

RECYCLING AND REUSE OF RAW MATERIALS

0. INTRODUCTION

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COURSE INSTRUCTORS

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STUDENT MEETINGS: to be scheduled case by case. In the e-mail object, indicate always «**MEETING RMM**»

WHERE? via Marzolo 9, building ex-DCT, first floor / online

CLASSES TIMETABLE

	lunedì 28/09	martedì 29/09	mercoledì 30/09	giovedì 01/10	venerdì 02/10
09:30					
10:00					
10:30			RECYCLING AND REUSE OF RAW MATERIALS Brunelli Katya, FALESCHINI FLORA M [COMPLESSO INGEGNERIA VIA MARZOLO] 10:30 - 12:30 Lezione	RECYCLING AND REUSE OF RAW MATERIALS Brunelli Katya, FALESCHINI FLORA R [COMPLESSO INGEGNERIA VIA MARZOLO] 10:30 - 12:30 Lezione	
11:00					
11:30					
12:00					
12:30					RECYCLING AND REUSE OF RAW MATERIALS Brunelli Katya, FALESCHINI FLORA M [COMPLESSO INGEGNERIA VIA MARZOLO] 12:30 - 14:30 Lezione
13:00					
13:30					
14:00					

ONLINE MATERIAL

- When the course is held with the support of slides, they will be uploaded online generally one or two days before.
- **If you cannot find anything online → class will be carried out mostly with the blackboard support.**
- **Take care: in the FORUM – MOODLE, the teacher can send you some messages regarding the classes (eg. modifications of the time-table)**

2023-IN0533-000ZZ-2020-INN1031298-N0-IN0533 / Annunci / Lezione I



Forum Impostazioni Valutazione avanzata Sottoscrizioni

2023-IN0533-000ZZ-2020-INN1031298-N0-IN0533 /



Forum Impostazioni Valutazione avanzata

Il tuo intervento è stato aggiunto con successo.
Hai 30 min. a disposizione se desideri apportare delle modifiche.

Annunci e news di carattere generale

Cerca nel forum **Aggiungi argomento di discussione**

Discussione

☆ Lezione MARTEDI 27/02/2024

Lezione MARTEDI 27/02/2024

Visualizza le repliche in formato nidificato

Sposta la discussione in... Sposta



Lezione MARTEDI 27/02/2024
di Flora Faleschini - lunedì, 26 febbraio 2024, 08:35

Attenzione: la lezione di martedì 27/02/2024 avrà la durata di solo 2 ore al posto delle 3 previste e avrà inizio alle ore 11.30.

ONLINE MATERIAL

Students are advised that it is **prohibited to use the material uploaded in this course for any purpose other than exam preparation**. Any use of the aforementioned material that constitutes a violation of this prohibition (for example, communication, diffusion, sharing, even partial, on social networks or websites, whether free of charge or for a fee), will be prosecuted in accordance with the law.



AIM OF THE COURSE

The aim of this course is to present the life cycle of materials and the principles and technologies in the recovery and recycling of materials, with **special attention to the supply chains linked to construction materials.**

At the end of the course, you will be able to understand:

- the life cycle of the most used materials used in our society, with special attention to those linked to construction industry,
- the principal technologies to recycle and reuse materials, with main attention to metal, bulk materials and critical materials,
- the challenges related to the recycling of some materials,
- the environmental aspects and consequences of recycling and recovery of materials on our society
- key-issues related to reducing the impacts of construction industry.

COURSE UNITS AND CONTENTS

Introduction: Classification of materials and Properties of materials.

Instructor: both

Ceramics (properties, production): cement, mortar, lime, concrete.

Instructor: Flora Faleschini

Construction and inert waste: types, characterization, recycling plants and treatments. Recycled and artificial aggregates (glass, steel slag, rubber, etc.) for concrete. Recycled binders for concrete. Supplementary cementing materials (fly ash, steel slags, etc). Geopolymers. Carbon-capture in concrete.

Instructor: Flora Faleschini

Fiber reinforced polymers: properties, production, and recycling.

Instructor: Flora Faleschini

Timber and engineered timber: properties, production, and recycling.

Instructor: Flora Faleschini

COURSE UNITS AND CONTENTS

Glass: properties, production and recycling.

Instructor: Flora Faleschini

Metals. Steels: Production and recycling of steels. Aluminium alloys: production and recycling of aluminium. Copper and Lead: production and recycling. Strategic and critical raw materials. Recycling of metals from different types of waste: WEEE (electric and electronic equipment waste), ELV (end of life vehicles), photovoltaic panels, batteries, etc.

Instructor: Katya Brunelli

Basics of Polymers: production and recycling.

Instructor: Katya Brunelli

Basics of paper: production and recycling.

Instructor: Katya Brunelli

Recall: THIS IS NOT THE EXACT ORDER HOW THE UNITS WILL BE CARRIED OUT!!!

COURSE UNITS AND CONTENTS

Seminars and technical visits will be carried out during the course to cover peculiar aspects of the recycling chain of specific materials.

The **technical visit** will be a company specialized in the recovery and treatment of bottom ash from MSWI plants.

EXAMINATION

The final mark is given by the average of the two parts: **Group project + written exam.**

Group project: 30% final mark (not mandatory)

Written exam: 70% final mark (if the GP is not taken, the exam mark is given only by the written exam)

EXAMINATION

WRITTEN EXAM + GP:

- multiple-choice questions (up to 20 points)
- open-ended questions (up to 10 points)

WRITTEN EXAM ONLY:

- multiple-choice questions (up to 20 points)
 - open-ended questions+ 2 EXTRA open-ended questions (up to 10 points)
- ➔ INCREASED COMPLEXITY

HOW THE WRITTEN EXAM IS EVALUATED:

TECHNICAL LANGUAGE, CLARITY, COMPLETENESS, RIGOURNESS OF THE REPLY ARE ELEMENTS EVALUATED BY THE INSTRUCTORS.

EXAMINATION

GROUP PROJECT

- **At the end of the course – week 14/12 – 19/12**
- **A case study is presented to the class**
- **No access to internet, only to your notes**
- **Solve the case study, prepare a conceptual map and present it to the class**
- **Groups from 3 to 5 students**

HOW THE PROJECT WORK IS EVALUATED:

COMPLETENESS AND ORGANIZATION OF KNOWLEDGE (up to 10 points)

USE OF TECHNICAL LANGUAGE (up to 10 points)

COMMUNICATION SKILLS (up to 10 points) - supported by **PEER ASSESSMENT**

EXAMINATION

Number of exams during the year:

- 2 exams in the period JANUARY/FEBRUARY
- 2 exams in the period JUNE/JULY
- 1 exam in the period SEPTEMBER

Further, the exam is considered sufficient if both the parts are sufficient (mark $> 18/30$).

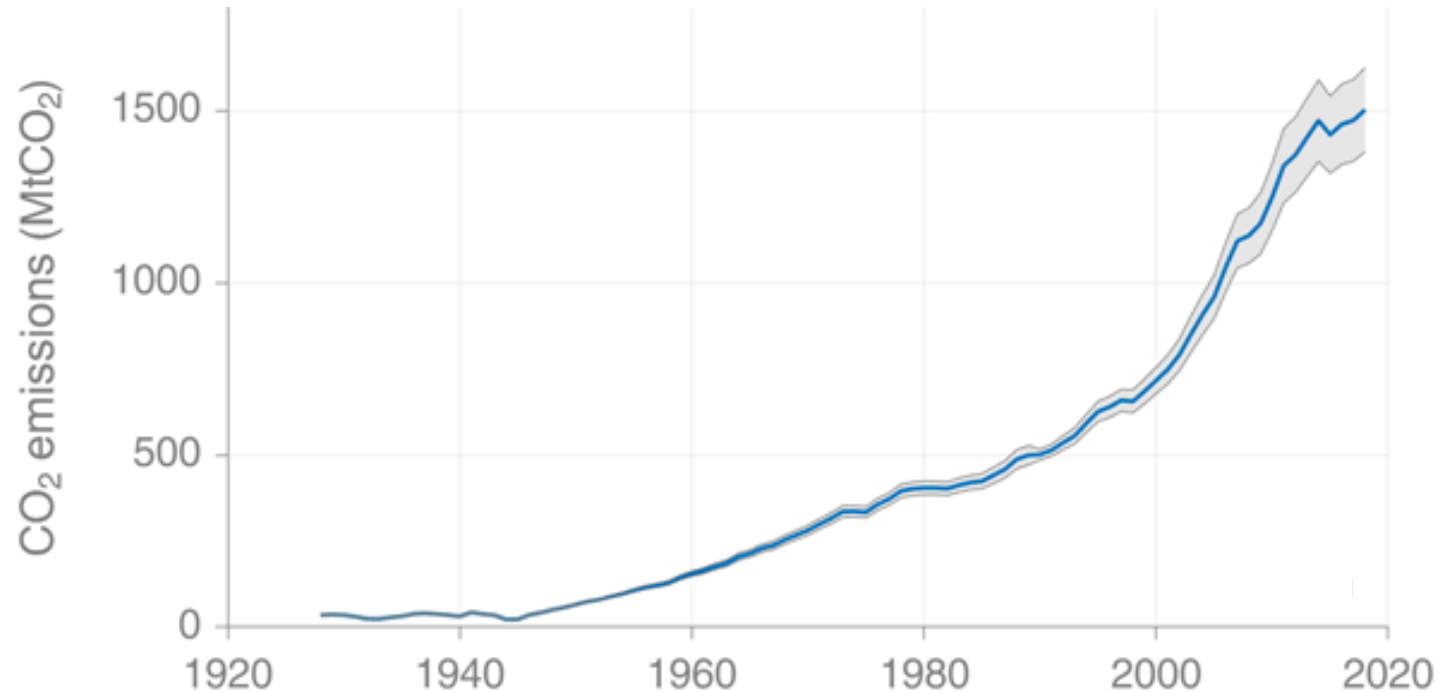
... ***and now we can start!***

CONSTRUCTION MATERIALS

Why construction materials are so important to us?

- <https://www.youtube.com/watch?v=Qa8YTviDpx0>
- <https://www.youtube.com/watch?v=WduShGhj0ks>
- <https://www.youtube.com/watch?v=7-d9gQC5eKA>

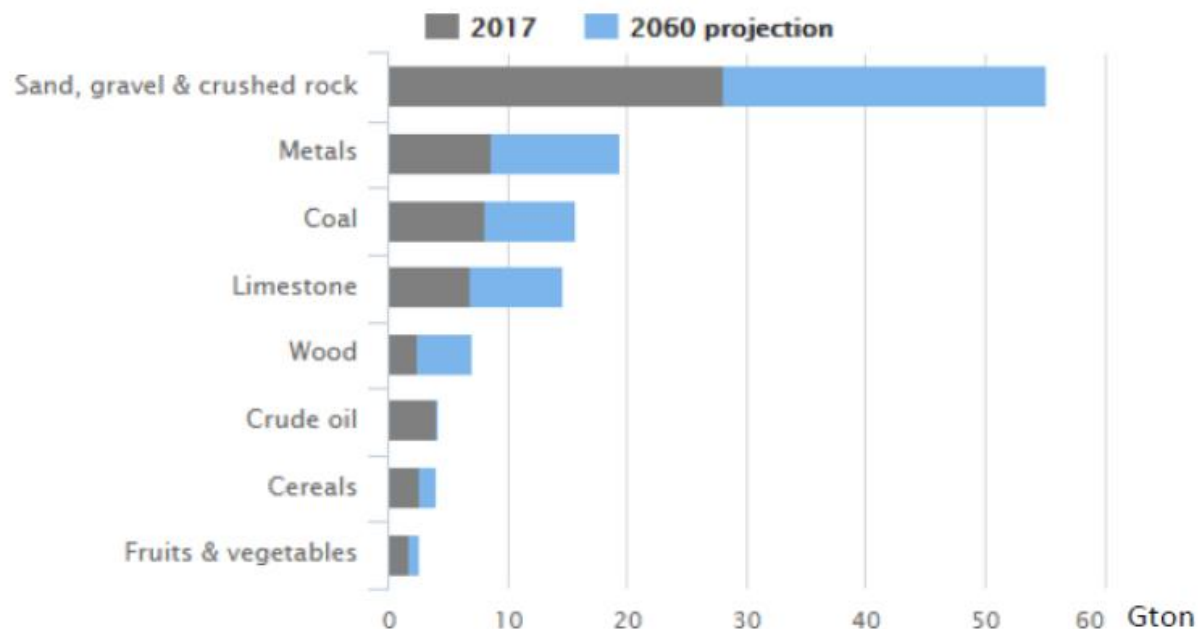
CONSTRUCTION MATERIALS



Cement accounts for about 8% of total carbon emissions, with **increasing** trend

Source: Andrew, R. M. (2019). Global CO₂ emissions from cement production, 1928–2018.

CONSTRUCTION MATERIALS



Natural aggregates are the most consumed raw materials for anthropogenic uses

Source: OECD, Global Material Resources Outlook to 2060 - Economic drivers and environmental consequences

CONSTRUCTION MATERIALS

Reply to Question #1

Come partecipare?



1

Vai a wooclap.com

2

Immettere il codice dell'evento nel banner superiore

Codice evento
ROTRMF

CONSTRUCTION MATERIALS

Reply to Question #2

Come partecipare?



1

Vai a wooclap.com

2

Immettere il codice dell'evento nel banner superiore

Codice evento
ROTRMF

CONSTRUCTION MATERIALS

Reply to Question #3

Come partecipare?



1

Vai a wooclap.com

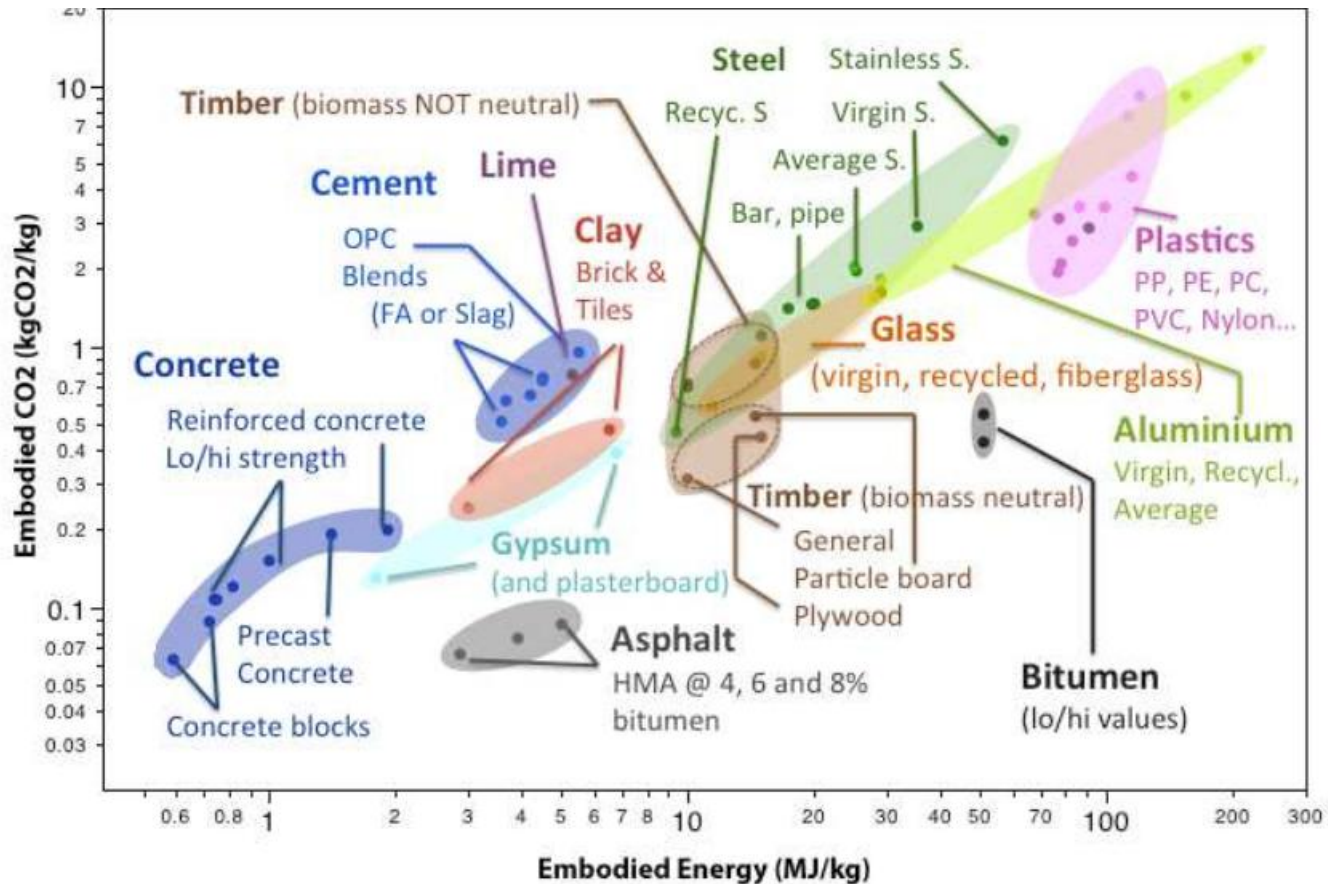
2

Immettere il codice dell'evento nel banner superiore

Codice evento
ROTRMF

CONSTRUCTION MATERIALS

Let's now discuss on the results

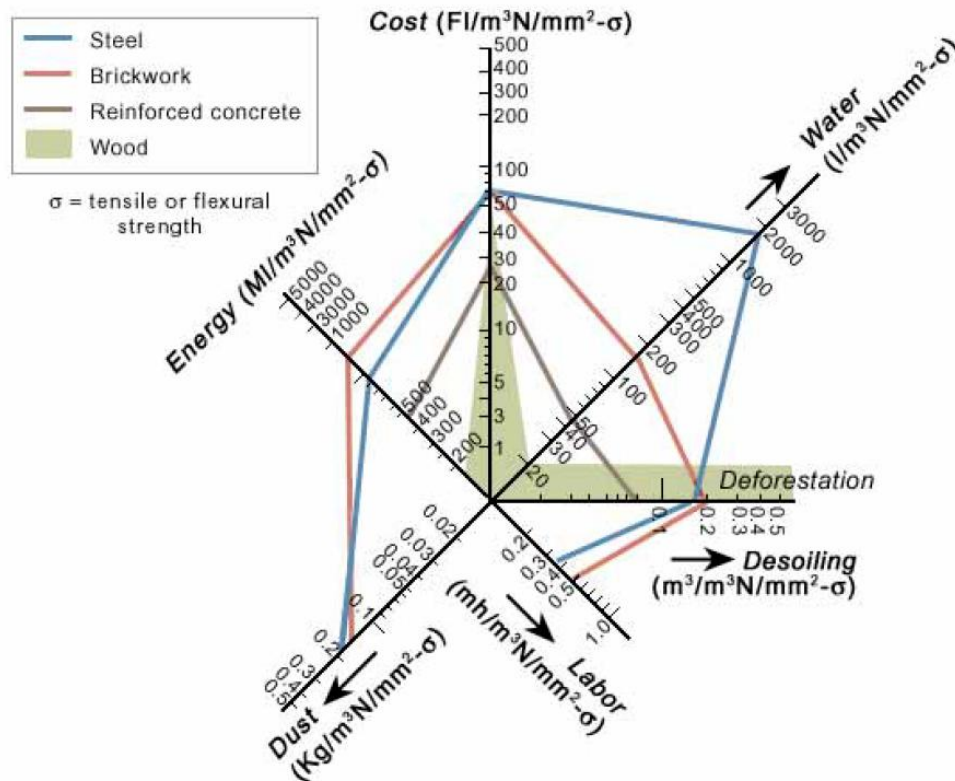


Embodied CO2 and embodied energy for materials typically used in the construction industry. Selection of data from Hammond(2011)

CONSTRUCTION MATERIALS

Let's now discuss on the results

Ecological Profile of Materials



Ecological profile of various material properties expressed per unit strength.

The Institution of Structural Engineering

CONSTRUCTION MATERIALS

Let's now discuss on the results

	Stiffness MN/m²	Density kg/m³	Energy kJ/kg
Wood	11000	500	1170
Brick	30000	1800	2800
Concrete	27000	2400	8300
Steel	210000	7800	43000
Al	70000	2700	238000

CONSTRUCTION MATERIALS

Let's now discuss on the results

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QUESTIONS?