

How can the TU Delft accommodate the growing student population whilst complying with its own sustainability goals?

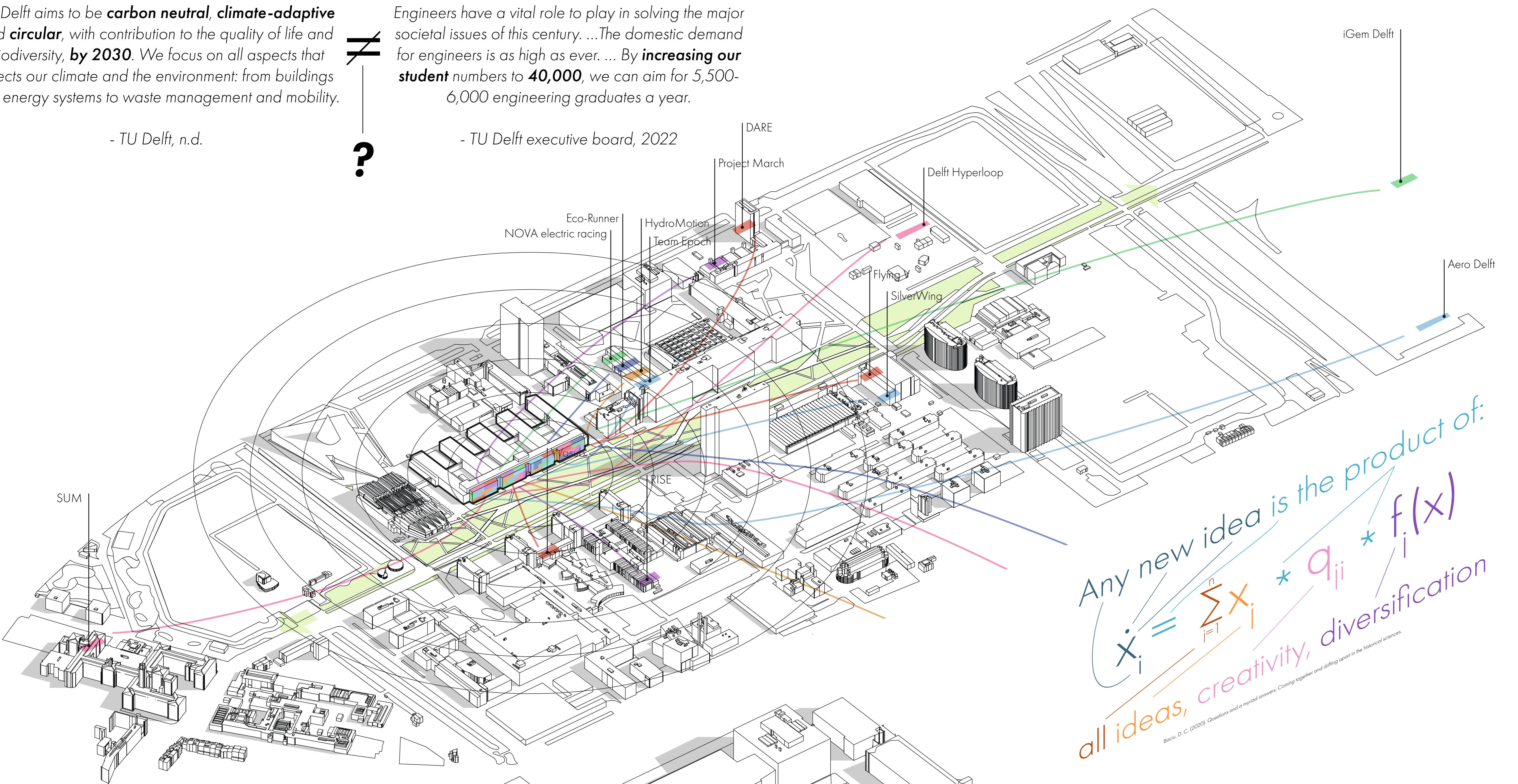
TU Delft aims to be **carbon neutral, climate-adaptive** and **circular**, with contribution to the quality of life and biodiversity, **by 2030**. We focus on all aspects that affects our climate and the environment: from buildings and energy systems to waste management and mobility.

- TU Delft, n.d.

Engineers have a vital role to play in solving the major societal issues of this century. ... The domestic demand for engineers is as high as ever. ... By **increasing our student** numbers to **40,000**, we can aim for 5,500-6,000 engineering graduates a year.

?

- TU Delft executive board, 2022



Any new idea is the product of:

$$x_i = \sum_{j=1}^n x_j * q_{ji} * f_i$$

 all ideas, creativity, diversification

Bateli, D. C. (2020). Questions and a myriad answers: Coming together and driving apart in the biological sciences.

With every increment of warming, climate change impacts and risks will become **increasingly complex** and more difficult to manage.

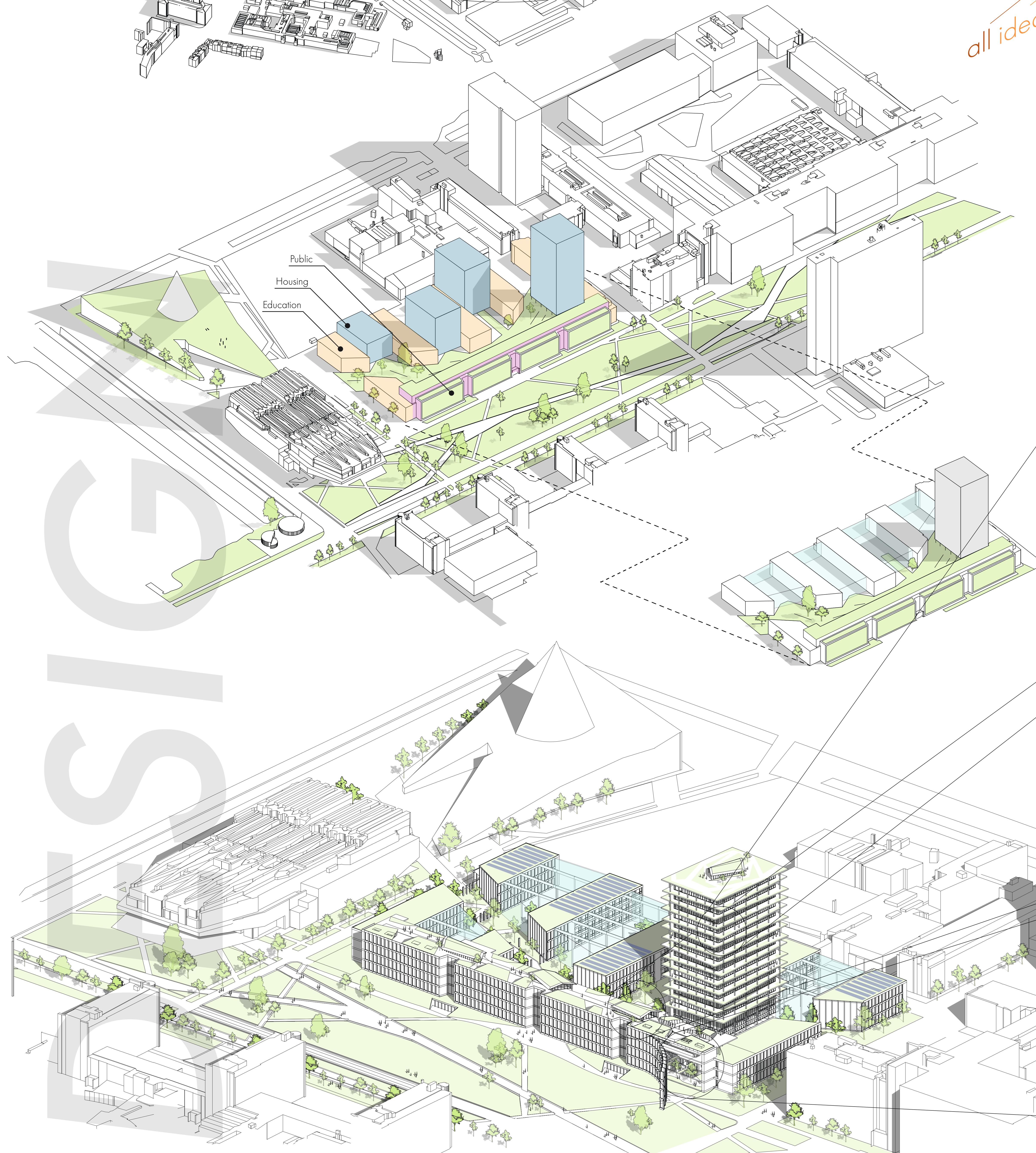
There is a **rapidly closing** window of opportunity to secure a liveable and sustainable future for all...

- IPCC Synthesis Report, 2023

"Humanity is on a highway to climate hell" ...

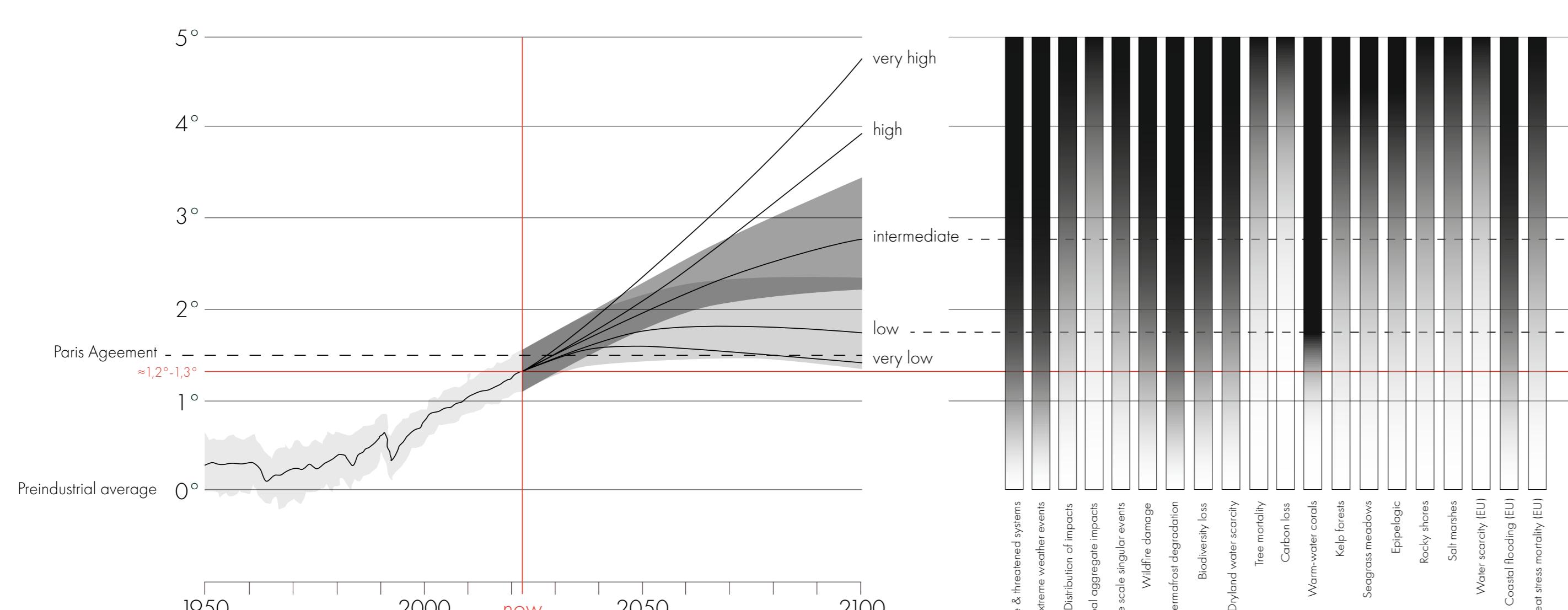
- UN secretary general, 2022

So: What if we do not meet our sustainability goals?

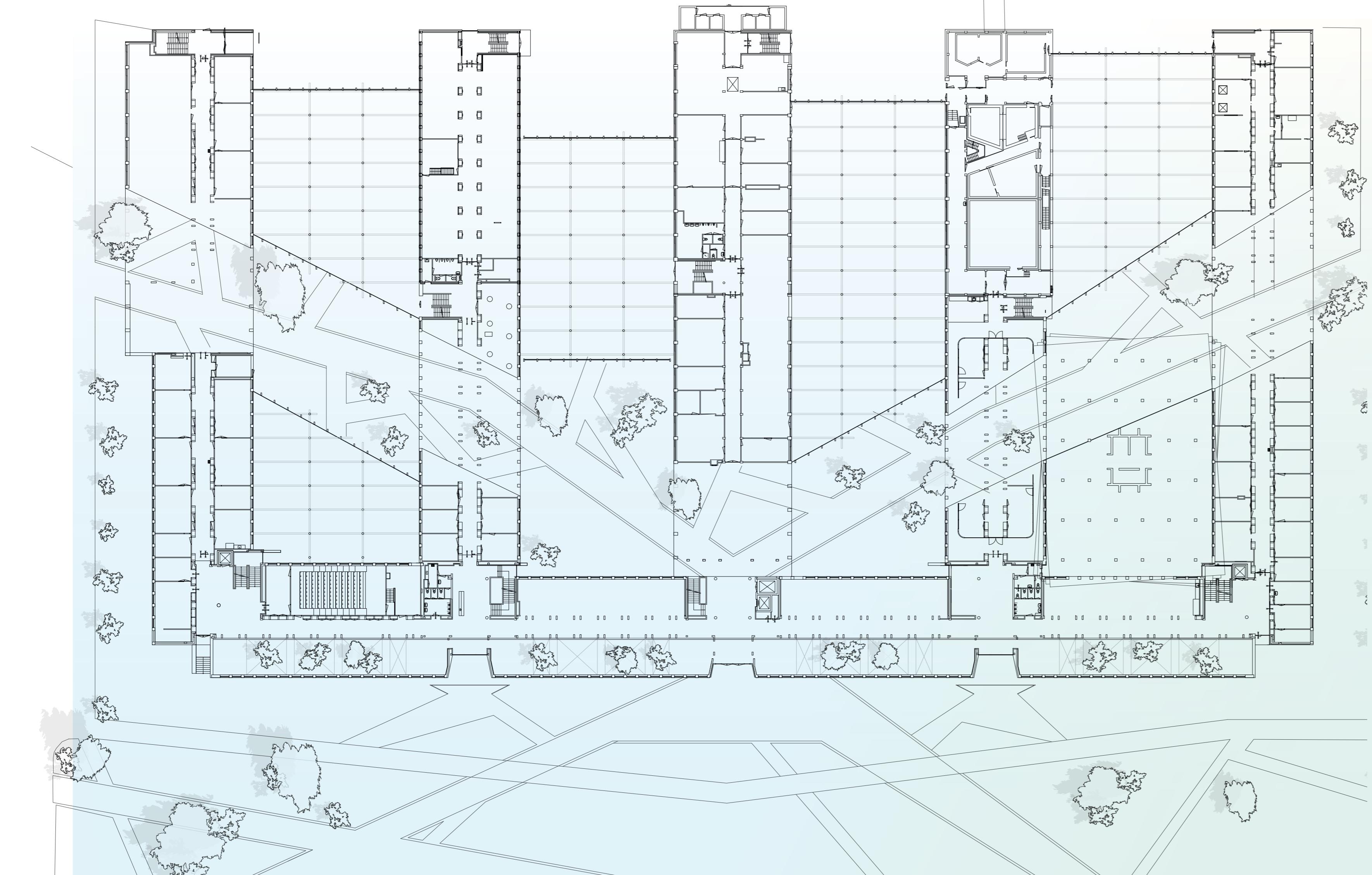
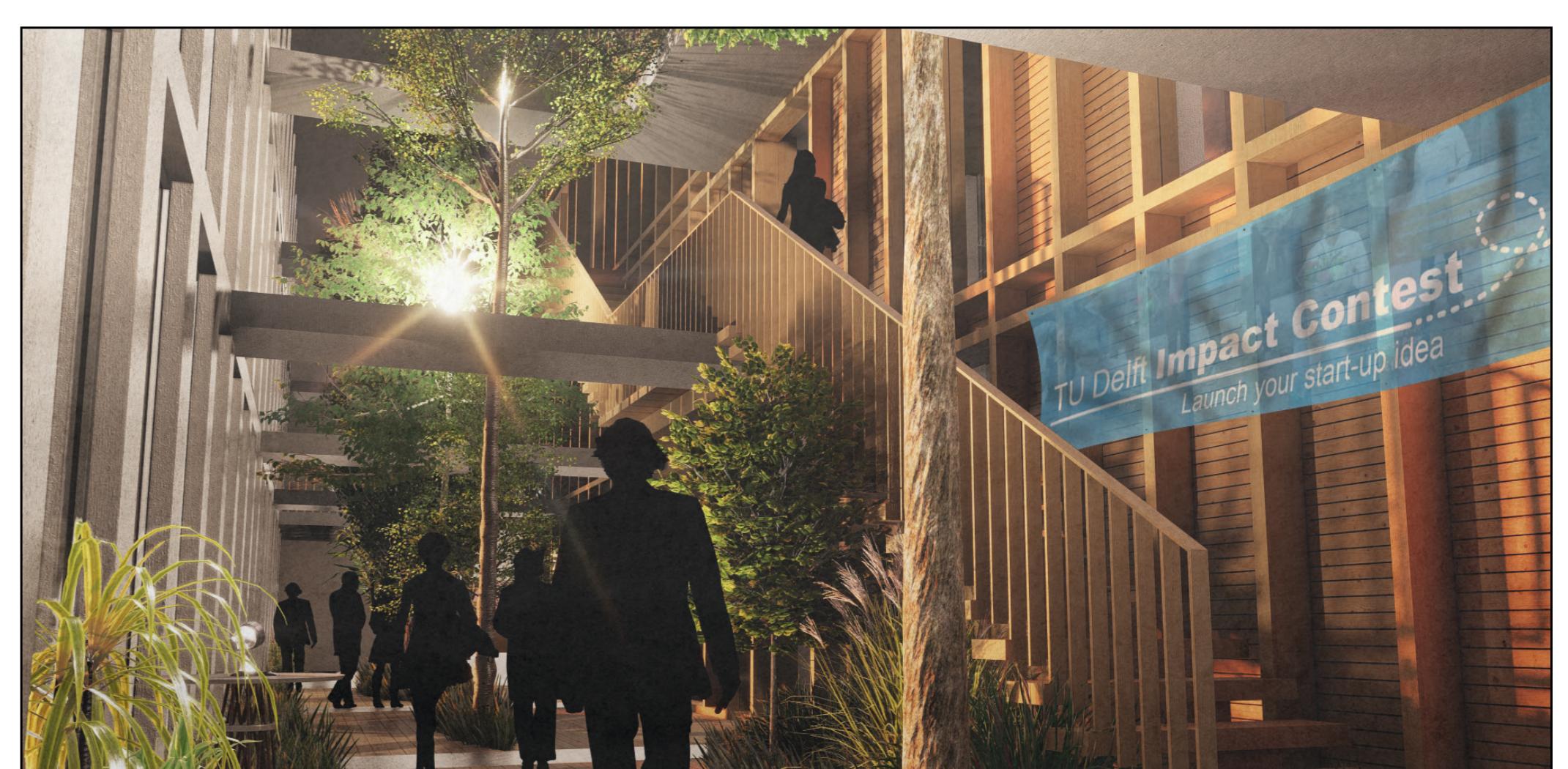
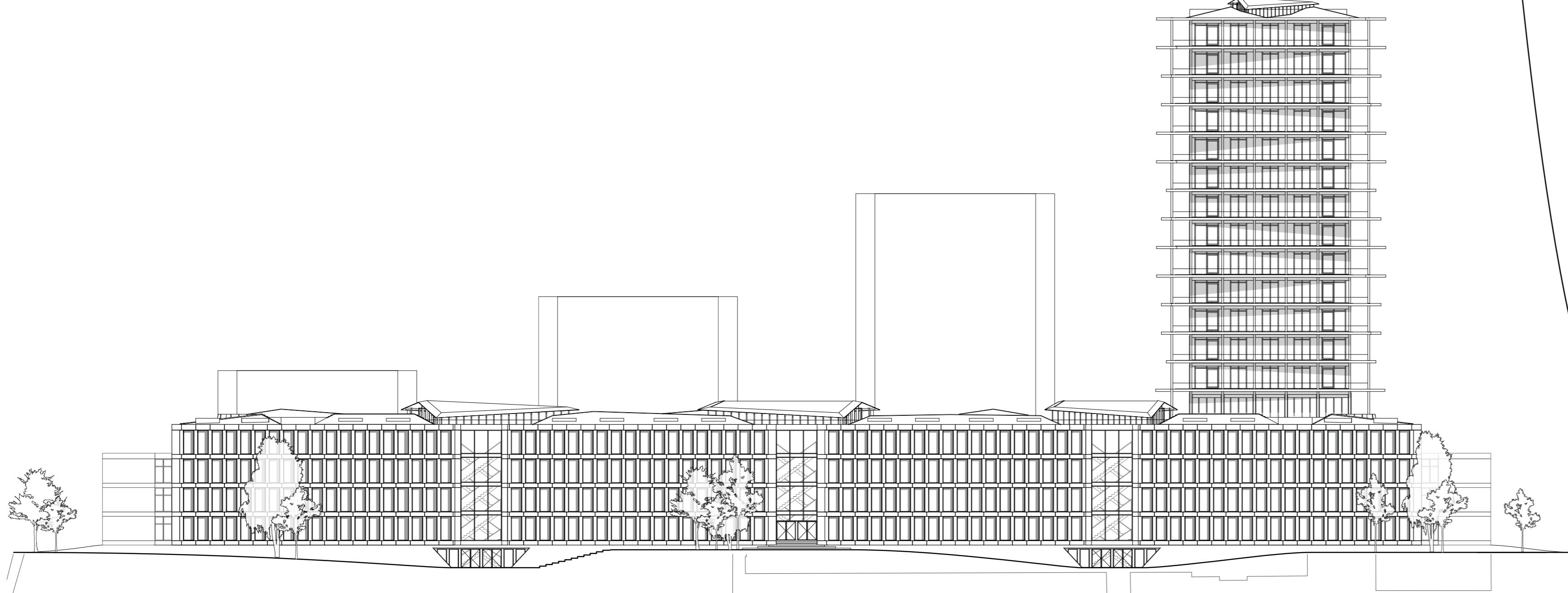
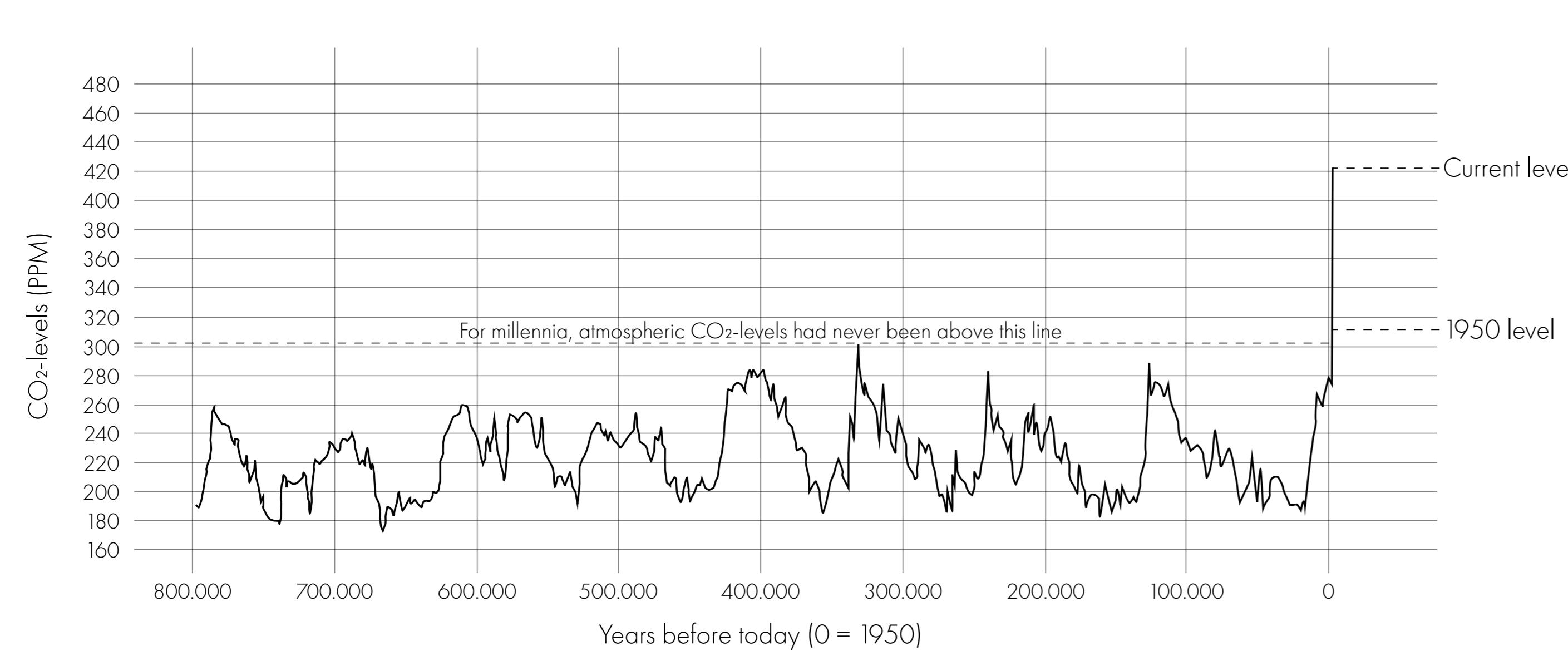


And what if we do not meet our sustainability goals?


With every increment of warming, climate change impacts and risks will become increasingly complex and more difficult to manage.



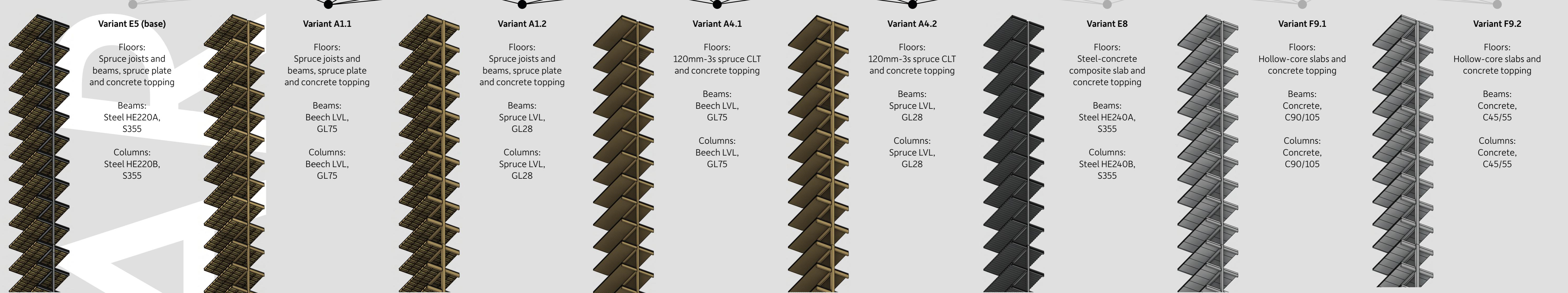
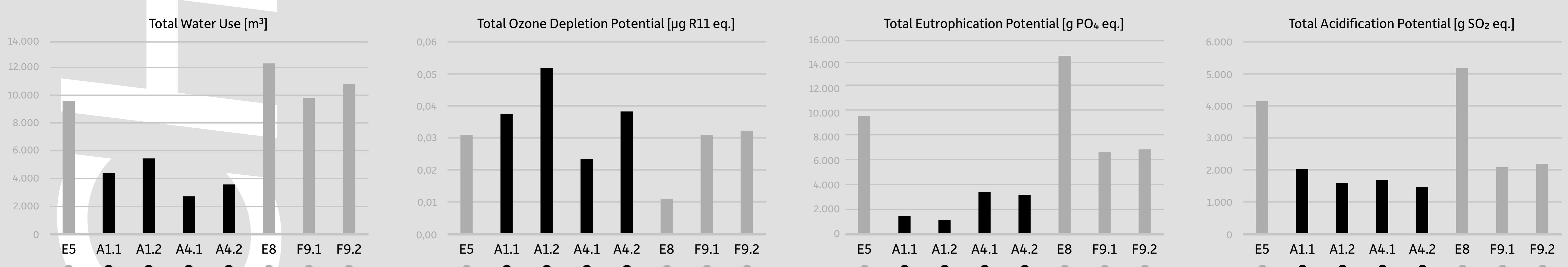
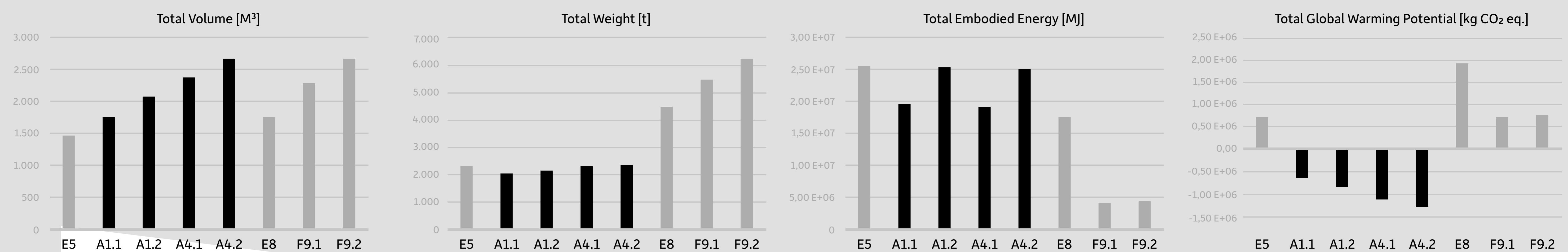
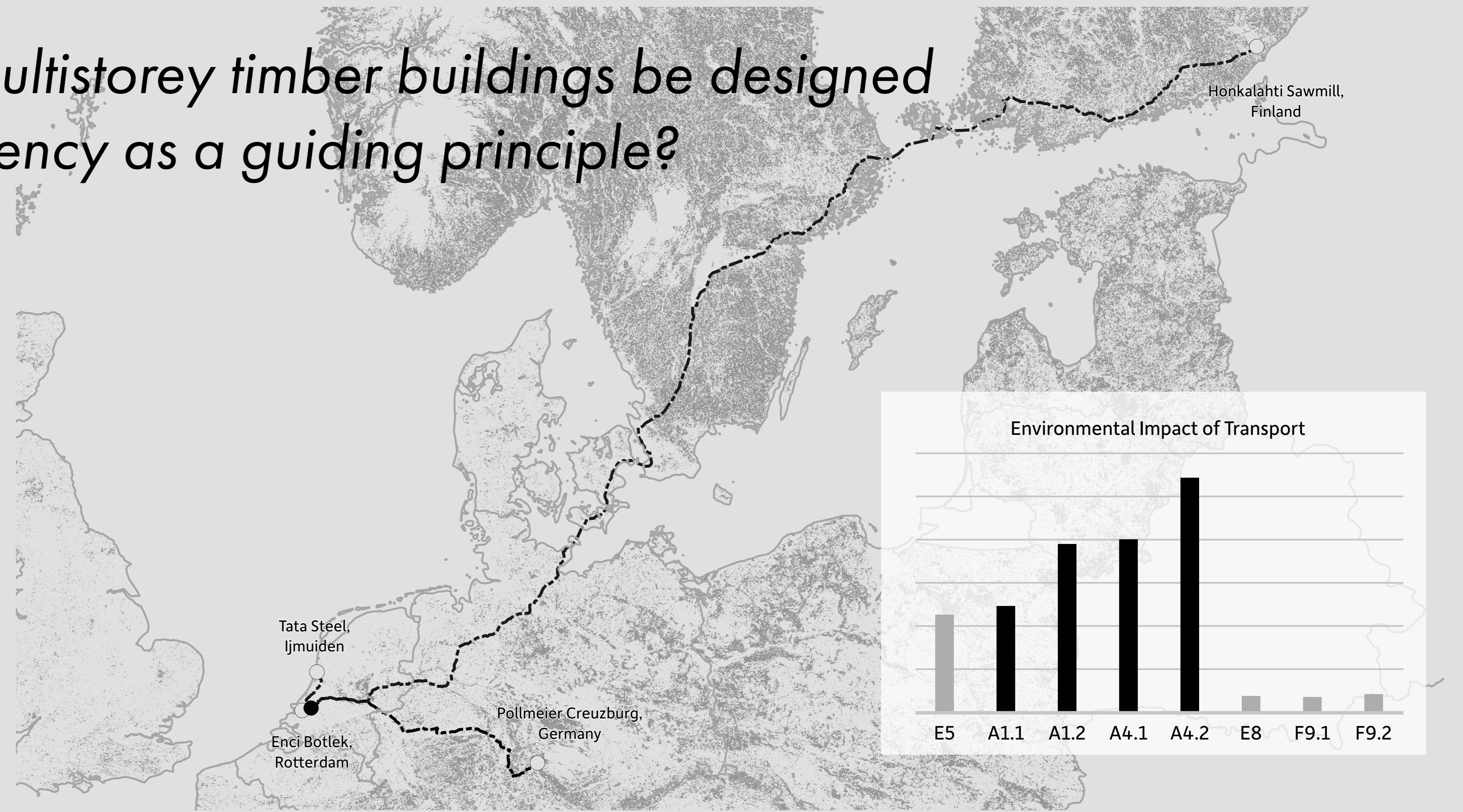
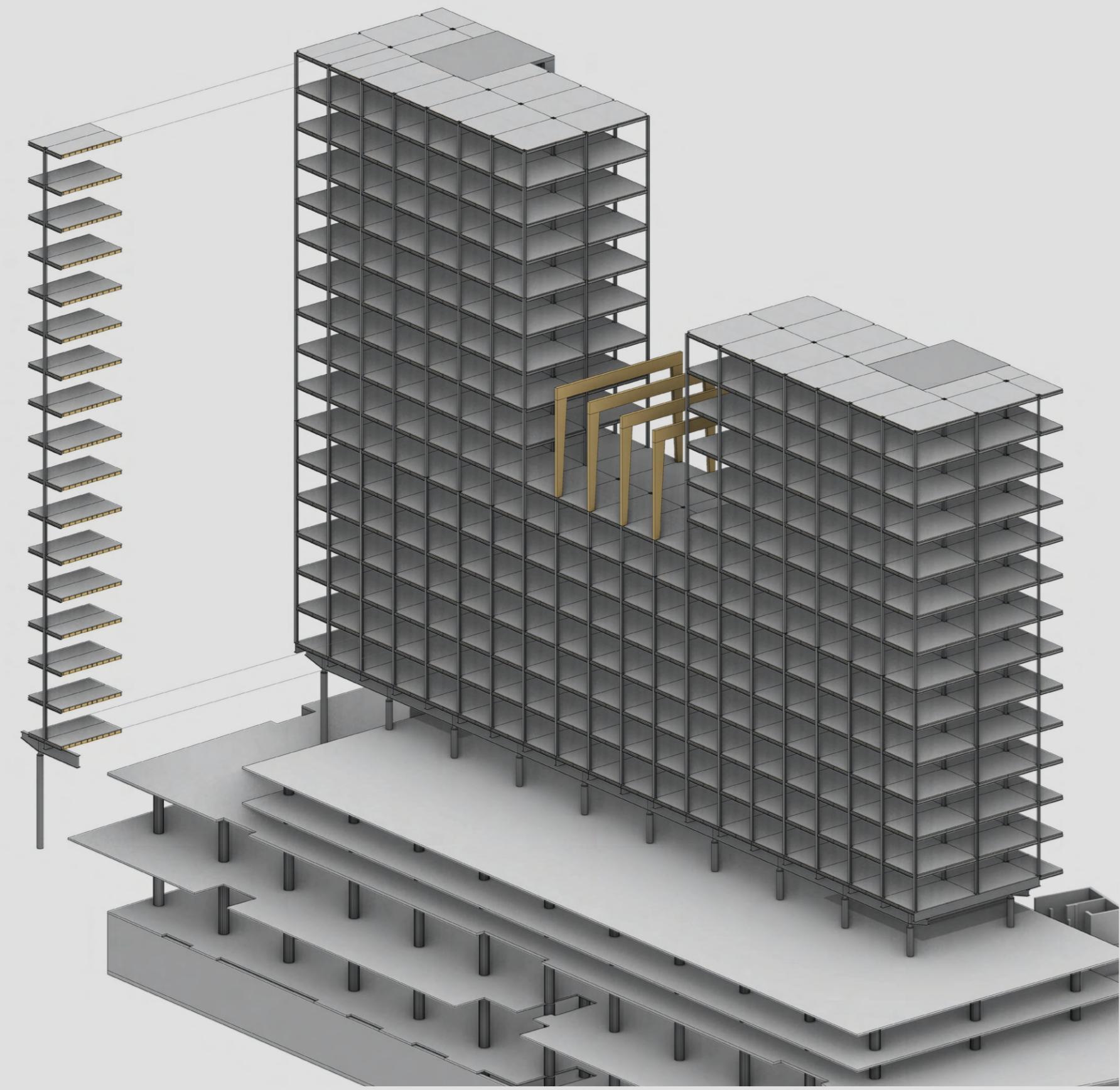
Principal hazards



Technical elaboration



How can the structure of multistorey timber buildings be designed when taking material efficiency as a guiding principle?



Common name, botanical name, DIN 4076 abbreviation		Common name, botanical name, DIN 4076 abbreviation		Common name, botanical name, DIN 4076 abbreviation		Common name, botanical name, DIN 4076 abbreviation		Common name, botanical name, DIN 4076 abbreviation	
Douglas fir, <i>Pseudotsuga menziesii</i> , DGA	Maple, <i>Acer pseudoplatanus</i> , <i>platanoides</i> , AH	Spruce, <i>Picea abies</i> , BU	Scots pine, <i>Pinus sylvestris</i> , KI	Oak, <i>Quercus robur</i> , <i>Q. petraea</i> , EL	European larch, <i>Larix decidua</i> , LA	Robinia, <i>Robinia pseudoacacia</i> , ROB	Pine, <i>Pinus sylvestris</i> , P. rigida + 4, PIP	Birch, <i>Betula pendula</i> , L...	Fr. Abies alba, TA
yellowish-white/reddish brown, darkening	yellowish-white, tendency to yellow, tan shiny	early wood yellowish-white, late wood reddish yellow	light yellowish to reddish grey, often speckled, cloudy red-brown	light yellowish-white/reddish white, turning to brown	grey/grey-yellow, darkening to light, dark brown	yellowish/reddish brown, darkening, late wood very dark brown	light yellow to greenish yellow/greenish white, reddish yellow to olive yellow	early wood almost white, late wood reddish	sapwood grey-white to yellowish-white, heartwood yellow-brown
Average density [kg/m³]	530..630..950	350..400..500	540..720..910	500..520..540	430..690..960	470..600..650	720..740..800	510..650..830	350..450..550
Theoretical differential shrinkage in % per 1% moisture change, radial/tangential	0.15..0.19..0.24..0.31	0.10..0.20..0.22..0.30	0.19..0.22..0.38..0.44	0.15..0.19..0.25..0.36	0.18..0.22..0.28..0.35	0.14..0.18..0.28..0.36	0.13..0.15..0.24..0.29	0.18..0.24..0.26..0.31*	0.12..0.16..0.28..0.35
Dimensional and form stability	Good	moderate to good	good	low	low	moderate	good	very good	moderate to good
Resistance to fungal attack	moderate	very low	low	very low	low to moderate	high	moderate to low	very high	good
Resistance to insect attack	moderate	very low	low	low	high	moderate to high	very high [termite-resistant]	very high	moderate to good
1) Availability of Sawn lumber/finger jointed and bending strength [N/mm²]	yes/yes	no/no	yes/yes	yes/no	yes/yes	yes/yes	yes/yes	yes/no*	yes/yes*
2) Availability of Glued laminated timber and bending strength [N/mm²]	yes/no	yes	yes..28.0..48.0	yes	yes..31.5..59.0	yes	no*	yes..30.0	yes
3) Availability of Cross laminated timber and bending strength [N/mm²]	yes/no	yes	no	rarely	no	yes	no*	no	no
4) Availability of Laminated veneer lumber and bending strength [N/mm²]	yes/no	yes	yes..75.0	yes	no	no	no*	no	no
5) Availability of Structural plywood/GSB	yes/yes*	no/no	yes/yes..80.0	yes/yes	no/no	no/no*	no*	no/no*	yes/yes..18.0..14.8
Burrone (1-5) [mm/min]	0.05/0.05/0.05/0.05/0.05*	0.65/0.65/0.65/0.65*	0.50/0.65/0.65/1.0	0.65/0.65/0.65/0.65*	0.50/0.50/-/-	0.65/0.65/0.65/-*	0.50/0.50/-/-*	0.65/0.65/-/-*	0.50/0.50/-/-*
Thermal conductivity (1-5) [W/mK]	0.12/0.13/0.13/0.13	0.09/0.13/0.13/0.13	0.13/0.17/-/0.17/0.13	0.12/0.13/0.13/0.13	0.13/0.17/-/-	0.11/0.13/0.13/-	0.13/-/-/-*	0.13/0.17/-/-	0.13/0.17/-/-
Water vapour diffusion resistance (1-3) [g/m²]	50..20/50..20/50..20	200..50/200..90/300..200	50..20/50..20/50..20	200..50/-/-	50..20/50..20/-	200..50/-/-	50..20/-/-	50..20/-/-	50..30/-/-
Highest durability class	DC3/moderately durable	DC5/not durable	DC4/slightly durable	DC3/moderately durable	DC1/very durable	DC4/slightly durable	DC1/very durable	DC4/slightly durable	DC5/not durable

