EXPERIENCES WITH RECYCLING AND PILOTS WITH CONSTRUCTION AND DEMOLITION WASTE

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RECOVERY CONSTRUCTION FORUM 3.0, 13/11-2024
Warsaw, Poland

Generation of C&D waste and MSW

Volume (mill. tons)	Europa[a]	USA[b]	India[c]	Japan[d]	Norge[e]
C&D waste	839	600	150-750	74	2.1
Municipal waste	262	292	62	43	2.4

[a] European Statistical System, 2022, Waste generation in EU and EEA area for 2018, C&D waste (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Waste_statistics#Total_waste_generation), Municipal waste (505 kg/capita) (https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Municipal_waste_statistics#Municipal_waste_generation), Accessed 02.04 2022.
[b] United States Environmental Protection Agency, 2022, Advancing Sustainable Materials Management: Facts and Figures Report, Generation data given for 2018 (Municipal waste 834 kg/capita), https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/advancing-sustainable-materials-management, Accessed 02.04 2022.
[c] Planning Commission 2014; Sekhar et al. 2016, Resource efficiency in the construction sector, GIZ report.
[d] Ministry of Land, Infrastructure, Transport and Tourism Japan 2018 (C&D waste). Ministry of Environment Japan 2019 (Municipal waste).
[e] Statistics Norway, 2022, C&D waste generation 2020 (https://www.ssb.no/natur-og-miljo/avfall/statistikk/avfall-fra-byggeaktivitet), Household waste generated in 2020 (449 kg/capita) (https://www.ssb.no/natur-og-miljo/avfall/statistikk/avfall-fra-hushalda), Accessed 02.04 2022.


Thane, India


Pimpri, India


Oslo, Norway


Delhi, India

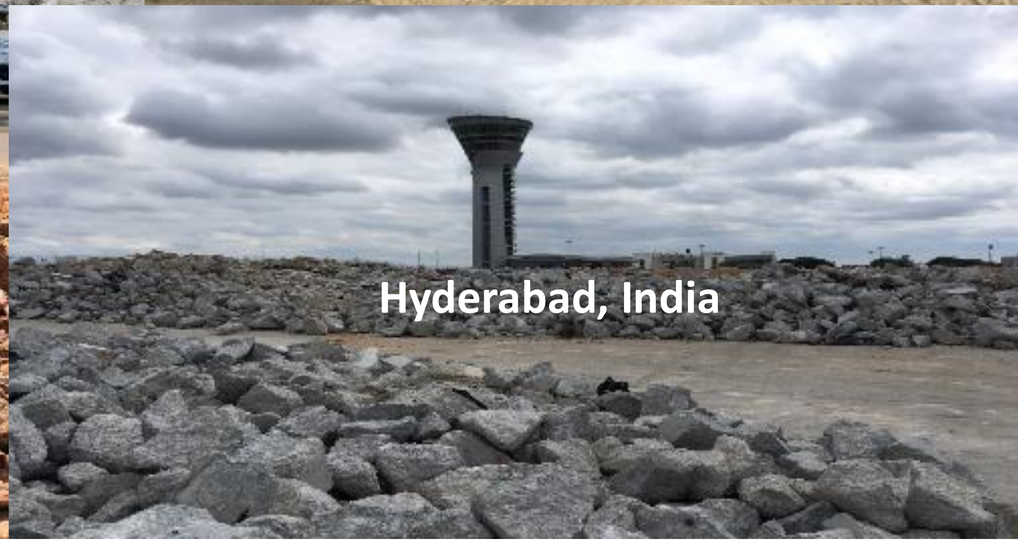

Skedsmo, Norway


Oxford, United Kingdom


Sandnes, Norway


Saitama, Japan


Goa, India


Hyderabad, India

Advanced technology


Clean materials

Modern recycling facility for C&D waste

Velde Industri AS, Sandnes Norway

Recycled aggregates with excellent properties can be produced with today's technology

Velde, Sandnes, Norway

Separate bin for recycled aggregates recycled from C&D debris

Unicon, Sjursøya, Norway

TREATMENT AND REYCLING C&D WASTE

= RECYCLED PRODUCTS

Products out of recycled C&D waste/Debris

- Recycled aggregates in ready-mixed concrete
- Recycled aggregates in concrete products
- Recycled aggregates in road construction
- Recycled cement paste as binder in cement based products
- Recycled cement paste in cement clinker production (as Ca and Si carrier).

SINTEF

Trial in 2000 with recycled aggregates

Full scale demo 2000 Oslo

Reuse of grain silo 2001

800 m^3 concrete with course recycled aggregates (269/m^3)

Sørumsand videregående skole 2001-2003

E6 highway 2004-2005

100% course recycled aggregates (800/m^3)

Retaining wall E6 2005

100% recycled excavation materials 2019

50% recycled fine aggregates 2021

100% recycled aggregates 2020

100% recycled excavation materials aggregates 2020 in pipeline trench 2021


Feed stock: Pre-stressed
hollow core concrete
~ 45 000 tons
Hokksund, Norway

Clean material 0/100 mm

Hokksund, Norway

Sørumsand High School 2001-2002 first full scale in Norway with recycled C&D waste


Excavated materials


Concrete Rubble

Full scale pilot:
100 m³ Concrete C35/45 produce
100% recycled aggregates (debris materials))

International Conference on Sustainable Materials, Systems and Structures (SMSS 2019)
New Generation of Construction Materials
20-22 March 2019 – Rovinj, Croatia

RECYCLED AGGREGATES PRODUCED FROM TWO DIFFERENT FEEDSTOCK MATERIALS – APPLIED IN READY-MIXED CONCRETE

Hernan Mujica (1), Egil Velde (1), Christian J. Engelsen (2), Monica S. Nodland (2)

(1) Velde Industri AS, Norway

(2) SINTEF Building and Infrastructure, Norway

Abstract

Construction and demolition waste (CDW) and waste excavation materials (WEM) from construction activities are important raw materials for new construction materials and products. Recycled concrete aggregates (RCA) from both waste streams are today not used in bound applications (e.g. ready-mixed concrete).

In this study, RCA was produced from a feedstock with 50% of each waste stream (WEM and CDW) and used in concrete pilot. The RCA replaced fully the natural aggregates in the concrete mix. It was found that the compressive strength complied to the requirements for C35/45 in NS-EN 206. Furthermore, the use of this type of RCA had no negative impact on the physical characteristics of the RCA and the concrete. Low content of cement paste was found in the RCA and resulted in low water absorption. This demonstrated the ability of the wet recycling process to remove significant quantities of the mortar in the CDW.

The total concentrations of inorganic and organic substances were found to be low and complied to the strict Norwegian soil quality criteria. Cr(total) exceeded the criteria. However, most of the chromium was present on the trivalent form, Cr(III), which has low solubility in the neutral to mildly basic pH region.

Keywords: Recycled aggregates, concrete, pilot demonstration

1. INTRODUCTION

The revised framework for waste management in the EU [1] which was adopted in 2008 includes a target for recovery of construction and demolition waste (CDW). Within 2020, the preparing for re-use, recycling and other material recovery of non-hazardous construction and demolition waste (excluding naturally occurring material) shall be increased to a minimum of 70 % by weight. The target was added during the final negotiations of the Directive text and instructions for verifying compliance was established in 2011 [2]. Norway has implemented the

100% recycled fine and coarse aggregates in B35 concrete slab implemented in 2019

Velde As, Norway

Sustainable Value Chain and use of materials in Road Construction – WP5

- Project owner: Nye Veier AS
- Project Leader: Vital infrastruktur arena (VIA)
- Objective: Testing, verifying, piloting, and industrializing new, climate-friendly, and resource-efficient building materials for use in road structure, in roadbeds, and in tunnels.

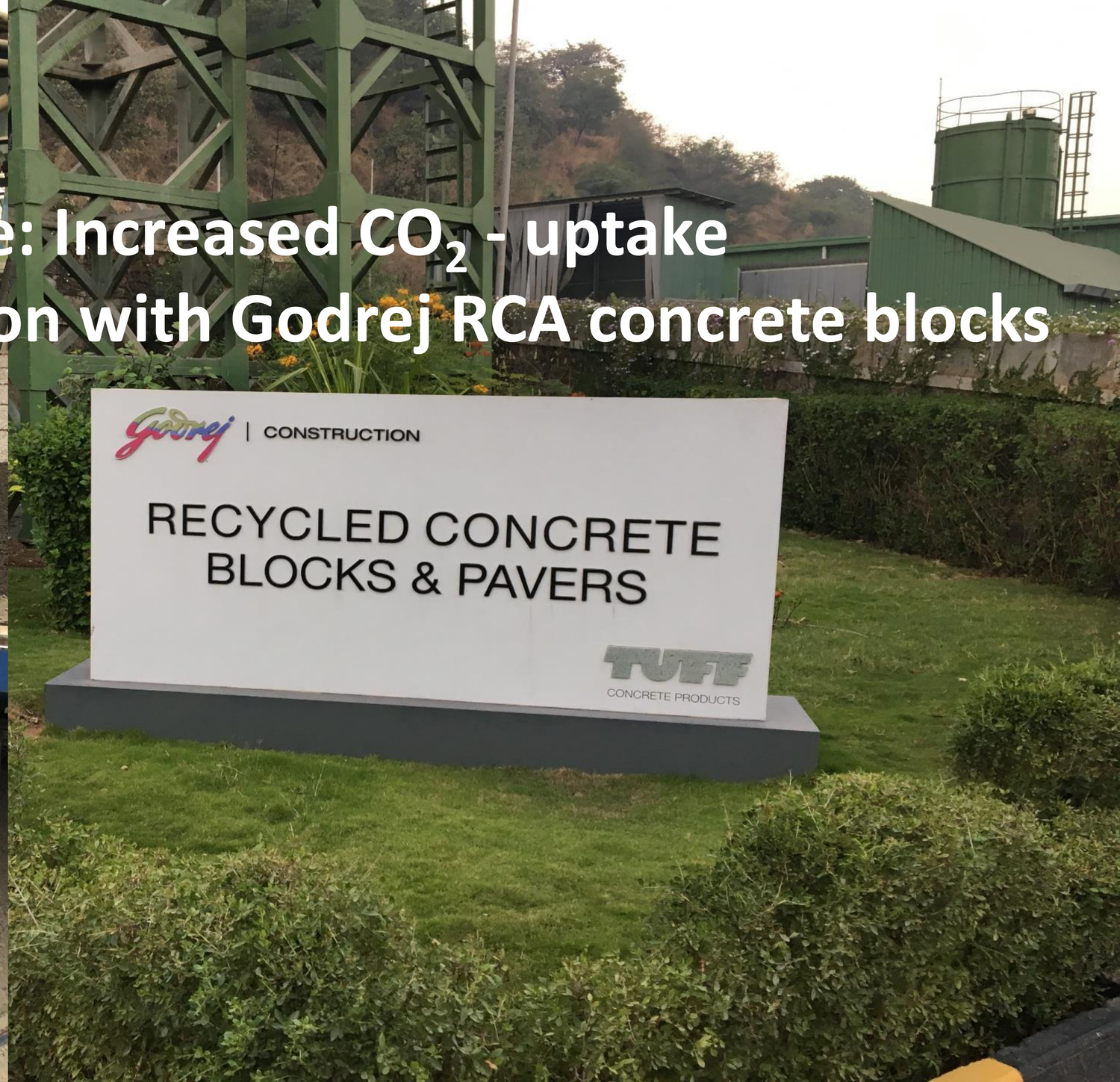
E18 Ramstadslettta, Norway

Velde in Norway is applying Urban Mining Technology applied on concrete element waste – 100% circularity

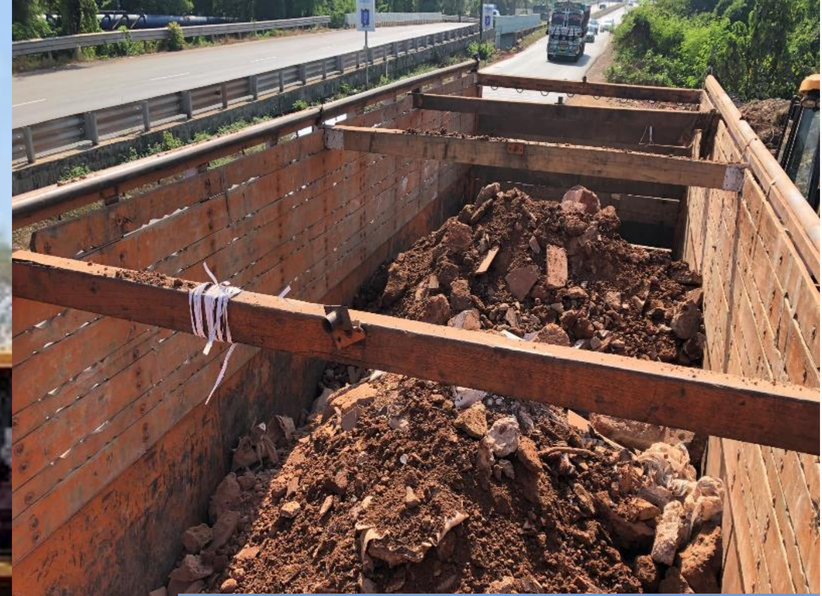
Concrete slab with 40-60% RCA sand fraction (ongoing pilot)

Mumbai, India

Beneficial use: Increased CO_2 - uptake
Full scale pilot verification with Godrej RCA concrete blocks



Full scale pilot in Goa



In a lst, state dept's invention of bricks from waste gets patent

Murari.Shetye@timesgroup.com

Panaji: In a first for Goa govt, the Goa Waste Management Corporation (GWMC) has secured a patent for Laterite-based Concrete Block for a term of 20 years.

The laterite-based concrete block will result in a cleaner environment and less contamination of soil and groundwater, a senior GWMC officer said.

The 20-year term allows revenue generation through private manufacturing with royalty payments. 'This pa-

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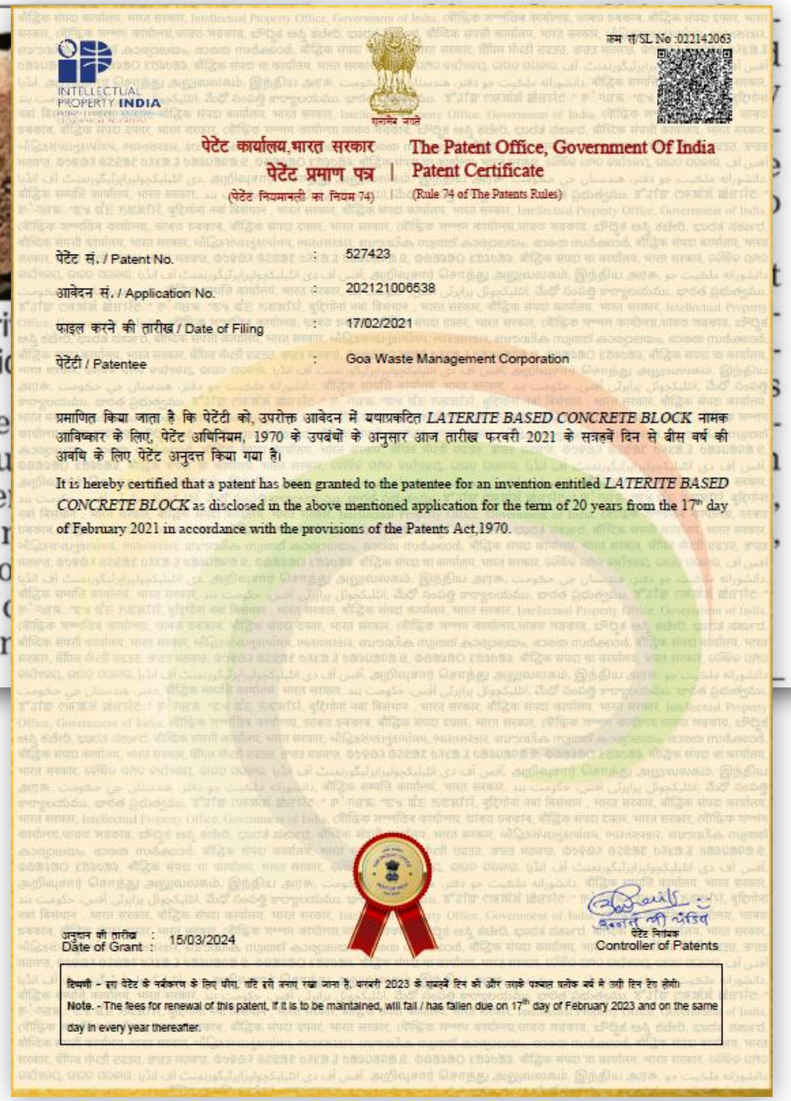

INTELLECTUAL PROPERTY INDIA

क्रम सं/SL No :022142063

पेटेंट कार्यालय,भारत सरकार
पेटेंट प्रमाण पत्र |
(पेटेंट नियमावली का नियम 74)

The Patent Office, Government Of India
Patent Certificate
(Rule 74 of The Patents Rules)

पेटेंट सं. / Patent No.	:	527423
आवेदन सं. / Application No.	:	202121006538
फाइल करने की तारीख / Date of Filing	:	17/02/2021
पेटेंटी / Patentee	:	Goa Waste Management Corporation

प्रमाणित किया जाता है कि पेटेंटी को, उपरोक्त आवेदन में यथाप्रकटित *LATERITE BASED CONCRETE BLOCK* नामक आविष्कार के लिए, पेटेंट अधिनियम, 1970 के उपबंधों के अनुसार आज तारीख फरवरी 2021 के सत्रहवें दिन से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled *LATERITE BASED CONCRETE BLOCK* as disclosed in the above mentioned application for the term of 20 years from the 17th day of February 2021 in accordance with the provisions of the Patents Act,1970.

अनुदान की तारीख : 15/03/2024
Date of Grant :

पेटेंट नियंत्रक
Controller of Patents

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि देनी बनती रखा जाना है, फरवरी 2023 के सत्रहवें दिन को और उसके पश्चात प्रत्येक वर्ष में उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained, will fall / has fallen due on 17th day of February 2023 and on the same day in every year thereafter.

Business

India's construction industry poised to be world's 3rd largest by 2025: Puri

IANS | February 19, 2024 05:00 PM

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NEW DELHI: Minister of Housing & Urban Affairs Hardeep Singh Puri on Monday said that India's fast-growing construction industry is poised to become the third-largest globally by 2025.

"The construction industry is the second-largest employer in the country and has forward and backward linkages across 250 sectors of the economy, " the minister said while addressing at the inauguration of the National Workshop on Recent Development with Recycling and Use of Construction and Demolition (C&D) waste in construction sector.

He said that the government is constructing a built environment at a great speed.

Quoting the statistics about the country's urbanisation demands, he said that India needs to add about 700-900 million sq. metres of commercial and residential space every year by 2030.

"If India is going to be a developed country by 2047, infrastructure will be a vital component in our ambition, " he said.

The workshop, organised by CPWD in collaboration with SINTEF Norway, gave an opportunity to the participants engaged in the construction sector to deliberate on various aspects of promoting the use of C&D recycle items in the construction industry.

Indian Minister of Housing highlights demand for recycling technologies to manage C&D waste

Hardeep Singh Puri was addressing at the inauguration of National Workshop on "Recent Development with recycling and use of C&D waste in construction sector."

Filed under
C&D

February 20 2024

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Highlighting the vitality of construction indust
Affairs and Petroleum & Natural Gas, said that
It is the second-largest employer in the country
economy. It is estimated that India will have th

The Minister was addressing at the inauguratio
of C&D waste in construction sector" on Febra

Home News What's New? Materials

The Workshop, organised by CPWD in collabor
engaged in the Construction Sector to delibera
Construction Industry. Experts in the field of C
dissemination of their views and apprising the

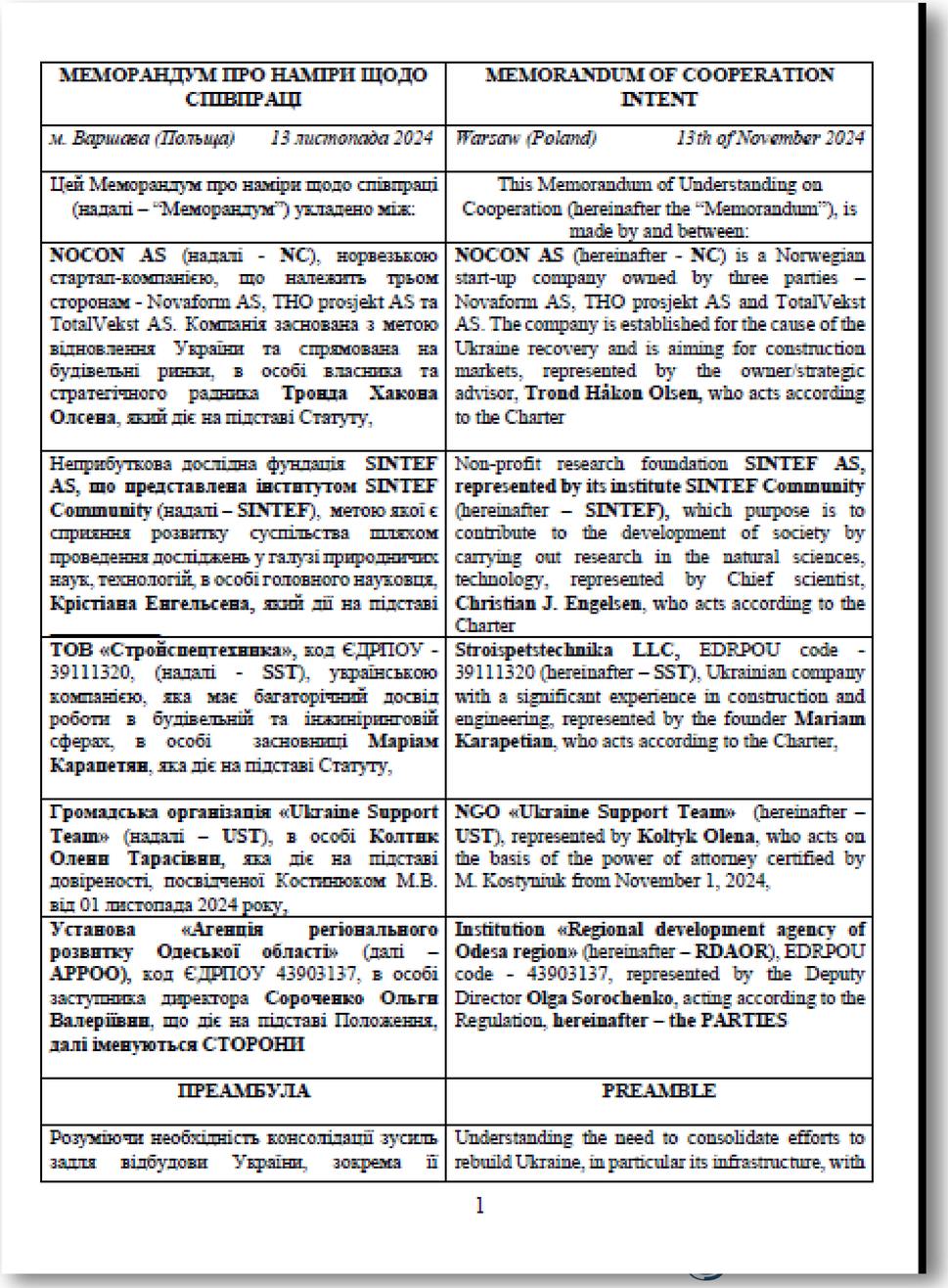
Challenges with debris from damaged buildings

- May contain Hazardous Waste building materials (e.g. asbestos, polluted materials etc.)
- Extremely mixed which makes it difficult to prevent «cross mixing»
- May contain Unexploded Ordnance (UXO)
- Rubble or larger building pieces/structures may be structurally damaged

MoU is signed

- Stroispetstechnika LLC, Ukraine
- Ukraine Support Team, Ukraine
- Regional Development Agency of Odesa Region (RDAOR), Ukraine
- NOCON AS, Norway
- The Foundation for Industrial and Technical Reseach (SINTEF), Norway

The goal is a feasibility study on Ukraine debris and conduct a pilot converting 100% of the heavy debris into recycled products.



МЕМОРАНДУМ ПРО НАМІРИ ЩОДО СПІВПРАЦІ	MEMORANDUM OF COOPERATION INTENT
м. Варшава (Польща) 13 листопада 2024	*Warsaw (Poland) 13th of November 2024*
Цей Меморандум про наміри щодо співпраці (надалі – "Меморандум") укладено між:	This Memorandum of Understanding on Cooperation (hereinafter the "Memorandum"), is made by and between:
NOCON AS (надалі - **NC**), норвезькою стартап-компанією, що належить трьом сторонам - Novaform AS, THO prosjekt AS та TotalVekst AS. Компанія заснована з метою відновлення України та спрямована на будівельні ринки, в особі власника та стратегічного радника **Тронда Хакона Олсена**, який діє на підставі Статуту,	**NOCON AS** (hereinafter - **NC**) is a Norwegian start-up company owned by three parties – Novaform AS, THO prosjekt AS and TotalVekst AS. The company is established for the cause of the Ukraine recovery and is aiming for construction markets, represented by the owner/strategic advisor, **Trond Håkon Olsen,** who acts according to the Charter
Неприбуткова дослідна фундація **SINTEF AS, що представлена інститутом SINTEF Community** (надалі – **SINTEF**), метою якої є сприяння розвитку суспільства шляхом проведення досліджень у галузі природничих наук, технологій, в особі головного науковця, **Крістіана Енгельсена**, який дії на підставі	Non-profit research foundation **SINTEF AS, represented by its institute SINTEF Community** (hereinafter – **SINTEF**), which purpose is to contribute to the development of society by carrying out research in the natural sciences, technology, represented by Chief scientist, **Christian J. Engelsen**, who acts according to the Charter
ТОВ «Стройспецтехника», код ЄДРПОУ - 39111320, (надалі - **SST**), українською компанією, яка має багаторічний досвід роботи в будівельній та інжиніринговій сферах, в особі засновниці **Маріам Карапетян**, яка діє на підставі Статуту,	**Stroispetstechnika LLC**, EDRPOU code - 39111320 (hereinafter – **SST**), Ukrainian company with a significant experience in construction and engineering, represented by the founder **Mariam Karapetian**, who acts according to the Charter,
Громадська організація «Ukraine Support Team» (надалі – **UST**), в особі **Колтик Олени Тарасівни**, яка діє на підставі довіреності, посвідченої Костинюком М.В. від 01 листопада 2024 року,	**NGO «Ukraine Support Team»** (hereinafter – **UST**), represented by **Koltyk Olena**, who acts on the basis of the power of attorney certified by M. Kostyniuk from November 1, 2024,
Установа «Агенція регіонального розвитку Одеської області» (далі – **АРРОО**), код ЄДРПОУ 43903137, в особі заступника директора **Сороченко Ольги Валеріївни**, що діє на підставі Положення, **далі іменуються СТОРОНИ**	**Institution «Regional development agency of Odesa region»** (hereinafter – **RDAOR**), EDRPOU code - 43903137, represented by the Deputy Director **Olga Sorochenko**, acting according to the Regulation, **hereinafter – the PARTIES**
ПРЕАМБУЛА	**PREAMBLE**
Розуміючи необхідність консолідації зусиль задля відбудови України, зокрема її	Understanding the need to consolidate efforts to rebuild Ukraine, in particular its infrastructure, with

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Thank you for the attention!
christian.engelsen@sintef.no