# Reducing the use of natural sand and gravel in road construction

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# Balancing priorities

- Economy
- Traffic flow
- Biodiversity
- Climate
- Natural resources


# Challenges relating to availability and price of sand and gravel

- Small and densely populated country
- No rock materials
- Land use
- 70% of sand and gravel goes to road construction
- Gravel pits are not popular neighbours
- Prices going up
- Paved area increasing, challenged circularity

# What can we do?

- Reduce new construction
- Materials from the road line
- Import
- Modify design – thinner layers
- Recycled materials or industrial byproduct

# Traditional Danish design

25 cm asphalt
Base, binder and top layer

20 cm unbound gravel base

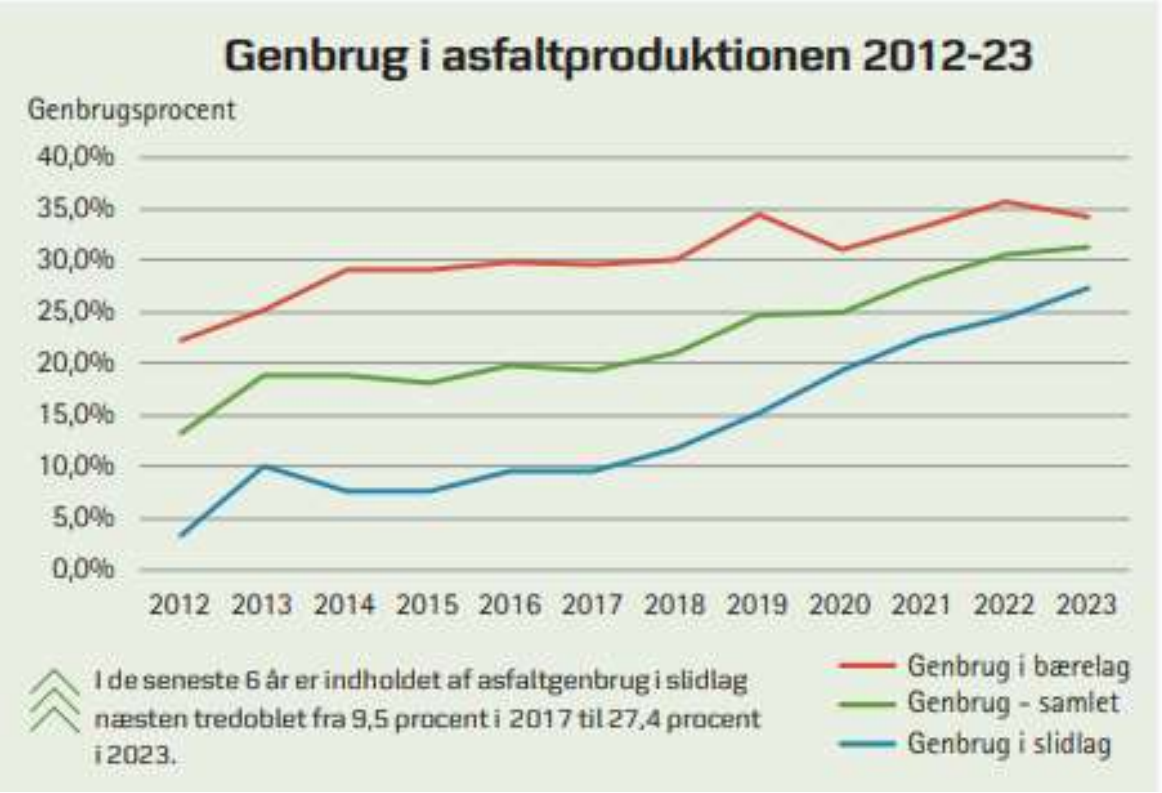
35 cm subbase

Subgrade

# Asphalt

- Asphalt recycling for 40 years

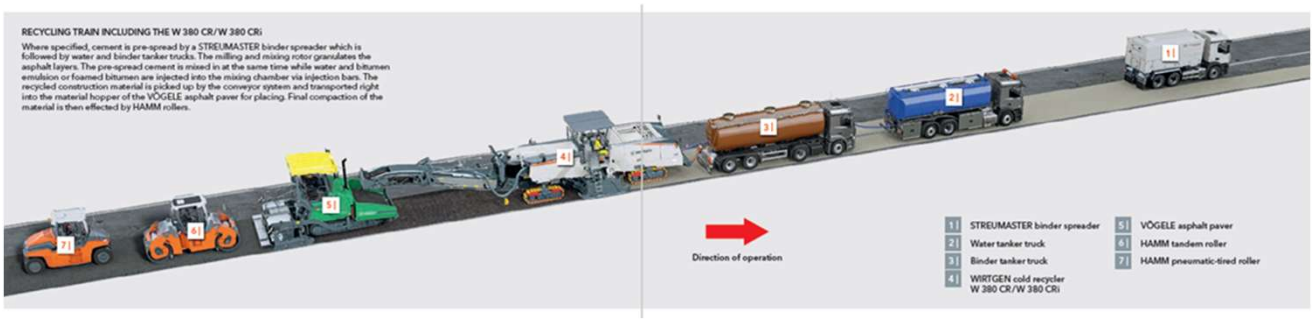
- In recent years also in top layers




Kilde: Asfaltindustrien

# Other materials

- BSM – Bitumen Stabilised Materials, >95% recycled aggregate + foam bitumen and cement




- Crushed demolition waste

- MSWI ashes for subbase and base

# Road design

- Actual road constructions outperform our design – up to 12 times as much traffic as designed for
- Conservative designs
- Sand/gravel was for many years very cheap and accessible
- Running project is looking at geotechnical evaluation of foundation modulus and design criteria
  Can we reduce layer thicknesses?
- Find the balance - long life is also sustainable

# Potential savings

- Modified design up to 10 – 15 %
- Demolition waste and by-products now covers 5 – 10 %, potential maybe 10 – 20 %
- Careful with fixed requirements for xx % alternative materials

# Porous asphalt (re-)introduced

- Three short sections + 6 km on Copenhagen ring Motorway paved in 2024
- Noise reduction
- German OPA mix: 5 – 8 mm aggregate, around 24% voids
- Expected life 10 years vs 17 years for our standard top layer