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Cross-disciplinary GDSI projects

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 $f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^{i}}{i!}$

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Case study #1

Prosciutto Cotto (Cured Ham)

 $f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^{i}}{i!} f^{(i)}(x)$



Elena Yan Stefano

GDSI

WHICH IS THE BEST PRACTICAL DECISION ?





Life cycle of prosciutto





Life Cycle Assessment







GDSI

Global Decision Support Initiative

NEED OF RISK BENEFIT ANALYSIS

Carcinogenicity of consumption of red and processed meat

In October, 2015, 22 scientists from ten countries met at the International Agency for Research on Cancer (IARC) in Lyon, France, to evaluate the carcinogenicity of the consumption of red meat and processed meat. These assessments will be published in volume 114 of the IARC Monographs.¹

Red meat refers to unprocessed mammalian muscle meat-for example, beef, veal, pork, lamb, mutton, horse, or goat meat-including minced or frozen meat; it is usually consumed cooked. Processed meat refers to meat that has been transformed through salting, ing formontation smoking

more than 200 q per person per day.⁴ Less information is available on the consumption of processed meat.

The Working Group assessed more than 800 epidemiological studies that 📺 <u>"atiat" "Ithnowing time at consumption:</u>

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Overall, the Working Group classified consumption of processed meat as "carcinogenic to humans" (Group 1) on the basis of sufficient evidence for colorectal cancer. Additionally, a positive association with the consumption of processed meat was found for stomach cancer.

The Working Group classified utation consumption of red meat as "probably t were carcinogenic to humans" (Group 2A). (23%)In making this evaluation, the Working cancer Group took into consideration all uming

day of red meat and an 18% increase (95% Cl 1.10–1.28) per 50 q per day of processed meat.12

Data were also available for more than 15 other types of cancer. Positive

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and	October 26, 2015
loccod	http://dx.doi.org/10.1016/
lessea	S1470-2045(15)00444-1
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HOLISTIC ASSESSMENT

PATHOGENS -> DISEASES -> DRUGS



GDSI Transport studies





Global Decision Support Initiative



<u>Transport demand</u>: policies aimed to redistribute travel demand in terms of mode shares, space or time (e.g. <u>Food case study</u>: sustainability impacts of different (i) freight vehicle types, (ii) intermodal options, (iii) logistic chains, within the food production and consumption process)



<u>Transport supply</u>: infrastructural projects aimed to modify (improve) the transport infrastructure, in terms of quality or quantity (*e.g. Cph Circle metro line, Frederikssund bridge*)



Case study #2

Protecting the Copenhagen Metro from floods



Simona Stylianos Hjalte





1872 Baltic Sea storm flood





Recorded high sea levels in Copenhagen

Water level above normal sea height:

- 1902 (154 cm)
- 1921 (157 cm)
- 2013 (168 cm, Bodil)





To avoid in future









History of water levels



12/2012



Future water levels?





Climate change

Climate warming needs to be incorporated

- > Impact of climate change on flooding
- > Intensity, frequency and variability of flooding is likely to increase
- > Increased number of people affected

Technical aspects

- > 10,000-year event
- > Long technical lifetime
- Time of adaptation
 - > When is the optimal time for action?



Alternatives & Decision making

- Costs
 - > Monetary
 - Society
 - > Environment
- sustainability
- Definition of alternatives
- Characterization of Uncertainties
- Decision making optimality (to whom?)
- Stakeholders
 - > Metro company
 - > Copenhagen municipality
 - > Government



Uncertainty quantification

Flood Water Level

- Reliable weather & hydrological data
- Extreme events & Low probability high consequences events
- Probabilistic modelling:
 - > Better understanding of the phenomenon
 - > Describe it in a more realistic way
 - > Epistemic uncertainty



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Framework

Decision making in Risk and Sustainability Assessment

 $f(x+\Delta x) = \sum_{i=0}^{\infty} \frac{(\Delta x)^{i}}{i!} f^{(i)}(x)$



Simona

Decision Problem



Fundamental aspects of any decision problem :

- The need to accomplish some objectives by allocating resources
- Availability of several alternatives, one of which must be selected
- Different consequences associated with the alternatives
- Uncertainty affects the consequences of each alternative
- Consequences are not equally valued.



Phases of Decision Process



STEP1: Define Problem Structure Objectives, Attributes, Hazard Identification, System Boundaries, Alternatives System

STEP2: Assessing Alternatives and Consequences Prediction Models, Data Analysis, Quantification of the Consequences Options

STEP3: Assess Preferences of Decision Maker and Willingness to Risk Trade-off of the DM, Preferences, Discount rate

Preferences

Boundaries?

STEP3: Choice of Decision Rule and Evaluation of Alternatives Cost-Benefit Optimization, Sensitivity and Uncertainty Analysis

Ranking

Framework

Logic Structured Format/Procedure to Analyze the problem and solution alternatives before to take a decision



Integration of Risk - Sustainability Cost/Benefit Analysis



Framework and Case studies





