# Future Views on Life Cycle Costing - LCC ©

***Rakennuskannan ja infrastruktuurin kunnonhallinta***
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***Olavi Tupamäki***
***Villa Real Ltd/SA***

PO Box 100
FI-02321 Espoo Finland
www.villareal.fi
*tel +358 9 802 3667*
*fax +358 9 802 3610*
*info@villareal.fi*

# VILLA REAL for Sustainable Construction

- ***We offer engineering and consulting services to the international clientele of the Construction and Real Estate Cluster - CREC**:*
  - *On **technological**, **economic** and **sustainability** topics in general*
  - ***Post Occupation Evaluation – POE** using the **BUS** method licensed from the UK*
  - *Advanced **FutureConstruct® Total LCC** services for investors, developers, designers, contractors and users, (1) to **monetarise externalities and intangibles** (occupational, mobility, environmental and societal impacts) and (2) utilising the newest science and software to **replace deterministic singular values for costs and performance with a probabilistic approach***
  - *Advance energy efficiency towards "**zero energy houses**", in the stages 4…5 of the RTD&IDC chain "research ⇨technological development & ⇨innovation ⇨demonstration ⇨commercialisation"; design, software, equipment*
- *We publish reports and analyses, available in our **Online Bookshop***
- ***Keywords characterising our experience: International • Strategic • Sustainable • Energy & Environment • Construction • IT & Robotics • RTD&IDC***
- *Our **clients** include several leading European contractors, Shimizu Corp. Japan, Singapore Ministry of National Development, the European Commission, and numerous European, Nordic and Finnish CREC organisations*

*For additional information, see www.villareal.fi*

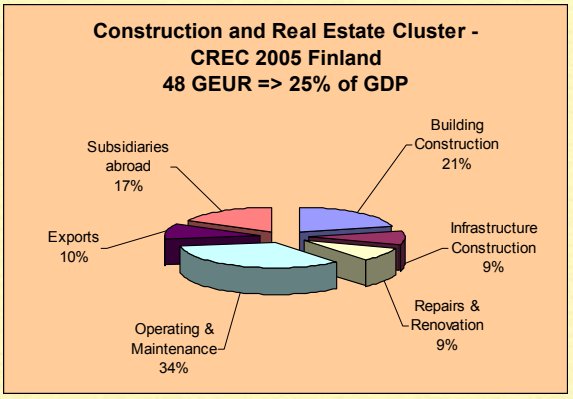
# Contents

- ***Construction and Real Estate Cluster – CREC for sustainability***
- ***What are LCA and LCC?***
- ***ISO 15686 Buildings and constructed assets - Service-life planning***
- ***Total LCC & monetarisation – the ultimate solution***
- ***Probabilistics to replace deterministic values***
- ***Where are we today?***

*Matalaenergiatalo Villa Real (Oy Honkarinne 10)*
*Hämeenlinnan asuntomessuilla 2007*
***Energy efficient & sustainable construction***

# The Construction and Real Estate Cluster – CREC for sustainability

- *While in Finland construction represents 10% of GDP (or 13% if repairs & renovation are counted in), CREC represents 25% of the same GDP. The same is true for the EC 15 / 27.*



## Why sustainable construction is important?

- *In advanced European vocabulary "construction" is considered to cover the entire value chain of develop/own, design, manufacture, construct, recycle a building, infrastructure or other constructed assets.*
- *Today in Finland and elsewhere, an expression Construction and Real Estate Cluster - CREC has been taken to use to cover all activities directly related to construction and real estate (buildings, infrastructure and other facilities = 60-70% of the national wealth). Compared to the above, CREC covers the whole life of a building, hence additional activities concern operating and maintaining the building, which more often is done by facilities management.*
- *A reason to this approach is the fact that major contractors are moving from plain construction towards taking care of the building/facility for a certain period or its whole life. Also public-private partnership projects (BOOT, PFI; toll roads & bridges, schools, prisons etc) require this approach. All investors and property developers need this.*
- ***Buildings consume 40% of total energy and account for 30% of $CO_2$ emissions**, thus **environmentally alone, CREC's sustainability is most important for whole society!***

## Could this be sustainable construction?

- *The ways in which built structures are procured and erected, used and operated, maintained and repaired, modernised and rehabilitated, and finally dismantled (and reused) or demolished (and recycled), constitute the complete cycle of sustainable construction activities.*
- *Minimise the use of **materials**, **energy** and **water** and **mobility**. (factor 4/10; NL: factor 20; Passive House, et al)*
- *Building products should, as far as possible, be **reusable** and materials **recyclable**. Design for **long service life** (and durability) is superior to design for reusability. Reusability is superior to recycling, and recycling is superior to waste disposal.*
- *In sustainable construction, reusability and ease of **changeability** are necessary product properties, in particular for modular products and systems with different service lives.*

# What are LCA and LCC?

- *Derived from ISO 14040: In the Construction and Real Estate Cluster - CREC, environmental life cycle assessment - **LCA** is for assessing the total **environmental impact** associated with a product's manufacture, use and disposal and with all actions in relation to the construction and use of a building or another constructed asset. LCA does not address economic or societal aspects!*
- *Derived from ISO 15686*: In CREC, Life cycle costing - **LCC** is a technique which enables **comparative cost assessments to be made over a period of analysis**, taking into account all relevant economic factors both in terms of initial capital costs and future operating costs less residual value. It can be defined as the net present value - **NPV** of the total costs of an asset over the period of analysis.*

*Suomennettuna: **LCC** on menetelmä, joka mahdollistaa **kustannusten vertailukelpoisen laskemisen tarkasteltavana olevalta ajanjaksolta** kattaen kaikki vaikuttavat taloudelliset tekijät mukaan lukien investointikustannukset ja tulevat käyttökustannukset sekä jäännösarvon. Voidaan määritellä, että se on tarkasteluajanjakson kaikkien kustannusten diskontattu **nykyarvo**.*

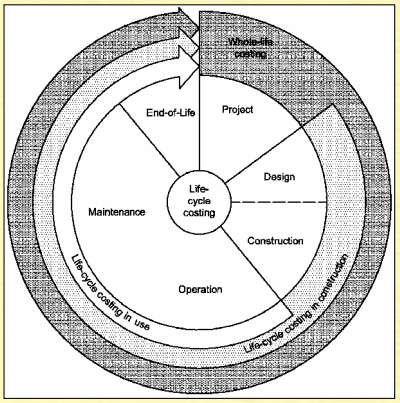
**ISO/FDID 15686-5(2008E): life-cycle costing = methodology for systematic economic evaluation of life-cycle costs over a period of analysis.*

# ISO 15686 Buildings and constructed assets - Service-life planning

- *This series covers 10 parts: 5 parts are ready and the remaining parts advanced, and the first part "umbrella standard" already under revision. The proposed ten parts are as follows:*
- *• ISO 15686-1 "General Principles" deals with issues and data needed to forecast service lives and gives a method for estimating the service lives of components and assemblies; umbrella standard; approved 2000, today under slow revision.*
- *• ISO 15686-2 "Service Life Prediction Procedures" describes a generic method for using testing of performance of components and assemblies to provide a service life prediction; approved 2001.*
- *• ISO 15686-3 "Performance audits and reviews" provides tools for audits and reviews to ensure that relevant steps have been taken to achieve a service life that will match or exceed the design life; approved 2002.*
- *• ISO 15686-4 "Data requirements" is a technical guide on methods of presenting data and evidence to support forecasts; under development*
- *• **ISO 15686-5 "Life cycle costing" will provide guidance on life cycle costing; to be approved 2008, the final voting closed 15 Apr 2008**.*
- *• ISO 15686-6 "Procedure for considering environmental impacts" provides guidance on assessing environmental sustainability in the context of service life planning; approved 2004.*
- *• ISO 15686-7 "Performance evaluation and feedback of service life data from practice" provides guidance on how to structure and use feedback data on in-use condition; approved 2006.*
- *• ISO 15686-8 "Reference service life and service life estimation" will provide guidance on assessment of default service lives using available information.*
- *• ISO 15686-9, vaguely under development.*
- *• ISO 15686-10, vaguely under development*

# ISO 15686-5 Life cycle costing (1)

- *The standard is now mostly as proposed by myself (five year's effort: title, several definitions and articles). Satisfactory but not good. A major problem is that the British Standard Institute – BSI managed to edge in their confusing Whole Life Costing – WLC to cover non-construction costs and externalities.*




# ISO 15686-5 Life cycle costing (2)

### How to calculate NPV

- *The **Net Present Value – NPV** procedure reduces a series of cash flows which occur at different times in the future to a single value at one point in time, the present. The technique which makes this transformation possible is called discounting. LCC is calculated as NPV of the accumulated future costs (C) over a period of analysis (t), eg 25 years (N), at an agreed discount rate (d), eg 2% (d =0.02) pa dependant on prevailing interest and inflation rates.*
- *NPV is calculated according to the following formula, and can be done with eg MS Excel (up to 29 years easily...).*

$$NPV = \sum_{t=0}^{N} \frac{C_t}{(1+d)^t}$$

- *It proved very difficult to get this fundamental formula into the standard. Yet, it is there now (but they changed the marking).*

# ISO 15686-5 Life cycle costing (3)

### Which discount rate?

- *NPV can be calculated using **nominal** costs and discount rate based on projected actual future costs to be paid, including general inflation or deflation, and on projected actual future interest rates. Nominal costs are generally appropriate for preparing financial budgets, where the actual monetary amounts are required to ensure that actual amounts are available for payment at the time when they occur.*
- *NPV can be calculated also using **real** costs and discount rate, ie present costs (including forecast changes in efficiency and technology, but excluding general inflation or deflation) and real discount rate ($d_{real}$), which is calculated according to the following formula, where (i) = interest rate and (a) = general inflation (or deflation) rate, all in absolute values pa.*

$$d_{real} = \frac{1+i}{1+a} - 1$$

# ISO 15686-5 Life cycle costing (4)

### Discount rate is important

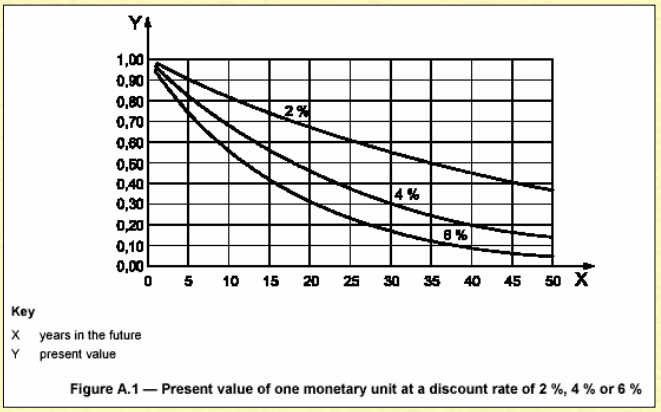
- *For any long-term (investment) calculation discount rate is necessary. Simple payback is too crude, and too high discount rate nullifies the future costs/savings. Thus a **correct discount rate** must be used.*
- *For any professional investor the use of **discount rate is a must**. The rate used depends on the return of investment required/expected.*
- *In addition to the interest rates and inflation, the selected discount rate also depends on the risk involved; the higher the risk ⇨ the higher the discount rate.*
- *In sensitivity analyses discount rate is often one of the most **sensitive** determinants.*
- *For PPP projects real discount rate and real costs should be used. For the good of society and to avoid escalating future operating costs, optimally **$d_{real}$=1...2% pa** in the today's EU11 economic environment.*

*A winner can be always selected at whatever predetermined discount rate (the actual rate used may change the winner!). Yet the eventual outcome may be disastrous for the stakeholders and society! Particularly so, if too high $d_{real}$ or wrong formulas are used.*

# ISO 15686-5 Life cycle costing (5)

***What discount rate?***

- *The standard shows the commonly known chart on how the NPV of future annual costs will decline at various discount rates. This is discouraging!*




Key

X years in the future

Y present value

**Figure A.1 — Present value of one monetary unit at a discount rate of 2 %, 4 % or 6 %**

# ISO 15686-5 Life cycle costing (6)

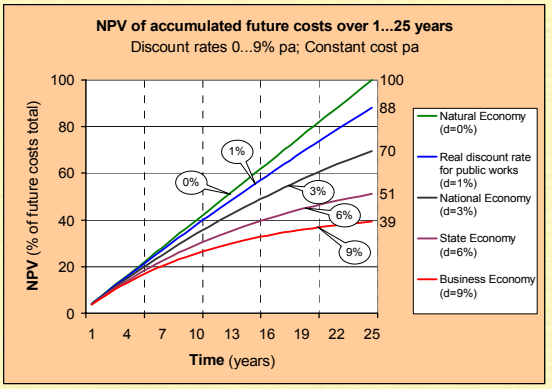
***What discount rates for what economies (1)?***

- *The net present value - NPV of accumulated future costs depends on the used discount rate(s). In the following chart I introduce four "rooms" of different stakeholders. For each room a certain level of discount rate is applicable, dependant on the return of investment required/expected by the particular stakeholder.*
- *These rooms I descriptively call **Natural** (d=0% = simple payback), **National** (3%), **State** (6%) and **Business** (9%) Economies. The chart shows how NPV is accumulating over 1…25 years in each room/ economy at their respective nominal discount rates.*
- *In addition, I offer 1% pa as a suitable real discount rate for public works, suitable for EU11 ⇦ as the risk in public works does not exceed the risk characters of a nation in general, thus a low $d_{real}$ is truly applicable.*

# ISO 15686-5 Life cycle costing (7)

### What discount rates for what economies (2)?

- *The following chart is "innovatively" showing what the actual NPV is at various discount rates. This proves that investment for lower future costs could be profitable. Unfortunately this chart was left out of the standard.*




# ISO 15686-5 Life cycle costing (8)

- *The actual rate of return available through LCC considerations on the operating costs of buildings and other constructed assets may be lower than that offered by alternative long-term investment: as a nominal annual rate of return, stock market 15% (-90% for dot.coms ⇨risk), 9% business ROC/ROE (⇨risk), 6% bonds, 3% bank deposits.*
- *Yet, buildings, roads, bridges and other constructed assets have long service lives. At low discount rates long-term future costs and savings are immediately meaningful, as can be seen in the above figure at 1% rate. Then investment for the better future looks more rewarding.*
- *Also, it can be claimed that future operating costs will be increasing due to higher energy prices and new environmental and other regulatory requirements. This development will raise the calculated return in Euros or Dollars and enable market-driven LCC considerations.*
- *And, often the investment for lower operating (eg energy) costs is only marginally higher than for a "standard" design.*

## ISO 15686-5 Future (1)
## Total LCC (1)

- ***6.5 Sustainable construction****: The objective of service-life planning should generally be to allow decision makers to include technical, environmental, economic and social (read: societal) aspects, all within a long-term context, in their decision making.* ***LCC analysis is a technique that should form part of an overall aim to balance the objectives of sustainable construction****.*
- ***6.2 Externalities****: Life cycle costing can help to ensure an optimized approach to asset selection, maintenance and use. However, judgements made on the basis of investment returns can be based purely on market efficiency, and can fail to recognize the wider implications economic decisions have on society. Market prices for construction might not value the social, environmental or business costs or benefits of production and consumption.*
- ***6.6 Intangibles****: Intangibles arise as a result of improvements in a constructed asset that can be difficult to quantify. These improvements can affect the user's comfort, amenity and efficiency, which can lead to increased satisfaction and efficiency, with associated financial implications (e.g. improvement in morale leading to reductions in absence through stress).*

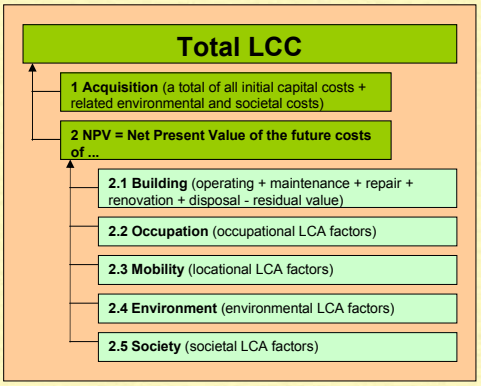
## ISO 15686-5 Future (2)
## Total LCC (2)

- *To advance sustainable construction, we should be able to calculate LCC + LCA, ie money plus points! Eg, in the case of tenders, considering construction cost as usual plus LCC calculations plus LCA scoring, you should be able to calculate LCC + LCA ie a* ***total = money + points!*** *No existing related software gives you any proper consistent solution to this equation (3 apples + 2 oranges = 5 fruits, but 3 Euros + 2 points = nil).*
- *To overcome this LCC + LCA problem, I try to look at it purely arithmetically. In the book "****Construction Can!****" published by arrangement of ENCORD in 1998, I introduced a fresh approach to* ***LCC to cover*** ***not only the initial capital and direct future costs of a building or another constructed asset but also externalities and intangibles*** *(occupational, locational, environmental and societal impact costs), as shown below.*

- *To put it simply,* ***Total LCC*** *just tries to* ***convert all various LCA impacts to money****. After this monetarisation everything can be calculated mathematically as LCC = NPV of all effective costs over the period of analysis.*

# ISO 15686-5 Future (3)
# Total LCC (3)

- *For mobility this is easy and customarily done. For occupational factors more and more studies are coming out showing the value of various office properties / features in productivity and expressed in monetary terms. For environmental LCA impact, the environmental profiles of construction materials, components and elements are in a good progress.*




# ISO 15686-5 Future (4)
# Total LCC (4)

- ***Acquisition*** *(capital costs + environmental and societal costs) refer to costs directly related to the whole building and its components and assemblies, including planning, design, construction, installation, fees and charges and other acquisition costs, plus related environmental and societal costs.*

- ***NPV = Net Present Value*** *of the accumulated future costs over a period of analysis, as described earlier.*
- ***Period*** *is determined as per the planned/ongoing activity and can be whatever up to the end of the service life of the building.*

- ***Building*** *(operating + maintenance + repair + refurbishment + disposal - residual value) refers to the future costs of all the different activities necessary to run the building over a period of analysis.*

# ISO 15686-5 Future (5)
# Total LCC (5)

- ***Occupational*** *factors refer to health, comfort, productivity, safety and security of the building (eg office). It is here important to realise the relationship of different accumulated costs for an office building with eg 30-year ownership:*
  - ***1 : 5 : 200***
  - *1 = acquisition (see 1 above)*
  - *5 = building operating and maintenance (see 2.1 above)*
  - *200 = business operating costs ⇨ here the biggest benefits are easiest to achieve thru better comfort and productivity ⇨ good indoor environment/climate/air*

# ISO 15686-5 Future (6)
# Total LCC (6)

- *Example Finland - Productive office 2005 (final report 2004):*
  ***High office temperatures****: 1 person per room; work value 50kEUR/a:*
  *Before: Temp max = 32.7°C; 890°Ch >25°C [optimal 21…25°C = reference temp; productivity loss percentage = 2*(t-25)%]*
  *Productivity loss =* ***330EUR/a***
  *Improvement: Centralised cooling 20W/m2, usage increased 10⇨ 24h/d*
  *Investment: 316EUR/room; annual cost = 35EUR/a*
  *Increased energy cost: 68EUR/a*
  *After: Temp.max = 27.3°C; 51°Ch >25°C*
  *Productivity loss =* ***19EUR/a***
  *Improved productivity:* ***311EUR/a*** *(= 0.6%*50kEUR/a)*
  *Beneficial return:* ***208EUR/a*** *(= 311-68-35)*
  ⇨ ***Occupational impact monetarised****, and improvement profitable!*
- *In the Finnish case study object Intentia HQ, a Post Occupancy Evaluation – POE was performed utilising the* ***BUS method*** *from the UK, licensed by Villa Real; report is available free of charge in our online bookshop at www.villareal.fi.*

## ISO 15686-5 Future (7)
## Total LCC (7)

- ***Mobility**, hence locational factors refer to the location of a (industrial, commercial, office, school etc) building. We should calculate LCC not for the building alone but also its location in relation to incoming material and outgoing product flows, employees' daily commuting, customer traffic to a shopping centre, or school children's daily transport, ie the mobility the building is causing.*

  - *Example Finland - Road traffic costs (2000/2005), simplified:*
    ***Travel to/from work**: by car, alone; 20km, 30min*
    *Vehicle cost: 0.40EUR/km (private/company car), 0.15EUR/km (society)*
    *Time cost: 31EUR/h (private/society)*
    *Mobility cost = 16.00/**47.00EUR/d** (private)*
    *= **16.00EUR/d** (company)*
    *= 6.00/**37.00EUR/d** (society)*
    ⇨ ***Locational impact monetarised**!*

## ISO 15686-5 Future (8)
## Total LCC (8)

- ***Environmental** factors refer to different environmental impacts that various materials and actions cause; environmental profiles. Environmental factors still need quite a lot of RTD at European and international levels to define their features and properties and, to give them generally accepted monetary values. This work is in good progress (ISO & CEN).*

  - *Example Finland - Environmental declaration of building products (2004):*
    *Environmental profile - altogether 31 properties defined & quantified*
    ***Ormax concrete roofing tile**, manufactured by Lafarge Roofing Ltd*
    *Emissions to air (10 prop.) - $CO_2$: 0.137kg/kg = 137kg/ton*
    *European (Kyoto) market price for $CO_2$ = 10 EUR/ton*
    *Environmental impact cost = **1.37EUR/ton** = 0.006 EUR/tile (@4.3kg)*
    ⇨ ***Environmental impact monetarised**!*

  - *Today 34 materials / products have achieved a certified environmental declaration in Finland. And more are coming; manufacturers provide information and apply, then a regulatory board will evaluate and certify, if ok.*

## ISO 15686-5 Future (9)
## Total LCC (9)

- ***Societal*** *factors finally need to be taken into account. This area is very little covered so far. Yet, for the CREC industries, cultural and other societal phenomena are necessary every-day considerations (eg concerning a new road through a village).*

  ***It is important to realise that it is not environmental LCA factors only to count in. And, that without economic considerations, there is no future for environmental LCA considerations.***

- *Finally, a probabilistic approach could be incorporated in all impacts and all costs, delivering a* ***Total LCCP*** *(using @Risk 4.5 and Monte Carlo / Latin Hypercube simulation).*
- *All the aforesaid is thoroughly studied and developed towards practical application and commercialisation in* ***my PhD Dissertation*** *now under its finishing stage in HUT. This study necessarily covers also what is said about discount rates, plus sustainable construction and LCC in general, particularly the ongoing actions on ISO15686 and the directive development work on LCC methodologies by Davis Langdon, GB, employed by the EC DG Enterprise; their report "Life cycle costing (LCC) as a contribution to sustainable construction: a common methodology" came out in 2007.*

## ISO 15686-5 Future (10)
## Probabilistics (1)

- ***8 Uncertainty and risks – 8.1 General****: As LCC analysis requires assumptions about future behaviour, iterative risk analysis can be used to progressively reduce uncertainty, but a residual risk always remains. Therefore, LCC analysis should include consideration of uncertainty and risk.*
- ***8.3 Monte Carlo analysis and confidence modelling****: Where a range of possible costs is calculated, it can be beneficial to model the uncertainty attached to the cost or time variables using statistical techniques, such as the Monte Carlo analysis. This should allow the identification of a distribution of possible costs and a range of more and less probable figures for use in calculations.*
- ***8.4 Sensitivity analysis and modelling the effects of changing key assumptions****: Sensitivity analyses can be undertaken to examine how variations across a (plausible) range of uncertainties can affect the relative merits of the options being considered and compared. These ranges should be probable, within the limits of what is anticipated and fit within the client's brief. These analyses can help to identify which input data have the most impact on the LCC result and how robust the final decision is.*

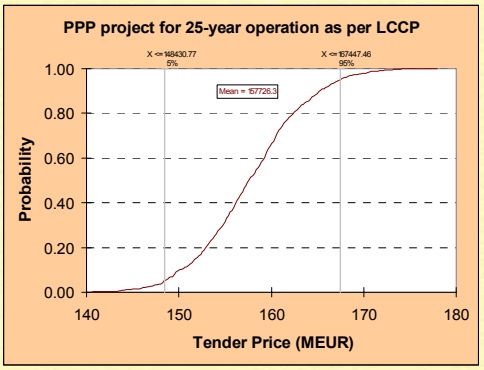
## ISO 15686-5 Future (11)
## Probabilistics (2)

- *For LCC to become widely accepted, concerns about uncertainties in forecasting must be overcome: costs and performance of a building, its components, assemblies, systems and services.*
- *An important European RTD project **EuroLifeForm** is to develop a design methodology and supporting data, using a probabilistic approach, with a budget of 3.8 MEUR over 2001…05. Villa Real (FI) is the originator and a major partner and Taylor Woodrow (GB) the coordinator.*
- *The newest theories and software are used for probability, risk, sensitivity analyses and optimisation (**@Risk 4.5** Industrial using Monte Carlo / Latin Hypercube simulation) and for complex multi-objective/multi-criteria decisions (**Logical Decisions 5.1**). In all seven partner countries data and information is collected; generic and on 11 case studies.*

## ISO 15686-5 Future (12)
## Probabilistics (3)

- *The principal outcome will be a model for **LCC with Probabilistics - LCCP**, in a software format, to replace deterministic (read: historic) singular values for costs and performance (read: service life) with a probabilistic approach, good for investors/developers/owners, designers, constructors, facilities managers, users and other stakeholders. Plus a stint of environmental LCA incorporated.*
- *Here it is worthwhile to recognise two fresh CIB reports: "Performance Based Methods for Service Life Prediction - State of the Art Reports" and "Guide and Bibliography to Service Life and Durability Research for Building Materials and Components". They both strongly support the use of probabilistics in the service life planning and LCC-computing.*
- *As an example, a contractor can use LCCP software in his tendering for a BOOT or other type PPP or private project. As shown in the following chart, he is able to make a well informed intelligent decision on the final tender price based on probability, or risk he is ready to take. Risk involved he can also reduce by scenarios and more accurate source data.*

# ISO 15686-5 Future (13)
# Probabilistics (4)



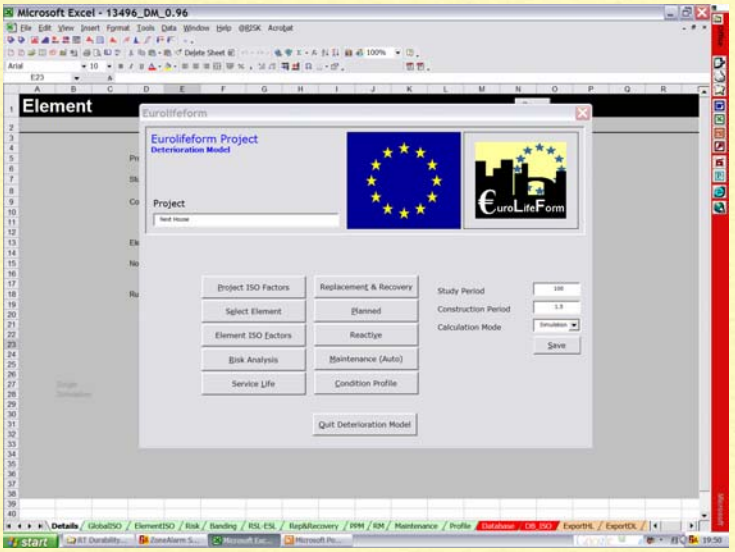

- *A pack of models to enable a lifetime design process utilising the LCCP approach was developed. The under-listed related software tools are now near completion, soon ready for national and international customisation, commercialisation and consulting services. The integrated pack and its modules are superior to and ultimate winners over the insular deterministic software tools currently in use.*

# ISO 15686-5 Future (14)
# Probabilistics (5)

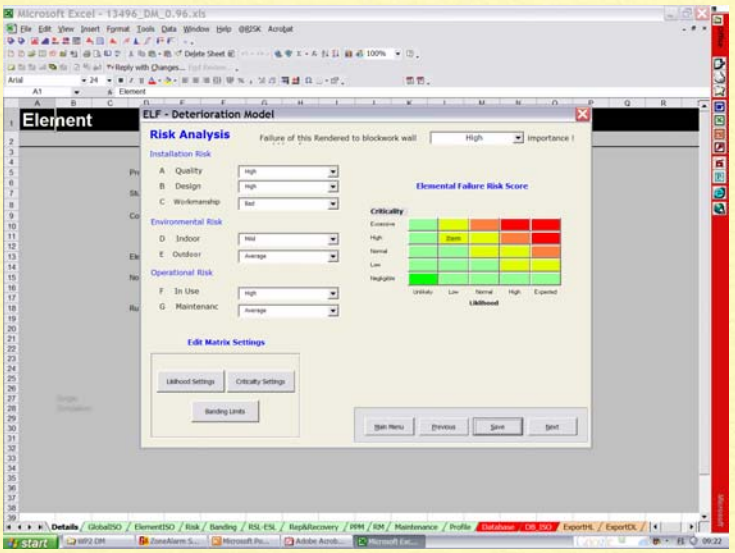
- ***LCCP Gate**: A gateway to the other LCCP tools, registries for computation results & decisions made, and database repositories.*
- ***LCCP DB Life**: Database with min/most likely/max reference service life values for building elements (components, services, parts).*
- ***LCCP Life**: Deterioration model at @Risk & Excel, utilising ISO 15686-1 factor method. It provides estimated service life for replacement, as expected in the particular project on hand, plus data for planned preventive maintenance and reactive maintenance, all in a probabilistic format. Integrated with LCCP All.*
- ***LCCP DB Cost**: Database with min/most likely/max cost values for building elements (components, services, parts). Usually this data is highly commercially sensitive, kept secret and not available for the public. Contractors, quantity surveyors etc can use their own data.*
- ***LCCP All**: A calculator at 3 levels, Client brief, Concept design and Detailed design based on @Risk; most important and advanced.*
- ***Sustain**: Excel-based screener to assess environmental impact.*

*Villa Real has global rights to this integrated software pack. The commercial software and services under the EU-wide registered brand name **FutureConstruct®** shall be introduced in 2008…09.*

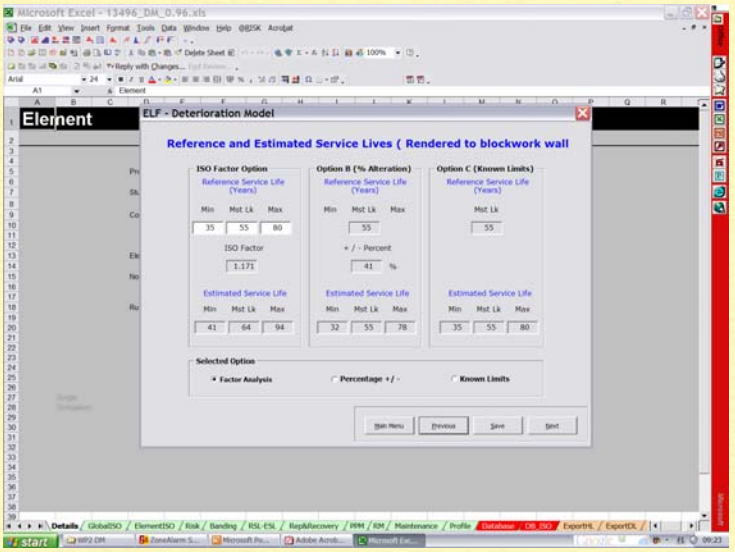
# ISO 15686-5 Future (15)
# Probabilistics (6)




# ISO 15686-5 Future (16)
# Probabilistics (7)



# ISO 15686-5 Future (17)
# Probabilistics (8)




# Where are we today (1)

***Where we are today***:

- *Acquisition capital costs govern!*
- *LCC is up and coming; today mainly for future energy costs. In various PPP and similar projects LCC is a must.*
- *Probabilistics is new and "difficult". Yet, advanced CREC partners are already applying it.*
- *Total LCC gives valid answers easy to understand.*
- *The probabilistic approach could be attached to all impacts and all costs, delivering a Total LCCP (using @Risk 4.5 and Monte Carlo / Latin Hypercube simulation).*
- *This writer is confident that eventually the* ***Total LCC/LCCP will be taken to use in the EU****. It was already initially approved in 2001 by the task group TG4 of the EC DG Enterprise! What will be determined in the EU, will eventually come effectively to use in all the member states.*

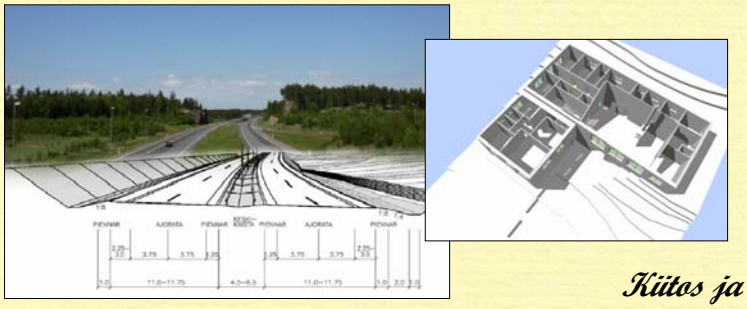
## Where are we today (2)

***Particularly for PPP projects, what should be done**:*

- *Increase awareness and knowledge within the decision-makers and all CREC partners [urgent and possible].*
- *To ease the decision-making process (initials, invitation to tender, evaluation, decision; documents and tools) and to save in process costs, standard models for sustainable construction projects should be developed [urgent and possible].*
- *Some public, and why not private too, organisations should take a lead as an ideal/educated client (Senaatti, and social housing organisations in Finland?) [urgent and possible]!*
- *LCC information should be part of the progressive object-oriented product model system (cost, service life, maintenance; first deterministic, later probabilistic) [important, not quickly possible].*
- *Finally, ISO15868-5 should be finalised and taken to use in a correct easy-to-understand form, tempting the CREC stakeholders to use LCC, not alienating them from LCC and sustainable construction [proved to be surprisingly difficult].*

## Where to find more...

- *Kaikki edelläsanottu ja paljon muuta löytyy Villa Realin **Online Bookshop**ista www.villareal.fi tai suoraan suojatusta https://onlinebookshop.villareal.fi.*
- *Suurin osa julkaisuista, ohjelmista etc ilmaisia. Maksullisten tuotteiden ostaminen tapahtuu luottokortilla (Visa, MasterCard/EuroCard) simppelisti, heti ja turvallisesti, **/easy/instant/secure/**.*



*Kiitos ja kumarrus!*