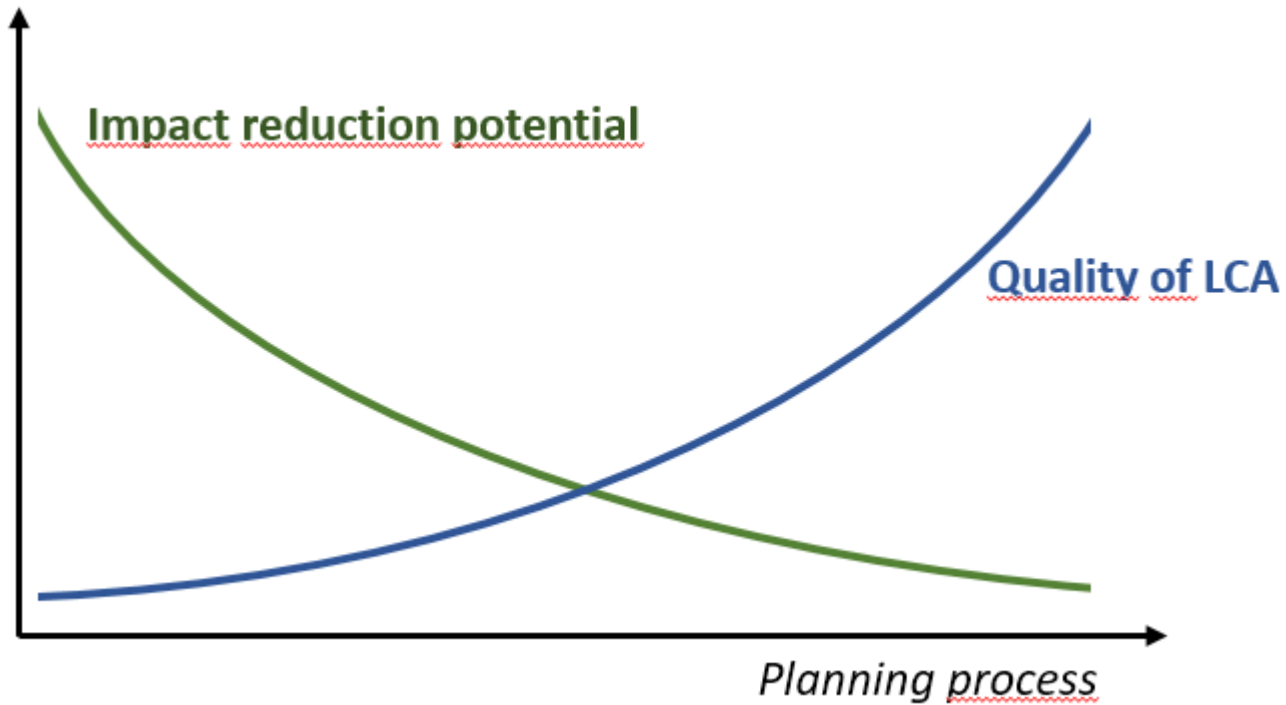




Sustainable Road Planning

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LCA IN ROAD PLANNING - CHALLENGES



Complexity of assessment vs. user-friendliness



Standardized tools
tailor-made for
different planning
stages



LCA IN EARLY PLANNING STAGES

Life cycle GHG emissions as part of SCBA

Climate module implemented in NPRA (Norwegian Public Roads Administration) cost-benefit tool EFFEKT

AVAILABLE DATA RELEVANT FOR LCA

- **AADT and Highway class**
 - Number of lanes, thickness of road layers, tunnel class, etc.
(NPRA Handbooks for design guidelines and requirements)
- **Road alignments from GIS software and geometry of road elements**
 - Generic data for material consumption
- **County**
 - Average data for share of rock and slope height

LCA IN EARLY PLANNING STAGES

DECISION-SUPPORT

- **Prioritizing amongst projects at a National level**
- **Road alignment**
 - Road around fjord vs. bridge crossing
 - Road around/over mountain vs. tunnel
- **Bridge material**
 - Steel vs. concrete

**LARGE POTENTIAL FOR EMISSION
SAVINGS AT THIS STAGE**

**EFFEKT IN USE, MANDATORY IN IMPACT ASSESSMENT
FOR ALL ROAD PROJECTS**

LCA IN LATER PLANNING STAGES

LCA alongside economic budgeting for road projects

TOOL: VegLCA (RoadLCA)

AVAILABLE DATA

- **Bill of quantities in standard format**

Large part of the data is given in material quantities directly applicable to impact calculations

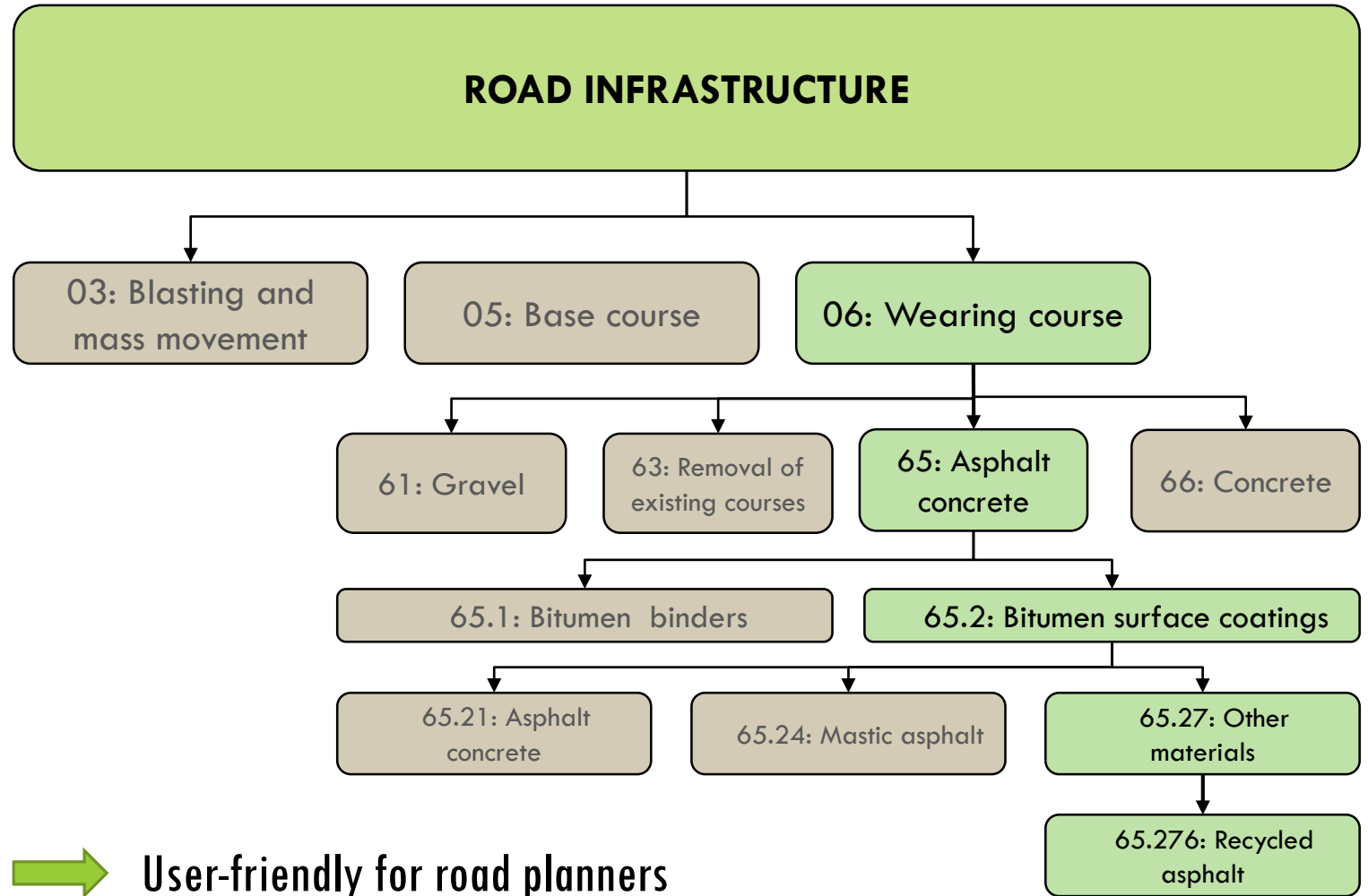
- **Data that are not directly applicable**

Default calculation factors (estimates) for material and energy use OR project specific factors entered by user

VegLCA

DESCRIPTION

- Developed in MS Excel
- Main results printed in PDF format for reporting
- Similar hierarchic structure as used for economic budgeting (bill of quantities)



CURRENTLY BEING TESTED BY THE NPRA AND ENTREPRENEURS

VegLCA

DECISION-SUPPORT – Examples:

- **Construction design**
 - Timber arch vs concrete slab bridge
- **Technologies**
 - Water and frost protection system
 - Drill and blast vs tunnel boring
- **Material types and qualities**
 - Conventional vs. lightweight concrete
 - Recycled steel vs. virgin steel
- **Earthworks and transportation of masses**
 - Construction machinery (energy use)
 - Mass transport technology
 - Mass transport distances

HIGH LEVEL OF DETAIL
- POSSIBLE TO ADDRESS MANY ASPECTS

VegLCA

APPLICATIONS

- Climate budgeting internally in the NPRA
- Weighting in public procurements
- Climate emission accounting and reporting

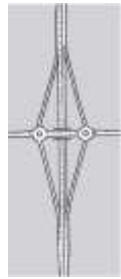
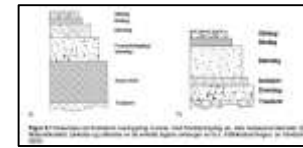
EXPERIENCES SO FAR

- Suitable for identifying the elements, components and materials that cause the highest impacts
- The use of machinery in the construction phase contribute 30 % of the climate emissions on average
- The greatest contributors to environmental impact are asphalt, concrete and steel

POTENTIAL IMPROVEMENTS

NEW TOOL TO FILL THE GAP BETWEEN EFFEKT AND VegLCA

- Generic road elements and components
Highway class, tunnel class, frost and water protection systems, railings, lighting systems, bridge designs, roundabouts, highway ramps, etc
- Based on requirements regarding design and materials
- Greater variation in alternatives on designs, technical solutions, material types and qualities, etc.



POTENTIAL IMPROVEMENTS

EFFEKT

- Improvements in inventories for generic road elements
- Inclusions of more materials and components

VegLCA

- Higher level of choice in material types and qualities
- Visualization of potential impact reductions related to choice of materials, design and technology (e.g. benchmarking to some defined current practice)
- Implementation in public procurements
- Develop a simplified version for use when less data is available

POTENTIAL IMPROVEMENTS

LINK LCA TOOL (METHOD) TO BIM-SOFTWARE

- BIM-software is increasingly being used in road infrastructure planning
- Obtain consistency

DEVELOP/EXTEND TOOLS FOR USE IN ACROSS COUNTRY BORDERS

- Current project: NordLCA (Norway, Sweden, Finland)

CONCLUSIONS

CHALLENGES FOR LCA AS DECISION-SUPPORT IN ROAD INFRASTRUCTURE PLANNING

- Good enough data before the big decisions are made
- User-friendly tool for assessments at a satisfactory level of detail
- Generic road elements inventories at a satisfactory level of detail

BRIDGING THE GAP BETWEEN EFFEKT AND VegLCA

- Improving data in EFFEKT
- Simplification of VegLCA to allow for use at an earlier stage
- A new tool with detailed inventories of road elements, components and materials



THANK YOU FOR YOUR ATTENTION