**Closing Seminar**
**14-15 May, 2012**
**Malmö**

NordFoU

# ETSI

## New ways to include life cycle issues into design, decision making and procurement

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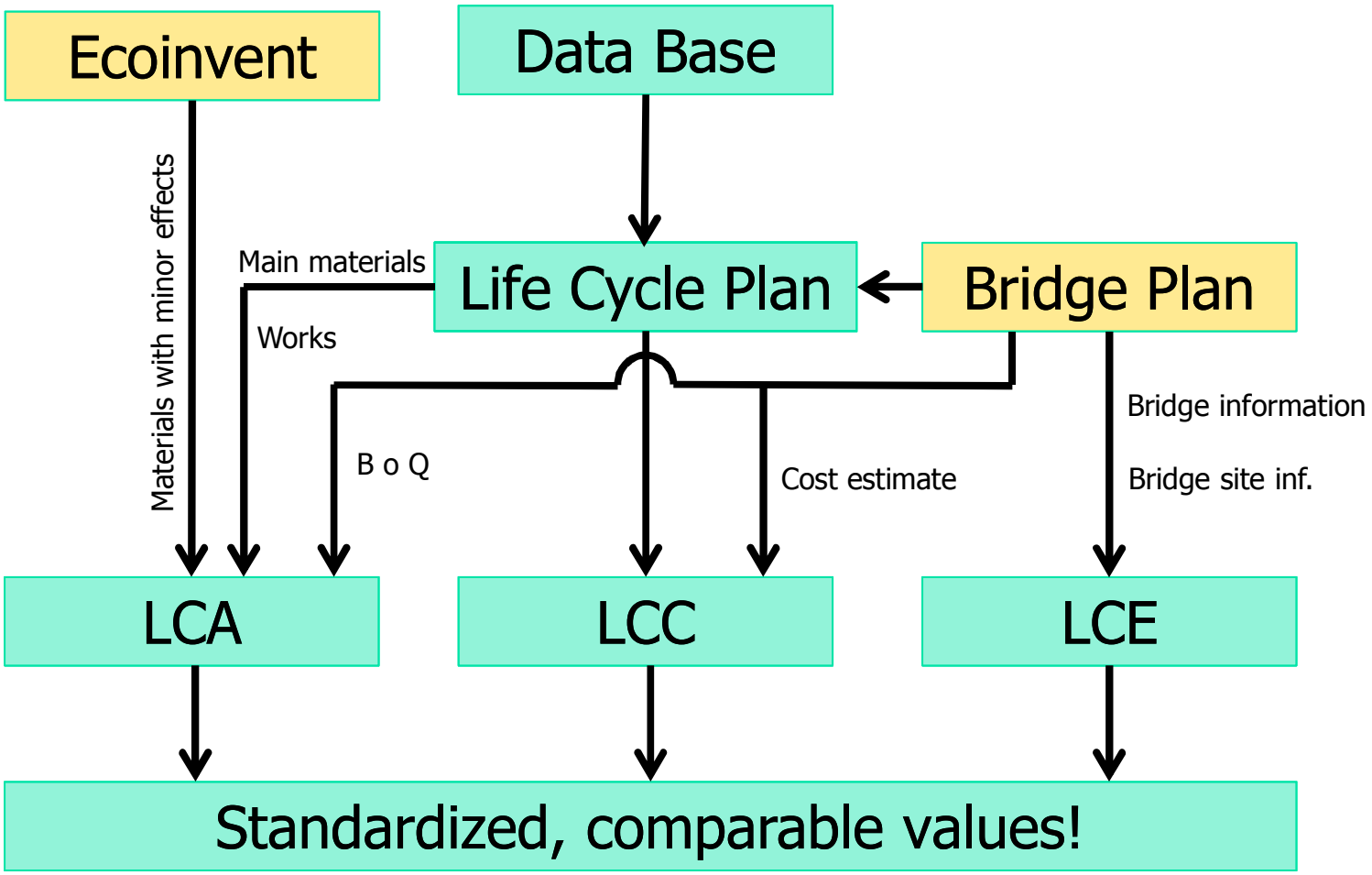
# New Design Culture

Bridge designer makes a life cycle plan and calculates the life cycle effects

**Bridge Life Cycle Optimisation**



# Data Base

**Bridge Life Cycle Optimisation**

From the data base designer gets life cycle information of bridge parts. Cost and duration times of actions are also given.

| Nomenclature ETSI | Nomenclature FIN | Title | Unit | Year of Action | Maximum delay | Unit cost of repair €/unit | Unit cost of repair % of construction cost | Unit duration | Duration | Traffic disturbance (of the repair duration) |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | | **FOUNDATION** | | | | | | | | |
| 1.1 | 4207 | **Foundation slab** | | | | | | | | |
| | | *1 Patching the surface* | m2 | 100 | +25 | | 50% | 0,1 | | |
| | | * underwater, sea | | -50 | | | | +0,1 | | |
| | | * underwater, fresh water | | -25 | | | | +0,1 | | |
| 1.2 | 4201.2.1 | **Excavation, soil** | | | | | | | | |
| 1.3 | 4201.2.2 | **Excavation, rock** | | | | | | | | |
| 1.4 | 1320 | **Pile** | m | | | | | | | |
| 1.4.1 | 1321 | **Driven piles** | | | | | | | | |
| 1.4.1.1 | 1321.1 | **Concrete piles** | | | | | | | | |
| | | *1 Repair* | | 70 | +30 | | 200% | 0,05 | | 25% |
| | | * design service life 100 years | | +50 | | | | | | |
| 1.4.1.2 | 1321.2 | **Steel piles** | | | | | | | | |
| | | *1 Repair* | | 70 | +30 | | 200% | 0,05 | | 25% |
| | | * design service life 100 years | | +50 | | | | | | |
| 1.4.1.3 | 1321.3 | **Wooden piles** | | | | | | | | |
| | | *1 Repair* | | 50 | +20 | | 100% | 0,05 | | 25% |
| 1.4.2 | 1324 | **Excavated piles** | | | | | | | | |
| 1.4.3 | 1325 | **Bored piles** | | | | | | | | |

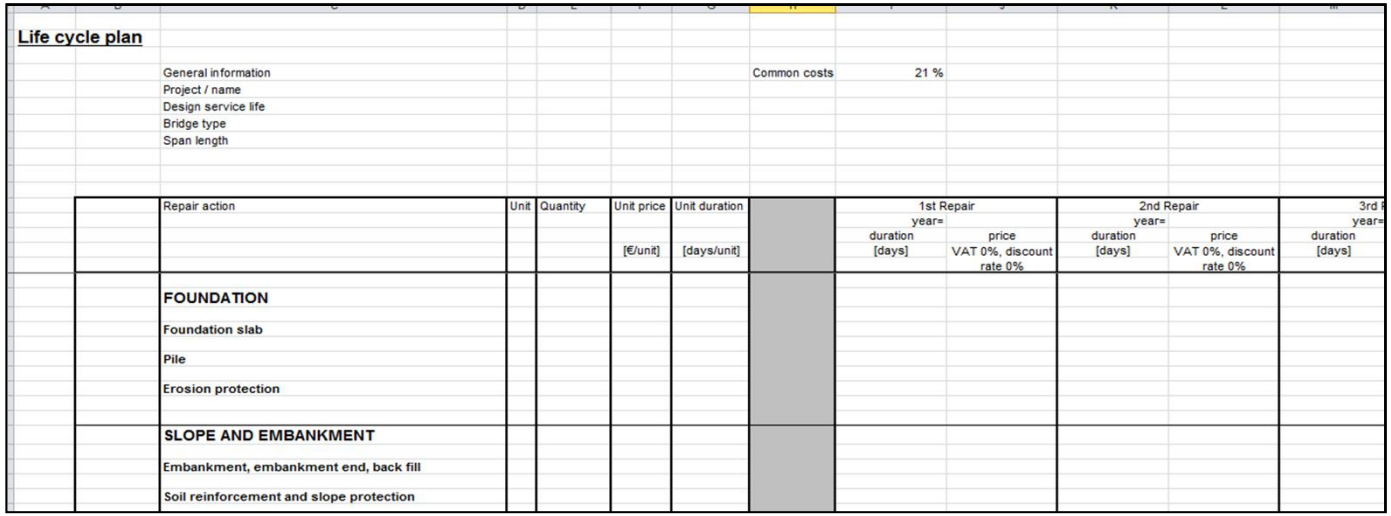
Data base is maintained nationally by the whole branch and in co-operation with other ETSI countries. It is distributed by road authorities.

# Life Cycle Plan

**Bridge Life Cycle Optimisation**

Bridge designer chooses bridge parts and plans the maintenance actions according to Data Base aiming for the most sensible service life

- When to go to the bridge and what actions to take
- What is the cost and duration of the visit
- How long the traffic is disturbed



Life cycle plan

General information
Project / name
Design service life
Bridge type
Span length

Common costs 21 %

| Repair action | Unit | Quantity | Unit price [€/unit] | Unit duration [days/unit] | | 1st Repair year= duration [days] | 1st Repair year= price VAT 0%, discount rate 0% | 2nd Repair year= duration [days] | 2nd Repair year= price VAT 0%, discount rate 0% | 3rd R year= duration [days] |
|---|---|---|---|---|---|---|---|---|---|---|
| **FOUNDATION** | | | | | | | | | | |
| Foundation slab | | | | | | | | | | |
| Pile | | | | | | | | | | |
| Erosion protection | | | | | | | | | | |
| **SLOPE AND EMBANKMENT** | | | | | | | | | | |
| Embankment, embankment end, back fill | | | | | | | | | | |
| Soil reinforcement and slope protection | | | | | | | | | | |

# Life Cycle Values



- Bridge designer is calculating life cycle costs and environmental effects with the new LCC and LCA tools
- In certain projects aesthetical factor is calculated by bridge designer based preferably on a survey of experts and people affected
- These factors and values are based on **standardized** values, methods and tools and are thus easily **comparable**

# Applications in design and decision making

**Bridge Life Cycle Optimisation**

- Bridge designer can optimize his/hers plans according to life cycle issues and verify the benefits to the client
- Client can utilize life cycle view in decision between proposed alternatives and also in project guidance
- Client can utilize the life cycle plan in maintenance planning

# Applications in procurement using standardized methods and tools

Bridge Life Cycle Optimisation

- Instead of comparing investment prices one can compare life cycle costs. This opens truly remarkable possibilities for new innovations!
- Limits for environmental burdens may be set or different bonus systems created based on the values calculated from LCA.
- Aesthetical values may be compared (even in monetary terms) using LCE. This is particularly suitable in bridge design competitions

# Effects on new bridges

**Bridge Life Cycle Optimisation**

## Life cycle view changes materials and design solutions

- 100 years service life affects material choices and their protection
- Use of LCA friendly wood increases?
- Maintainability and access to the structures gets more attention?
- More surface treatments and protective layers to postpone or avoid reparations?

## Bridge site affects materials and design solutions

- Aesthetical and cultural values of a site affects design solutions
- Transporting costs affects material choices
- Amount of traffic and possibilities of detours affect materials and design solutions

# New ideas on heavily trafficked bridges

**Bridge Life Cycle Optimisation**

- Why not sometimes build extra broad bridges to be able to fix the parapets without traffic disturbance?

- Why not make the water isolation of “gold” if it would last 100 years?

- Should we learn from the quick erection and repair methods used in railway bridges?

Foto: Megasiirto

# Starting to cash in benefits

**Bridge Life Cycle Optimisation**

Road authorities are in key position.

Nothing happens if we don’t support and require the use of ETSI!