asian cement

Co-processing of non-recyclable plastic waste in China and Vietnam

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Norad SINTEF Norwegian Ministry of Foreign Affairs

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More than 9 billion tons of plastic have been made since the 1950s

- Made from oil (polymer hydrocarbons, often with additives).
- Mouldable.
- Durable – strong & robust.
- Resist degradation, but will slowly break-down to Microplastics in nature.
- Recyclability depends on the polymer group, previous usage, practical aspects etc.
- High in energy content.

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>6.3 billion tonnes of plastic waste have been created globally since the 1950s; out of this, only
~9% has been recycled,
~12% incinerated
~79% dumped ☹

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Dumping

Ticking time-bomb !

>5 Billion tonnes of plastic wastes is today accumulated in dumpsites/landfills around the world…

…. will slowly break-down and be released to groundwater & rivers and constitute a continuous source of microplastics to our Oceans ☹

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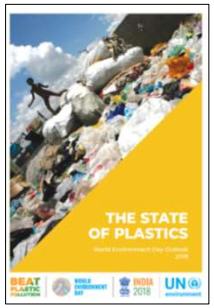

Release to the Oceans

Millions of tonnes of plastic leak into our Oceans every year.

If no effort is made there may be more plastic than fish in the oceans, by weight by 2050.

Microplastic in the Ocean will hurt biodiversity, economy and our own health.

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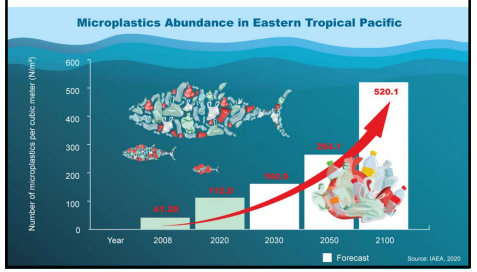
Plastic production is expected to increase significantly towards 2050



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Improved treatment of plastic waste is urgently needed

The most significant sources of plastics litter in the oceans is due to insufficient waste management capacity and infrastructure, especially connected to major world river basins, landfills and industrial sites.

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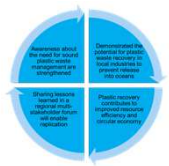
The Norwegian project "Ocean Plastic Turned into an Opportunity in Circular Economy" (OPTOCE) is part of the Norwegian development program on marine littering and microplastics

OPTOCE aims to explore how the cement industry can be involved and increase the treatment capacity for non-recyclable plastic wastes in China, India, Myanmar, Thailand and Vietnam.



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A super-important region

The OPTOCE countries have a population of 3 billion people, of which half live-in coastal areas.

They are amongst the highest plastic consumers in the world, with some of the highest releases to the Ocean, and generating an estimated 64 million tonnes of plastic waste every year.

They all have insufficient waste management infrastructure and treatment capacity!

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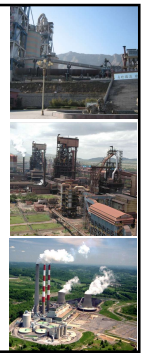
The most industrialised region in the world

The five OPTOCE countries produce around 75% of the world's cement, steel and electric power, in tens of thousands of plants that use huge amounts of coal and contribute with a large chunk of the world's CO_2 emissions.

Replacing parts of the coal with non-recyclable plastic waste seems to constitute a win-win opportunity. This is called Co-processing or Integrated waste management.



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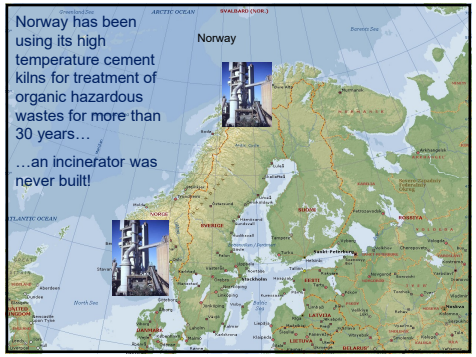

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Co-processing in Asia

Asian cement industry replace today an average ~3% of their coal with wastes.

Co-processing will be an important tool in reaching net-zero…and help us to improve waste management!

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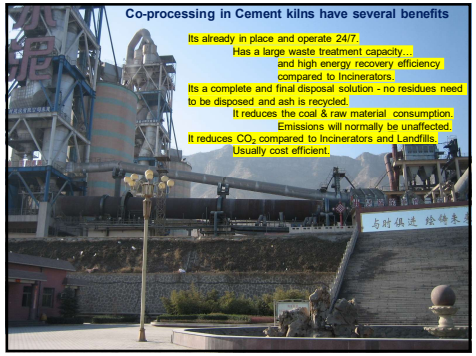

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We want to showcase the potential through local proof of concept in all OPTOCE-countries

Pilot Demonstrations will test and compare the technical and environmental performance under Baseline conditions, i.e. when using coal only, with co-processing conditions where various sources of non-recyclable plastic waste are used as a co-fuel together with coal.

Independent and accredited third party companies will sample and analyse pollutants in the emissions when conducting the pilot demonstrations.

Results will be openly published in scientific Journals.

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Regional Academic Collaboration

The OPTOCE-project fund MSc-thesis research on treatment options for non-recyclable plastic wastes and fate of plastic waste dumping .

AIT Asian Institute of Technology
DHQGHN
JADAVPUR UNIVERSITY
University Of Yangon
CRAES

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~ 48-Million-ton plastic waste is generated annually in China.

MEE 生态环境部

The OPTOCE-project has conducted pilot tests with Huaxin cement in Hubei province and investigated:

- The feasibility of using floating material from the Yangtze river as co-fuel.
- The feasibility of using Refuse Derived Fuel (RDF) from Zigui city as co-fuel.
- The feasibility of disposing low-infectious Covid-19 hospital and health care plastic wastes in cement kilns around Wuhan.

华新水泥 HUAXIN CEMENT

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Collection of floating material at the Three Gorges dam in Yangtze river

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Yangtze river is the biggest in China and with the highest plastic loads in the world. Location of Zigui town and upstream the Three Gorges dam

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Pilot Test at Huaxin cement plant, Zigui, Hubei China

	Floating material from Yangtse River	RDF from Zigui city
Feeding rate t/h	12.9	13
Plastic content weight %	13.9	12.3
Chloride %	0.062	0.41
Net Calorific value (kcal/kg)	2 223	1 955
Thermal substitution rate%	9.6	8.2

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Main results from three-day test at Huaxin cement

	Baseline using Coal only	Floating material from Yangtse River	RDF from Zigui city
PCDD/PCDF ng TEQ/Nm^3	0.053	0.056	0.049
HCl mg/Nm^3	2.4	2	2.3
TOC mg/Nm^3	4.3	6.5	8.6
Particulate matter mg/Nm^3	2.2	2.3	2.7

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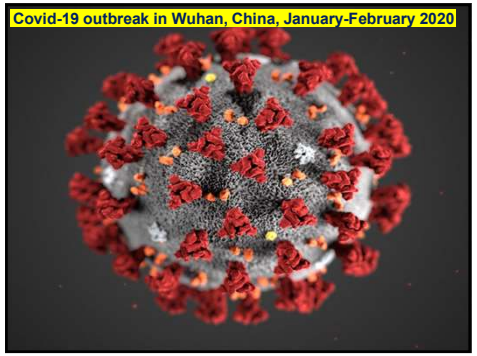

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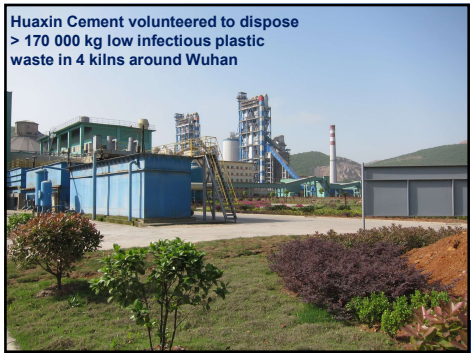

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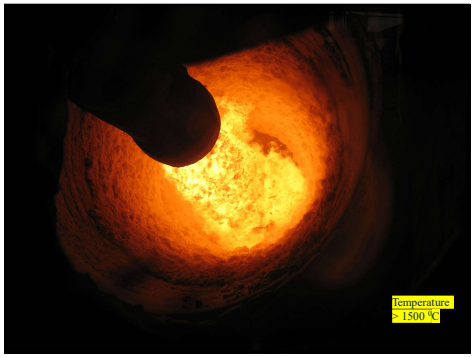

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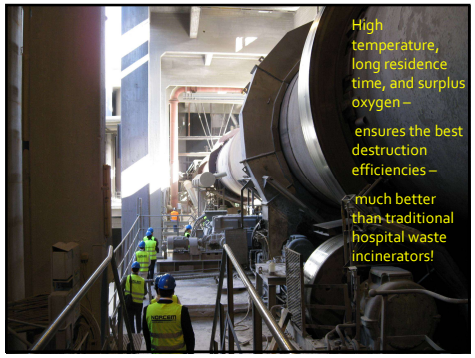

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~ 2.8-Million-ton plastic waste is generated annually in Vietnam

The OPTOCE-project has conducted pilot test at Siam City cement in Kiến Giang province and investigated:

- The feasibility of using using non-recyclable plastic waste from Vietnams biggest paper recycling plant as co-fuel.
- The feasibility of using Rubber waste from shoe/footwear-manufacturing as co-fuel.

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Location of Vietnams largest paper factory Lee & Man and the INSEE Hon Chong cement plant

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Pilot Test at Siam City cement in Kien Giang province, South Vietnam

	3 December 2021 Footwear/rubber waste	4 December 2021 Plastic waste from recycling of paper
Feeding rate t/h	5	6.5
Plastic content weight %	~ 3	~ 45
Chloride %	0.06	0.48
Net Calorific value (kcal/kg)	4 300	4 100
Thermal substitution rate TSR %	~ 11.7	~ 17

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Main results of the four-day test at Siam City cement in Kien Giang

	Baseline using Coal only	Plastic waste from recycling of paper	Footwear/ rubber waste
PCDD/PCDF ng TEQ/Nm³	0.027	0.016	0.029
HCl mg/Nm³	0.6	0.04	0.007
TOC mg/Nm³	3.3	2.6	2.8
Particulate matter mg/Nm³	1.3	3.7	3.5

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Conclusion

Two recent Pilots conducted in China and Vietnam have tested four different types of large volume non-recyclable plastic waste and demonstrated its technical and environmental feasibility for co-processing in local cement kilns.

The tests shows that the emissions of dioxins are unaffected by plastic-waste feeding and in compliance with the most stringent emission limit value of 0.1 ng TEQ/Nm³.

This practice will increase the local treatment capacity significantly, save large amounts of coal, and reduce the release of microplastic to the East and South China Sea.

Maybe not a perfect solution, but definitely worth considering…

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A Regional multi-stakeholder forum is planned organised in Bangkok, 27-28 October 2022.

Lessons learned from the Pilot demonstrations will be shared and discussed.

Thank you !

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