CITYLOOPS - SOIL TOOLS

Instruments for predicting future production of excavated soil (and CDW)

WP: 2

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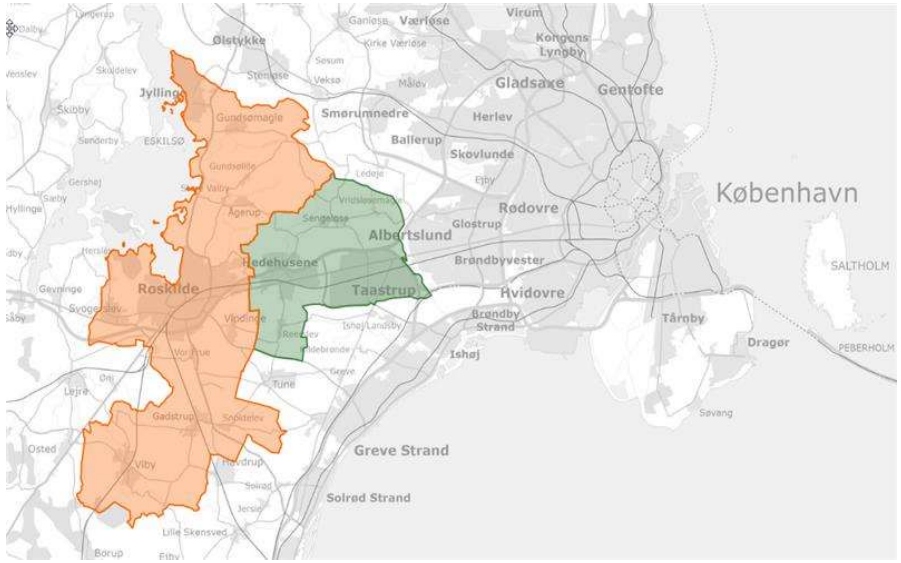
CityLoops work on soil

CityLoops soil partners:

- Høje-Taastrup Municipality (pop 51.000)
- Roskilde Municipality (pop 87.000)
- Capital Region of Denmark (pop 1.8 mil)



Soil instruments/tools:

- Framework for soil management
- Instrument for predicting future production of excavated soil
- Assessment of soil reuse potential within construction sites
- Identification and assessment of local sites fit for soil reuse

Soil instruments are important because

- Excavated soil is the largest single fraction of waste related to construction in Denmark (> 2x CDW)
- Removal of excavated soil causes massive emissions
- Dumping of excavated soil, especially on agricultural land, may constitute an environmental risk
- Excavated soil has a considerable potential for substitution of virgin non-renewable raw materials
- Early planning may reduce the production of excavated soil and support circularity and SDGs

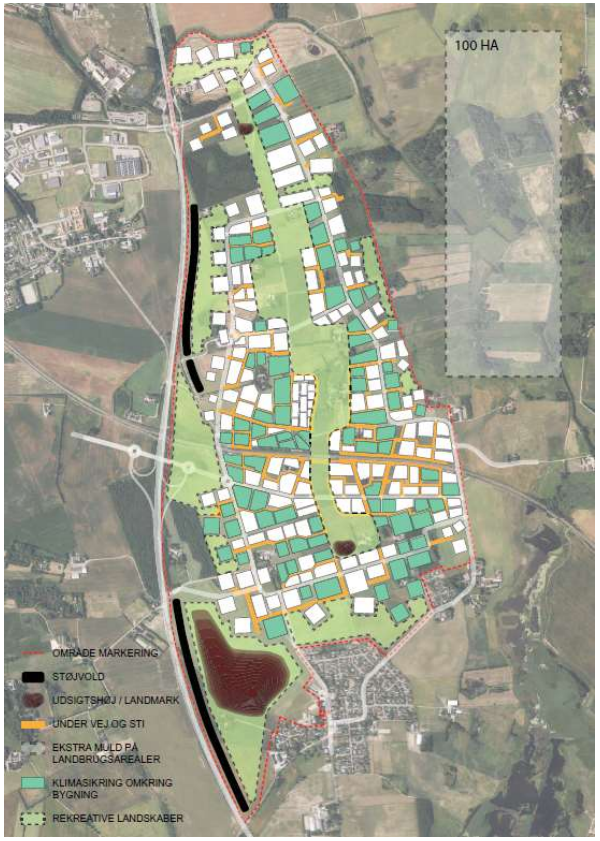
Imagine…

You have a project involving

- 300 ha of urban development on agricultural land
- 20.000 new inhabitants
- 4000 new workplaces

…and a dream: All excavated soil to be reused locally

Now, what would you do?



Imagine…

You would probably…

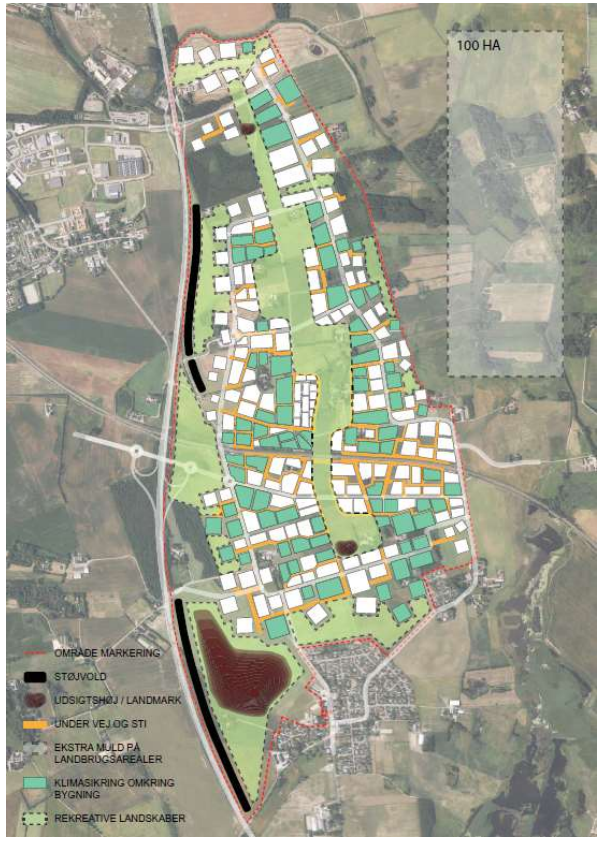
1) **Make an estimate of soil volume to be excavated**
   - By assessing buildings' footprint (typology, plot ratio, foundation)

2) **Make an estimate of volumes of individual soil types**
   - By employing existing geological data

3) **Establish timeframe of construction activity**

4) **Investigate options for local reuse of excavated soil**
   - By assessing geotechnical properties of excavated soil, and
   - Look into technical uses, landscaping, climate change, noise barriers etc.
   - Estimate social, environmental and economic benefits

5) **Recommend initiatives on planning, constructing, tendering etc.**
   - Report and further info, see http://xn--jordhndtering-tfb.dk/



Predicting production of excavated soil - on a municipal level

CityLoops work in Roskilde and Høje-Taastrup

Employ and adapt methodology developed by Niras A/S

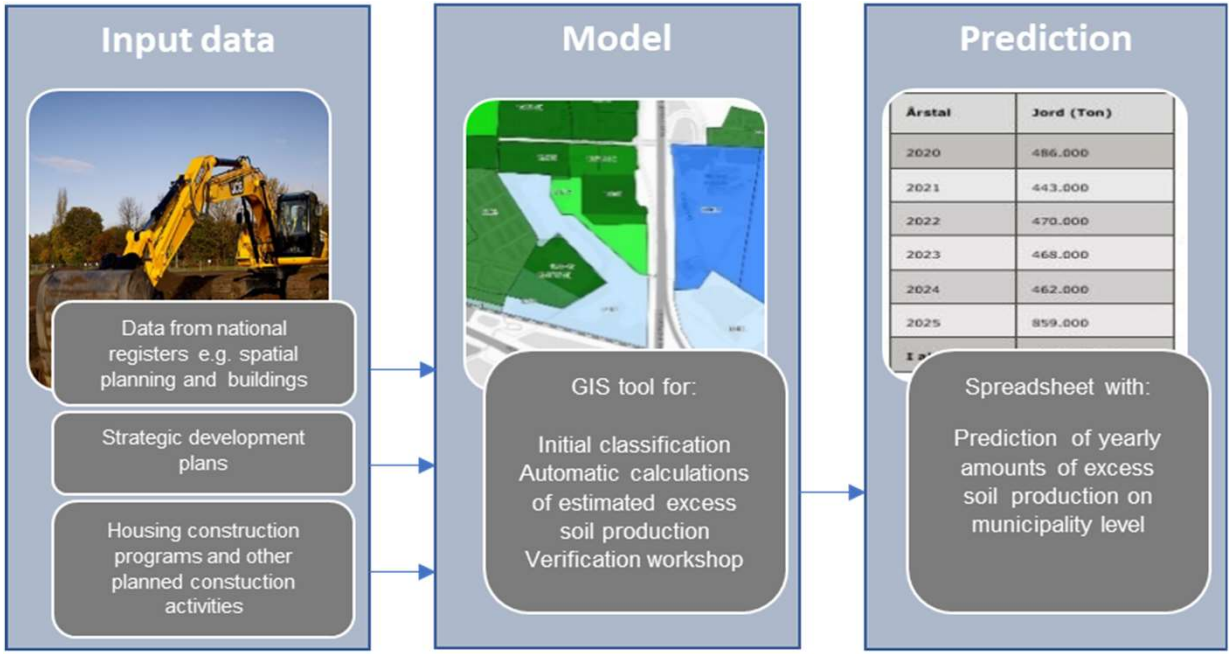
Verify predictions (using historic data and knowledge of planned projects)

Explore options for use of prediction in municipal administration

Use prediction in a municipal effort to limit production of excavated soil (soil strategy)

Predicting production of excavated soil - on a municipal level

Methodology



Predicting production of excavated soil - on a municipal level

Results (reflecting a business as usual scenario)

YEAR	TON
2020	150.000
2021	250.000
2022	200.000
2023	250.000
2024	200.000
2025	300.000
2026	300.000
2027	200.000
2028	150.000
2029	100.000
2030	100.000
2031	100.000
In total approx.	2.3 million tons

Roskilde (pop 88.000): Predicted soil production
Per capita soil production (12 years): 26 tons

YEAR	TON
2020	300.000
2021	250.000
2022	900.000
2023	450.000
2024	200.000
2025	250.000
2026	400.000
2027	250.000
2028	250.000
2029	250.000
2030	90.000
2031	90.000
In total approx.	3.7 million tons

Høje-Taastrup (pop 51.000): Predicted soil production
Per capita soil production (12 years): 72 tons

Uses of prediction

Municipal planning

Overview of expected production of soil in specific geographical areas within a certain timeframe can be integrated into municipal planning.
Enabling planners to:

- Evaluate options for reducing the future generation of soil at an early planning stage
- Adapt development plans to minimize soil generation and to ensure that excess soil can be reused within the area in question
- Explore potential options for sustainable local reuse related to climate mitigation, liveability, infrastructure or recreational uses, etc.

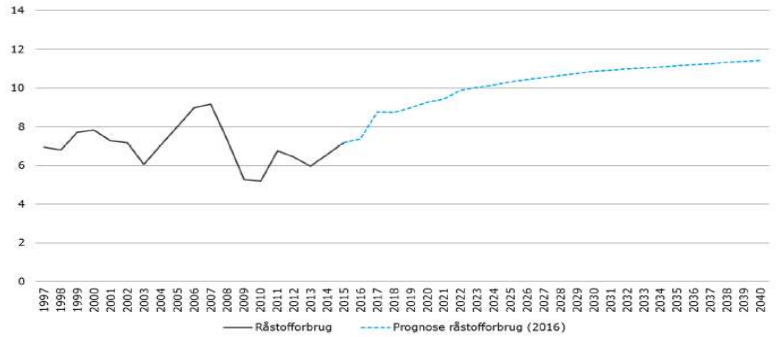
Can production of CDW be predicted by employing the “soil approach”?

Pilot study performed by Niras a/s, municipalities of Roskilde and Høje-Taastrup and Capital Region of Denmark

Why this pilot study?

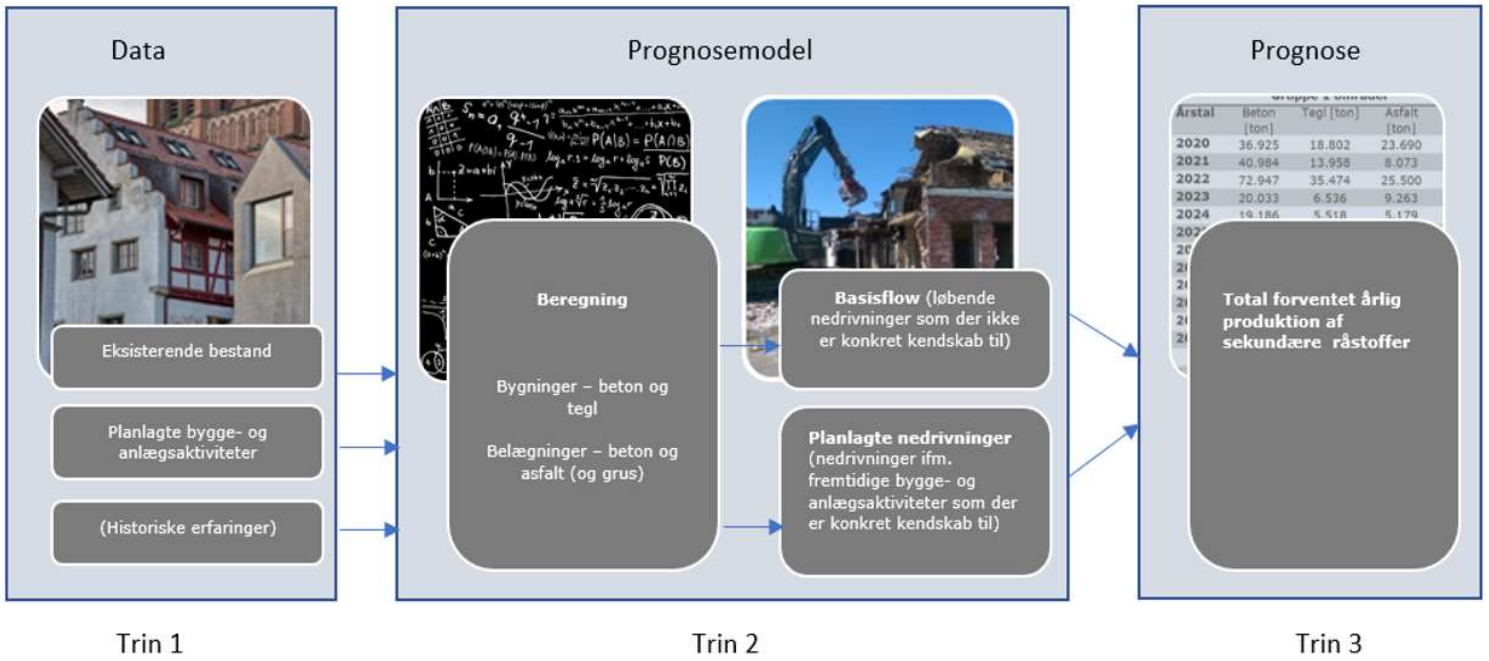
- we need a better basis for regional resource planning, focusing in on sustainability
- supply of natural raw materials is running low
- projected demand for raw materials is increasing
- we need to decouple consumption from economic growth
- increased circularity supports decoupling
- a transparent market supports a better match of demand and supply

Goal: what CDW-products will be produced where and when, and in what amounts?

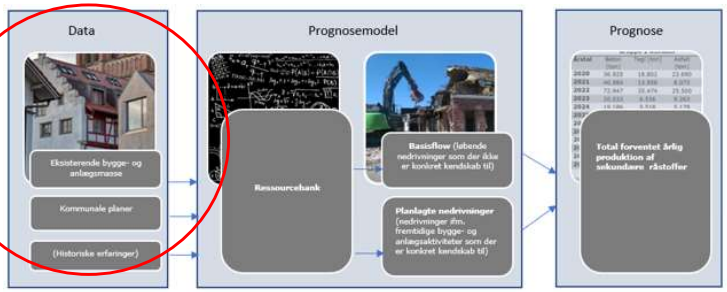


Predicting the production af CDW on a municipal level

Methodology



Predicting the production af CDW on a municipal level



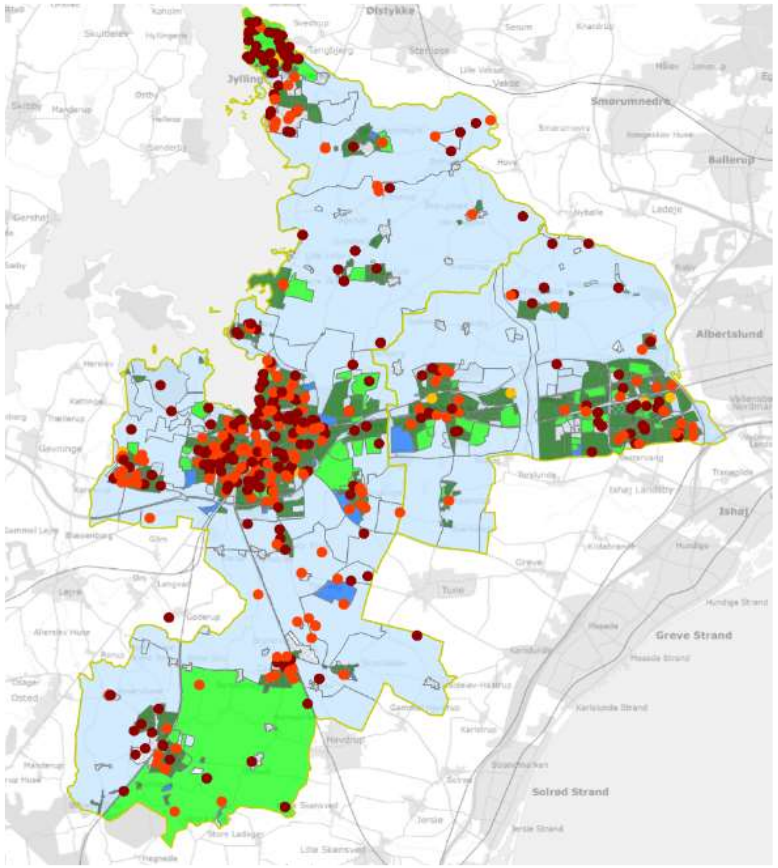
Step 1

Taking stock of buildings in entire municipality

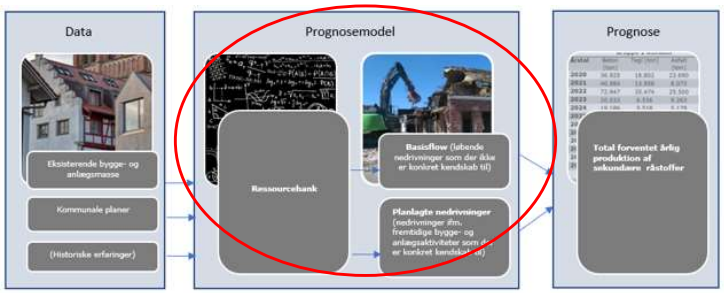
Planned construction activities

History of demolition activity/volume of CDW

(for calibration and verification)



Predicting the production af CDW on a municipal level



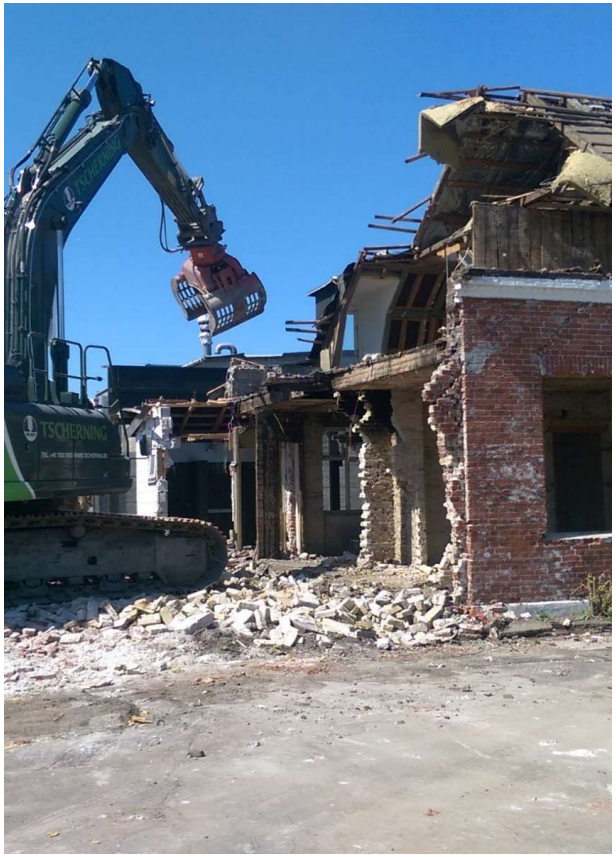
Step 2

Calculating materials in all existing buildings

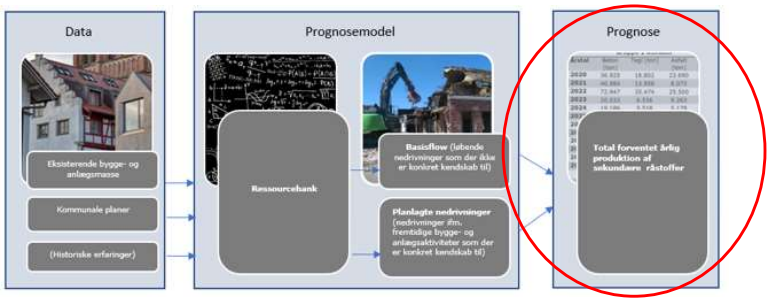
Calculating CDW from planned demolitions

Establish area of paved surfaces (roads etc)

Estimate flow of CDW from demolitions not reported



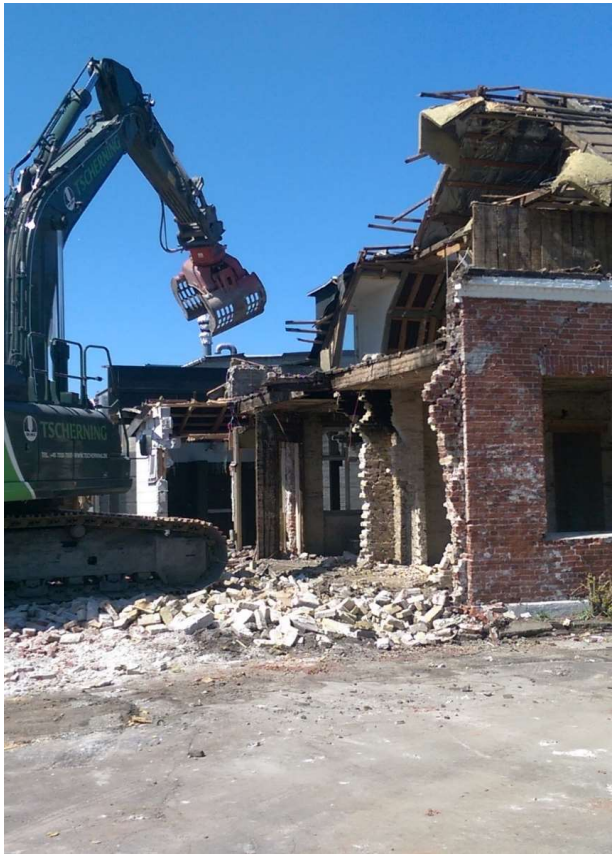
Predicting the production af CDW on a municipal level



Step 3

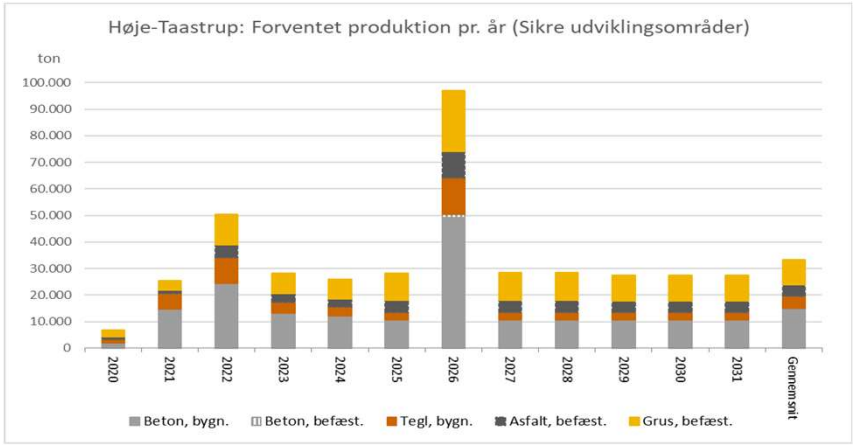
Calculating materials produced annually in a 12-year period within areas to be developed/transformed

Adding estimated annual baseflow

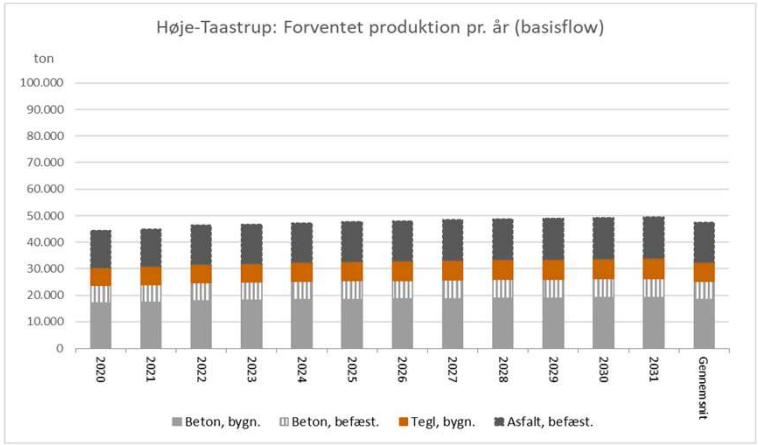


Predicting the production af CDW on a municipal level

Results, CDW-production in Høje-Taastrup



Predicted annual production of concrete, bricks, asphalt and gravel (high probability areas)



Predicted annual production of concrete, bricks, asphalt and gravel (baseflow)

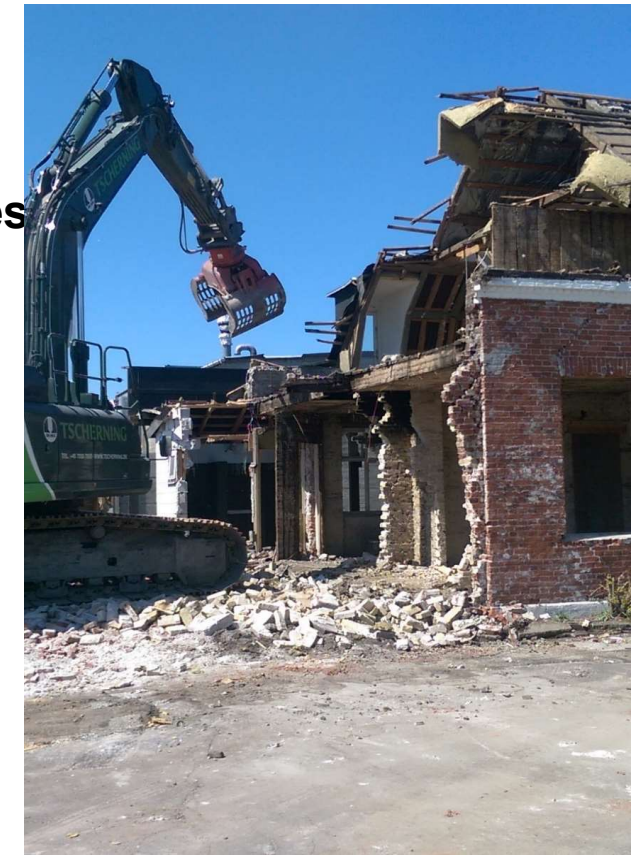
Predicting the production af CDW on a municipal level

Next moves:

Prepare adapted prognosis model in two additional municipalities

Identify reliable indicators on future production of CDW in the entire Capital Region of Denmark

Integrate CDW in regional raw materials planning



The soil team

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Roskilde municipality: Pia W Bjerggaarde, Julie Albers, Klaus Kellermann
Capital Region of Denmark: Jens L Gregersen

Jette Karstoft and Solvejg Qvist of consulting company Niras A/S did most of the more tedious work

THANK YOU VERY MUCH!

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