

# Circular economy as a tool for Sustainability: case Europe Arctic

**Anzelika Krastina, senior lecturer, Lapland UAS, Finland**

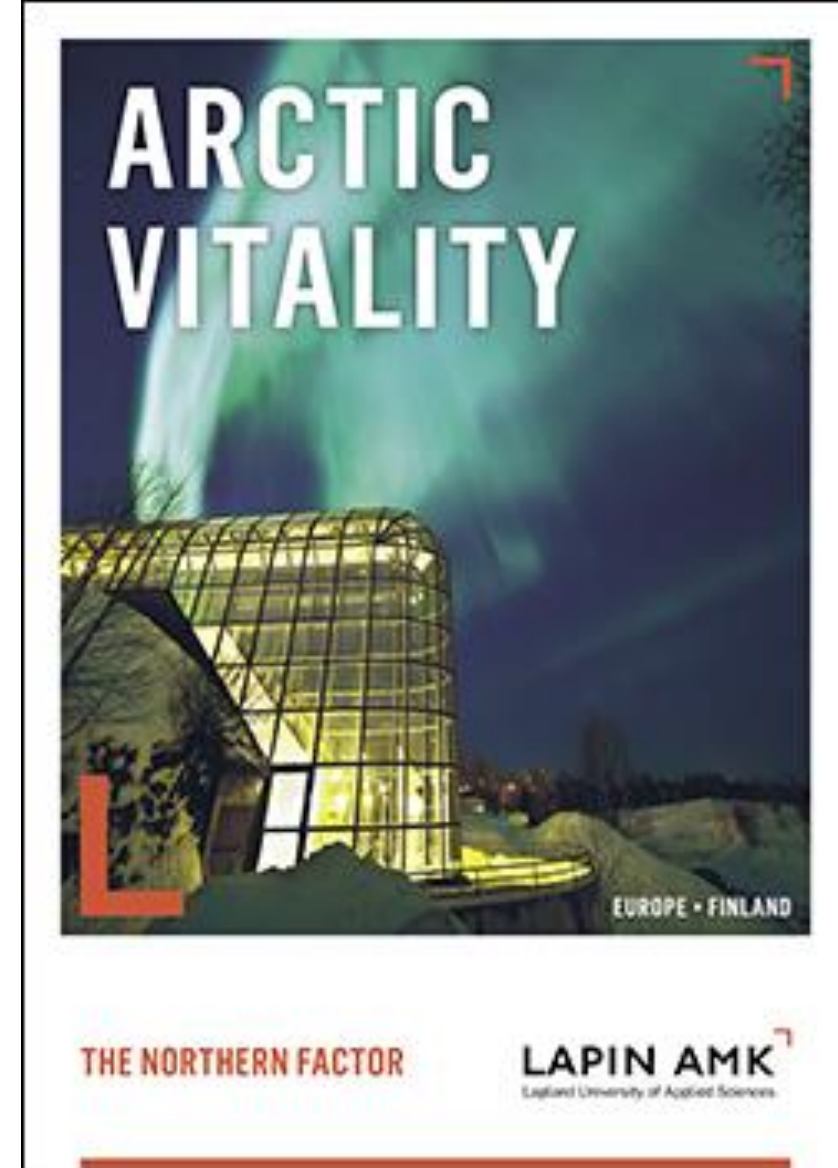
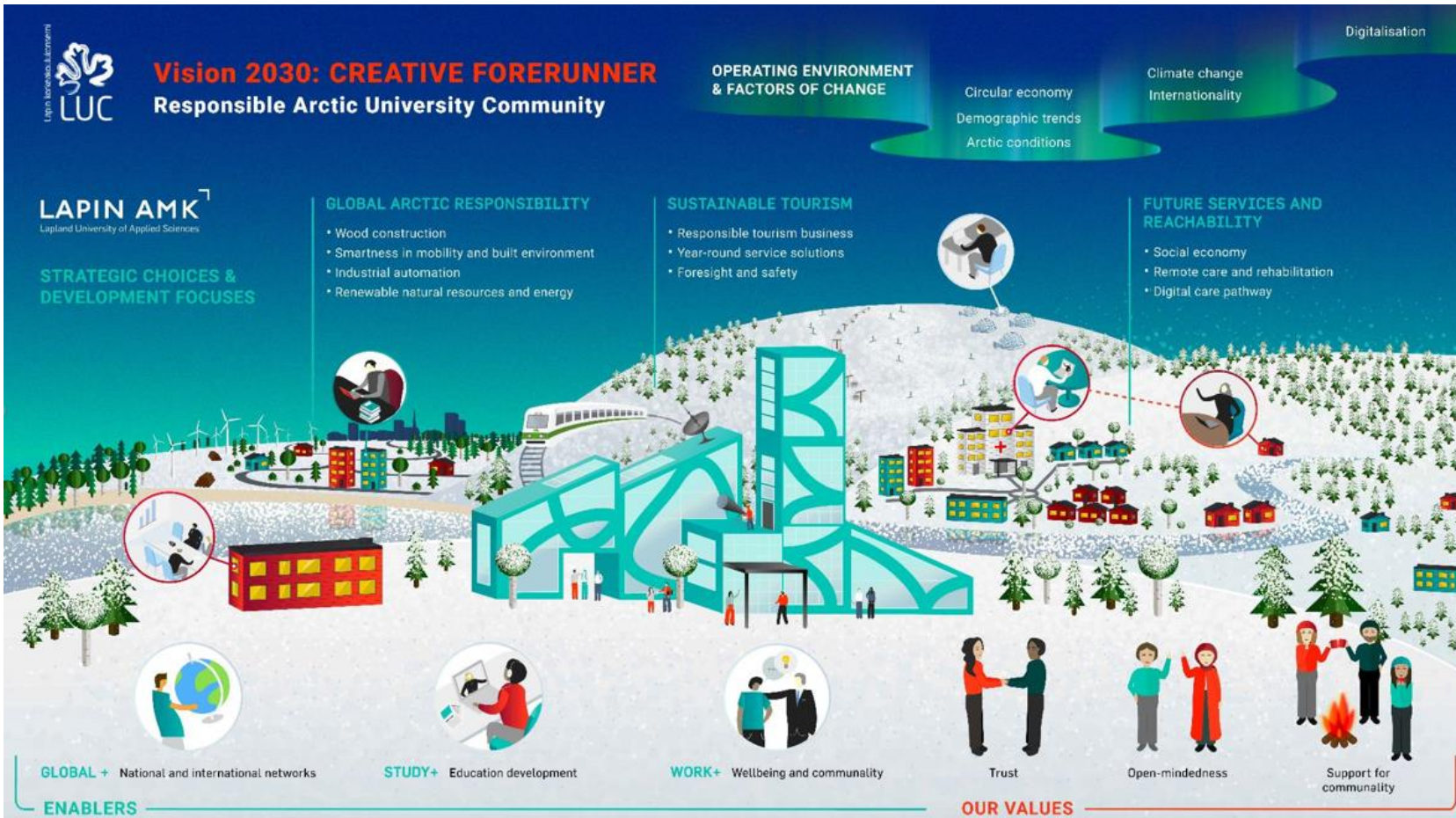
SUSTAINABLE SOCIETY AND BUSINESS, Riga, 19.4.2023

# Presentation content

- Context introduction: SECA project roots in the Arctic
- Why Arctic – a global prospective
- Circular economy principles – a way to sustainability
- Circular business model approach : case study in Finnish Lapland and Arctic cooperation

# SECA project roots in the Arctic

- Lapland UAS location on the Arctic Circle
- Mission – a regional developer





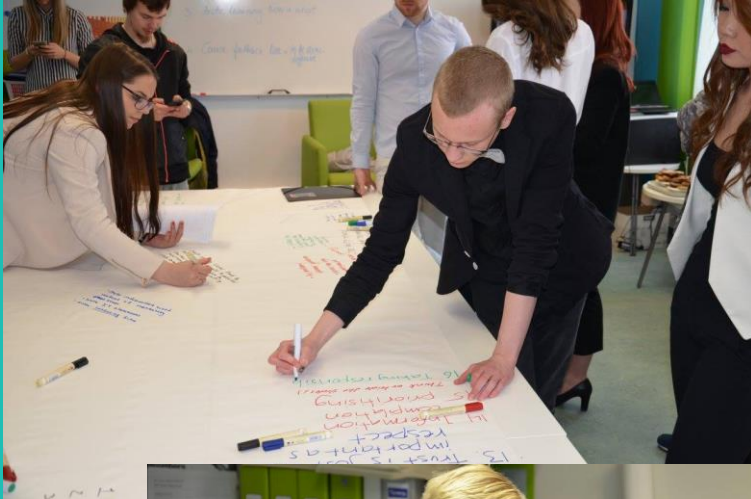
# COP 21 – Paris agreement

- December 2015 – Arctic Encounter in Paris



The lead venue of the 2015 Arctic Encounter Paris - l'Ecole Militaire

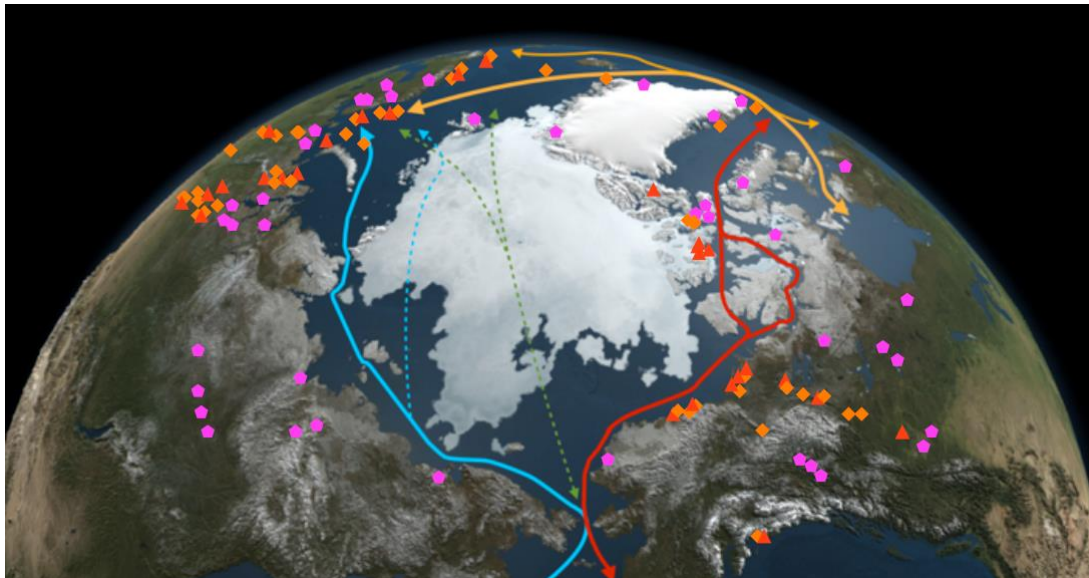
# Sustainable Entrepreneurship for Climate Action



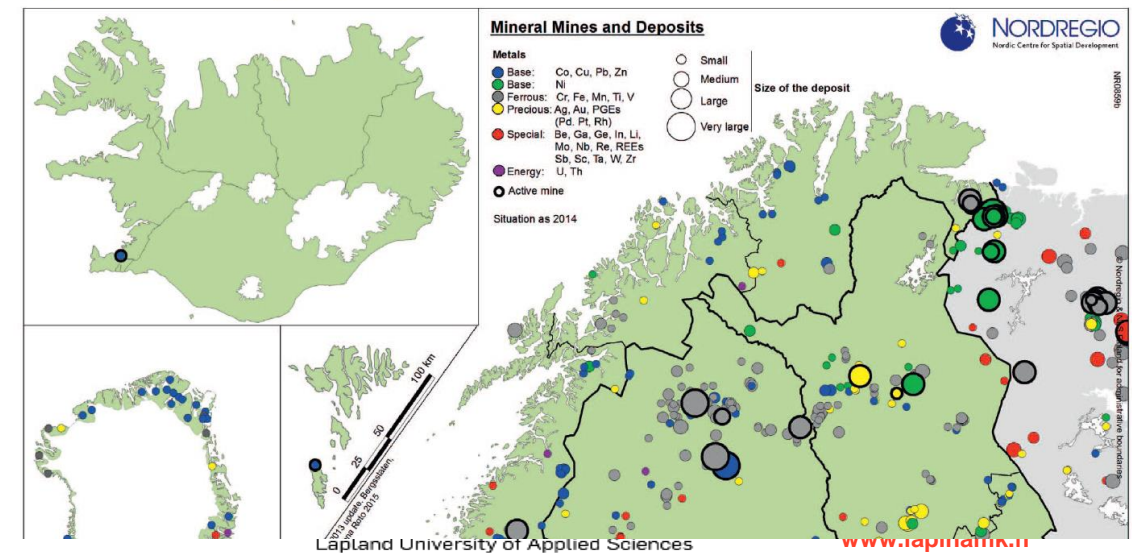


# Why Arctic – a global prospective?

- Large scale industries
- Natural resources
- Northern sea route
- Arctic construction era
- +37% energy demand – 30% of world NR



Map 3: Mineral mines and deposits in the Nordic Arctic



# ARCTIC

*from local to global*

**Geography**  
**Politics**  
**Economics**



## Arctic Definition

- High Arctic
- Low Arctic
- Sub Arctic
- the Arctic Circle (66° 33' 44" North)  
The Arctic Circle is the southernmost latitude in the Northern Hemisphere at which the sun can remain continuously above or below the horizon for 24 hours
- 10°C July isotherm  
defined as being the area where the average temperature for the warmest month (July) is below 10°C / 50°F
- Arctic AHDR boundary  
Arctic Human Development Report
- Arctic EPPR boundary  
The Emergency Prevention, Preparedness and Response
- Arctic CAFF boundary  
The Conservation of Arctic Flora and Fauna
- Arctic AMAP boundary  
The Arctic Monitoring and Assessment Programme
- Arctic Tree line boundary  
The northernmost latitude in the Northern Hemisphere where trees can grow; further north, it is too cold all year round to sustain trees

Source: GRID - Arendal, ADHR, EPPR Working Group, National Snow and Ice Data Centre, Boulder, CO, AMAP, CAFF



# Arctic cooperation and governance

- The Rovaniemi Declaration of 1991 - Protection of the Arctic environment
- Barents Euro-Arctic Council 1993
- Arctic Council 1996
- Arctic Economic Council 2014





# Arctic economy and industry



# Kiiruna





# Finnish Lapland as an Arctic region

## Lapland in facts & figures

Surface area  
**100,366 km<sup>2</sup>**



Water  
**7,699 km<sup>2</sup>**



Population  
**178,530**  
Population density  
**1.8 /km<sup>2</sup>**



Employment  
**69,000 jobs**  
50% in private enterprises  
**9,100 private enterprises**



Annual revenue  
**€ 13,300 M**  
70% from private enterprises

**Fastest growing economy in Finland**



Mining & metal industry  
**€ 5,000 M**  
Annual revenue



Forest bioeconomy  
**€ 1,300 M**  
Annual revenue

Tourism overall demand  
**€ 1,000 M**  
**Fastest growing industry in Lapland**  
Annual growth 9%  
20% in 2017



Agricultural production & reindeer husbandry  
**€ 340 M**  
Annual revenue



**4<sup>th</sup>** largest export region in Finland  
**7%** of Finnish export

- + World's northernmost bio, mining and metal industry hub
- + Only chromium mine and the largest gold mine in Europe
- + 9 national parks in the area
- + World's cleanest air and Europe's purest water
- + World's largest wild organic harvesting area
- + Strong educational structure: University of Lapland, Lapland University of Applied Sciences, Vocational College Lappia, Lapland Education Centre REDU and Sami Education Institute
- + Research institutes: Geological Survey of Finland (GTK), Natural Resources Institute Finland (LUKE), Sodankylä Geophysical Observatory (SGO) as the most notable
- + National circular and bio-economy centre in Kemi



Illustrations: Lasse Paldanius



# Circular economy principles – a way to sustainability

- The **action plan by EC for the circular economy** aims to 'close the loop' by complementing the measures contained in the legislative proposals and to contribute to meeting the United Nations Sustainable Development Goals (SDG) adopted in 2015

# Circular economy principles

- The circular economy is a model of production and consumption, which involves sharing, leasing, reusing, repairing, refurbishing and recycling existing materials and products as long as possible. In this way, the **life cycle of products is extended**. (Compared to linear economic model based on a 'take-make-consume-throw away' pattern)
- Circular economy is relevant as it offers companies the opportunity to turn **inefficiencies** in linear value chains into **business value**
- These inefficiencies look **beyond production waste**, focusing on under-utilised capacities, premature product lives, unsustainable materials, wasted end-of-life value and unexploited customer engagements
- Three drivers underpin the shift towards circular: the trend of increased
  - **customer-centricity, sustainability and enabling technologies**





# Circular principles are about addressing **inefficiencies** of business models

## Inefficiency

### Illustrative examples from manufacturing companies

#### UNSUSTAINABLE MATERIALS

Volvo uses **one third recycled materials** in new trucks and designs them for recycling so that 90% can be recycled  
Wärtsilä applies a **modular engine design** to enable increased commonality and backward compatibility of parts

#### UNDERUTILISED CAPACITIES

Caterpillar acquired Yardclub, a **platform facilitating equipment sharing**

#### PREMATURE PRODUCT LIVES

Bosch operates **remanufacturing** chains for high-quality components to ensure a high fraction stays in its loops  
The Schneider Electric Circuit Breaker Retrofit-program **modernises and updates** electrical distribution centres  
Konecranes provides a Lifecycle Care-program that includes consultation services, **modernisation & maintenance**

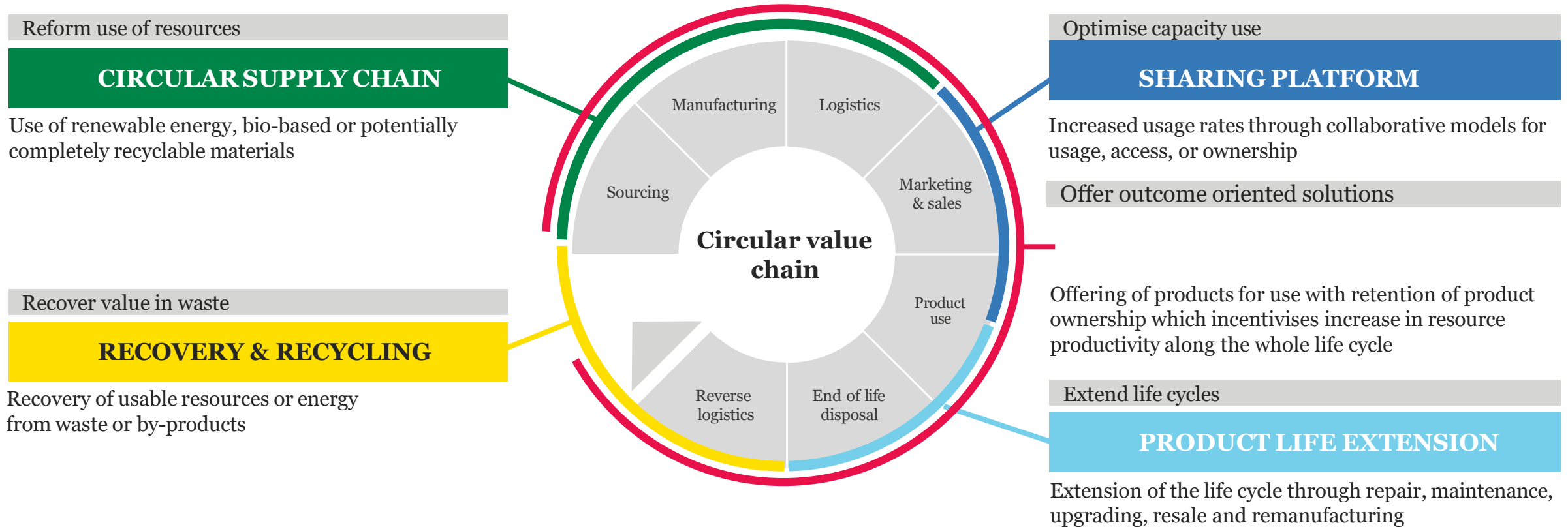
#### WASTED END-OF-LIFE VALUE

GM recycles 84% of its worldwide manufacturing waste and has **111 landfill-free facilities**  
Maersk introduced a Cradle-to-Cradle Passport for vessels, a **database listing the material composition** of the main parts of the ship, enabling better recycling of materials and parts

#### UNEXPLOITED CUSTOMER ENGAGEMENTS

Michelin offers **tire as a service** (pay per mile) and sensor-based data analytics for predictive maintenance  
Philips has several contracts signed for providing **light as a service** on a pay-per-lux basis or monthly subscription

# Business models reduce the inefficiencies and create value for companies



# Relevant circular business models depend on the type of inefficiencies that need to be addressed

		Business Models	CIRCULAR SUPPLIES		SHARING PLATFORM	PRODUCT AS A SERVICE		PRODUCT LIFE EXTENSION				RECOVERY & RECYCLING	
Inefficiencies		Level*	Build to last	Circular supplies	Share	Product as a service	Performance as a service	Repair & Maintain	Upgrade	Resell	Remanufacture	Recycle/Upcycle	Return
NON-REUSABLE MATERIALS	Direct materials	Medium	●	●	<b>Example:</b> To address underutilised capacity, Share, Product as a Service, Performance as a Service, Repair & Maintain and Upgrade are relevant circular business models.			●	●		●	●	
	Indirect materials	High		●					●	●		●	●
UNDER-UTILISED CAPACITY	Availability	Medium			●	●	●	●	●				
	Operational performance	Very low	●			●	●	●	●		●		
PREMATURE PRODUCT LIVES	Relevance	Low	●		●	●	●	●	●	●	●		
	Functionality	Very low	●		●	●	●	●	●		●		
WASTED END-OF-LIFE VALUE	Waste in production	Medium	●			●	●				●	●	●
	Take-back	Very high	●			●	●				●	●	●
	Recycling	Low	●			●	●				●	●	●
UNEXPLOITED CUSTOMER ENGAGEMENTS	After-sales	High	●		●	●	●	●	●	●	●	●	●
	Add-on sales	Very high	●		●	●	●	●	●	●	●	●	●

\*Analysis based on survey responses of 30 Finnish manufacturing SMEs. More detailed information on the survey replies in Appendix 1.



# Circular Economy Business Models

Circular economy is based on keeping the resources in the loop instead of linear "take-make-waste" approach. To accomplish the shift, companies must develop and implement new business models which requires a new mindset. For small companies co-operation with others may open new doors.

## 5 recognized business models

- **Product-as-a-service:** service of renting instead of owning
- **Renewability:** using renewable energy and materials
- **Sharing platforms:** more usage out of products using digital platforms
- **Product-life extension:** maintenance, repairing and refurbishing
- **Resource efficiency and recycling:** efficient use, collection and reuse of materials



## Circular Economy opportunities for micro and small-scale companies

- Product and service development, especially in companies' interactions
- Utilizing the networks
  - mapping the side streams and reorganizing their use
  - taking customer's needs and values into account
  - co-developing products and services that solve actual customer problems

# Circular business model approach : case study in Finnish Lapland and Arctic cooperation

- Lapland is the northernmost region of EU where unique nature consists of abundant natural resources which naturally creates strong accumulation of northern expertise
- SMART specialisation (S3) - the vision of Lapland's Smart specialization is to enjoy a leading position in sustainable utilization and commercialization of Arctic natural resources and conditions
- World's northernmost hub of bio-, mining-, metal industry and services
- 1,7 Mt of by-products and residues (excluding waste rock)
- Responsible for 80% of Lapland's industrial production, with over 5 billion EUR of exports annually (7-8 % of the total export value of Finland)
- Industrial symbiosis estimated at 700 million EUR annually



# Arctic Circular Economy Cluster

- Ecosystem of the Arctic Industry is an operational environment and unique innovation platform
- The process industry, which is largely concentrated in the Kemi-Tornio region, actively searches for new, eco-innovative ways to modernise its processes
- Management of by-product processes of industries and process optimisation in the Kemi-Tornio region is a prioritised issue
- The annual volume of by-products and residues of Kemi-Tornio large scale industries amounts to 1,7 million tonnes
- Rovaniemi is the administrative centre of Lapland and an important regional centre of public governance for mining in Finland
- Mining industry is active throughout Lapland.
- With the long traditions in Lapland the coexistence between industries using natural resources has been amicable



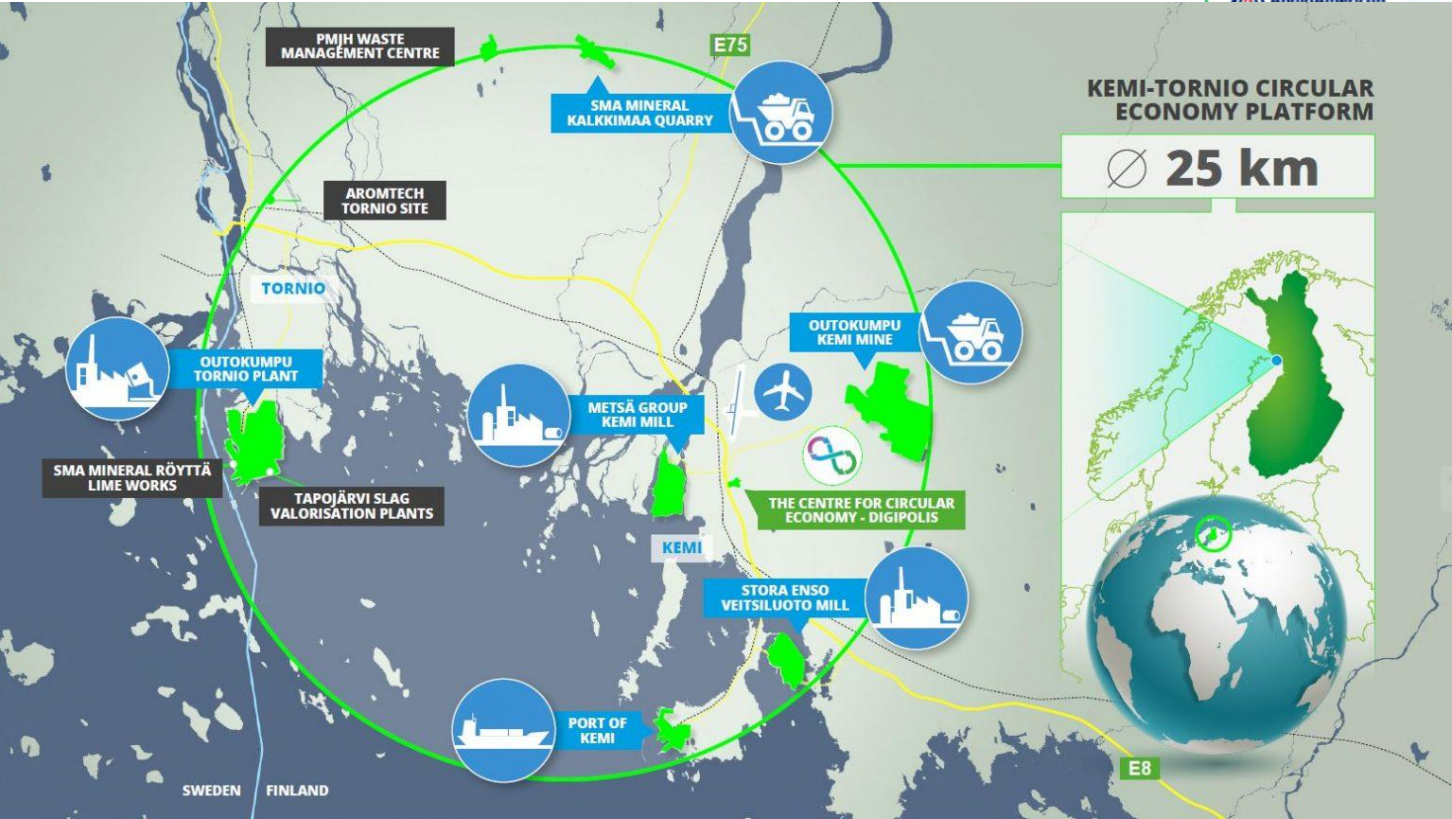


# Ecosystem for circularity of the Arctic Industry

## Kemi-Tornio Industrial park network

The infographic illustrates the Kemi-Tornio industrial park network ecosystem, organized into several key sections:

- COMPANIES:** A grid of logos for various industrial and service companies, including Agnico Eagle Finland, MetsäFibre, Kemi Katama, Etteplan, Manga Lng, Boliden, Norra Hydro, eco clorg, Caverion, Ecolan, Jäkäla, eurofins, syno mineral, Esa ja pojat, Kemi Shipping, TOIVANEN, TAPOJÄRVI, fortum, ANDRITZ, and Anso American.
- NETWORK OF ECO INDUSTRIAL PARKS:** A collection of logos for various eco-industrial parks and centers, such as Centre for Circular Economy, MIKSI, KARKOLA, SCP, Prizztech, KEMI JÄRVI, Pasintze, and others.
- INTERNATIONAL PARTNERS:** Logos of international organizations and institutions, including EYDE, UUC, ICAMCVL, SINTEF, and others.
- ARCTIC INDUSTRY AND CIRCULAR ECONOMY CLUSTER:** A central hub for the cluster's activities.
- EDUCATIONAL AND R&D SECTOR:** Logos of educational and research institutions like Luke, Lapin AMK, and others.
- PUBLIC SECTOR:** Logos of regional and national public sector entities, including Kemi, Digipolis, Tervola, and others.
- PARTNERS:** Logos of partner organizations like Motiva, SYKE, and others.



Outokumpu- 90% recycled material content in stainless steel

<https://youtu.be/V2UVDNZv2Ks>

# Circular economy in Lapland UAS

## Arctic Natural Resources and Economy

### Digital solutions

*(Cross-cutting)*

- Business and Administration
- Information Technology
- Data processing
- Fine Arts
- Master School

### Smart built environment

*(CE included)*

- Civil Engineering
- Land Surveying Engineering
- Master School

### New industry *(CE included)*

- Mechanical Engineering
- Electrical Engineering
- Master School

### Future bioeconomy *(CE included)*

- Forestry
- Rural Industries
- Master School



## Northern Well-being and Services

### Participation and functional capacity

- Social Services
- Elderly Care
- Physiotherapy
- Master School

### Future healthcare services

- Nursing
- Public Health Nurse
- Master School

### Responsibility in business and services *(CE included)*

- Tourism and Hospitality Management
- Business and Administration
- Sports and Leisure Studies
- Master School



## Building Ecosystem Integration Labs at HEI to foster Smart Specialization and Innovation on Sustainable Raw Materials

# HEI4S3<sup>RM</sup>

### Project aims to

- develop innovation campuses focusing on sustainable raw materials and mining
- support innovations in circular economy in higher education institution and entrepreneurship in mining and raw material industry
- enhance mining and raw material industry and HEI to work side by side to develop more sustainable mining solutions and innovation projects by applying circular economy concepts and business models

**LAPIN AMK**<sup>7</sup>  
 Lapland University of Applied Sciences

## Building Ecosystem Integration Labs at HEI to foster Smart Specialization and Innovation on Sustainable Raw Materials

# HEI4S3<sup>RM</sup>

**Time:** 1.7.2022–30.6.2024

**Financier:** European Institute of Innovation and Technology

**Budget:** 225 000 € (LUAS) / 1 193 940 € (project)

**Contact person:** Sirpa Kokko (sirpa.kokko@lapinamk.fi)

### Project partners:

- Lapland University of Applied Sciences (FI)
- University of Oviedo (ES)
- University of Huelva (ES)
- Technical University Georg Agricola (GER)
- International Hellenic University (GR)
- Banat University of Agricultural Sciences and Veterinary Medicine of Timisoara (RO)
- Mining and Metallurgy Institute Bor (RS)
- Geological Survey of Slovenia (SLO)
- Pheno HORIZON (PL)

**LAPIN AMK**<sup>7</sup>  
 Lapland University of Applied Sciences

## LTKT2.0 – Lapin teollinen kiertotalous 2.0 – Lapin kiertotaloustoiminnan vahvistaminen



Hankkeen tavoitteena on vahvistaa Lapin teollisen kiertotalouden alueellista kilpailukykyä ja toimenpiteillä luodaan edellytyksiä uusille kiertotaloustoimintoihin ja kiertotaloutta hyödyntäville liiketoimintamalleille. Hanke vahvistaa Lapin tutkimus-, osaamis- ja innovaatiotoiminnan infrastruktuuria, teollisten kiertotalouden toimijoiden yhteistyötä ja verkostoa. Toimenpiteissä korostuu etenkin energia- ja materiaalihokkuus, kiertotalouden uusimman tiedon ja osaamisen hyödyntäminen sekä uuden liiketoiminnan kehittäminen. Hankkeen toteuttamisessa hyödynnetään Kiertotalouskeskuksen ([www.teollinenkiertotalous.fi](http://www.teollinenkiertotalous.fi)) osaamista, kontakteja ja verkostoa. Keskeisenä tulostavoitteena on varmistaa ja tukea Lapin teollisen kiertotalouden osaamisen ja kilpailukyvyn kehittymistä myös 2020-luvulla ja tarjoaa täydentävän väylän myös Lapin kiertotalouden EU-yhteistyön vahvistamiseen. Hankkeen tuloksena luodaan edellytyksiä ja uusia liiketoimintamalleja kiertotalouden tuomiseksi vahvasti mukaan Lapin yritysten toimintaan.

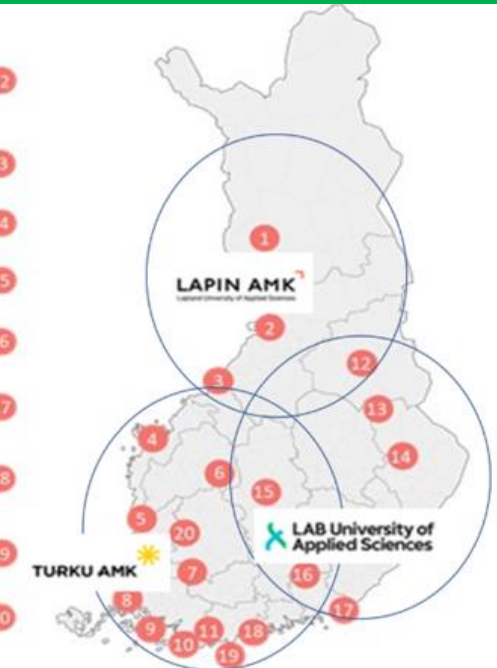
Hankkeen aikataulu: 1.6.2020 – 31.3.2023  
 Hankkeen EAKR-tuki: 1 491 423€ (Kokonaisbudjetti 1 864 282 €)  
 Hankkeen www-sivut (Lapin AMK): <https://www.lapinamk.fi/fi/Yrityksille-ja-yhteisöille/Lapin-AMKin-hankkeet?RepoProject=522326>  
 Yhteyshenkilöt:

## SERI – Resurssiviisas Meri-Lappi



Hankkeen tavoitteena on edistää Meri-Lapin kuntien vähähiilisyttä ja resurssiviisautta konkreettisten toimenpiteiden ja pilotointien kautta. Hanke keskittyy rakentamiseen ja elintarvikeviisauden teemoihin sekä nostamaan esille konkreettiset toimenpiteet, joiden kautta osoitetaan Meri-Lapin olevan kiertotalouden edelläkävijäalue laajalla toimintasektorilla. Yhdistävänä tekijänä eri teemoilla ja toteutettavilla piloteilla on vähähiilisuuden, elinkaariajattelun ja resurssiviisauden näkökulmat. Uusien pilotointi- ja liiketoimintamahdollisuuksien avaaminen alueen elinkeinoelämälle lisää myös alueen elinvoimaa. Hankkeessa laaditaan seudullinen vähähiilisyys- ja resurssiviisaisuusstrategia, toimenpideohjelma sekä toteutetaan vähähiilisyttä edistäviä pilottitoimenpiteitä kuntien toimipisteissä sekä yksityisen sektorin yrityksissä. Lisäksi hankkeen tavoitteena on osallistaa alueen yritykset, yhteisöt ja ihmiset osaksi kokonaisväitosta vähähiilisyttä edistävää toimintaa Meri-Lapin alueella. Monipuolinen ja erityyppiset toiminnot esittelevä toimintapalaletti on monistettavissa myös Lapin muihin kuntiin ja kaupunkeihin sekä erilaisiin toimipisteisiin tai yritysisiin.

Hankkeen aikataulu: 1.1.2020-31.12.2021  
 Hankkeen EAKR-tuki: 282 952€ (Kokonaisbudjetti 353 600€)



Kuva 1. Ammattikorkeakoulut, joilla tunnustettua kiertotaloustoimintaa. (Sara Kuure, Lapin AMK, 2021)





SERI – Resurssiviisas Meri-Lappi

KIERTOTALOUS, RESURSSIVIISAUS JA VÄHÄHIILISYYS



Kohti Kestäviä Hankintoja



LAPIN LIITTO

Vipuvoimaa EU:lta 2014-2020



Euroopan unioni Euroopan aluekehitysrahasto



BUILDING ECOSYSTEM INTEGRATION LABS AT HEI TO FOSTER SMART SPECIALIZATION AND INNOVATION ON SUSTAINABLE RAW MATERIALS



Työ- ja elinkeinoministeriö Arbets- och näringsministeriet



DUKE – Digitaalisilla Kaksosilla Vipuvoimaa Uusiutuvalle Energialle



# Circularity Gap Report 2022



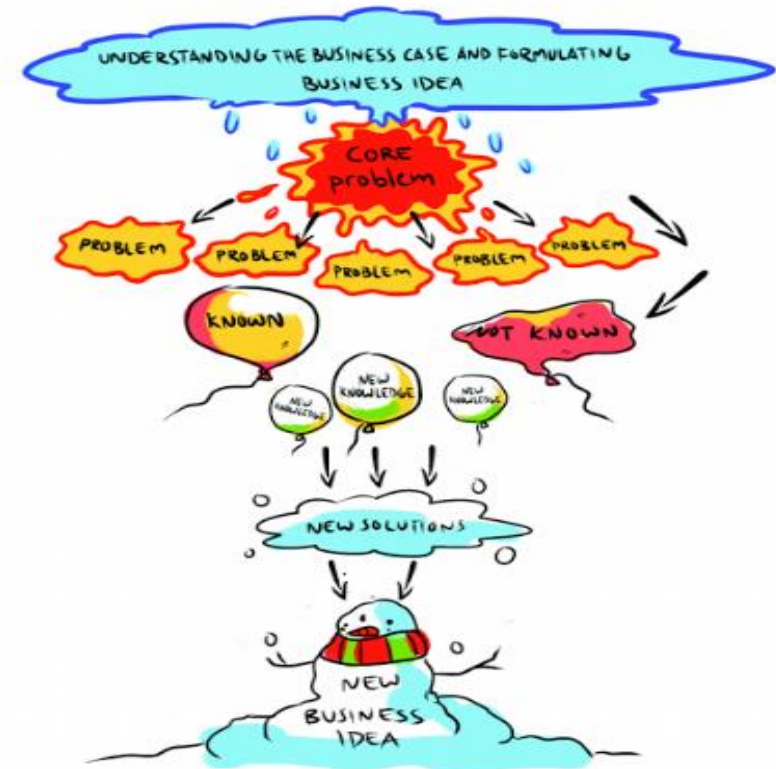
**More than 91% of what we take from the earth is wasted.**

**HALF A TRILLION TONNES OF VIRGIN MATERIALS, OUR WORLD IS ONLY 8.6% CIRCULAR.**



# SECA - Innovation and Sustainable entrepreneurship with Circular mindset

- Purposeful search for **innovative** opportunity
- Creative approach to sustainable **solutions**
- Sustainable **value creation**
- Problem-solution method







**Thank you!**