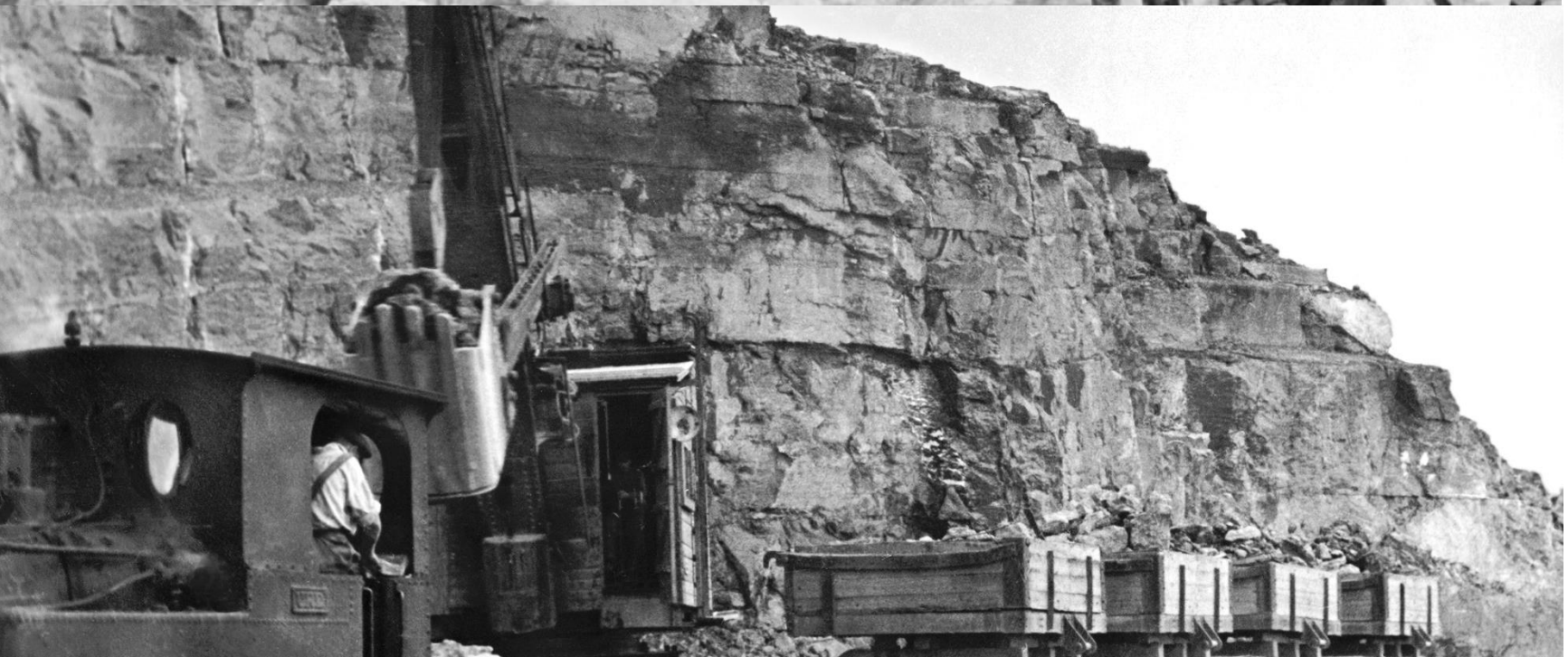
CEWEP Residues Conference – Ash to Resource

Mechelen 2024-09-25



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100 years of limestone quarry

30 years of landscape rehabilitation

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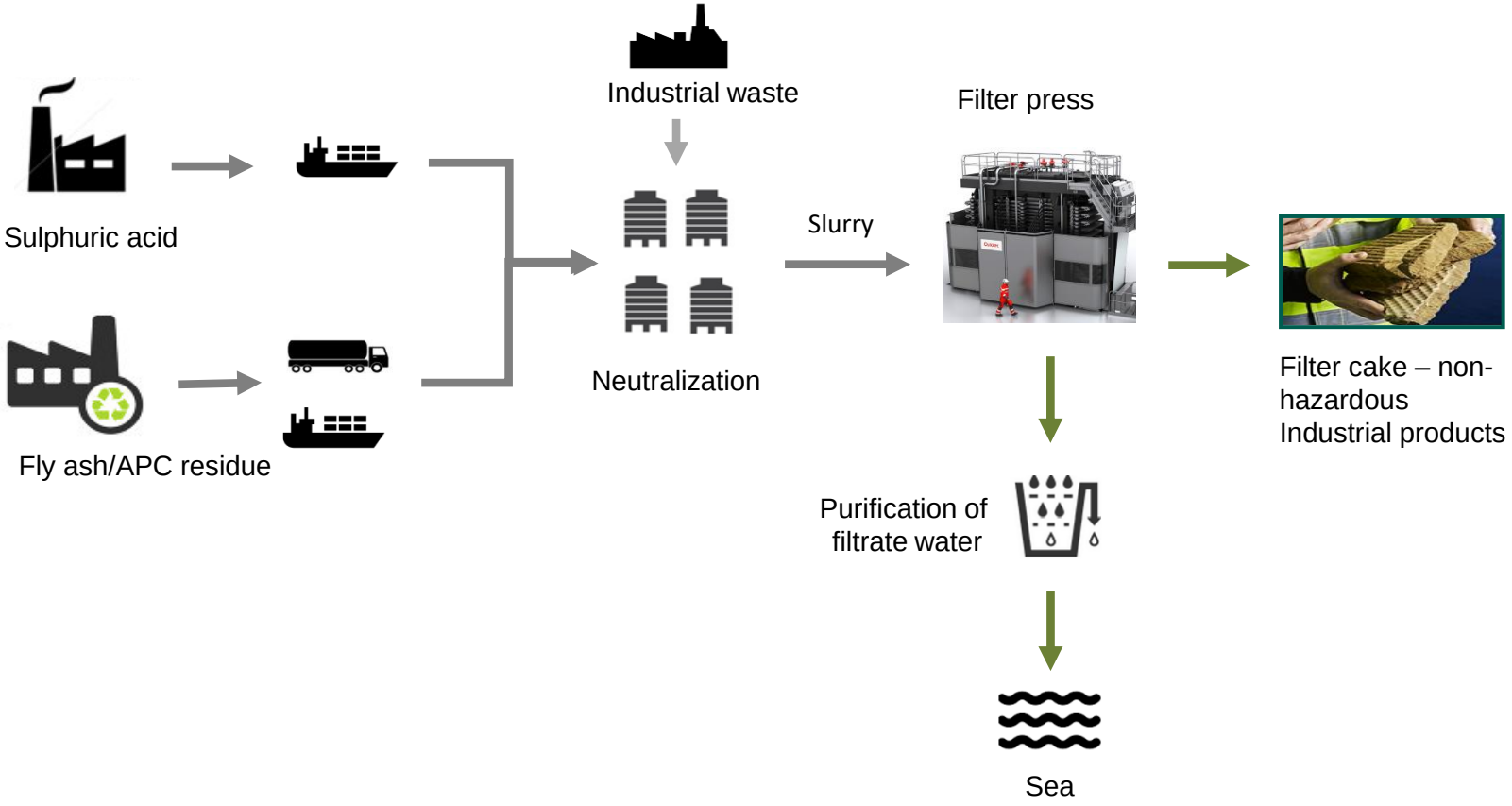
Current process



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Turning hazardous waste into non-hazardous waste

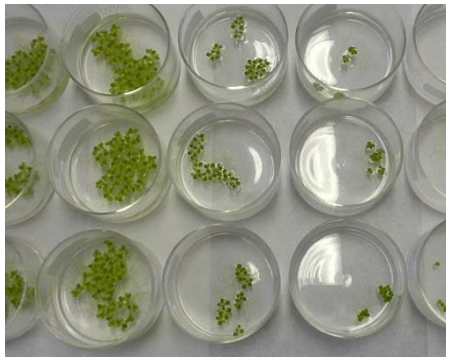
Where it all started…

Studying speciation of

- copper
- zinc
- lead

Tests on Ecotoxicity

Test	Group/ family	Salt/fresh water organisms	Value	Test time	Untreated fly ash/APC	Filter cake	Washed filter cake	Limit EC50		Limit LID
								Moser et al (2011)	Hennerbert (2014)	Hennerbert (2014)
					Share (in %) of eluate from L/S 10					
Microtox (V.fischerii)	Bacteria	Salt	EC50	15-30 min	<6.25	>100	>100	-	<10	-
			EC20	15-30 min	<6.25	>100	>100	-	-	-
Phaeodactylum tricornutum	Marine algea	Salt	EC50	72 h	61	>90	>90	<20	<10	-
			EC10	72 h	41.6	38.6	38.1	-	-	-
			LID	72 h	22.5	22.5	22.5	-	-	<8
Pseudokirchneriella subcapitata	Fresh water algea	Fresh	EC50	72 h	0.09	32	36	<20	<10	-
			EC10	72 h	<0.028	17.2	25.3	-	-	-
			LID	72 h	<0.028	11.3	22.5	-	-	<8
Nitochra spinipes	Crustacea	Salt/brackish	LC50	96 h	18	68	75.2	<10	<10	-
Artemia fransiscana	Crustacea	Salt	LC50	24 h	72	>100	>100	<10	<10	-
Daphnia magna	Crustacea	Fresh	EC50	48 h	17	31.5	>100	<10	<10	-
			LID	48 h	6.3	12.5	>100	-	-	<8



Comparison between results and suggested limits in literature (preliminary results)


EWC-code 190304*
190305
600 000 ton filter cake without hazardous properties!

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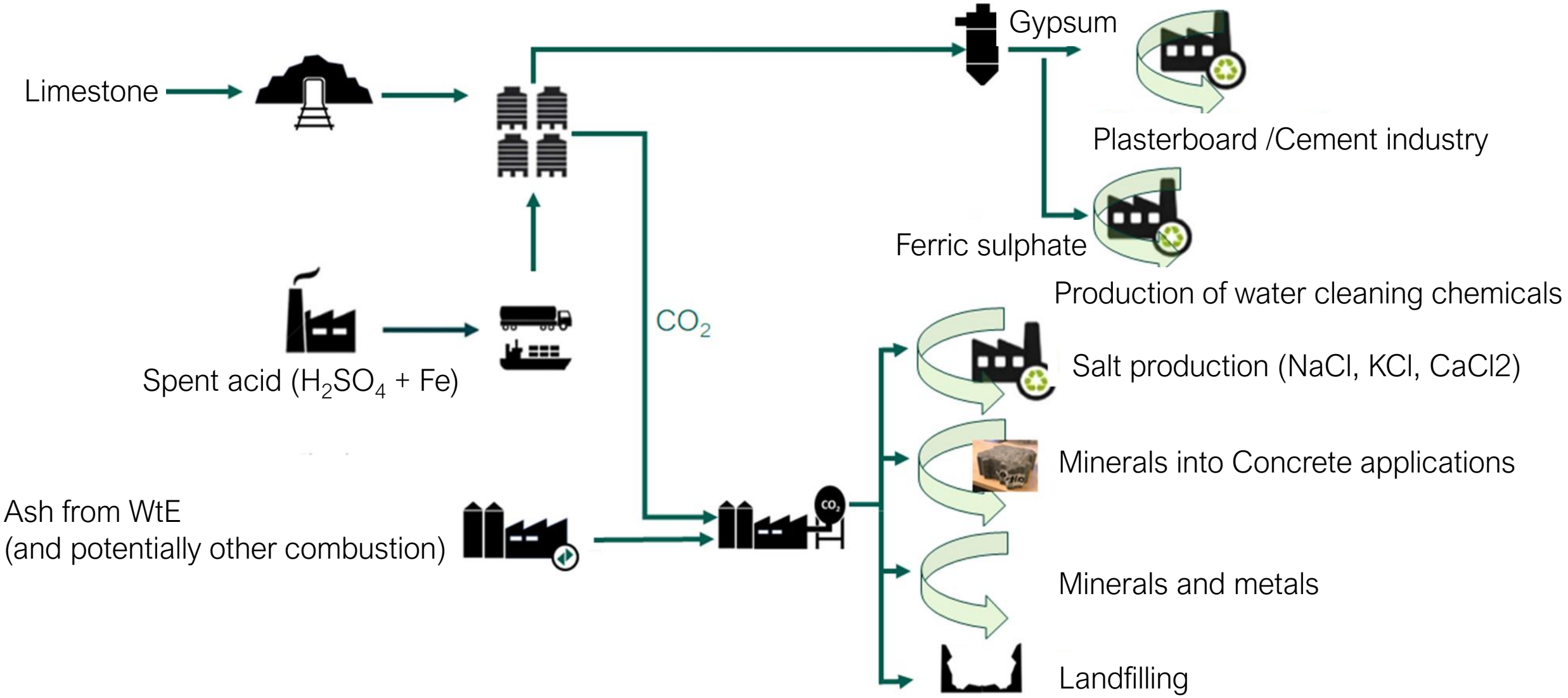
Increased circularity

Aim for the future



Gypsum production
Askepott (Cinderella)

Forskningsrådet

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ReSiTec

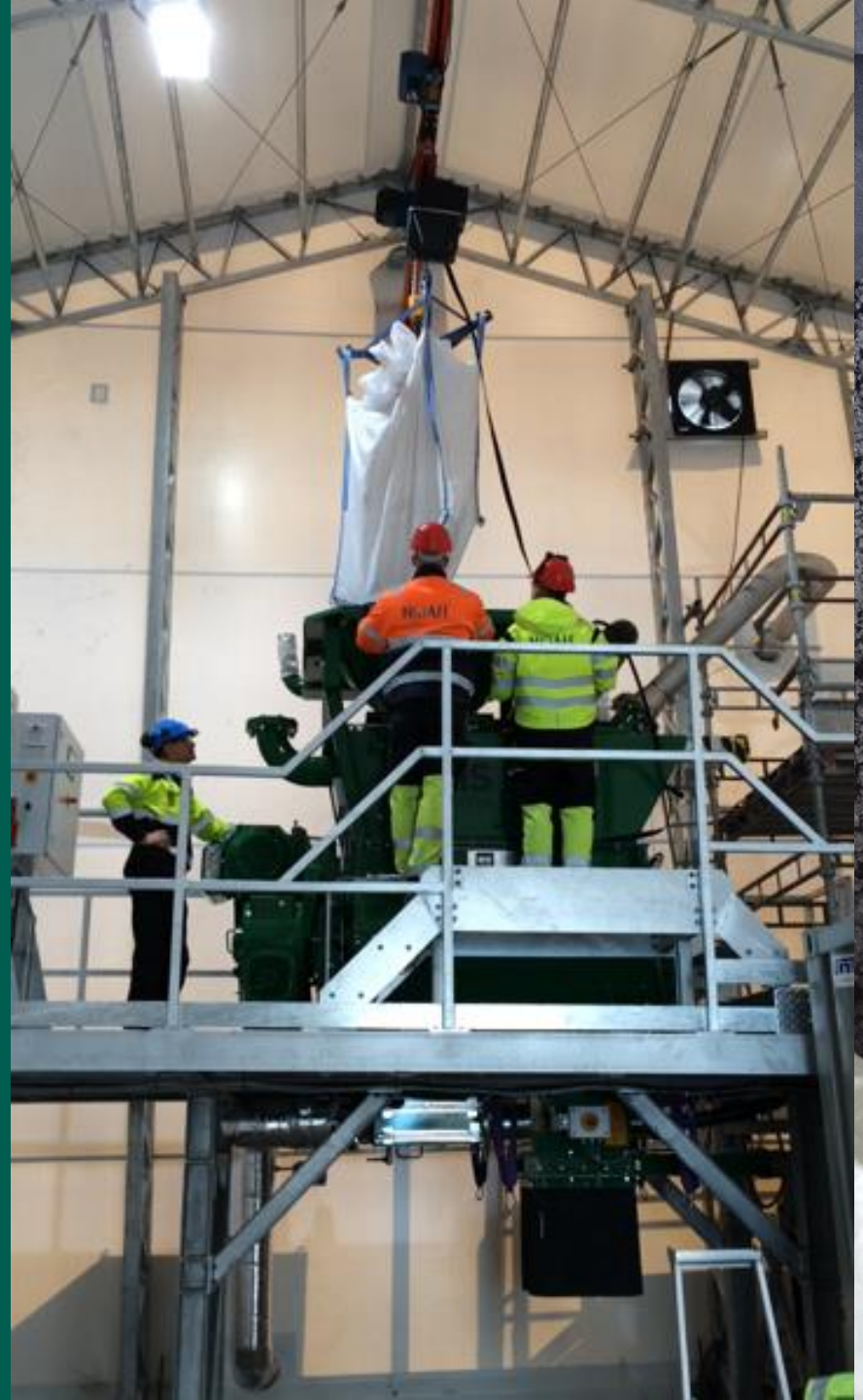
NTNU
Kunnskap for en bedre verden

TU/e Technische Universiteit Eindhoven University of Technology

KRONOS

BOLIDEN

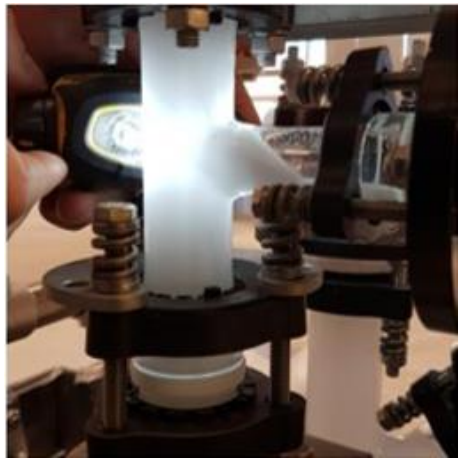
Carbontec



Salt separation and crystallization

2021 - 2022

- Building start middle of January 2021
- Commissioning late February 2021
- Testing with brine early March 2021



- Full scale vacuum salt plant rearranged to five stage batch test
- Energy input – steam boiler
- Evaporated water cools down and enters the Herøya Industry Park sewage
- Waste with salt content transported back to Langøya

Cement replacement/construction materials

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What climate benefit do the recycling of lime in the ash do?

What CO_2 impact do we get?

Fly ash 63 %
(-109 kg CO_2eq)

Sulphuric acid 37 %
(-61 kg CO2eq)

100 % allocation -170 kg $CO_{2\ eq}$

What is best?
Salt- or lime recycling?

- Avoided salt production
  - 151 kg $CO_{2\ eq}$
- Avoided landfill, avoided limestone, avoided burnt lime
  - 170 kg $CO_{2\ eq}$

Best if we can do both!

Source: Miljö- och klimatpåverkan för offsite-behandling av flygaskor: Avfall Sverige

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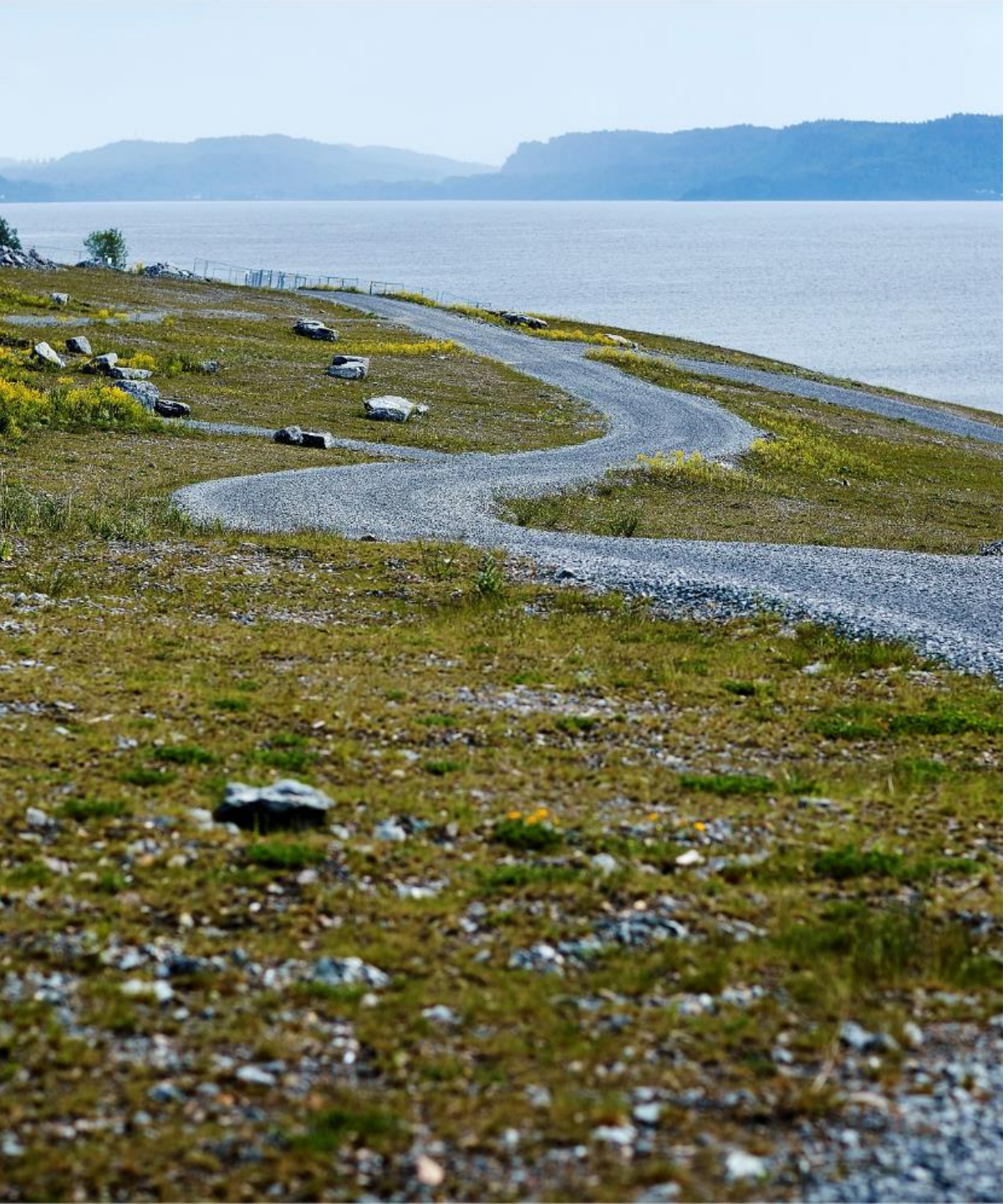
Transforming the logistics



Goals

Destination and nature attraction

- Completed, open recreational areas
  - Langøya's landfills rehabilitated into a rare habitat type and opened to the public in 2034
- Specialist communities for recovery and circular solutions
  - Establishing joint research and development communities with academia and industry partners in Holmestrand
- Recovery and production of secondary products
  - Green industry for circular solutions can be established in the industrial area

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Thank you for your attention!

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