

MODERN CLUSTER OF ARCTIC INDUSTRY

Sustainable utilisation of
arctic natural resources

DIGIPOLIS

Kierto- ja biotalouskeskus
kehityksen mahdollistajana

KIERTOTALOUS KUNTIEN
MAARAKENTAMISESSA -seminaari
Kemin Digipolis 14.3.2018

THE FUTURE OF THE CIRCULAR AND BIOECONOMY IN LAPLAND

DIGIPOLIS



Leverage from
the EU
2014–2020

4,000

The Kemi–Tornio industries currently employ 4,000 people in the region. With future investments in the bio- and circular economy (such as Boreal Biorefinery, Kaidi), the employment effects in northern Finland are estimated at 2,000 persons.



Annually the Kemi–Tornio industries produce

1.7 million

tonnes of industrial byproducts

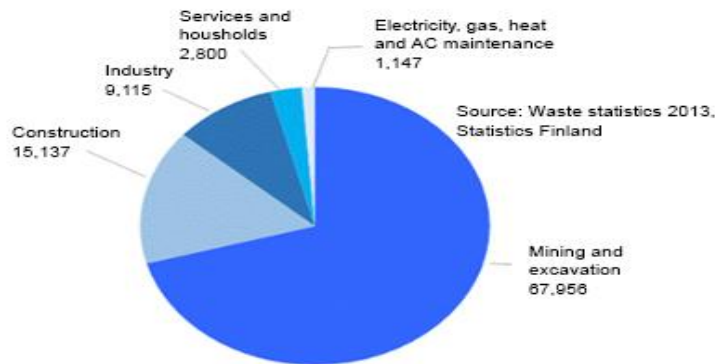
Utilisation categories include neutralisation, circulation of nutrients, excavation, landscaping, soil enrichment, building products, water treatment.



From waste into profitable business



Finland has great potential to utilise industrial side streams (94 million t/a), which are currently classified as waste.



96%

of waste is non-household generated.

VISION

Lapland world's leading arctic bio- and circular economy region

Business potential

The current value of Lapland's industrial symbiosis and the potential of the bio- and circular economy

2000

2 billion

1000

200 million



CE-approved recycled materials from industrial side streams:

The annual use of ferrochromium slag in road construction (400,000 tonnes) saves 600,000 tonnes of virgin gravel and rock aggregate and reduces road construction carbon dioxide emissions by 200,000 tonnes.

Source: Outokumpu plant in Tornio

Kemi–Tornio circular economy Ecosystem



Kemi-Tornio's circular economy innovation platform

- **Worlds 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**



FURTHERING THE CIRCULAR ECONOMY AND BIOECONOMY IN LAPLAND IN 2012–2016

Industry byproducts
utilised

Where did it all begin?

11/2012

The key players of Kemi–Tornio industries and industrial services were interviewed in the side-stream evaluation of needs.

Prioritisation of development tasks



4/2013

Prioritisation of development tasks with key players of industries and industrial services

Lapland EU's model region

7/2014



European Commission's selection: Lapland EU's model region in sustainable processing of natural resources

The FISS model

10/2014

FISS workshops, Finland benchmarking, business potential

Recognition for work



21 September 2016

Work carried out by the Kemi–Tornio region & Lapland and Digipolis and partners: Key project of Sitra's Finnish circular economy action plan

Development of operations

2014

Side-stream recognition tool development together with industries across sectoral boundaries. Development of measures furthering the systematic process and taking the matter forward

27 side-stream recognition, total volume:

1.4 million tonnes annually



Over 100 trucks daily

Expansion of operations



2015–2016

Entire Lapland's big industries involved in development. Synergies between mines and the processing industry, and entry of new service businesses. Expanding the process to northern Finland, northern Sweden and northern Norway.

2017



Implementation of Sitra's action plan

1 700 000 t of Industrial by-products

Identification

Stream	Quantity t/a
Ferro-Chrome Slag	650000
Steel Slag	400000
Lumpy rock	220000
Sawmill by-products	170000
Calcite + Filter Dust	60000
Burnt Lime/Slaked Lime	30000
Fly Ash	22000
Fiber Clay	20000
Water Purification Precipitate (Steel)	20000
Dolomite- Bricks	20000
Clacite	15000
Biosludge	12000
Ferro-Chrome Underflow	10000
Debarking Waste	9000
Fly Ash	7000
Green Liqour Dregs	6300
Filter Dust (Lime)	5000
Green Liqour Dregs	5000
Bottom Ash	4000
Fly Ash	3000
Knot Reject	2500
Bottom Ash	2400
Burnt Lime	2000
MgO-C Bricks	2000
Bottom Ash	1500

Characterisation

Stream	Characterisation
Ferro-Chrome Slag	Highly acidic, high in iron, chromium, and silicon. Used in construction and as a soil amendment.
Steel Slag	Highly acidic, high in iron, silicon, and manganese. Used in construction and as a soil amendment.
Lumpy rock	Highly acidic, high in iron, silicon, and manganese. Used in construction and as a soil amendment.
Sawmill by-products	Highly acidic, high in iron, silicon, and manganese. Used in construction and as a soil amendment.
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Recognition



Classification

Classification	Examples of utilization
Supporting materials	Agriculture and road construction, concrete aggregate, mining areas
Bases	pH control, liming and soil amendments
Organic matter	Landscaping, combustion
Ashes	Agriculture and road construction, soil amendments, mine filling
Packing materials	Sealing layers of landfill sites
Symbiotic products	Multiple uses

Potential utilisation sites in Northern Finland area

- Infrastructure Projects (incl. landfills and recovery sites)
- Mining Projects
- Other industrial projects
- Other projects

Mine projects in Northern Finland

- The cooperation has started with mines that are different stages of the life cycle
- Applications examples: construction, landfills, mine fillings, neutralization etc.

Investment potential and job creation in Kemi-Tornio and Lapland

- 500 000 000 € in 14 different IS investment projects
- 400 new employees
- Kaidi (in Kemi) and Boreal Bioref (in Kemijärvi) biorefineries are CE and IS cases, total Investments 1,68 billion €
- 1300 new employees in potentially circular value chains - ecosystems

Digipolis key actor in Finland's Circular Economy roadmap



THIS IS HOW WE BUILD CIRCULAR ECONOMY IN FINLAND

Technical loops

Competitive advantage from the decreased use of virgin raw materials and long lifecycle of materials and products.

Key projects:

- **The Arctic industries ecosystem and Kemi-Tornio circular economy innovation platform. (Digipolis Oy)**
- Circular economy demo plant for waste electrical and electronic equipment. (Technology Industries of Finland)

Plans

- Making pilots, scale-ups and investments to happen, process of cluster funding
- Tighter cooperation and benchmarking through Scandic & European networks
- More resources through strategic alliance with Lapland UAS and growing capacity
- Modern cluster approach and cooperation
- Efficient development/funding tools
- Establishment of Centre for industrial circular economy
- Lapland UAS: CE curricula starts on 2018

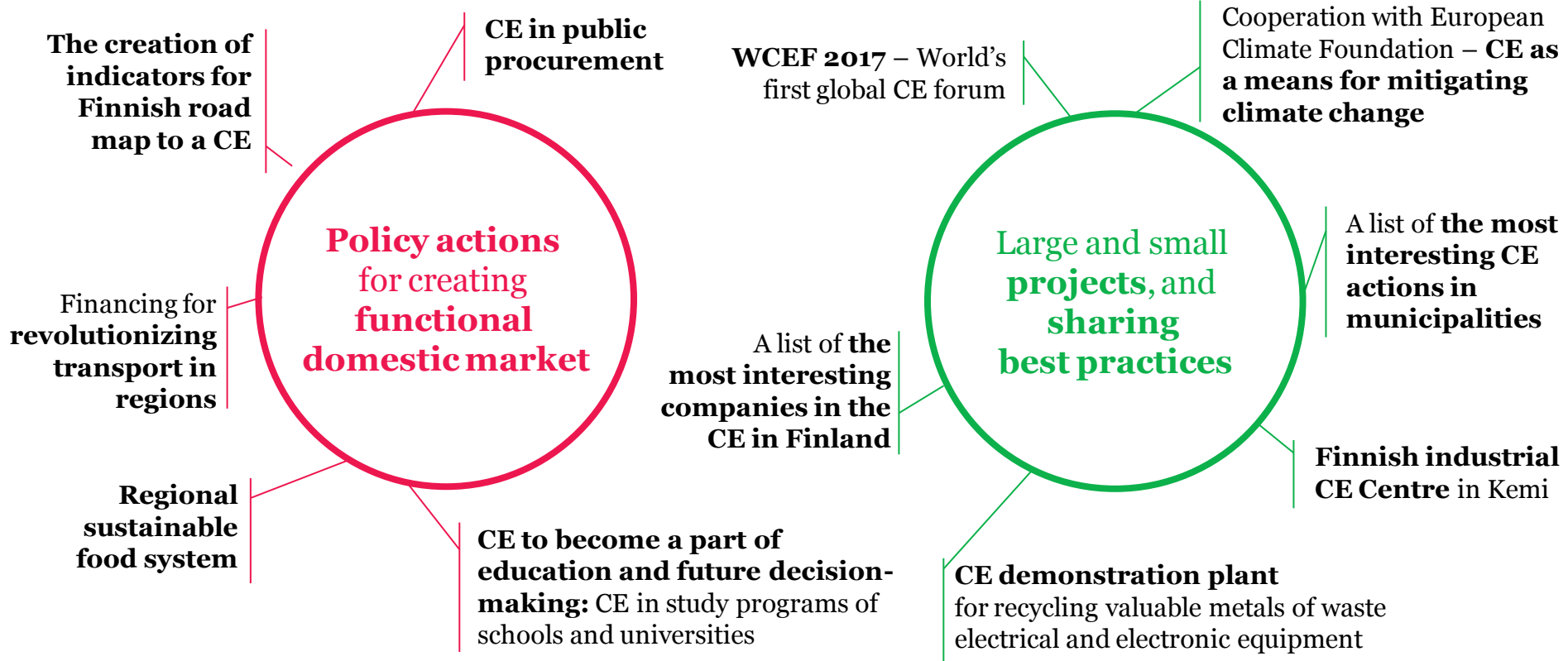
Utilisation of the arctic natural resources – Lapland's Arctic Industry

- Arctic Spring, Investment boom in Arctic regions
- Industrial- and mining service companies receive orders worth of hundreds of millions.
- International-industry standards, HSEQ
- Cleantech – growing need of sustainable solutions
- Enhancing Circular Economy
- Internationalization in home market, glocalization
- Internationalization in the surrounding countries
- Own products and services





Circular economy can be boosted through long-term systemic changes, quick experiments, scalable solutions, and stimulation of demand



Arktisten teollisten symbioosien osaamis- ja koulutuskeskus

TAVOITE:

Kemi-Tornioon ja Lappiin perustetaan asiakastarpeisiin pohjautuva kierto- ja biotalouskeskus, joka perustuu verkostomaiseen toimintamalliin. Tavoitteena on hyödyntää olemassa olevaa ja koko ajan laajentuvaa yritys- ja asiantuntijaverkostoa sekä tutkimus- & kehitysympäristöinfraa + klusteriyhteistyötä niin Suomessa kuin Pohjoismaisella ja Eurooppalaisellakin tasolla.

HAASTE, johon osaamiskeskus vastaa:

Yleinen haaste yrityksille ja organisaatioille teollisessa kiertotaloudessa ovat testien, kokeilujen, pilottien ja skaalausten toteuttaminen (vain suurilta yrityksiltä löytyy resursseja, mutta niiltäkin uupuvat usein yhteistyöverkostot) sekä näihin liittyvä prosessiosaaminen. Näissä kysymyksissä osaamiskeskus tulisi toimimaan oman verkostonsa avulla kiertotalouden edistäjänä ja mahdollistajana.

Miten osaamiskeskus toimii?

Osaamiskeskus vastaa räätälöidysti yritysten ja muiden toimijoiden (kohderyhminä mm. päättäjät, virkamiehet, suunnittelijat, opettajat, opiskelijat jne.) kiertotalouden osaamis-, kehittämis-, palvelu- ja tietotarpeisiin, erilaisilla koulutuspalveluilla:

- Olemassa olevien asiantuntijoiden osaamisen kasvattaminen
- Uusien osaajien kouluttaminen (osaamispuutteita ja -tarpeita tunnistamalla)
- Uusien osaajien ja parhaiden asiantuntijoiden etsintä yhteistyökumppaneiden tarpeisiin
- Toimijoiden auttaminen ympäristölupaprosesseissa
- Kestävyysanalyysien tuominen yritysten käyttöön yhdistettynä toiminnan jatkuvaan parantamiseen
- Monimutkaisiin haasteisiin vastaaminen sitoutuneella monialaisella osaamisverkostolla (teollisuustoimijoiden asiantuntijat, palveluyritysten asiantuntijat, yliopistojen tutkijat, ammattikorkeakoulujen TKI-henkilökunta ja opiskelijaryhmät opettajineen, ELY:n asiantuntijat – etenkin ympäristöpuolelta, sektoritutkimuslaitosten asiantuntijat)
- Yritysten tukeminen mahdollisten pilotointirahoittajien etsimisessä ja hankehakemusten tekemisessä
- Osaamiskeskus edistää ja edelleen kehittää systeemitason toimintamallimuutosta

Tiedotus ja viestintä: Yksi olennainen osa keskuksen toimintaa on teknisen tiedon kerääminen (esim. toimintamallit, benchmarkkaukset, potentiaaliset sivuvirrat ja niihin liittyvät haasteet sekä mahdollisuudet) ja jakaminen myös laajemmin Suomessa sekä Euroopassa sisältäen toiminnan kansaintajuistamisen esimerkiksi menestystarinoiden avulla eri kohderyhmille, kuten: päättäjät, virkamiehet, suunnittelijat, opettajat, opiskelijat jne.

Sitra tukee toimintaa osaamisen kehittämisen näkökulmasta, eikä suoraan yritysten tukemisen

Kemi CE Centre Advisory Board

1. Martti Sassi, Senior Vice President – Head of Operations, Outokumpu Tornio Works
2. Juha Mäkimattila, Mill Director, Stora Enso Veitsiluoto Mill
3. Kari Ala-Kaila, Vice President – Technology, Metsä Fibre
4. Mikko Korteniemi, General Manager, Agnico Eagle Finland Kittilä Mine
5. Jukka Jokela, General Manager/Project Manager, Anglo American - Finland AA Sakatti Mining
6. Jari Hietala, National Division Leader, Eurofins Environment Testing
7. Juha Koskinen, R&D Manager, Tapojärvi Oy/ Hannukainen Mining Oy
8. Tuula Sivonen, Regional Manager, The Federation of Finnish Technology Industries
9. Kimmo Heikka, Managing Director, Kemin Digipolis Oy
10. Heino Vasara, Sector Manager, Centre for Economic Development, Transport and the Environment

11. Eija Virtasalo, Head of Financial Unit, Centre for Economic Development, Transport and the Environment
12. Eira Luokkanen, Head of Unit – Environmental Protection, Centre for Economic Development, Transport and the Environment
13. Jyri Seppälä, Director – Centre for Sustainable Consumption and Production, Finnish Environment Institute (SYKE)
14. Eero Yrjö-Koskinen, Secretary General, Finnish Network for Sustainable Mining and Director, Green Budget Europe
15. Riikka Aaltonen, Senior Adviser – Mineral Policy, Enterprise and Innovation Department, Ministry of Economic Affairs and Employment
16. Kari Herlevi, Project Manager – Circular Economy, Sitra
17. Nani Pajunen, Leading Specialist – Circular Economy, Sitra
18. Olli Dahl, Professor, Aalto University, Clean technologies research group
19. Martti Lampela, Managing Director, Lapland University of Applied Sciences
20. Tero Nissinen, Chair, Mayor, City of Kemi

Case-esimerkki pilotin rahoittamisen haasteesta

- Tarkoituksena testata globaalissakin mittakaavassa uutta symbioosituotetta kaivokselle rakennettavassa pilottirakenteessa
- Suomen kaivoksilla pelkästään tämän pilotoitavan käyttökohteen potentiaalinen markkina on ennemminkin 100 miljoonaa euroa kuin kymmeniä miljoonia, globaaleista markkinoista puhumattakaan
- Symbioosituotteen resepti on patentoitavissa ja suurin osa symbioosituotteen kokonaismäärästä tulee teollisuuden sivutuotteista tai jätteistä
- Symbioosituotteen ympärille on potentiaalia rakentaa tuoteperhe useine käyttökohteineen, jolloin markkinapotentiaali kasvaa merkittävästi
- Ytimen yrityskonsortiossa muodostavat kolme yritystä ja niiden ympärillä pilotissa on jo 15 muuta organisaatiota, joista kaksi on globaaleja teollisuusyrityksiä
- Ympäristöluvut pilotin rakentamiseen ovat kunnossa
- Onnistunut pilotti on edellytys ja referenssi kestävän liiketoiminnan rakentamisen pohjaksi
- Pilotin kokonaishinta: Arvatkaapa?

200 000 €

Yleisesti

- Kiertotalous ei rakennu yksittäisien yritysten varaan vaan yritysverkostojen
- Juhlapuheista on päästävä toimivaan rahoitusprosessiin eli tahtotila on ohjaututtava toiminnaksi

Sustainability Assessment Tool (SAT)

- ✓ Sustainability of the mills means assessment of environmental, economical and social issues with legal aspects using proper metrics. It also covers Regional Economic Dimension (RED)
- ✓ The purpose was to develop a “simple” tool for evaluation the sustainability of process industry



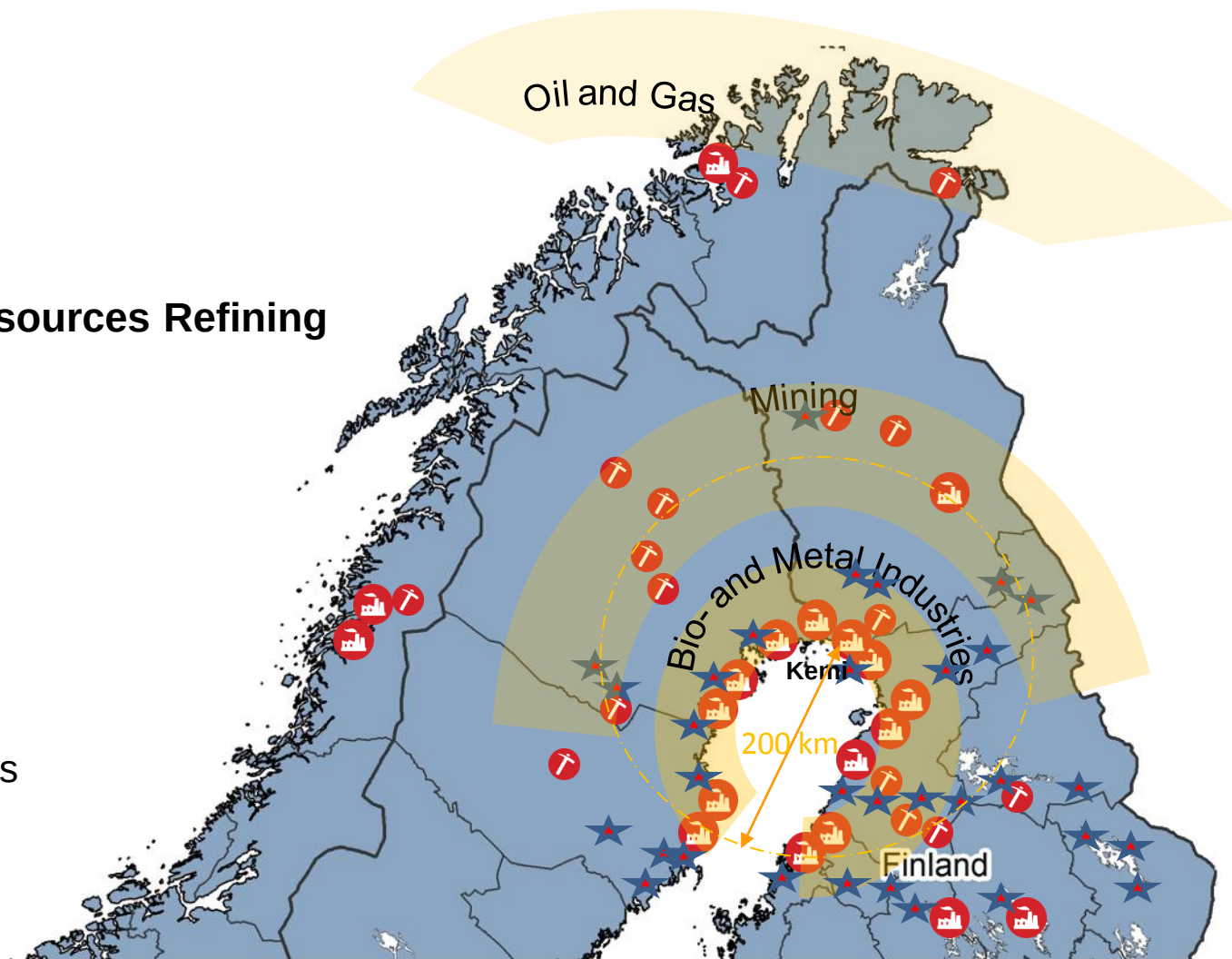
(Images:

<http://www.goodnewsfinland.com/archive/themes/mining-industry-2/eco-efficiency-in-mining-courtesy-of-finland/>, 19.11.2012,
http://www.energy-enviro.fi/index.php?PAGE=2906&NODE_ID=2906&ArchiveId=319&ArchiveSelect=200607, 19.11.2012.)

Nordic Industries

Story of Natural Resources Refining

- Global Markets
- Good Connections
- Arctic Solutions
- Cleantech Solutions
- 5 Bio Refineries
- 32 Sawmills
- 16 Mines
- 5 Metal Refineries
- 2 Aluminium Smelters
- 1 LNG Refinery
- 2 Chemical Plants



LAPLAND
Above Ordinary



Thank You!

DIGIPOLIS

Interested in to do co-operation?

Please contact:

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REGIONAL COUNCIL
OF LAPLAND

