



CIECTI

Centro Interdisciplinario
de Estudios en Ciencia,
Tecnología e Innovación

CIECTI / SEMINARIO INTERNACIONAL



**RECURSOS NATURALES Y DESARROLLO:
DESAFÍOS PARA LA CTI EN EL SIGLO XXI**

CENTRO CULTURAL DE LA CIENCIA (C3)

Godoy Cruz 2270

CABA

KNOWLEDGE PRODUCTION, AUTOMATIZATION AND INDUSTRY 4.0

Anticipation and Foresight for Transformative Innovation Policy

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Center for innovation systems & policy

International Seminar. Natural resources and development. Challenges for
STI in the XXI Century; Buenos Aires, Argentina. November 8th , 2017



THE WORLD IN 2030 – 2050?



Robotics

Will robots replace human work or will robots assist human needs?



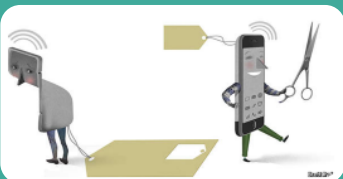
Research

Research divided 4.0 - New elites and traditional losers? OR Transdisciplinary co-production in research and innovation



Big Data


Controlled by Big Data OR Transparent Algorithms support individual and collective Decision Making



Blockchain

Dezentralized Ledger Technologies ensure trust OR New waves of cybercrime are all over

WHAT I WILL DISCUSS



Anticipating Futures in Europe – Megatrends 2050
Megatrend Accelerating technology
Scenarios for Europe in 2050
Trends in STI
Policy Concepts to Re-Conzeptionalize Innovation
Transformative Innovation policy
Conclusions

ANTICIPATING FUTURES IN EUROPE

- Expert Group - Key Long-term Transformations in Research, Innovation and Higher Education (2014/2015)
- *The Knowledge Future: Intelligent policy choices for Europe 2050. A report to the European Commission.* Borch, K; Daimer, S; De Roure, D; Deketelaere, K ; Dimitropoulos, A; Felt, U ; Geuna, A ; Glenn, J ; Gulda, K; Kolar, J; Gallart, Jordi Molas ; Narula, R ; Ringland, G ; Schaper-Rinkel, P ; Smith, J ; Tschaut, A; van der Wende, M.; Luxembourg : Publications Office of the European Union, December 2015.



MEGATRENDS 2050

Accelerating technology

- Each invention, coming faster and faster, changes not only society and economy, but also the way we work in education, science and business.

Demographic change

- the move to cities,
- the ageing population
- the shifts in family size and social norms
- → all will change expectations and options for policies regarding education, research and innovation.

Globalisation

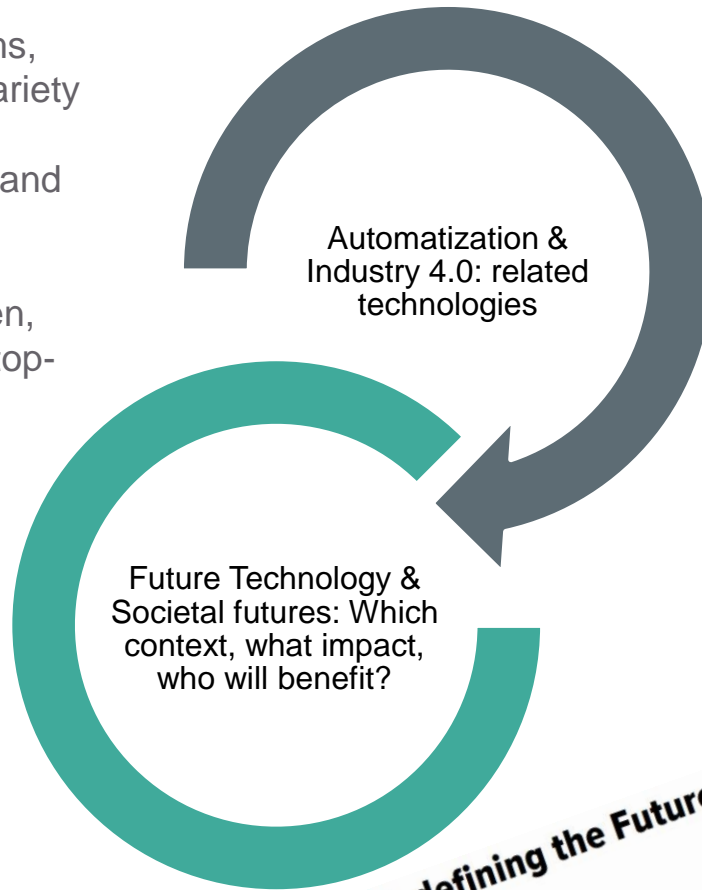
- world gets more inter-connected,
- and economic competition expands,
- interdependence will rise, power will shift; new opportunities and risks: for whom?



MEGATREND ACCELERATING TECHNOLOGY: AUTOMATIZATION, AND INDUSTRY 4.0

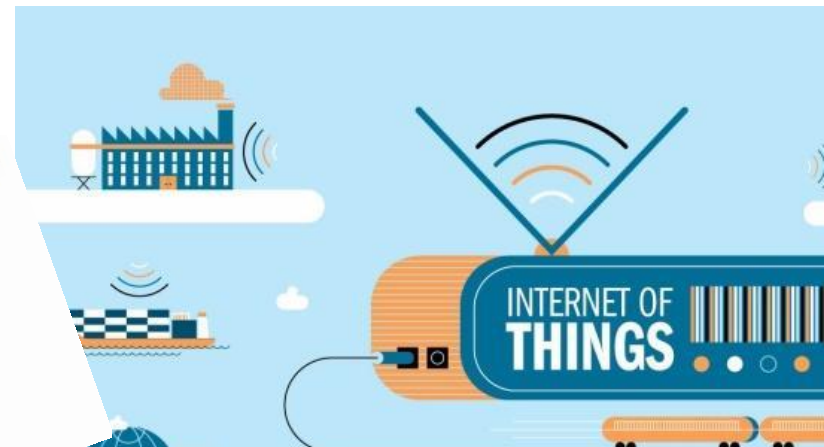
Automatization, and industry 4.0

- umbrella terms, covering in variety of new technologies and their impact
- In Europa: industry-driven, hierarchical, top-down



- Cyber-physical Systems
- Internet of things / Internet of Moving things
- Blockchain
- Semantic Web
- Augmented reality
- Quantum computing
- 4-D printing
- 3-D biological printing
- Nanorobotic manufacturing

How Blockchain Is Redefining the Future of Commerce

EUROPE 2050 – SCENARIO 1

EUROPEAN SUCCESS

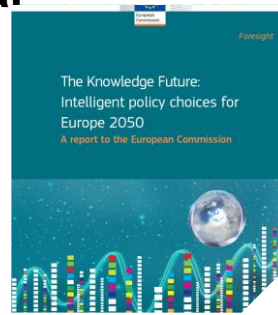
Open Innovation is the dominant mode: multinationals, SMEs, universities and many new actors – foundations, NGOs, individuals - work together in fast-changing global networks to solve global problems.

Automation and data-intensive science have changed the nature of doing research. From open science to radical open access: **new actors** are rushing into research; co-creation of knowledge

EU institutions generally are strengthened; regions and cities have climbed in importance – Europe’s growing **laboratories of democracy** – the coordinating role of EU institutions has risen.

Effect of coordination: **Multinational tax avoidance is under control**, strengthening public treasuries everywhere

core values: **equality, openness, social inclusion and environmental responsibility**



EUROPE 2050 – SCENARIO 2

EUROPE MISSES OUT

Megatrends beyond Europe's control: Automation and globalisation have triggered **mass unemployment, social exclusion, inequality** is higher than ever

New creative jobs evolving from new technologies – such as service bots, machine learning, ubiquitous sensing – but they are **only for the skilled few**

Politically: **Europe has fragmented** into a coalition of rich and poor regions with minimal coordination.

Multinational companies, SMEs and individuals use global markets & digital technologies to **avoid tax**. Public treasuries are impoverished; universities and labs depend heavily on private funding → new ideas and talent are **controlled by the wealthy and powerful**.

Big companies, on which public labs and universities rely for major funding, get early access to discoveries & use their influence to **steer the remaining public funds towards their projects**

RECENT TRENDS IN STI IN EUROPE

- Framework Program Horizon 2020
 - Extreme low success rates in funding (Future Emerging Technologies: below 2%)
- Grand Challenge Orientation (Lund Declaration 2009)
 - Thematic structure instead of real focus on the Grand Challenges of our time

Lund Declaration: Europe must Focus on the Grand Challenges of our Time, in: Swedish EU Presidency, Swedish EU Presidency, 2009.

POLICY CONCEPTS TO RE- CONZEPTIONALIZE INNOVATION

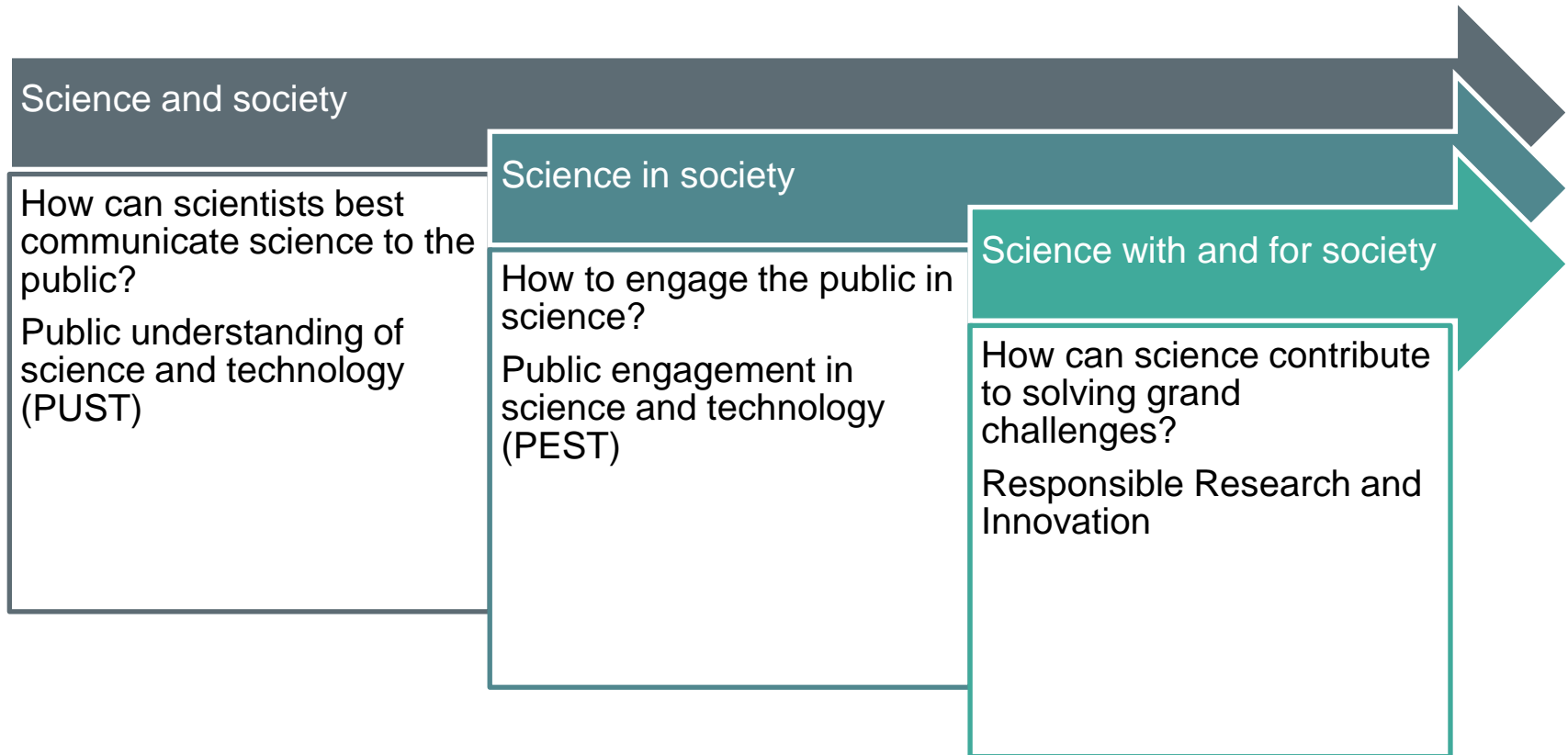
Science with and for
Society / RRI -
Responsible
Research and
Innovation

SDGs Sustainable
Development Goals

Social Innovation

Transformative
Innovation policy

SCIENCE WITH AND FOR SOCIETY – THE CONCEPT



RESPONSIBLE RESEARCH AND INNOVATION (RRI)

“Responsible Research and Innovation is a transparent, **interactive process by which societal actors and innovators become mutually responsive to each other with a view to the (ethical) acceptability, sustainability and societal desirability of the innovation process and its marketable products (in order to allow a proper embedding of scientific and technological advances in our society).”**

(von Schomberg, René. "A Vision of Responsible Research and Innovation."
In *Responsible Innovation*, edited by Richard Owen, John Bessant and
Maggy Heintz. 51-74: John Wiley & Sons, Ltd, 2013.)

TRANSFORMATIVE INNOVATION POLICY

- Framing 1: Innovation for Growth
 - commercialization of scientific discovery; boosting R&D
- Framing 2 – National Systems of Innovation
- Framing 3: Transformative Change
 - How could innovation directly address environmental challenges and social challenges?
 - central focus: how to achieve fundamental systemic change in the interests of social, economic and environmental sustainability
 - System innovation involves multiple actors, also innovative civil society actors, playing a crucial role in co-construction new systems
 - “it is essential to reflect on social and environmental needs and the search process has to be guided by improvements in anticipation of collateral effects and consequences” (Schot/Steinmueller 2016)

Schot, J. and Steinmueller, E. (2016) Framing Innovation Policy for Transformative Change: Innovation Policy 3.0. SPRU Science Policy Research Unit, University of Sussex: Brighton, UK.

SOCIAL INNOVATION – OPEN DEFINITIONS FROM THE SI COMMUNITY



.. “social innovation is a new combination of social practices in certain areas of action or social contexts **with the goal of better satisfying or answering social needs** and problems than is possible on the basis of existing practices“

- Better for whom?
- In which time horizon and which social and political context?



“Social innovations are innovations that are **social in both their ends and their means.**” (BEPA 2010)

SUSTAINABLE DEVELOPMENT GOALS (SDGS)

- The Sustainable Development Goals (SDGs), officially known as resolution adopted by the UN General Assembly on 25 September 2015 with the title “Transforming our world: the 2030 Agenda for Sustainable Development” is a set of 17 "Global Goals" with 169 targets between them.
- Explicitly, the document only mentions scientific and technological innovations.
- Explicit: innovation as scientific and technological innovations
- Addressing global innovation challenges
- The concept of social innovation is not explicitly mentioned

- Implicit: The challenges how to shape emerging technologies / how to innovate technologically and socially in search of sustainable alternatives for the planet



SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD



Explicitly Innovation oriented: Goal 9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation

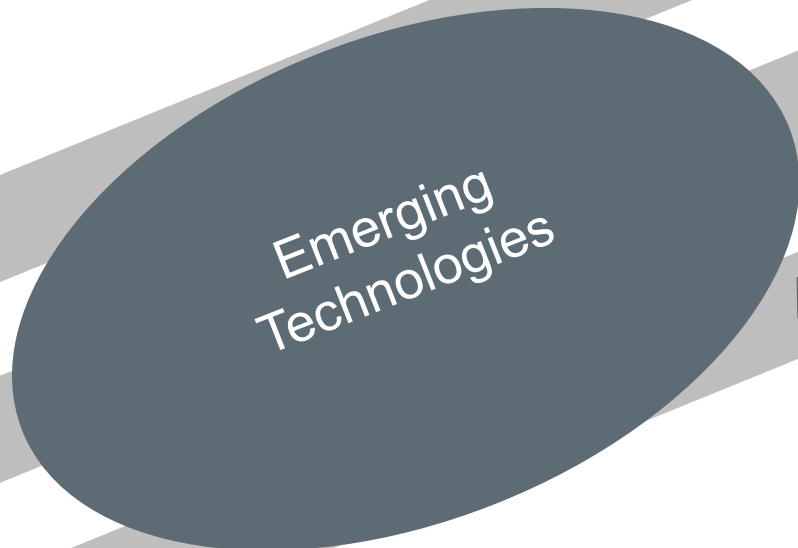
All Goals: Need for research to shape emerging technologies towards societal innovation - open question of new institutions to establish the societal innovation globally

ANTICIPATION AND FORESIGHT IN TRANSFORMATIVE INNOVATION POLICY



THE FUTURE OF INNOVATION SYSTEMS; TECHNOLOGY FORESIGHT

UNIDO: ...technology foresight provides support to innovation.... leading to enhanced competitiveness and growth



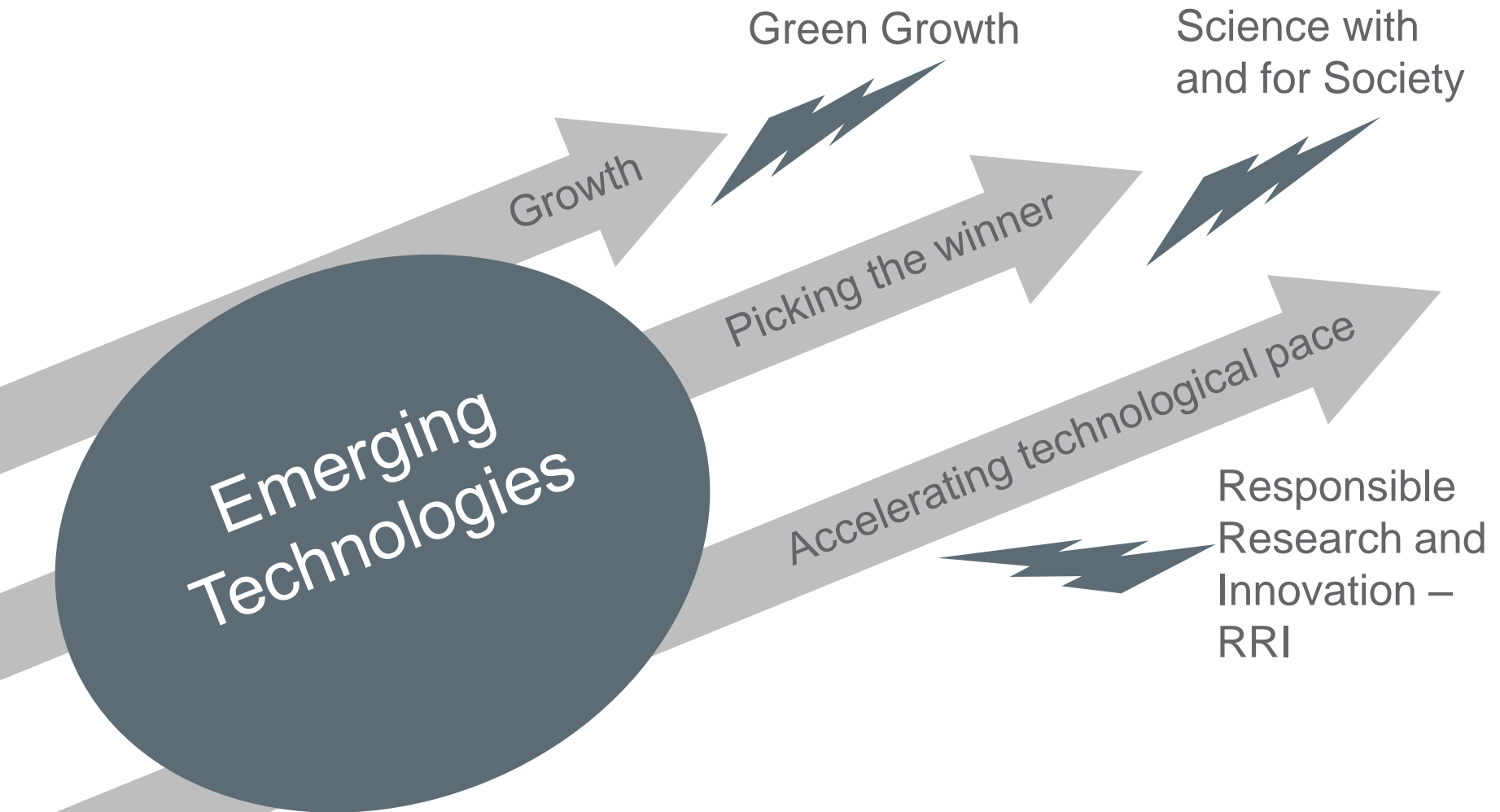
Growth

Picking the winner

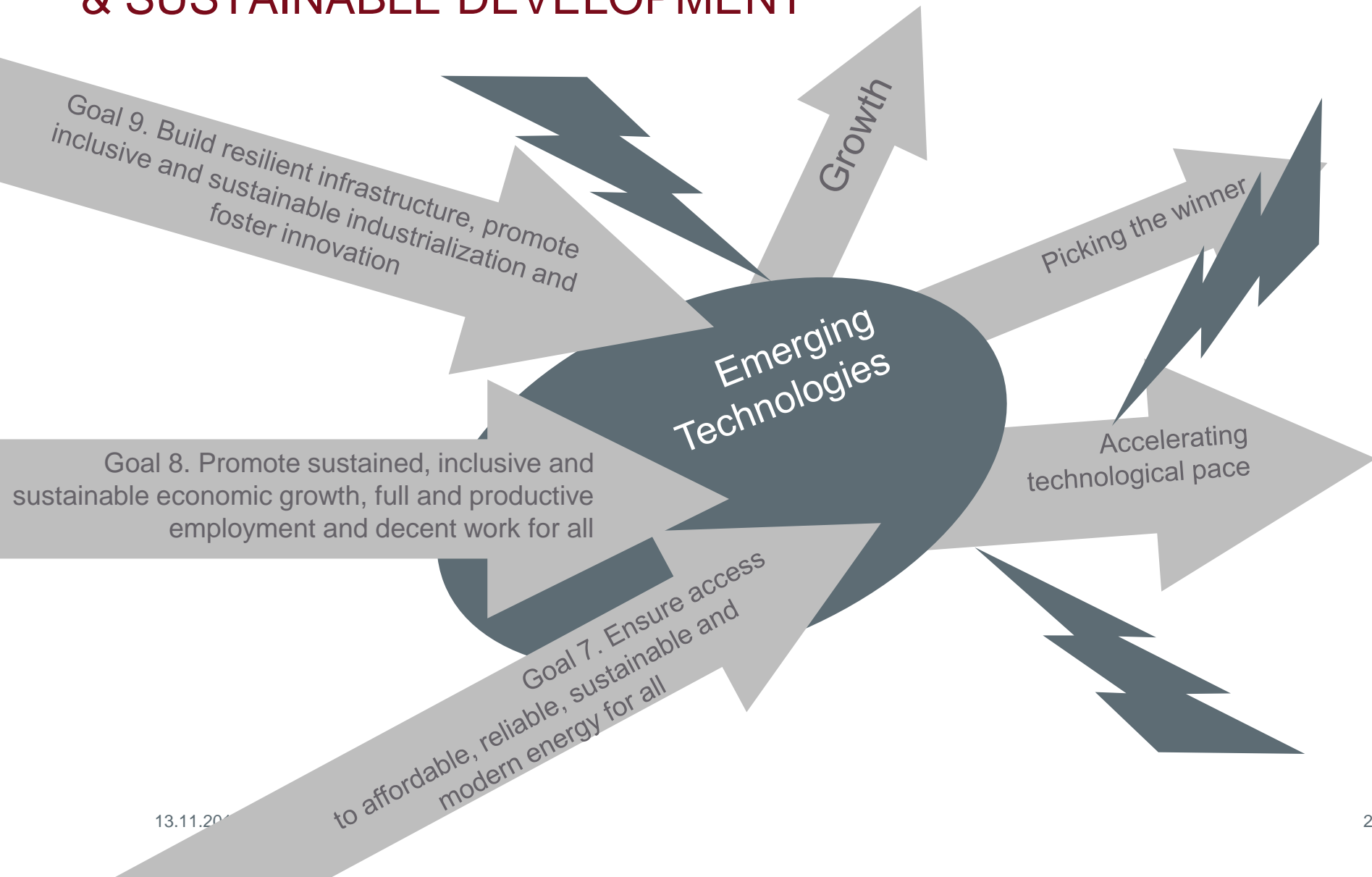
Accelerating technological pace

Irvine / Martin 1984: Foresight in science: Picking the winners, London 1984

FORESIGHT TODAY – TENSIONS - GROWTH, ACCELERATING TECHNOLOGICAL CHANGE AND PICKING THE WINNER



FORESIGHT FOR SOCIETAL FUTURES X.0 ? TENSIONS BETWEEN TECHNOLOGY RACE & SUSTAINABLE DEVELOPMENT



DISCUSSION

- Knowledge production, Automatization and Industry 4.0
 - Need to change the innovation dynamics in generic technologies such as blockchain:; Internet of (moving) things (from 'fail fast' logic to frameworks for responsible development)
 - co-creation of overall frameworks to develop complex technologies
- Anticipation and Foresight for Transformative Innovation Policy
 - Transdisciplinary integration of actors
 - New governance mechanism for co-creation of innovation
 - Objectives beyond growth and competitiveness
- What's missing so far in thinking experiments in foresight?
 - Disruptive events?
 - Degrowth in Europe?
 - Ownership of basic digital infrastructures of the future?

Weltausstellung vom 1.8. - 31.10. 2000 in Hannover

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THANK YOU!

Petra Schaper Rinkel, November 2017

