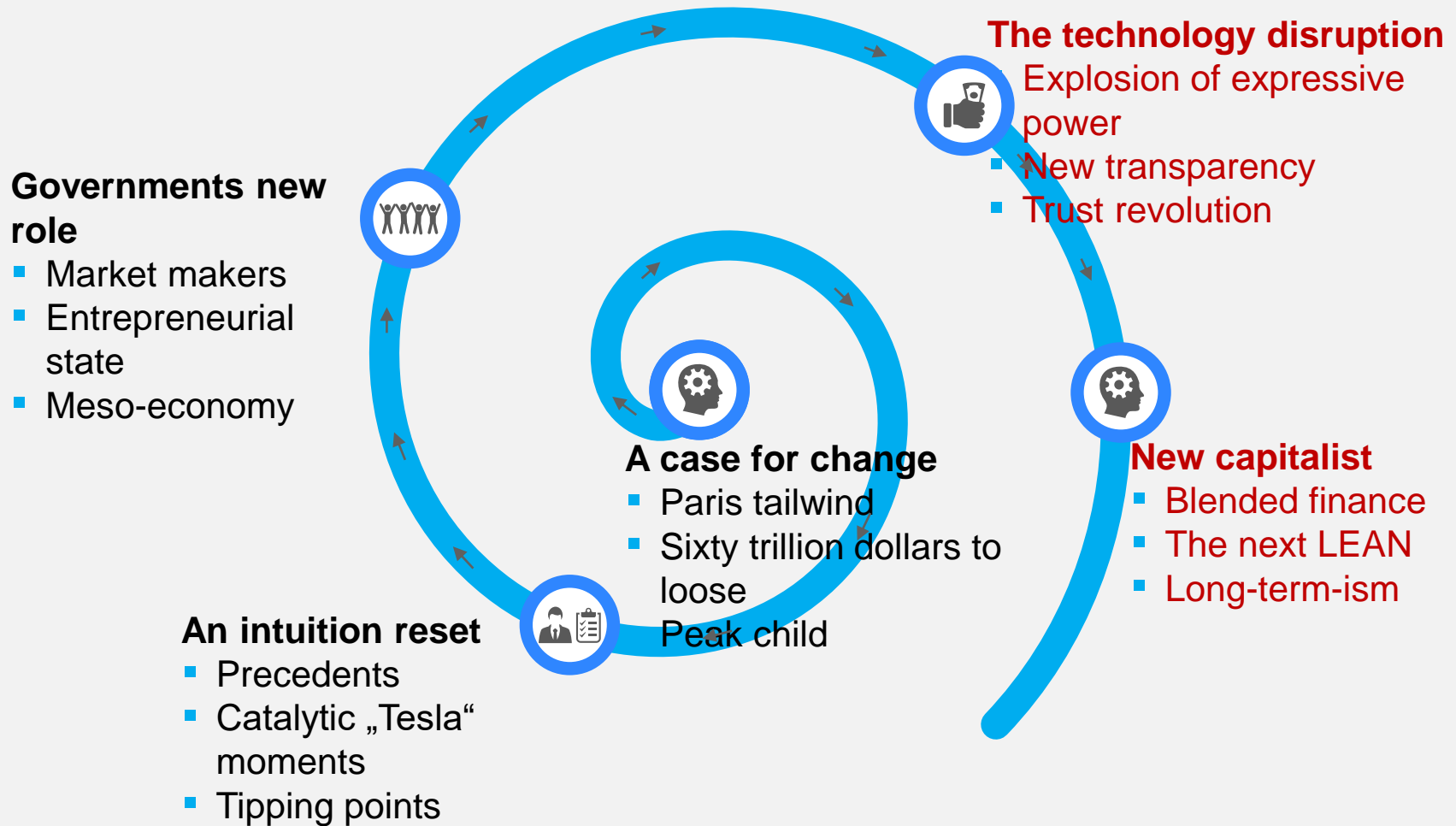


Primary material consumption

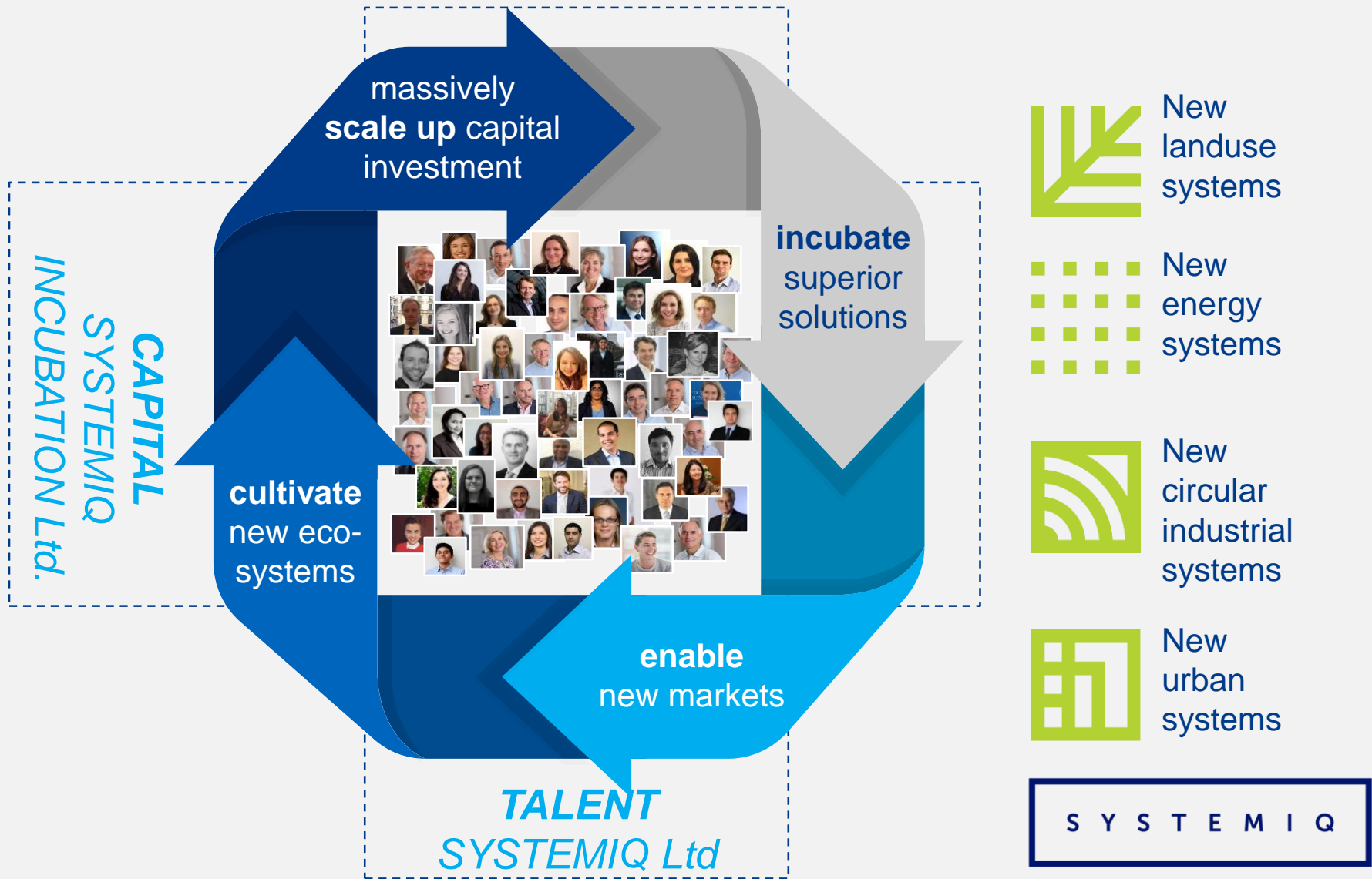
EU-27, indexed (2012 = 100)



Entering the upward spiral

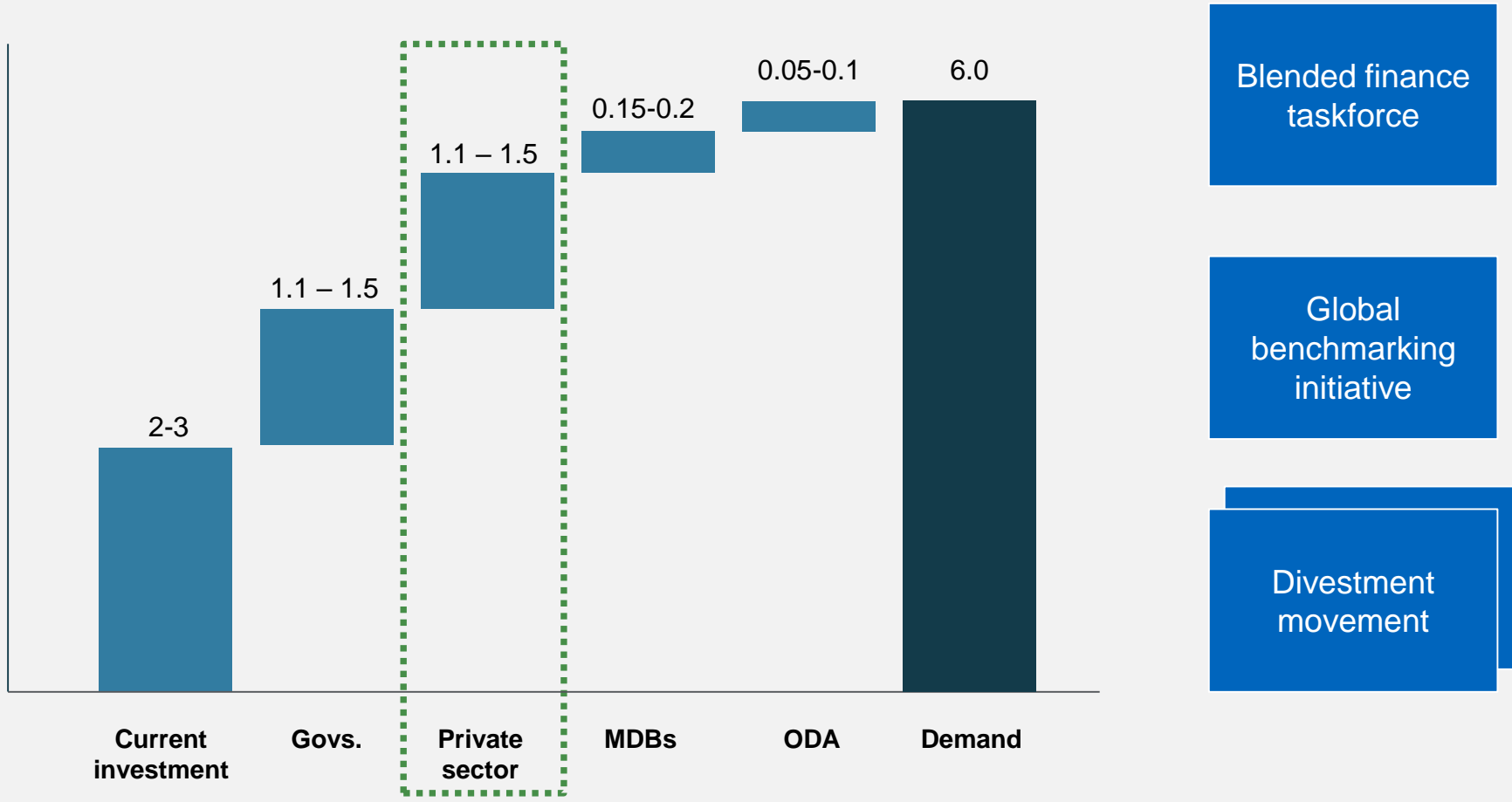


SYSTEMIQ was founded to make regenerative systems investible




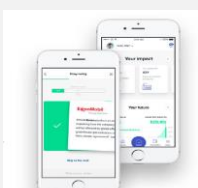



Scale-up capital – over 1 trillion of additional annual investment potential for the private sector

USD\$ trillions, constant 2010 dollars



Enable – using technology to disrupt economic systems

		Proposition	Enabling Tech	Disruptive
	BioCarbon Engineering	<ul style="list-style-type: none"> • Drone-based tree planting 	<ul style="list-style-type: none"> • Data Science • AI • Paintball 	<ul style="list-style-type: none"> • Reinvent reforestation
	Electron	<ul style="list-style-type: none"> • Linking electricity supply points 	<ul style="list-style-type: none"> • Blockchain 	<ul style="list-style-type: none"> • Mainstream renewables
	Upside Energy	<ul style="list-style-type: none"> • Flexible demand side management 	<ul style="list-style-type: none"> • Cloud • Data science 	<ul style="list-style-type: none"> • Massive demand reduction
	Open Invest	<ul style="list-style-type: none"> • Online advisory for responsible investment 	<ul style="list-style-type: none"> • Data Science • AI 	<ul style="list-style-type: none"> • Linking mainstream capital to purpose
	NewCo	<ul style="list-style-type: none"> • Trading secondary plastics, linking thousands of waste pickers 	<ul style="list-style-type: none"> • Data Science • Gamification 	<ul style="list-style-type: none"> • Turn waste pickers into circular economy agents

The next 20 years – towards an economy that prospers whilst natural systems thrive

First economy
(1820 – 2017)

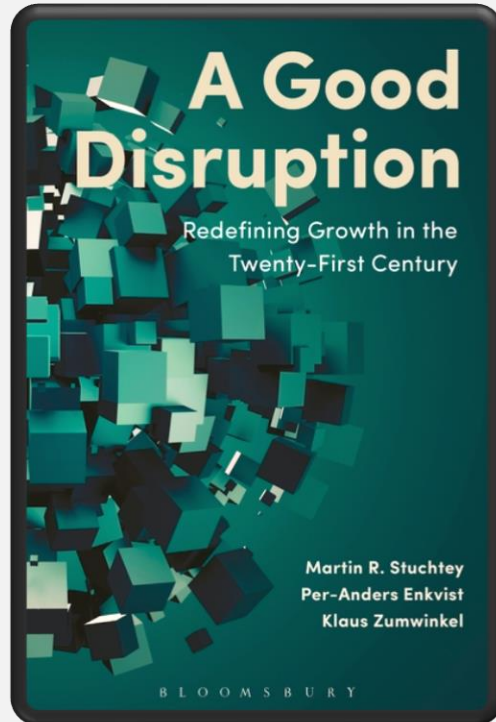


TRANSFORM

Second economy
(2018 – 2038)



RETHINK



Thank you!

