Conceptualizing good practices: adding efficiency by using intelligent systems and processes

EE, architecture and planning

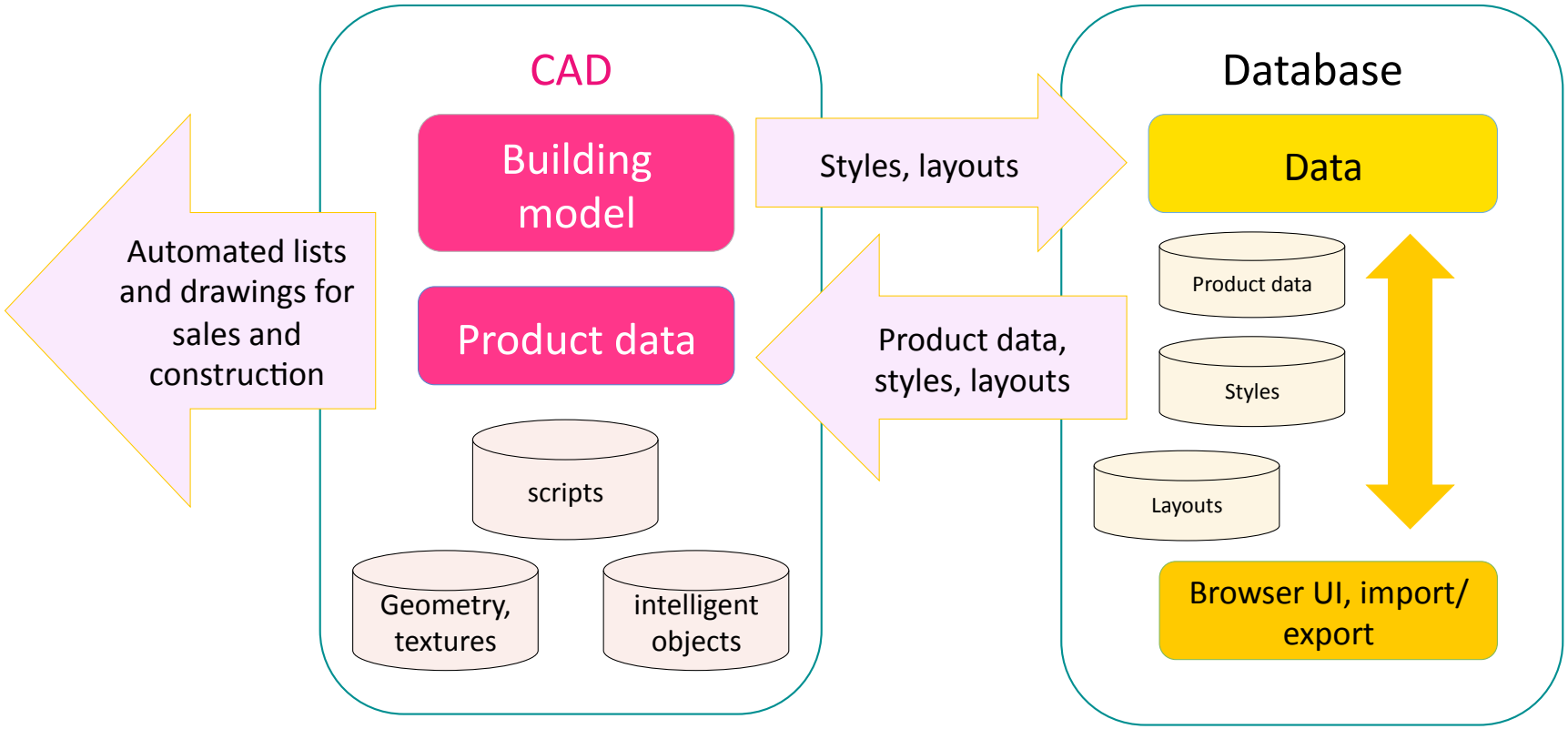
”I do not know anything, so I do not fancy I do” – *Plato/Socrates*

Ville Rantanen

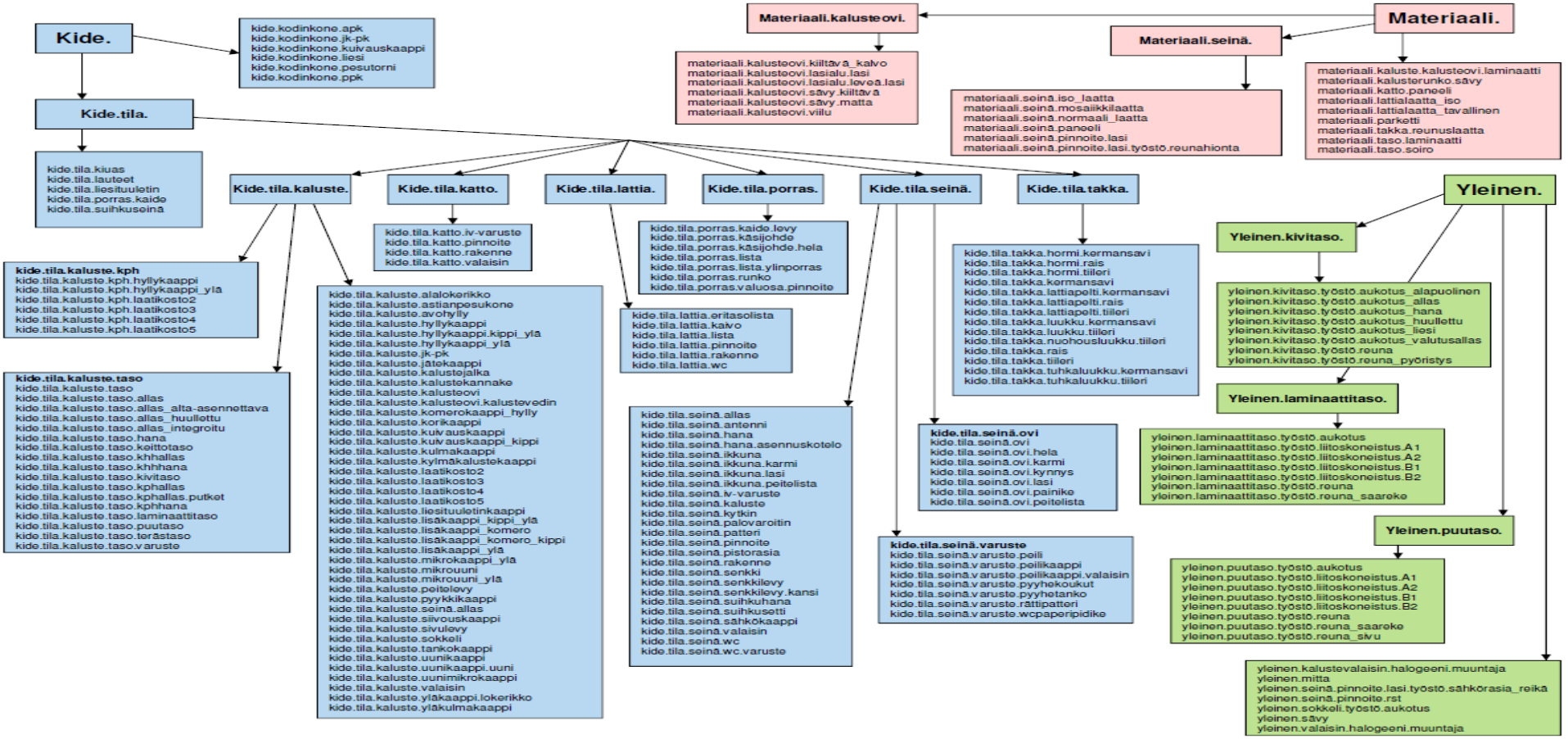
Arnhem 4.6.2014

A quick overview to what I have worked on…

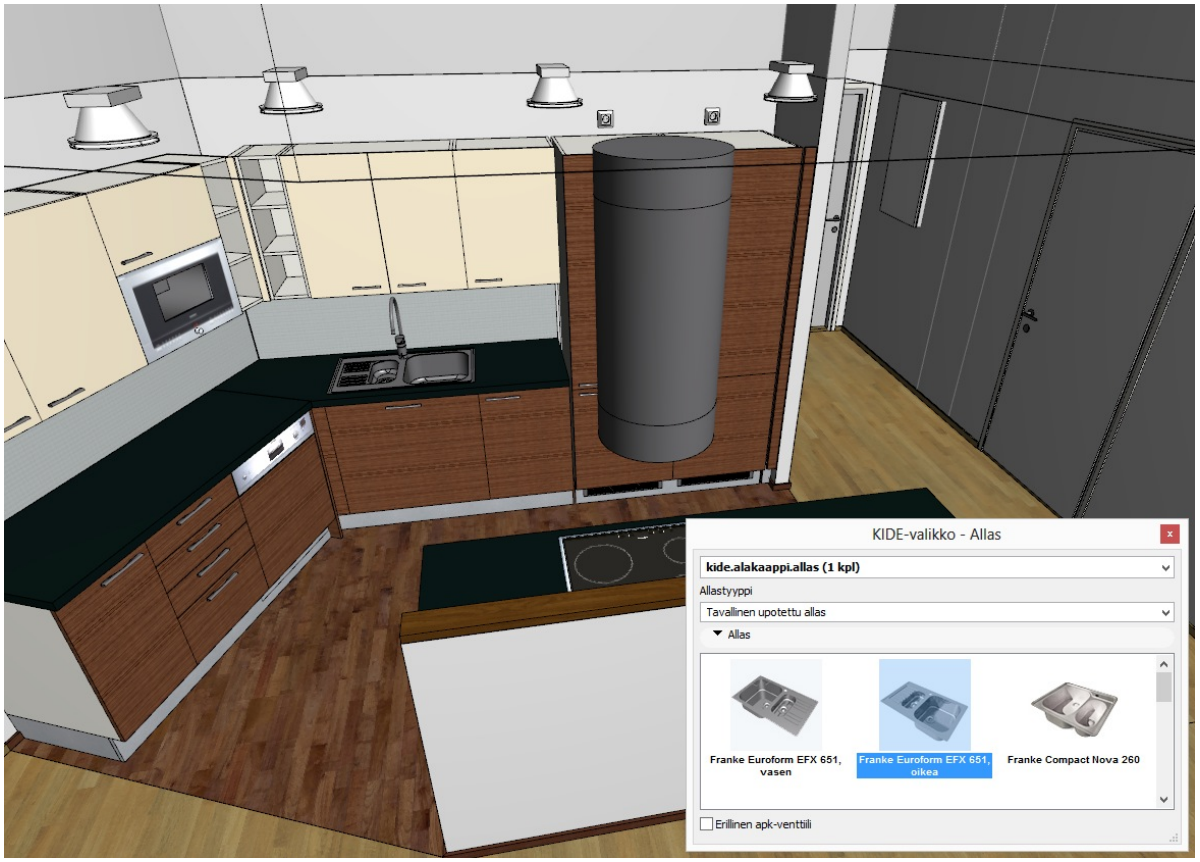
An example of intelligent system

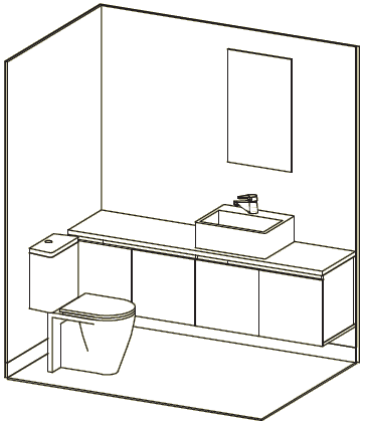


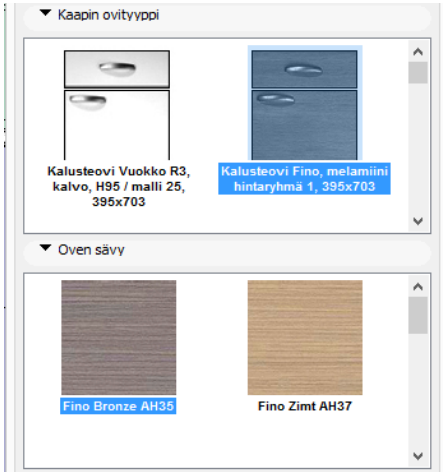
Classification of product data

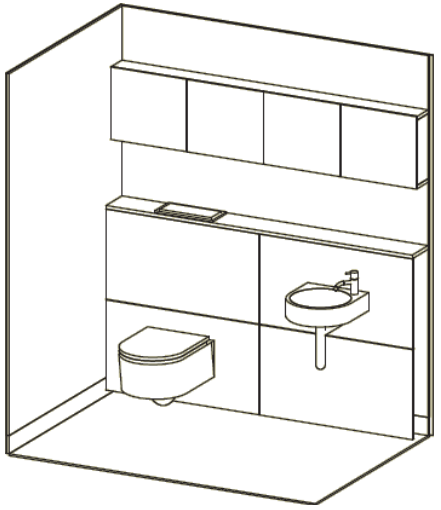


PDM integration with CAD

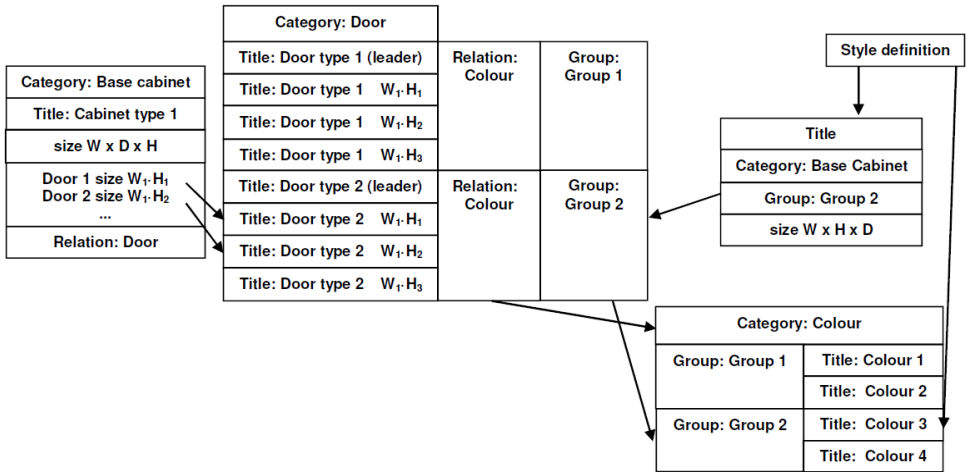








Logical rules (software automation)



User modification (single or multiple parameter setting)

User selection (single parameter setting) ⇩ Style definition (multiple parameter setting)

Update object: parameter verification

Search database: best match from several attributes, for example class+group+width+height+title

⇩

Set all parameters according to attributes from best match title

⇩

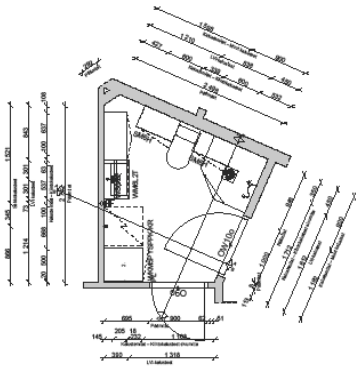
If other objects within the room are related to some of changed attributes, update them, too

Visualisation + web-app (for marketing and customization)

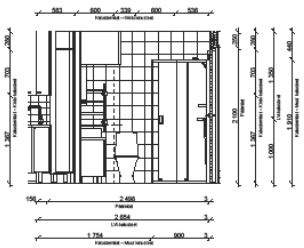
Automatic documentation and purchase lists

Huonekortti Kylpyhuone 3. kerros (3) 1/2: As Oy Skanssin Torinkulma 1139 91,5m2: E37 ja E43 (asiakkaan nimi)

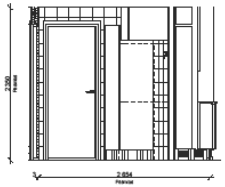
Pohjapiirustus Kylpyhuone 3. kerros (3)



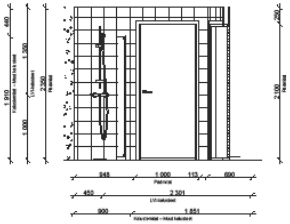
Leikkaus A-A



Leikkaus B-B



Leikkaus C-C



LATTIA Lattialaatta TH Fulda Antracite, 100x100

SEINÄT Seinän laatoitus, Iso laatta
Seinälaatta TH White, 400x250 valkoinen kiiltävä
Pinnoite/maalaus katon rajaan asti

KATOT Saunan kuusi paneeli 15x95
Raja seinän ja katon rajassa

OVI OVI 1:
Laakaovi tehdasmaalattu valkoinen: 07, 08, 09
Ovenpalnike Abloy Polarita
Oven peitelipl, Abloy 001, materiaali sinkki
Ovikarmi, maalattu valkoinen
PEITELISTA :
Maalattu peitelista, valkoinen
KYNNYS :
Tammi
OVI 2+3+4:
Laakaovi tehdasmaalattu valkoinen: 07, 08, 09
Ovenpalnike Abloy Polarita
Oven peitelipl, Abloy 001, materiaali sinkki
Ovikarmi, maalattu valkoinen
PEITELISTA :
Maalattu peitelista, valkoinen
KYNNYS :
Tammi
OVI 5+6+7+8:
Laakaovi tehdasmaalattu valkoinen, märkätila: 10
Ovenpalnike Abloy Polarita
Oven vääntönuppi - wc, Abloy 001, materiaali sinkki
Ovikarmi, maalattu valkoinen
PEITELISTA :
Maalattu peitelista, valkoinen
KYNNYS :
Tammi

KALUSTEET, VARUSTEET JA LAITTEET
YLÄKAAPPI :
Kalusteovi Vuokko R3, kalvo, H95 / malli 25
05 kiiltävä valkea kalvo
Runko valkoinen
KOMEROKAAPIN PEITELEVY 1:
Melamiini, valkoinen, Lx1750
KOMEROKAAPPI 2:
Kalusteovi Vuokko R3, kalvo, H95 / malli 25
05 kiiltävä valkea kalvo
Runko valkoinen
Nuppivedin, Siro 1404-15N1
Kaapin jalka 110KRK 150mm kromattu pyöreä (kodinhoitohuone)
KPH-KAAPPI :
Kph Allaskaappi kiint.allas WM6L2T 600x368x570, Allas Clever 600
Runko valkoinen
Kalusteovi laaka, Sara R2, maalattu matta muut värit
Ovisävy maalattu matta Puhdas Valkea 536
Kaapin jalka 491 1AL150 suorakulmainen (kylpyhuone ja wc)
Jätreelinkivedin V7 95, rst
PEILIKAAPPI : Kph Peilikaappi WS6/2P 600x160x703,
Ilman halogeenilippaa, kahdella ovella

LVIS ALLAS : Kph Allaskaappi kiint.allas WM6L2T 600x368x570,
Allas Clever 600
HANA : Kph hana Oras Vega (1814), bideellä + pesukoneen hana, kromi
PK-VIEMÄRI : 2120070 Oras pesukoneventtiilin viemäröintiliittin 1
SUIHKUSEINÄ : 2010060 Suihkukulma Sanka ST9090, 900x900, mattahopea kirkas lasi 1
SUIHKUSEKOITTAJA : 2140010 Oras Nova (7449), termostaattinen suihkuhana 1
WC-ISTUIN : Wc istuin IDO Seven D, pehmeällä istuin kannella
LATTIAKAIVO : RST-rlllä, kalvon kansi, pienet reiät
PISTORASIA 1: Laiterasia
PISTORASIA 2: Pistorasia-1, ABB Impressivo + peitelevy, kosteaan tilaan, IP 44
LTO:Lämmön talteenotto IloxAir 89
PPK-VARAUS : Pesutorni

Muutospäivämäärä

Päivämäärä 15.3.2012

1:50
Mitat tarkistettava työmaalla

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Back to the topic…

Intelligent systems

- Intelligent systems increase efficiency and they can be used to optimise the effects of planning and architecture, too
- Business models are becoming more customer-based
- Production is adapting to changing needs, focus on processes

~~Problem~~ ~~Project~~ Process

Big picture: hypermodernity

Key characteristics	Organization type			
	Premodern	Modern	Postmodern	Hypermodern
Size	Small	Large	Flexible (i.e. small, medium or large)	Hyperflexible (i.e. size can change rapidly to match market opportunities)
Key source of competitiveness	Labour	Capital	Knowledge	Acceleration (excess speed)
Technology	Hand tools	Large scale mechanical production equipment	Information and communications technologies	Internet and mobile communications
Nature of assets	Distributed	Heavy and centralised	Mixed	Light
Main period of dominance	Pre 1900s	Late 1800s-1970s	1980s →	Transient
Nature of the economic system	Proto – capitalism	Capitalism	Informational capitalism	Hypercapitalism

Big picture: hypermodernity

Key characteristics	Hypermodern organization	Enron
Size	Hyperflexible (i.e. size can change rapidly to match market opportunities)	Appearance (and disappearance) of business units and ultimately the organization
Key source of competitiveness	Acceleration (excess speed)	Acceleration evident in rate of innovation and management of staff as well as business practices such as mark-to-market accounting
Technology	Internet and mobile communications	Internet, use of mobile devices such as PDAs, etc. Prevalence of ICTs in employees work and home lives
Nature of assets	Light	Light assets embodied in the minds of employees in terms of knowledge, intelligence and creativity. Also in reputation and confidence of the financial markets built up through persistently high performance
Main period of dominance	Transient	Emerged as a modern organization in 1985 transformed into a hypermodern organization in the late 1990s, collapsed in 2001
Nature of the economic system	Hypercapitalism	Capitalism focused on image and symbolic value

Planning and architecture

- Planning solutions affect need for transportation, heating, cooling and lighting of buildings, real estate values and location of functions
- Design of buildings and transportation infrastructure affects their functional capabilities and flexibility, thus making one development possible and another impossible; companies and households need buildings and infrastructure for their operation
- External effects affect social behaviour, health, economy and climate
- New technology may reduce physical mobility and the use of energy and resources

Salutogenic planning

Planning affects:

Land use
→ stormwater drainage → flooding
→ green area access
→location of workplaces and housing; density

Behaviour
→ need to use motorized vehicles
→ willingness to walk or ride bicycle

Healthiness of environment
→ air quality, noise, vibration
→ natural light , windiness, shade from sunlight
→ possibilities/attractiviness to walk or ride bicycle

Society: infrastructure and systems

Built environment – physical layout and networks

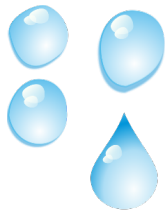
”The body: bones, muscles, veins and vessels”

Buildings
Roads
Railways
Power grid
Telecom network
Internet

Systems

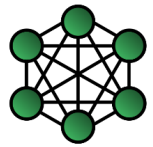
”Fluids and gases giving life to body: blood, air, food and excrement”

Water
- household use
- industrial use
- sewage
- natural water systems (flooding)



(Fuels)
Transportation
- goods, food
- people
- fuels
- materials

Electricity



Data, information

Society: infrastructure and systems

Public sector

Private sector

Built environment – physical layout and networks

”The body: bones, muscles, veins and vessels”

Buildings
Roads
Railways
Power grid
Telecom network
Internet

Private sector

Public sector

Systems – facilitating production & consumption

”Fluids and gases giving life to body: blood, air, food and excrement”

Water
- household use
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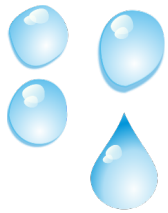

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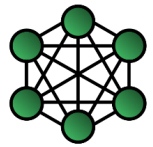
Data, information

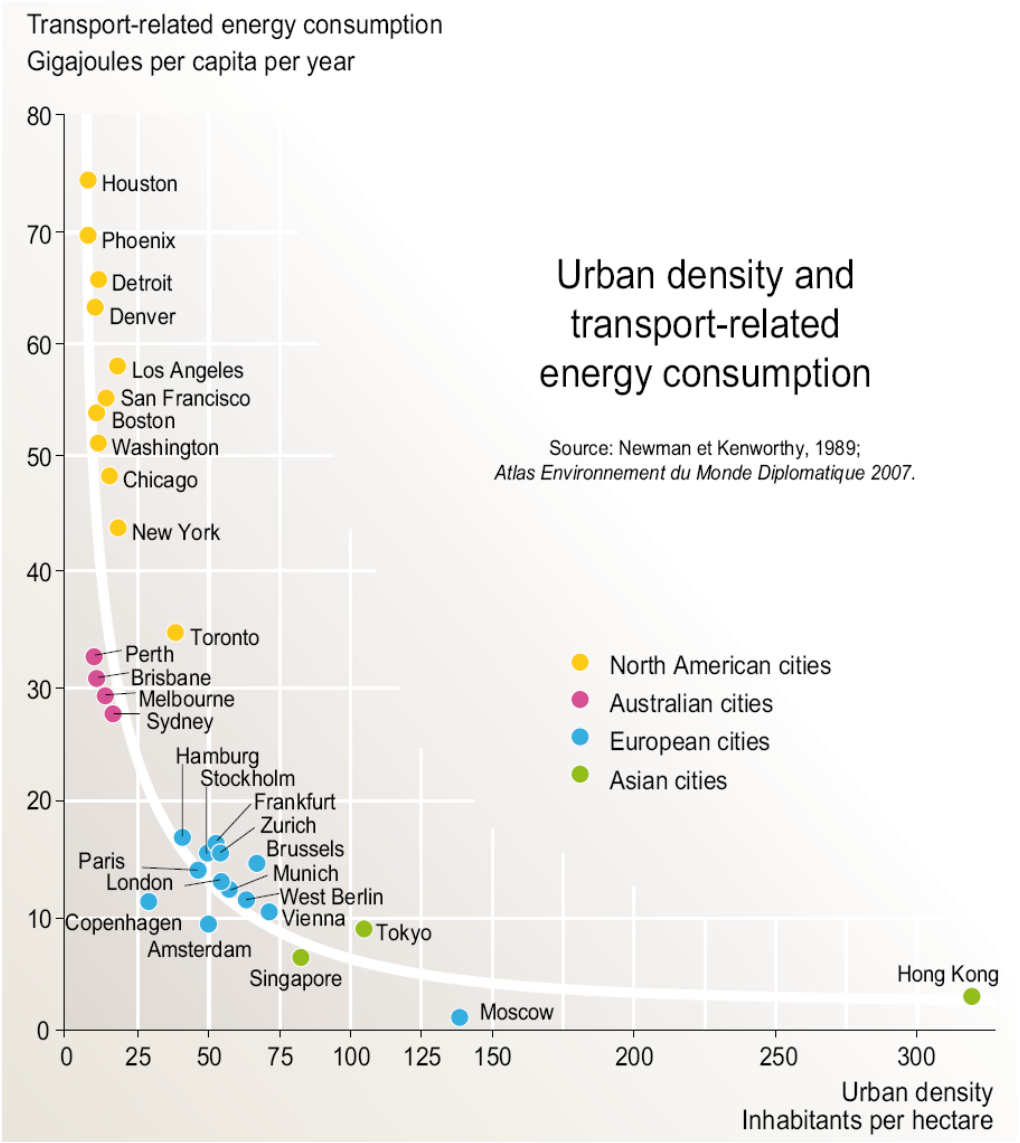


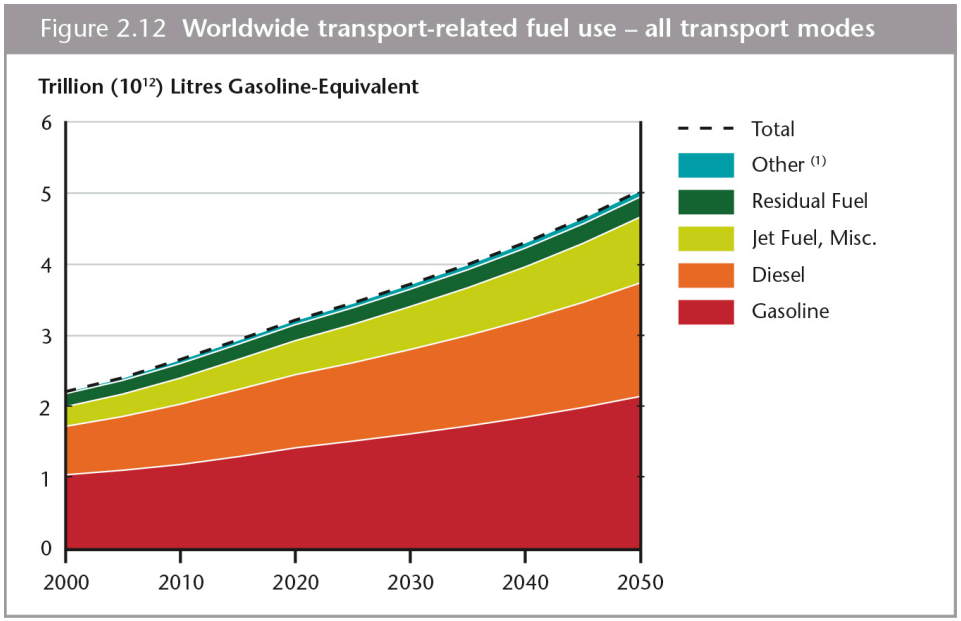
Complexity

- EE is important because it can increase profits
- EE is more important because it can facilitate sustainable development

- Tricky problem: a contradictory problem with no perfect solution

- Partial optimization problem: car traffic as an example
  - Developed motor technology and intelligent systems are increasing EE and reducing pollution
  - Land use remains a problem in urban areas
  - Car-based communities are spread on a wider area and use more energy to transportation





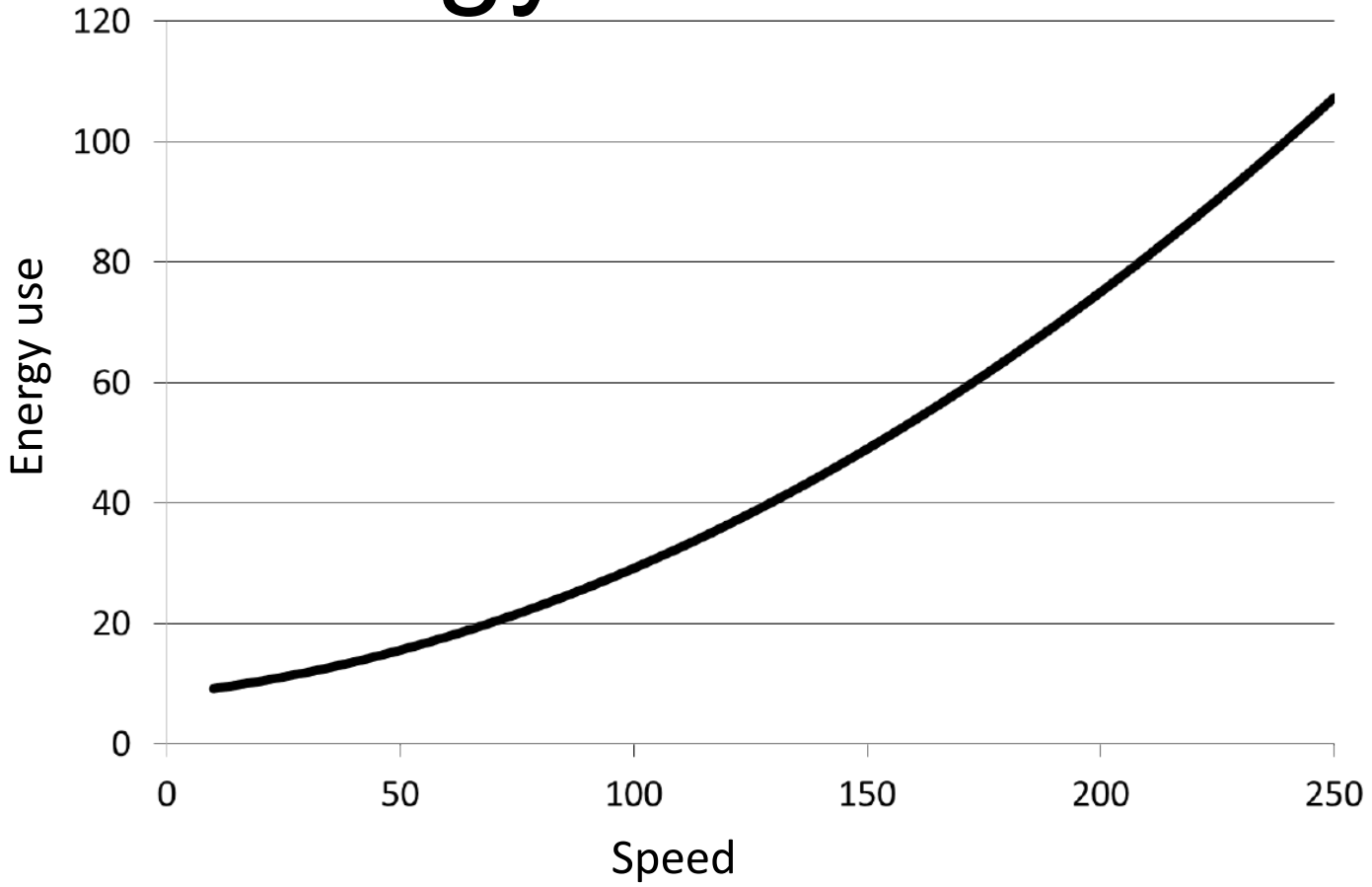
Sustainable Mobility Project calculations

To remember – an increasing amount of energy is consumed for other purposes than transportation and heating or cooling, surpassing the two.

Complexity

- It turns out, that sustainability is mostly related to the lifestyle and highly dependent on consumption habits. Even if the people living in countryside travel more by car than people in cities, they create a smaller carbon footprint as their total consumption is smaller – the most important part of which is the consumption of goods and services mainly related to the level of average income
- On global level, total consumption and emissions are at least as important as efficiency relative to output unit.
- Rail-based urban development as well as high-speed train networks between cities are currently in fashion, but there may be problems: all investment in transportation seems to increase mobility and urban sprawl due to rised real estate values
- Rail transportation is very efficient regarding land use in urban areas, but pedestrian and bicycle -based mobility is even more sustainable

Energy use of trains



Learning from other disciplines

- Intelligent systems are usually designed for a specific purpose in a narrow subsector. The solutions, policies and practices developed are usually recognized and used in the same zone only.
- Copying existing models can lead to unsatisfying results as situations and background conditions may differ significantly.
- By conceptualizing results to a more abstract level, good solutions found in different fields can be better utilized in an interdisciplinary way.

Learning based on analogies between systems

Public sector

Conglomerate

Managerialism – government as a business

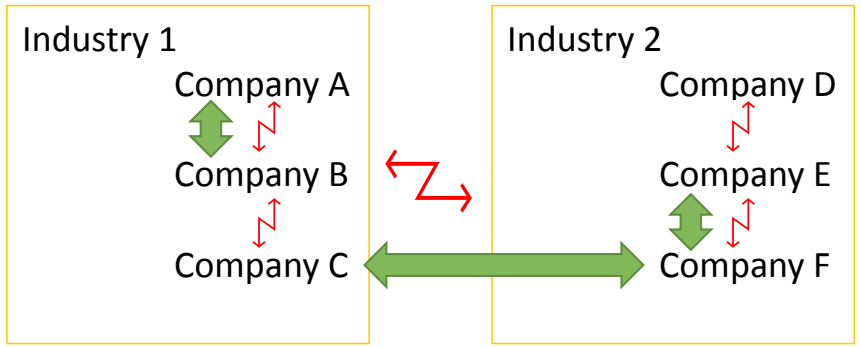
Silos (ministries)

- justice (court system)
- internal affairs (police)
- foreign affairs (foreign PR, marketing)
- defence
- economy and employment
- education
- health and social affairs
- transport
- agriculture
- business
- culture and sport
- environment

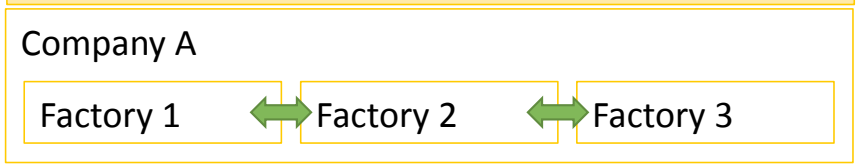
Private sector

Different industries

Collaboration between individual companies is growing based on economic benefits



Contemporary companies try to connect silos within each company or concern (group)



Learning based on analogies between systems

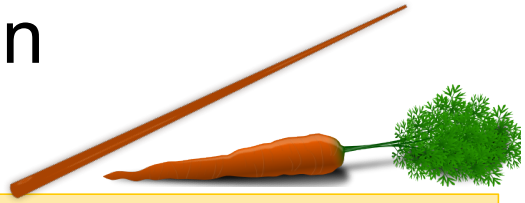
Public sector

Conglomerate

Public sector is seeking collaboration between silos and private sector to achieve a holistic approach

Private sector

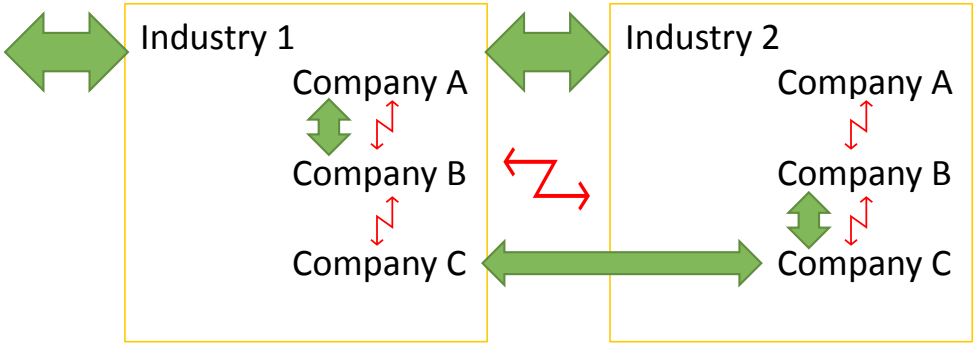
Different industries



Regulation and subsidies are used to promote Public Good and Sustainable Development

Silos (ministries)

- justice (court system)
- internal affairs (police)
- foreign affairs (foreign PR, marketing)
- defence
- economy and employment
- education
- health and social affairs
- transport
- agriculture
- business
- culture and sport
- environment



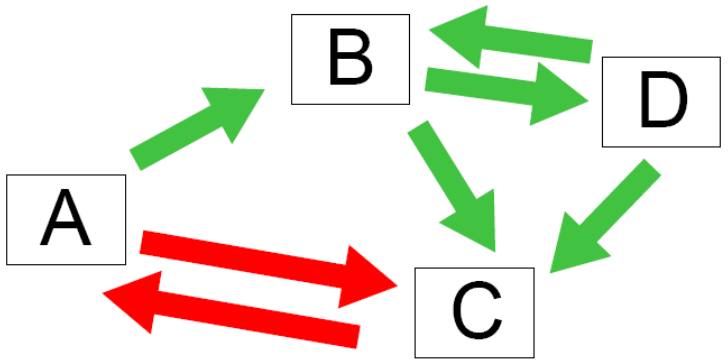
Yet, own research and experience are often protected and kept secret

Academic tradition of sharing knowledge

Key Differences	Characteristics of Transport Planning	Characteristics of Land Use Planning
1. Objectives	Primary objective is metropolitan level accessibility	Objectives include serving residential quality, social equity, economic development, etc.
2. Planning Methods	Quantitative focus on accommodating travel demand	Multiple concerns for land values, compatibility of land uses, affordable housing, redevelopment, etc.
3. Scales of Planning	Large scale; focus on metropolitan connectivity and continuous transport links	Includes small-scale neighborhood livability and other use localities
4. Implementation Powers	Governments have substantial power for reliable implementation	Private actors have more decision-making power; public powers limited
5. Scales of Investment	Large capital budgets, including state and national support	Mostly local funding and private-sector actions
6. Scale and Length of Future Vision	Deals with long-range vision for new transport system additions	Deals with small-scale incremental growth towards long-term change

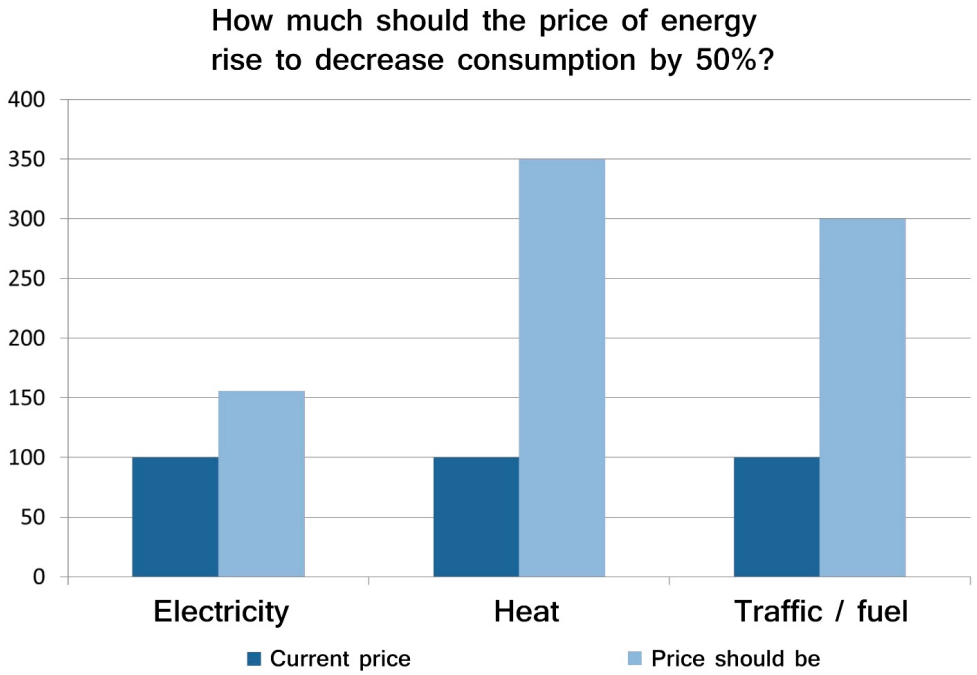
Methods

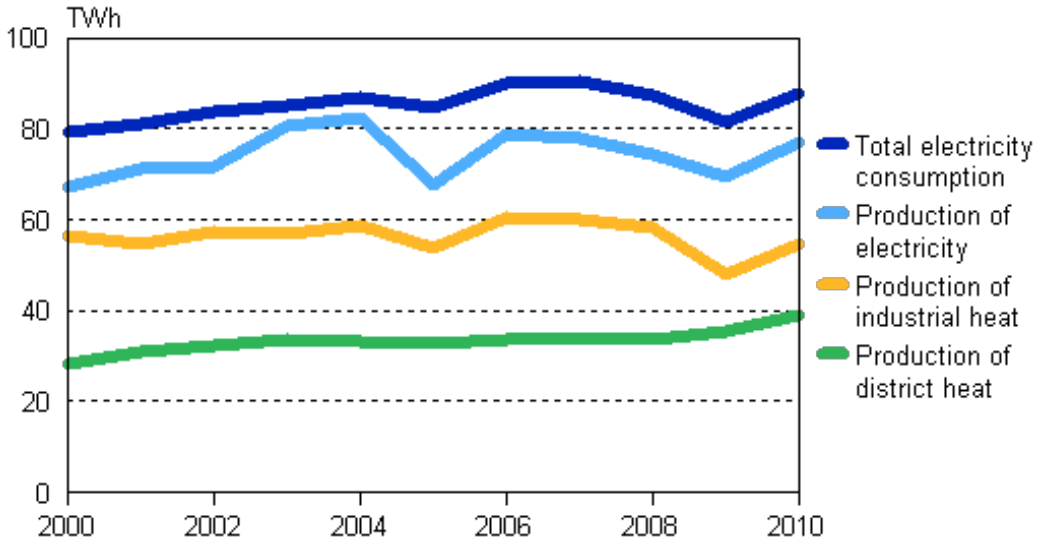
- Assesment and categorization
- Policy packaging, detecting relations
  - combined policies work better
  - policies can be adjusted for different groups (tribes)
- Prototyping and modularization
  - PLM / PDM -system
  - Standards
  - Realization adaptively in phases
- Validation and verification
  - Monitoring
  - learning



Energy use

- What could be a better measure for EE?

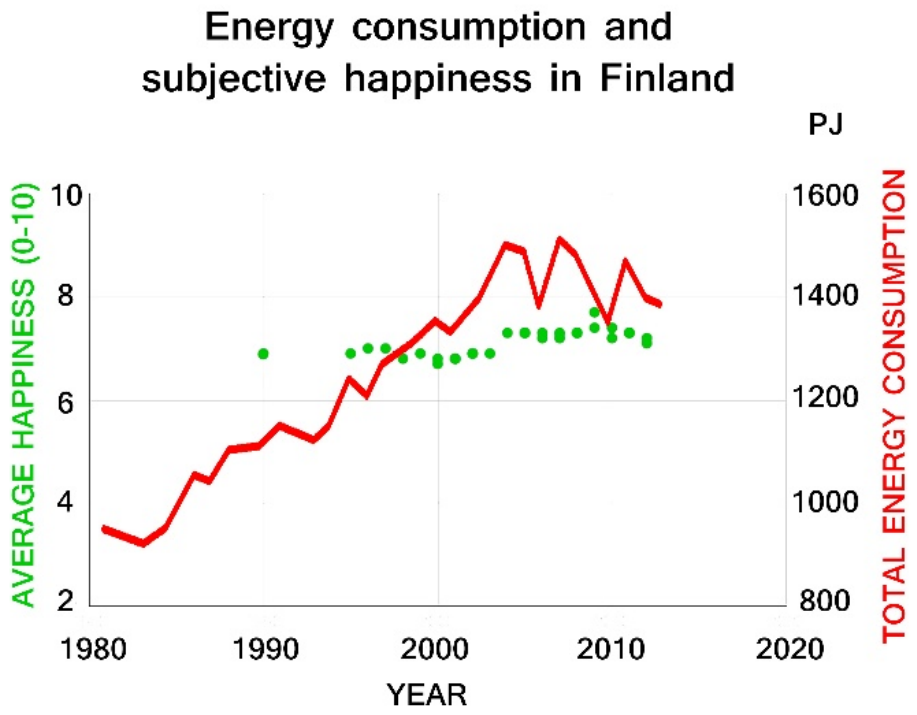




Energy use in Finland – CHP is widely used

Energy use and happiness

- Is happiness related to Energy use?



EE on global/societal level

- A crucial question is, whether increased efficiency makes more consumption possible and if increased consumption leads to using more resources and energy
- Consumers (like companies) don't always make rational decisions.
- In case of a market sector with low price-elasticity, regulation may be useful to promote better technology and organizational structure.
- A technology fix reducing emissions with current or more mobility, or reduction of mobility, may not alone be a sufficient solution. A social lifestyle change would be needed, too: consumption should be more focused on non-material services than material goods; production of food and necessary goods should be more local, reducing global logistics and freight networks.
- A holistic approach to society and economy may assist to perceive the functioning of global systems and to understand that there are unpredictable interactions. Therefore, practices and policies are needed to respond to the unexpected outcome of the existing complex processes.

Thank you!

A perfect process is perfect only as long as customers want the product.

Most efficient process is one, which produces products that are needed and used (for a long time)