Global technological changes – Challenges of the future:

How to assess & manage them responsibly?

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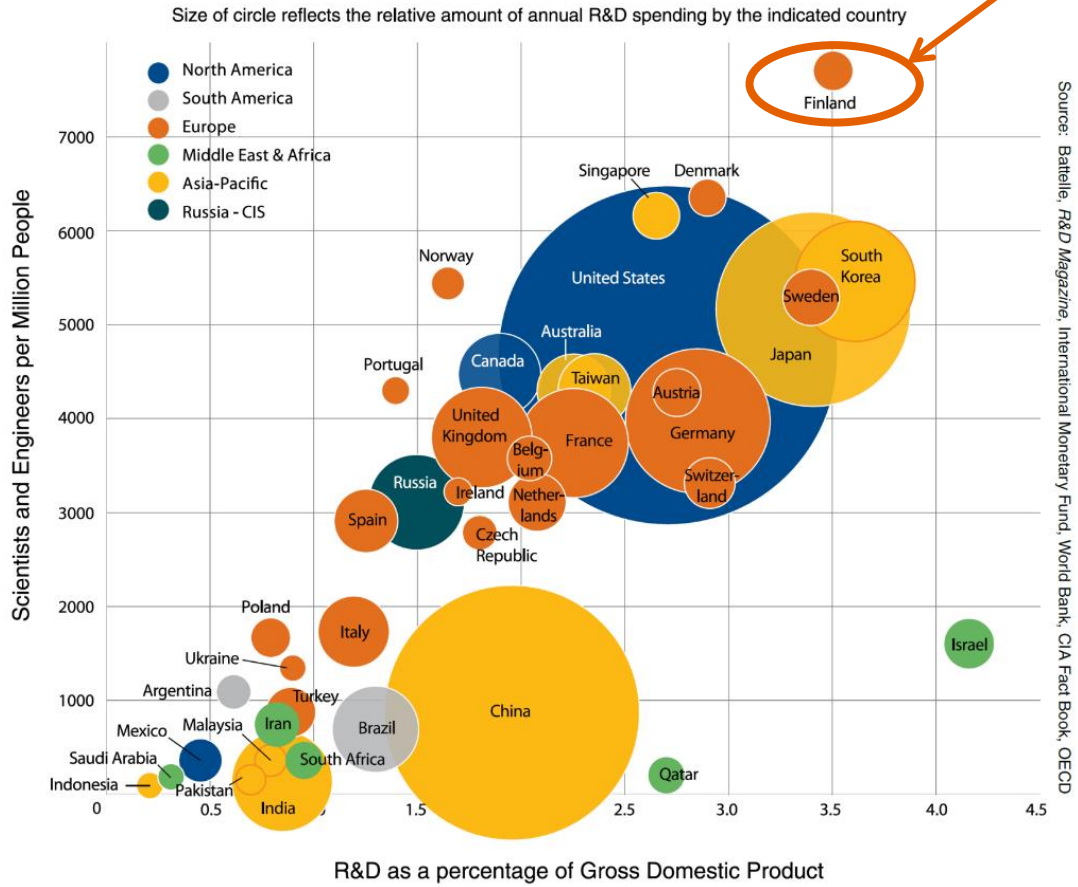
FINLAND IS A LAND OF SCIENTISTS AND ENGINEERS …



Note: Figures are from 2013

VTT – beyond the obvious

Our vision

A brighter future is created
through science-based innovations.

Our mission

Customers and society grow
and renew through applied research.

Strategy

Impact through scientific
and technological excellence.

Established in
1942

269M€
turnover in 2016

2,128
personnel

Owned by

Ministry of Economic Affairs
and Employment of Finland

36%
from abroad

28%
Doctorates and
licentiates

VTT on the map

VTT locations in Finland

Personnel by location

	VTT Group	Parent company
Espoo	1,674	1,484
Jyväskylä	92	72
Kuopio	26	13
Oulu	315	314
Sodankylä	29	-
Tampere	249	232
Other locations	29	13
Total	**2,414**	**2,128**

VTT's international research units
Seoul (South Korea)

VTT's marketing and networking offices
Brussels (Belgium)

36%

OF FINNISH INNOVATIONS INCLUDE VTT EXPERTISE

FORTUNE 500

9%

OF FORTUNE 500 COMPANIES

MOST ACTIVE PATENTING ORGANISATION IN FINLAND

TOP1

TOP1

MOST IMPORTANT PUBLIC RESEARCH PARTNER FOR FINNISH COMPANIES

EARTO
EERA
EIT DIGITAL
EIT RAW MATERIALS
JIIP
NULIFE/NUGENIA

Wide international networks

TOP1

LARGEST AMOUNT OF EU RESEARCH FUNDING PER RESEARCHER

- ✓ 242 projects under the seventh framework programme
- ✓ 445 ongoing international public research projects


VTT Lighthouses address global challenges and highlight opportunities for sustainable growth and development
Climate action
Clean energy for the future
Resource sufficiency
Prosperity from resource wisdom
Growth with Sustainable Innovations
Industrial renewal
Innovations empowering industry
Good life
Improved quality of life and work
Safety and security
Resiliency in turbulent world

Climate action

Mitigating the severe effects of climate change requires rapid transformations across all sectors. Countless mechanical devices, buildings, vehicles and production processes need to be modernised, and clean energy is needed to power our everyday lives and business operations.

Resource sufficiency

Resource wisdom is the key to gaining a balance between finite resources and ever-growing consumption in order to secure resource sufficiency. Resource wisdom comprises the smart use of raw materials, as well as a holistic approach to the design, manufacturing, delivery and use. People's consumption habits need also to change for the Earth's capacity to sustain life for future generations.

Good life

The quality of life depends on good health, meaningful work and comfortable surroundings. The increase in automation and digitalisation of business should be used to provide benefits for the whole society. Novel solutions are needed to increase the sustainability of the healthcare system and the resiliency of public infrastructure to ensure that the society can thrive.

Safety and security

To ensure the continuity of business and operations, the safety of people, governments, companies and infrastructures must be secured under all conditions. The development of smart technologies and the adoption of systemic models for comprehensive safety and security adds resilience.

Industrial renewal

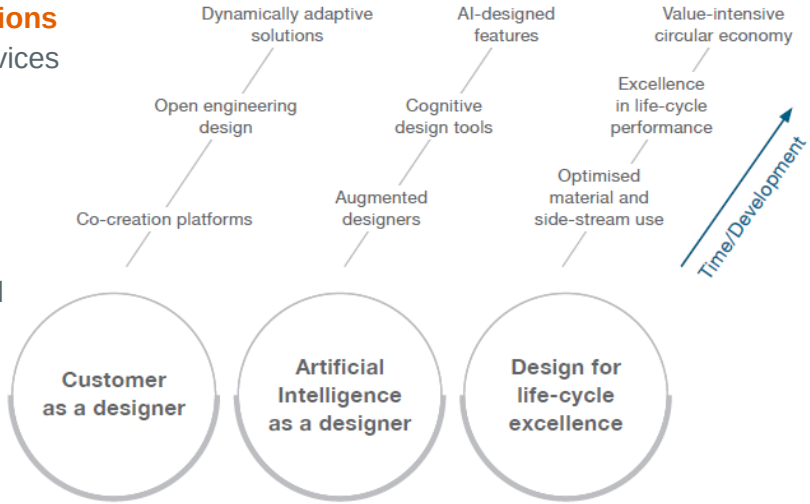
Digital transformation shakes up all industries, opening up opportunities for business renewal and sustainable growth. We should be investing heavily in our innovation capabilities to secure future operations and to stay ahead of the competition.

Circular economy as well as data-driven economy, supreme customer intimacy and improved operational efficiency all open up new opportunities for new and improved business. Companies must invest in high innovation capabilities and skilled workforce, which are key requirements for the next-generation manufacturing and services business.

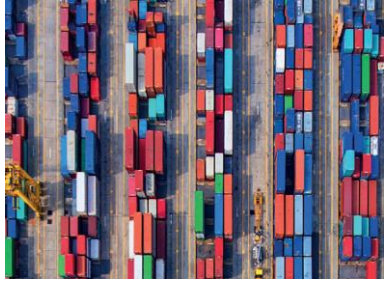
Design for the future

Customers and end-users are increasingly interested in **personalised solutions** adaptable to their changing needs. Sustainable high-value products and services empowered by customers will be the trump cards for future success.

Intelligent design systems will help companies optimise products and systems holistically, taking into account such factors as user experience, performance, energy efficiency, environmental impact, maintenance and service, and material usage over the whole life cycle.



Companies are looking for advanced digital solutions that enable them to build competitive edge, increase revenue growth and customer loyalty. Companies that lead in user-experience outperform the competition clearly in revenue growth and customer loyalty. Digital solutions enforce the power of the customer by enabling transparency, new ways of interaction and performance optimisation over the whole **system life-cycle**.



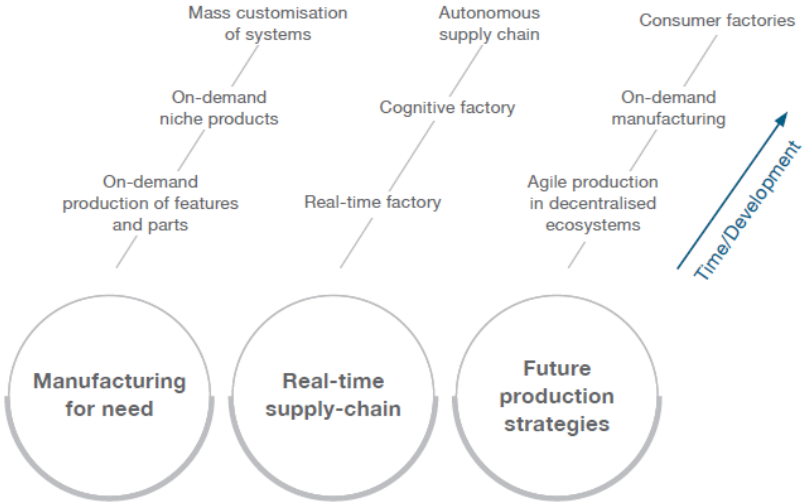
Rebirth of production

Advances in **automation**, **robotics**, **artificial intelligence** and **additive manufacturing** are **revolutionising production**.

Mass production becomes nearly independent of labour costs, while small batches and individual customisation become cost-efficient. **Decentralised production** may become a preferable option for producing highly-customised products near customers.

Companies across the globe are looking for ways to holistically optimise supply networks for lower losses, more efficient energy and resource use. But the complexity of **real-time optimisation** requires **cognitive and autonomous solutions** with superb **quality assurance**.

Developing competitive manufacturing requires business and ecosystem understanding backed up by deep process, material and manufacturing expertise as well as **knowledge of digital technologies**.



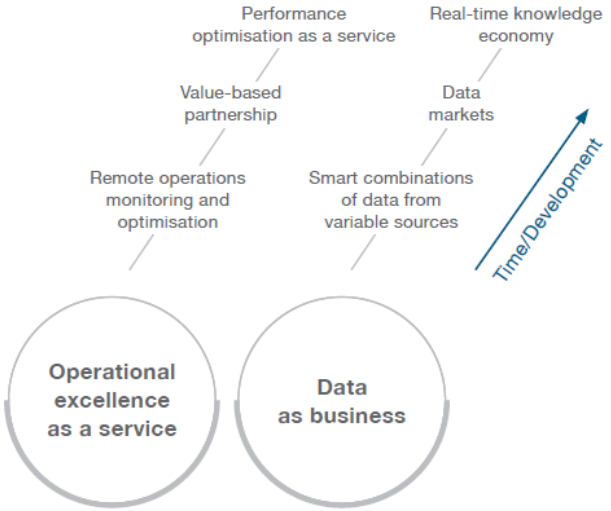
Disruptive businesses

Global flows of data and information have a higher impact on GDP growth than the trade in goods.

There are a number of ways to **use the value of data to build business**, such as data management, analysis and delivery.

Meanwhile **services are the core of outcome-economy based business**, where suppliers contribute directly to operational efficiency and core value-creation processes.

Building successful **business innovations based on data and services** calls for a visionary approach to disruptions and future markets. This requires companies to combine deep domain expertise with a thorough understanding of related **digital technologies**.



VTT drives innovation ecosystem around global challenges – these pave the way to high impact business opportunities

CLIMATE ACTION

- LOW CARBON MOBILITY AND COMMUNICATION
- ENERGY INTELLIGENCE
- LOW CARBON ENERGY
- CLIMATE NEUTRAL INDUSTRIAL PROCESSES

RESOURCE SUFFICIENCY

- RENEWABLE MATERIALS
- SUSTAINABLE NON-RENEWABLES
- CARBON REUSE ECONOMY
- FOOD 4.0

GOOD LIFE

- DISRUPTION OF WORK
- CITIZEN CENTRIC CARE
- SMART BUILT ENVIRONMENT

SAFETY AND SECURITY

- SECURING CRITICAL SUPPLIES
- CYBER SECURITY
- SECURED AUTONOMOUS SYSTEMS

INDUSTRIAL RENEWAL

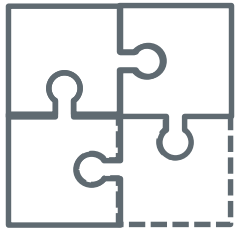
- DESIGN FOR FUTURE
- RE-BIRTH OF PRODUCTION
- DISRUPTIVE BUSINESSES

An area where VTT currently drives innovation ecosystem creation

VTT has a systematic approach to create and develop innovation ecosystems with continuous value add

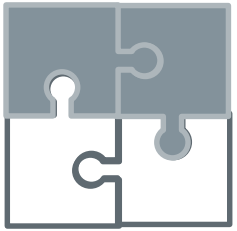
STRATEGIC PLANNING

- Joint vision creation
- Ecosystem blueprinting
- Core partners commitment



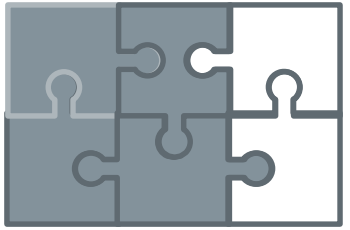
ECOSYSTEM CREATION

- Joint roadmap and target creation
- First projects creation
- Strategic steering and expansion



DEVELOPMENT

- Roadmap and target updates
- Continuous piloting and commercialization
- New project preparations and ecosystem expansion



Committed critical mass ensured before higher efforts

Creation by doing ensures concrete value add from day one

Value driven ecosystem development and expansion.

Examples of VTT innovations

Healthy home-grown crops in every kitchen

Coping with urbanisation and the environmental burden of agriculture create a need for **new food production methods**. We envisioned a **home appliance that produces healthy ingredients fast.**

We designed a **plant-cell bioreactor** that can utilise plant cells, non-traditional food crops, such as birch, and tailored cell lines with increased nutritional value.

The **first 3D-printed prototype is already producing harvests**. We are developing different product ideas in collaboration with consumers and aim to commercialise the appliance so that it **fits into any home kitchen**.

Shaping the future of clean energy

There is an increasing need to address **sustainable decarbonisation** of future energy systems and the whole society. Stakeholders throughout the energy value chain need support in formulating new strategies, policies and concepts.

We have developed an **advanced energy system modelling and simulation environment** that enables holistic analysis of energy systems.

Our solutions help increase efficiency in the use of natural resources, raise the competitiveness of clean and smart energy systems and support the creation of new **consumer-centric business models**.

3D-printed wound care with nanocellulose

Bio-based materials are an attractive alternative to many chemicals. Cellulose Nanofibrils are manufactured from cellulose or production side streams. We discovered that its mechanical strength, moisture tolerance, rigidity and flexibility make it suitable for 3D printing.

We have developed a **3D-printed wound care gel that helps promote the growth of new skin cells**.

Our prototype combines nanocellulose and printed electronics into a single product which **measures wound healing**. The work is carried out in collaboration with the University of Tampere, funded by The Academy of Finland, under the BioDisp3D programme.

A filter for a mobile-phone camera to help detect skin cancer

Hyperspectral cameras have traditionally been used in medical, industrial and space applications.

We created the **world's first hyperspectral mobile device** by **converting an iPhone camera into an optical sensor.**

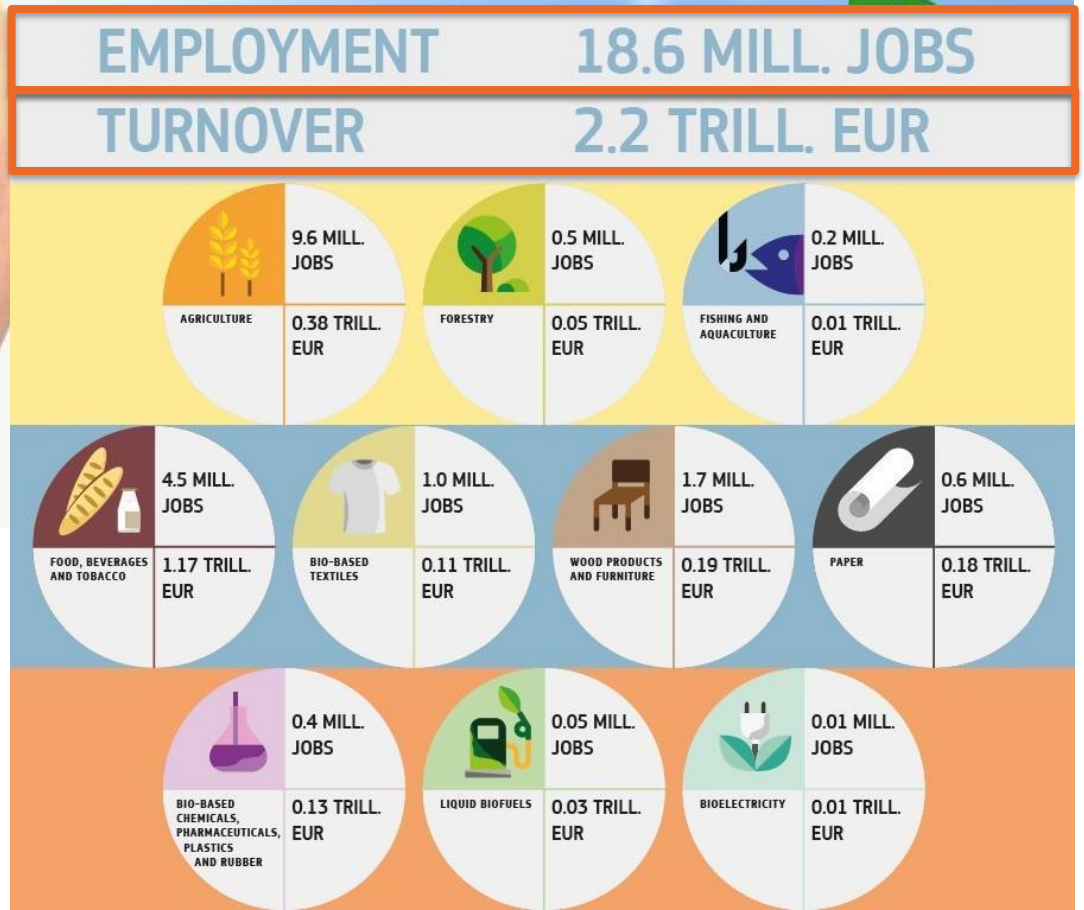
Our innovation opens up vast opportunities to develop low-cost consumer applications utilising spectral imaging. We have experimented with a wide range of applications, including the **diagnosis of skin cancer**, nanosatellites, drone applications, as well as the remote measurement of emissions. We will work together with companies looking to bring their own innovative hyperspectral solutions to the market.

Read more

https://www.vtt.fi/inf/julkaisut/muut/2018/VTT_Lighthouses.pdf

EU Bioeconomy

Source: European Commission (2016)



- In 2014, the EU bioeconomy employed **18.6 million people** and generated **approx. EUR 2.2 trillion**, representing around 9% of all sectors of the economy with regards to employment as well as to turnover.

VTT

Luke
NATURAL RESOURCES INSTITUTE FINLAND

Oficina de Planeamiento y Presupuesto

Unlocking the Bioeconomy Potential of Latin America

Strategic openings for key forest based bioeconomy areas (FBA) in Uruguay and the LAC region.

Today

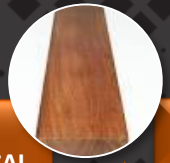
Future

Forest based bioeconomy areas FBA

(PLANTATION BASED) FOREST BIOMASS

ROUNDWOOD

BARK, THINNINGS, ETC



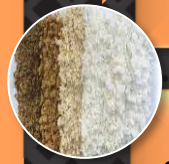
MECHANICAL PROCESSING

SAWNWOOD

ENGINEERED WOOD PRODUCTS

RECYCLED WOOD

PULPING (MAINLY CHEMICAL)



PULP

BIOMATERIALS (textiles, composites, etc.)

PAPER, CARDBOARD

RECYCLED FIBRES

BIOREFINING

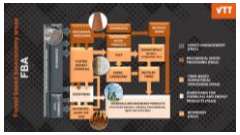
CHEMICALS AND BIOENERGY PRODUCTS
from forest biomass, cellulose, hemicelluloses, lignin and extractives

BIOENERGY, power and heat

- FOREST MANAGEMENT (FBA1)
- MECHANICAL WOOD PROCESSING (FBA2)
- FIBRE-BASED BIOMATERIAL PROCESSING (FBA3)
- BIOREFINING FOR CHEMICALS AND ENERGY PRODUCTS (FBA4)
- BIOENERGY (FBA5)

VTT

The FBA-Uruguay process and way forward in LAC



35
Actors
(Workshop)

96
Actors
(Public event)

15 + 15 Future Insights
Critical/Policy Issues & Opportunity Pathways
(Multi-actor- and Expert-based insights)

322
Critical Issues
Barriers, Drivers, Opportunities, Threats

440
Global Actors

121 KT+ Needs
(Expert-based insights)

211
GVN Actors

15 Future Actions
Powered by GVN Insights
(Expert-based insights)

4
Dimensions
10
Key aspects

1
Shared Vision

15
Action Roadmaps

FBA
2030
2050

150+
Key Actions

Step 1
Scoping & Mobilisation

Step 2
Global FBA Assessment & Anticipation

Step 3
KT+ Needs & Gaps

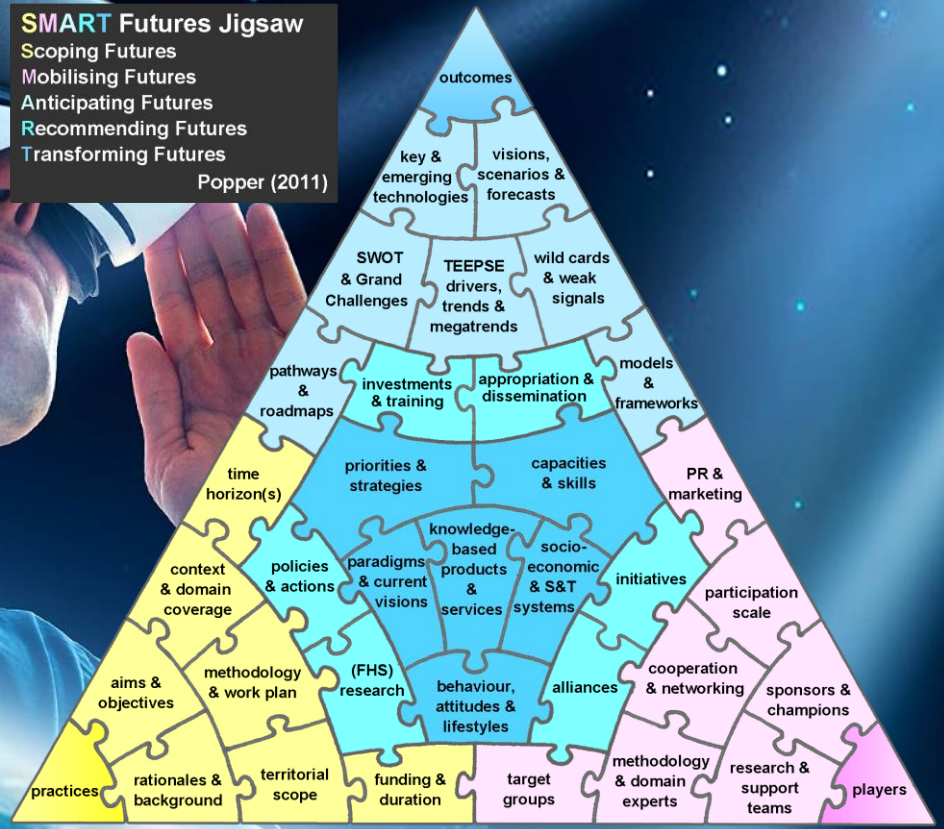
Step 4
Shared Vision

Step 5
Action Roadmap

The way forward for LAC

Promoting beyond the obvious assessment and management of sustainable innovation ecosystems powered by SMART futures aimed to advance the adoption of the 2030 Agenda and its Sustainable Development Goals (SDGs).

SMART Futures Jigsaw
Scoping Futures
Mobilising Futures
Anticipating Futures
Recommending Futures
Transforming Futures
Popper (2011)



Scoping futures

Mobilising futures

Anticipating futures

Recommending futures

Transforming futures

Thank you.

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