GLOBAL ISSUES

OPPORTUNITIES FOR RE-CYCLING

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Delft University of Technology

Nov 28th, 2018

TU Delft

Interreg North-West Europe SeRaMCo

Involvement of TU Delft in SeRaMCo project:

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- WP T3: Generating and implementing innovative cement and concrete based products based on recycled aggregates

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- WP T3: Generating and implementing innovative cement and concrete based products based on recycled aggregates
- WP I1: Test, implement and promote pre-cast products in urban public space facilities in the city of Seraing (Belgium)
- WP I2: Test, implement and promote pre-cast products for pavements and public buildings in the city of Saarlouis (Germany)

Involvement of TU Delft in SeRaMCo project:

- WPT3 Activity 1:
  Conceptualisation of innovative precast products

Involvement of TU Delft in SeRaMCo project:

Towards 10 innovative concepts

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Towards 10 innovative concepts:

dictionary:
inventive, original, proactive, visionary

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Towards 10 innovative concepts:

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PP's:
market potential
recognizable, remarkable, striking products

S+P:

- “With regard to product development, we suggest to invest into innovative products which highlight the specifics of recycled materials while assuring the same high-quality standards as traditional concrete products”.

S+P:

- “Creative design and new applications which do not exist yet on the market will stimulate the demand for new products”.

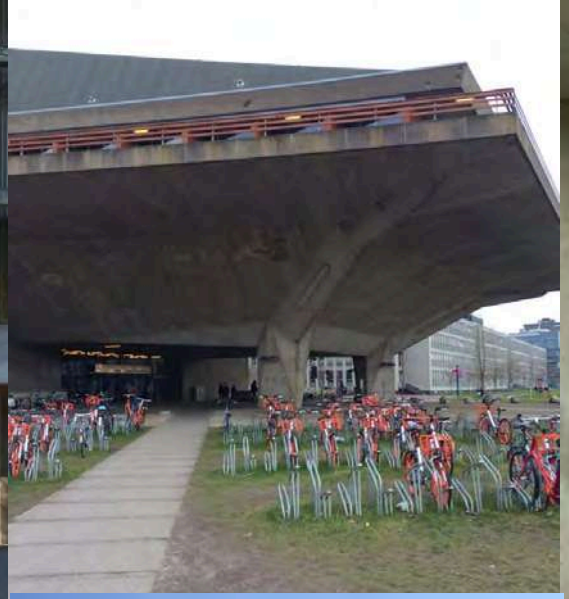
‘Conclusion’

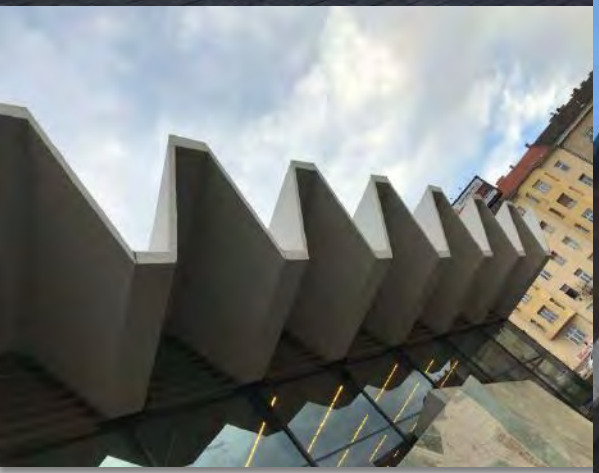
- If we develop concrete with recycled aggregates in same quality as all those current products, then we can make everything we already have.

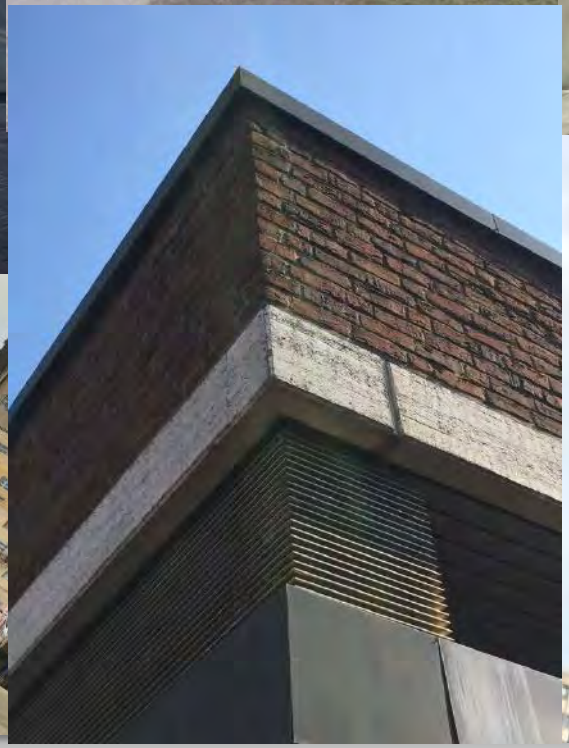





Photos by students TUDelft-AR0036-Spring18







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So,

- What can we make with recycled aggregates that we cannot achieve with ‘normal’ concrete?

- In other words:
  ‘what are the new, surprising, other properties that recycled aggregates give to concrete, that allow us to make new, innovative CPP’s?’

Perhaps….

- texture, expression of brick in concrete?
- better evaporation by brick?
- insulation?
- less cement?

That demands for additional innovative, technical research, based on concept ideas.

to find things we didn’t expect, nor anticipated.

"If I had asked people what they wanted, they would have said faster horses"

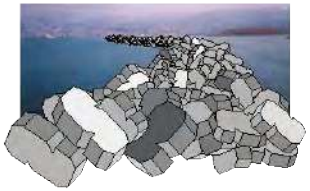
- *Henry Ford* -

★☆☆

02 Urban furniture

17 13

★★☆



15 Salt concrete

★★★

18 Cooling

17 12

★★★

21 Dust absorbing

★★★

20 Storing energy

17 11

★★★

24 Mycelium concrete

★☆☆

01 The obvious

16 11

★★

10 Soaking

★☆☆

04 Living

14 9

★

06 Retrofitting

★★★

22 Floating

Joker 9

★★★

23 Rammed

project research (agreement 5/6 July)

Rammed (KL)
Low strength (KL)
High strength (Lux)
Open structure (Lux)
Self compacting (Lux)

> plus: tests and input from producers
> results necessary input for product design

However….

- Optimal re-cycling of CDW can contribute to max. 20% of the total demand of concrete production.

> Cherry-picking or pavements

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- Re-cycling into CPP has still the same environmental impact (E, CO2, health)
- World is under threats of climate change

Re-cycling is an answer to the problem of waste and resources, not to other threats caused by the re-cycling process.

Would it be possible to come up with products that try to cover these climate threats as well ???

We need to take responsibility for the damaging impact that production and use in general has caused and will cause.

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This implies that our designs/products need to repair the intrinsic damage they cause on the earth's resources but also on her inhabitants, during production, use and at end of life.

Take Global Climate Issues as Design Parameters

Our current western, ‘consumerish’ way of life is for a great deal responsible for the cause of:

Climate change

(through CO2, N2O, CH4, H2O emissions)

Source: internet

Air Pollution

https://psmag.com/environment/air-pollution-is-killing-london

Chemical Pollution

https://www.videoblocks.com/video/man-with-mask-toxic-chemical-pollution-of-water-1mov-nppreFl

Resource depletion

https://scroll.in/article/836336/the-new-oil-the-global-battle-for-sand-is-getting-ugly

Fresh water withdrawal

https://phys.org/news/2018-08-esa-role-easing-scarcity.html

Biodiversity loss

http://time.com/4404981/biodiversity-study-human-welfare/

Global Threats

The provision of human needs as they currently evolve, is responsible for the cause of:

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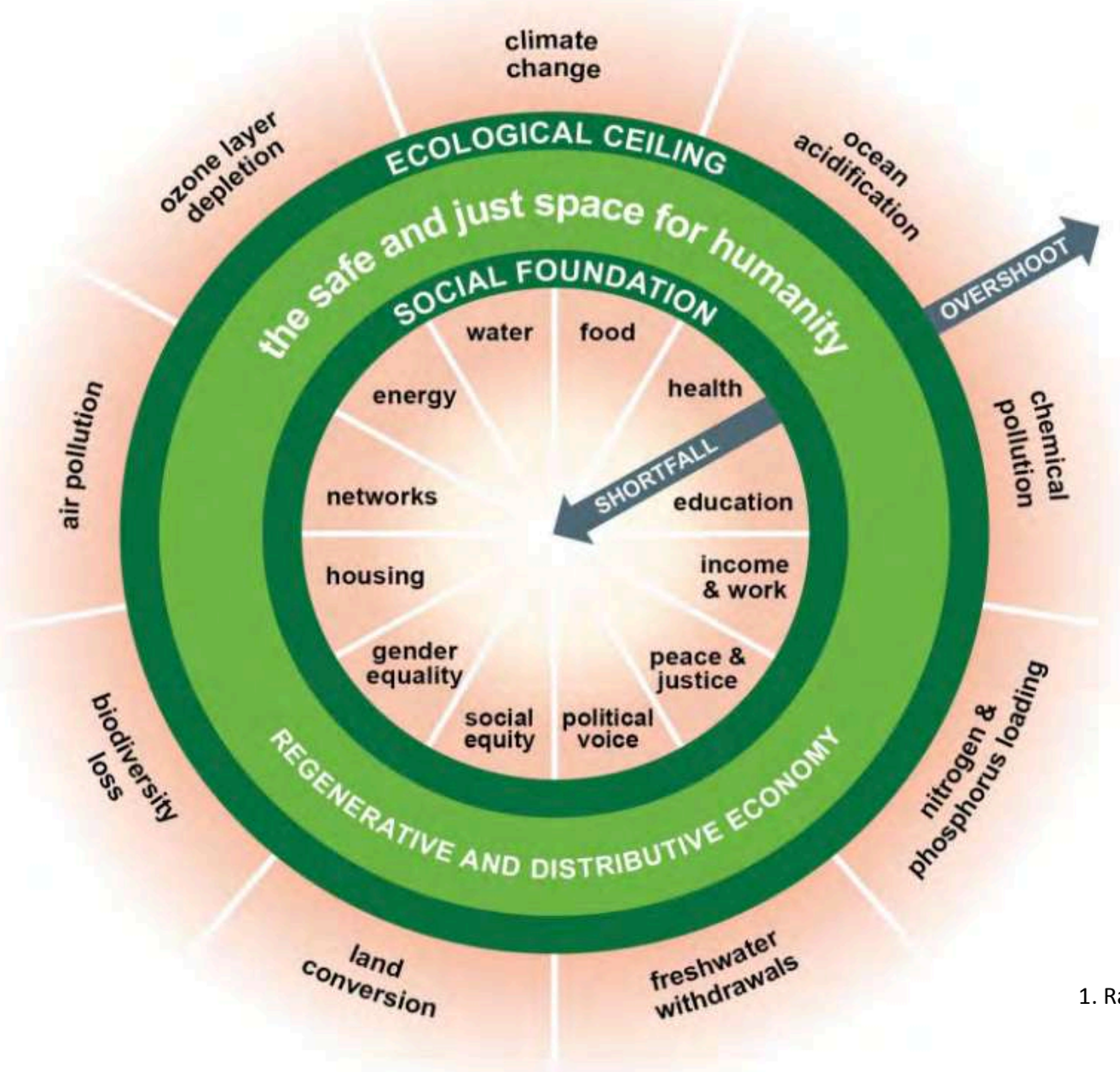
The provision of human needs as they currently evolve, is responsible for the cause of:

- Climate change

  (global warming from CO2, N2O, CH4, H2O emissions)
- Air pollution
- Chemical pollution
- Resource depletion
- Fresh water withdrawal
- Biodiversity loss



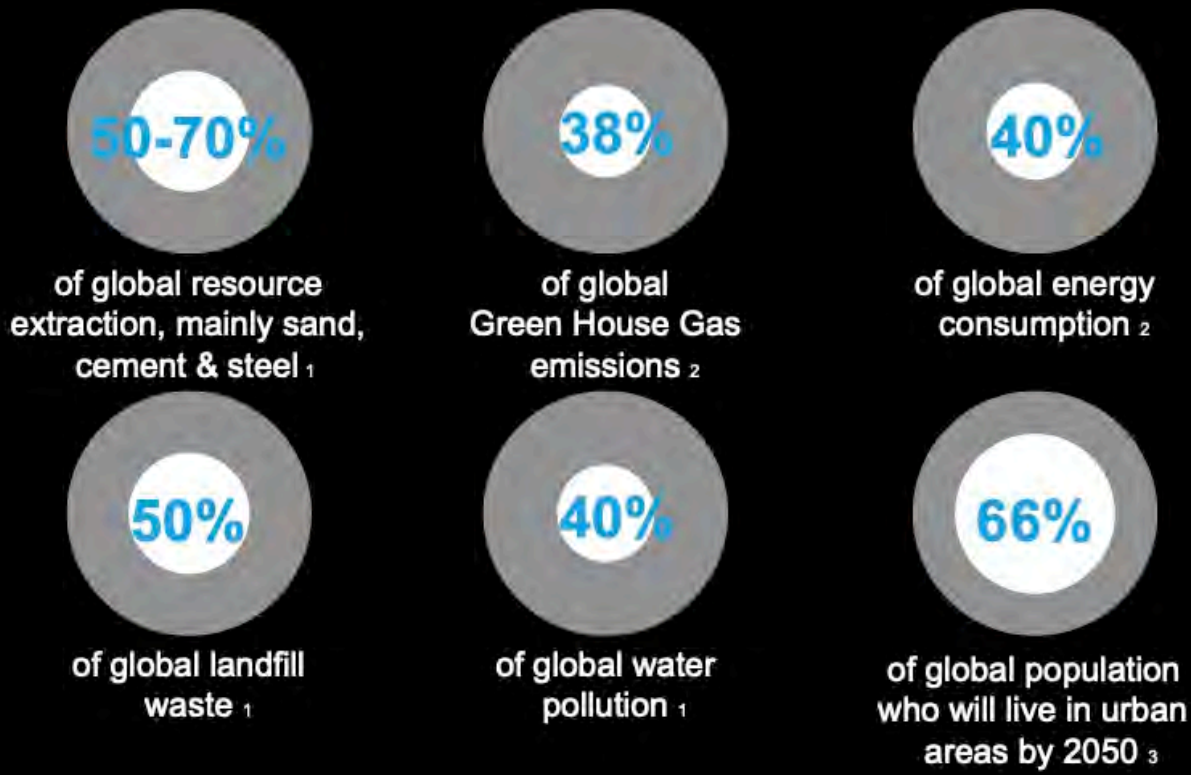
1. Raworth, K. (2017)

The Doughnut of social and planetary boundaries[1]

Global Trends Pressure Planetary Boundaries

https://jwa.org/sites/jwa.org/files/mediaobjects/3713942772_323d8df754_o.jpg

Direct/Indirect Impact Built Environment



1. Willmott Dixon 2010
2. Global Assessment Report on Disaster Risk Reduction 2015
3. World Bank 2015

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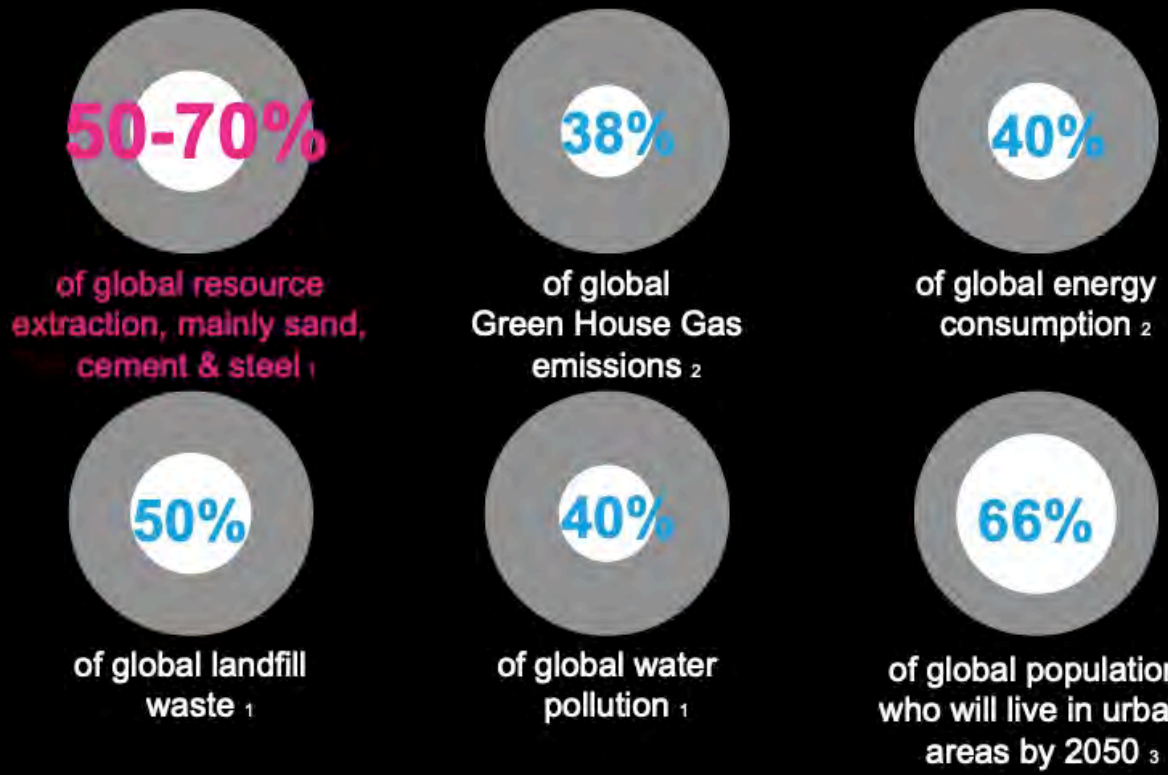

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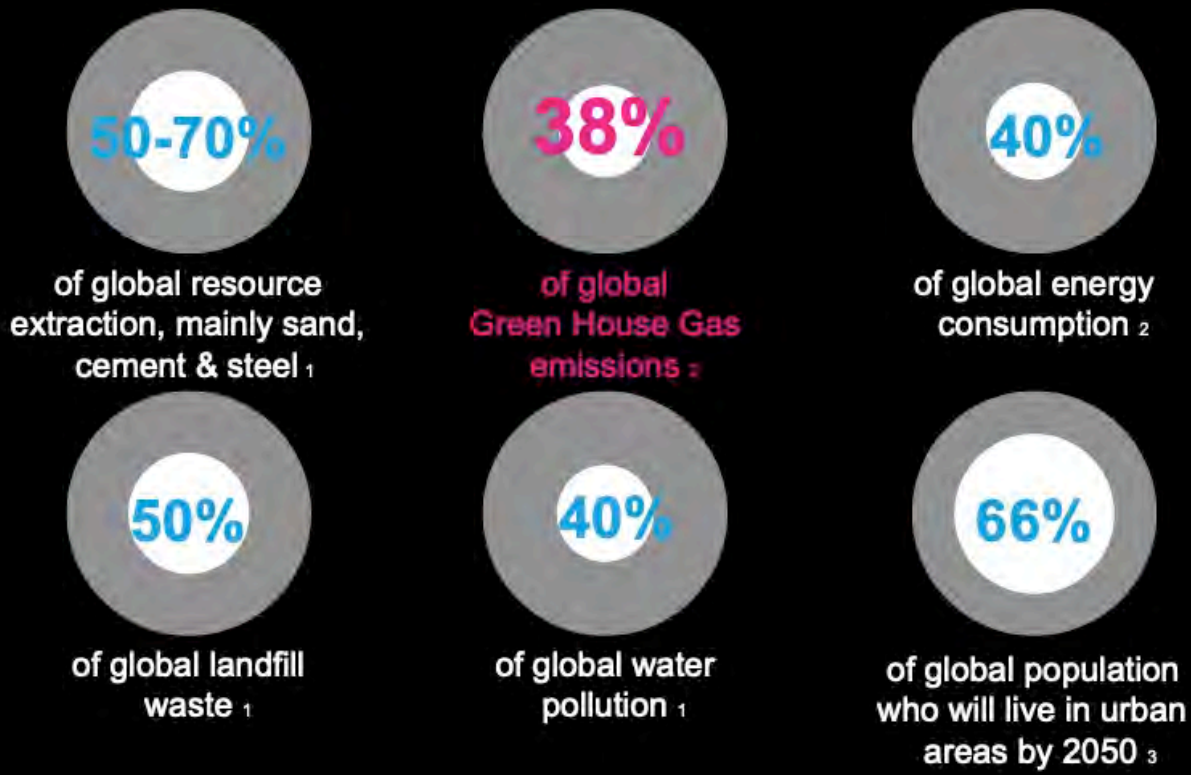

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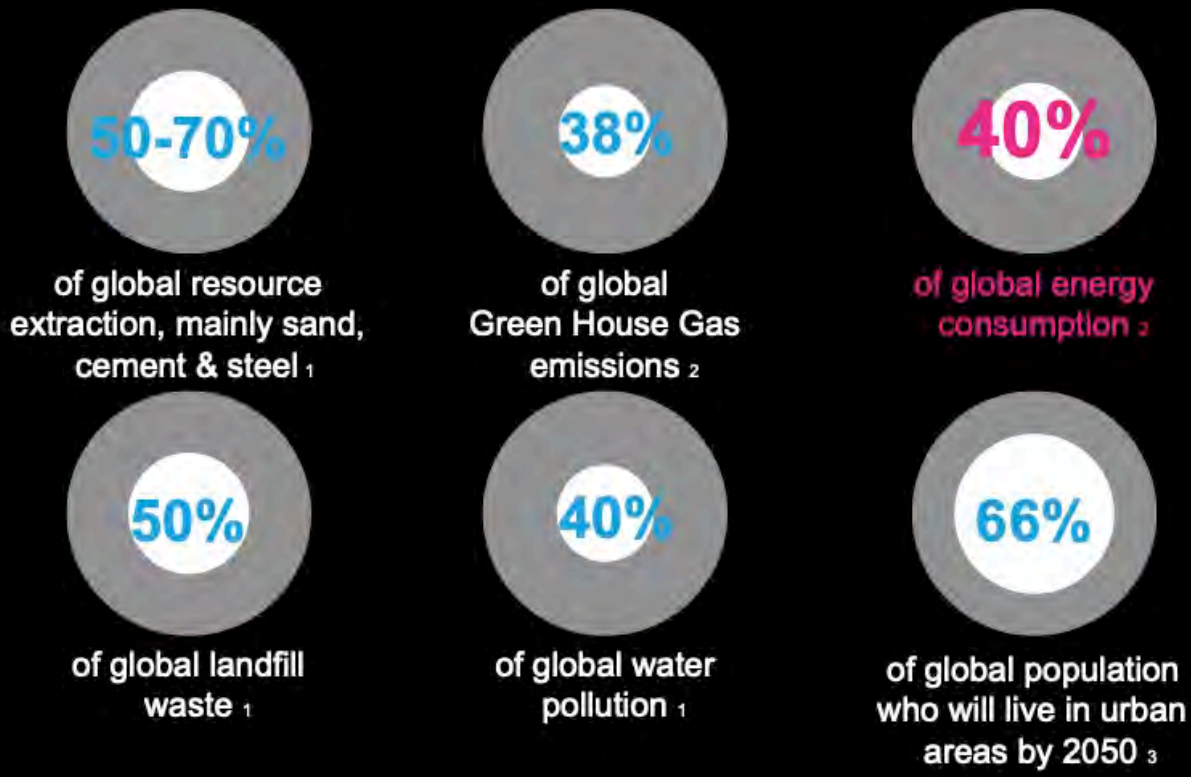

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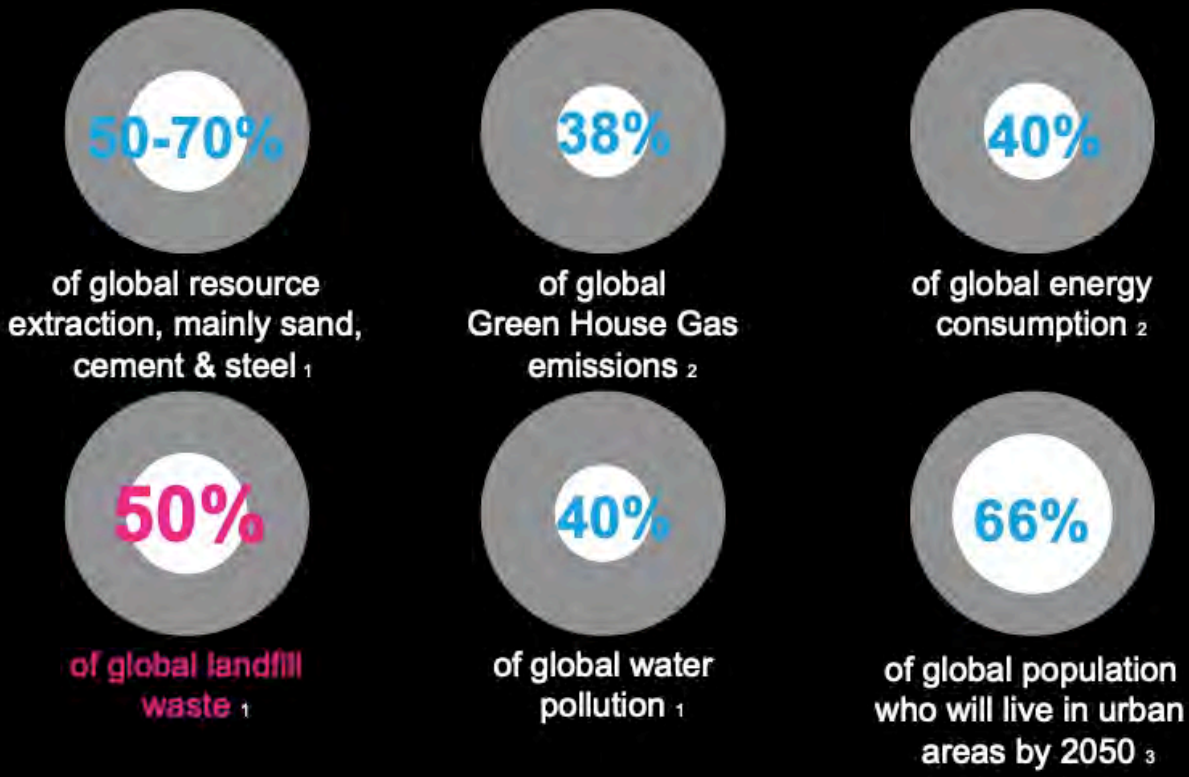

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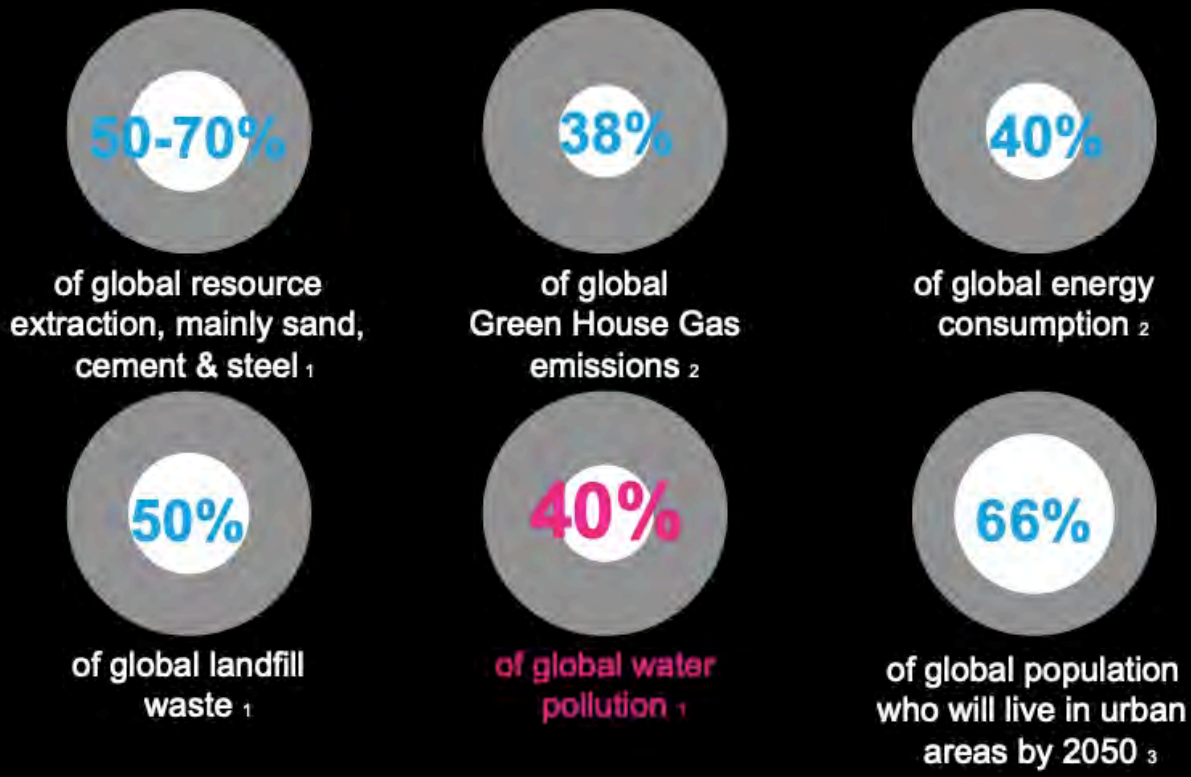

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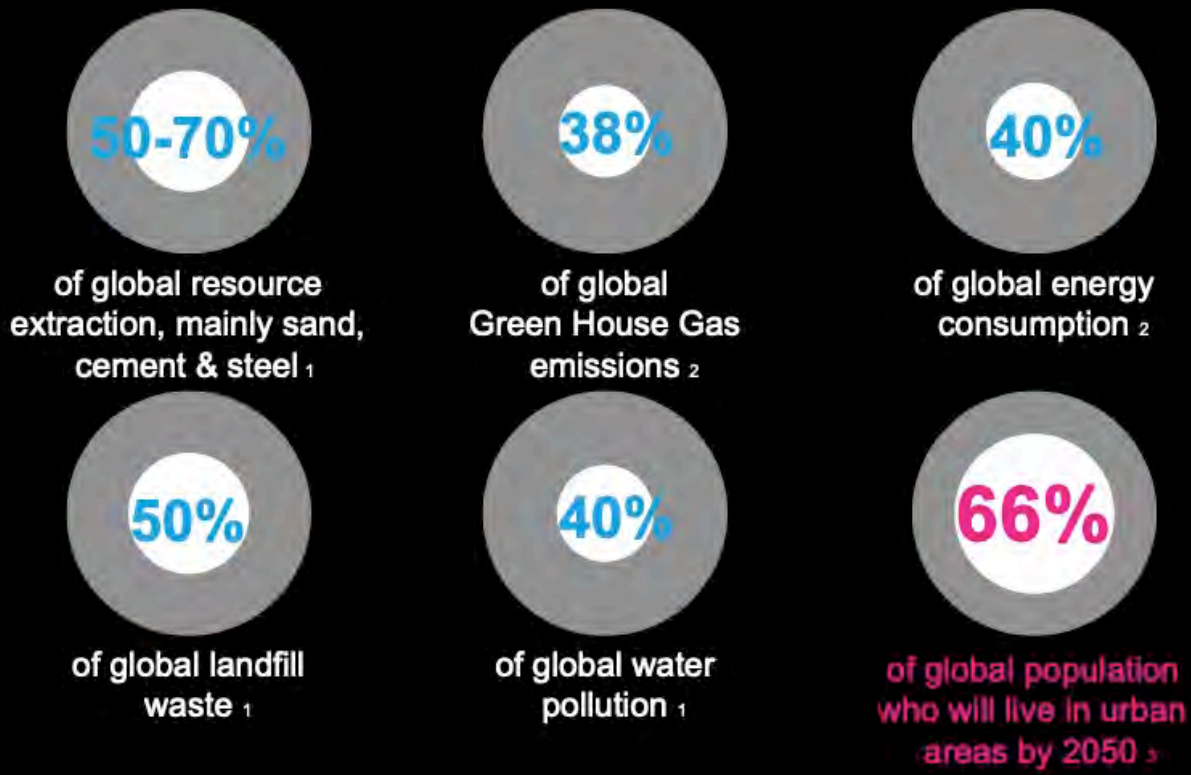

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Impacts cement / concrete production

Source: internet

Impacts cement / concrete production

- CO_2 Emissions
- Energy consumption
- Primary raw material depletion
- Water use
- Land reclamation
- Fine dust
- Waste

CO_2 emissions

Cement production is responsible for ca. 5% of global manmade CO_2 emission.

Energy use

Construction industry is responsible for ca. 40% of Europe's energy consumption

Primary raw materials

Global construction industry uses around 50% of the available primary raw materials

Global use of concrete is enough to build a wall 25m high by 25m wide around the equator…. per year

50 billion tons of aggregates per year are trapped behind dams! Meaning sand for industry is not naturally replenished….

And…. the stock is finite….

Water use

After water, concrete is the most consumed substance on earth

For making concrete we use yearly 5.000.000.000.000 liter of fresh water. (five thousand billion liter)

Water use

= 2 million Olympic swimming pools

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= pipe (d=4m) from here till the moon filled with water

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= daily 2 liters of fresh water for every person on earth