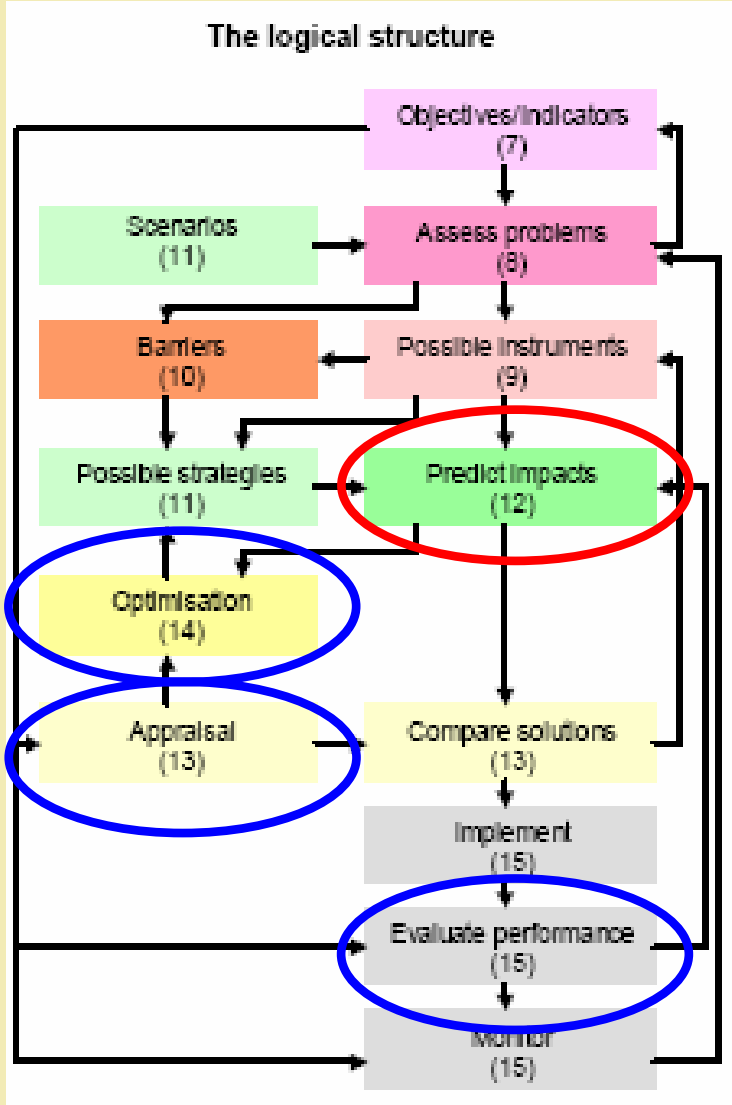
Predicting Impact, Appraisal and Evaluation

Agachai Sumalee

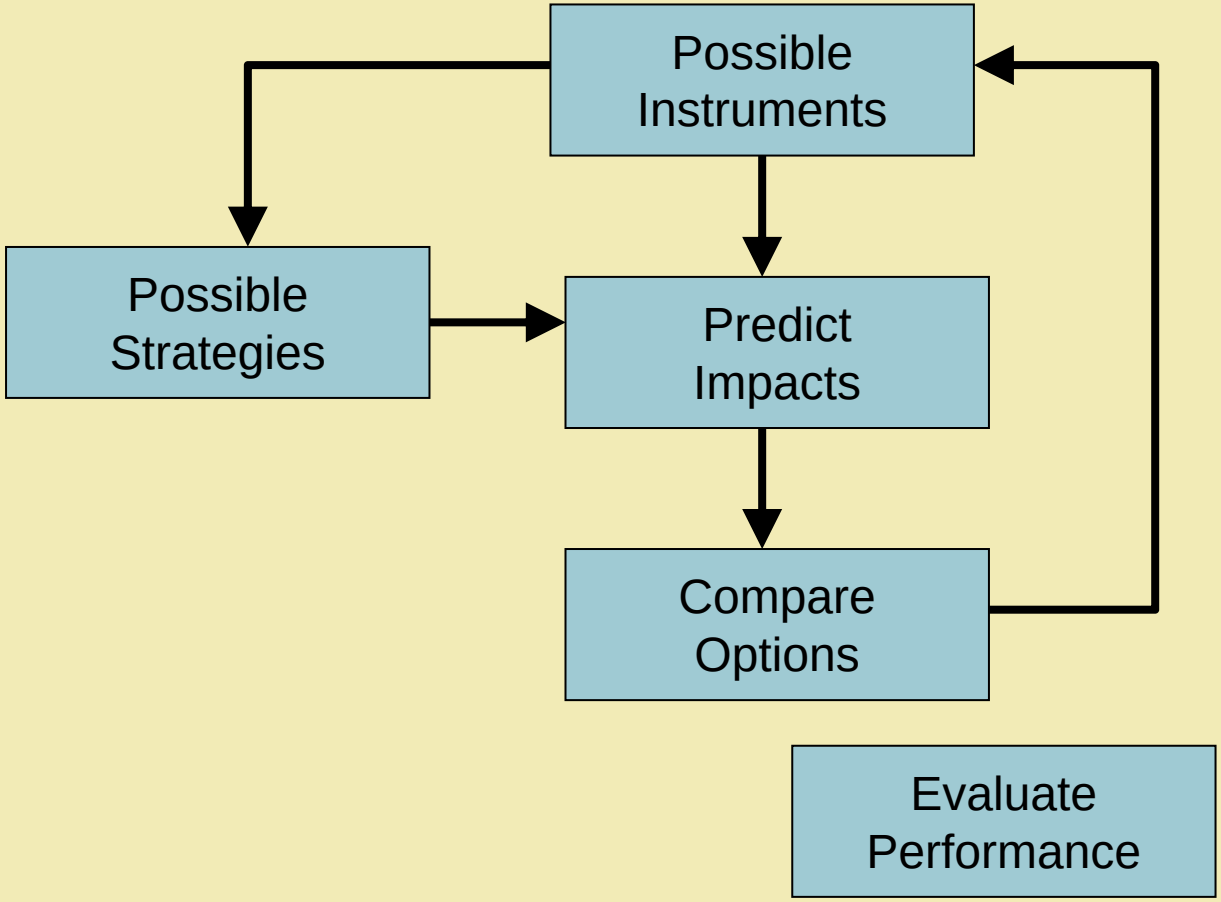
Institute for Transport Studies (ITS),

University of Leeds

Logical structure



Interaction process



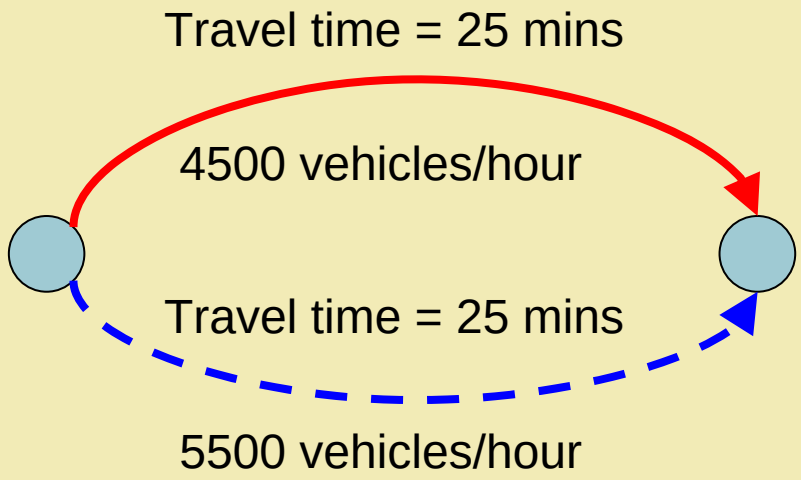
Why do we need to predict impacts?

- Complex results of the policy upon the system and behaviour (complex casual loop and interaction between demand & supply)
- Influence of the policy on short, medium, and long term
- Relation to the set objectives, target, indicators
- Seek for synergy or integrated strategies

Example

- Consider that you have to look at the impact of building a new road between A to B

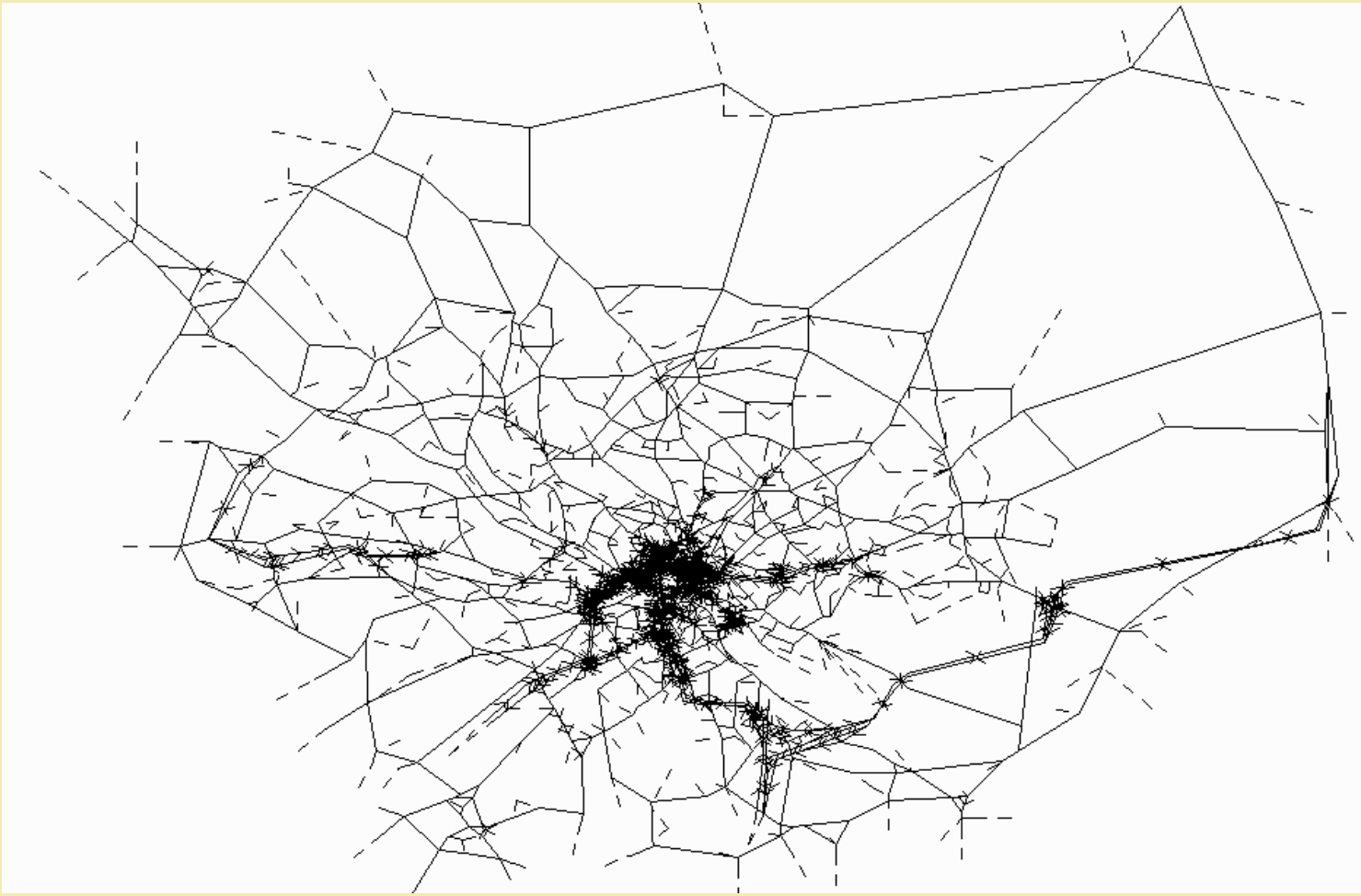
Day 4



Now let's consider

- Effect of elastic demand, travel cost and demand level
- Effect of the change of destination
- Effect of the departure time choice
- Effect of mode choice
- Change of living location and destination attraction (land use change)
- And…

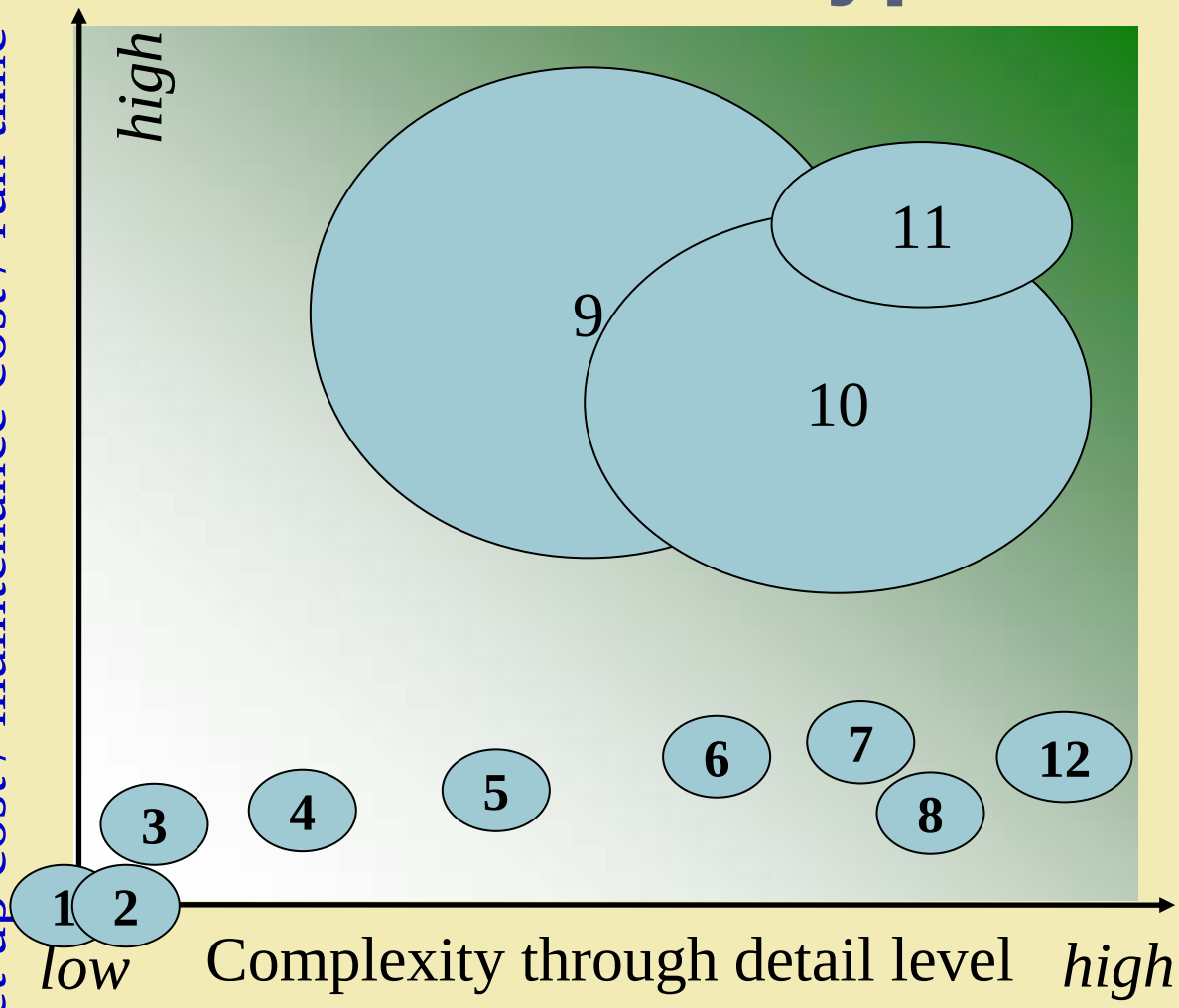
How about this network?



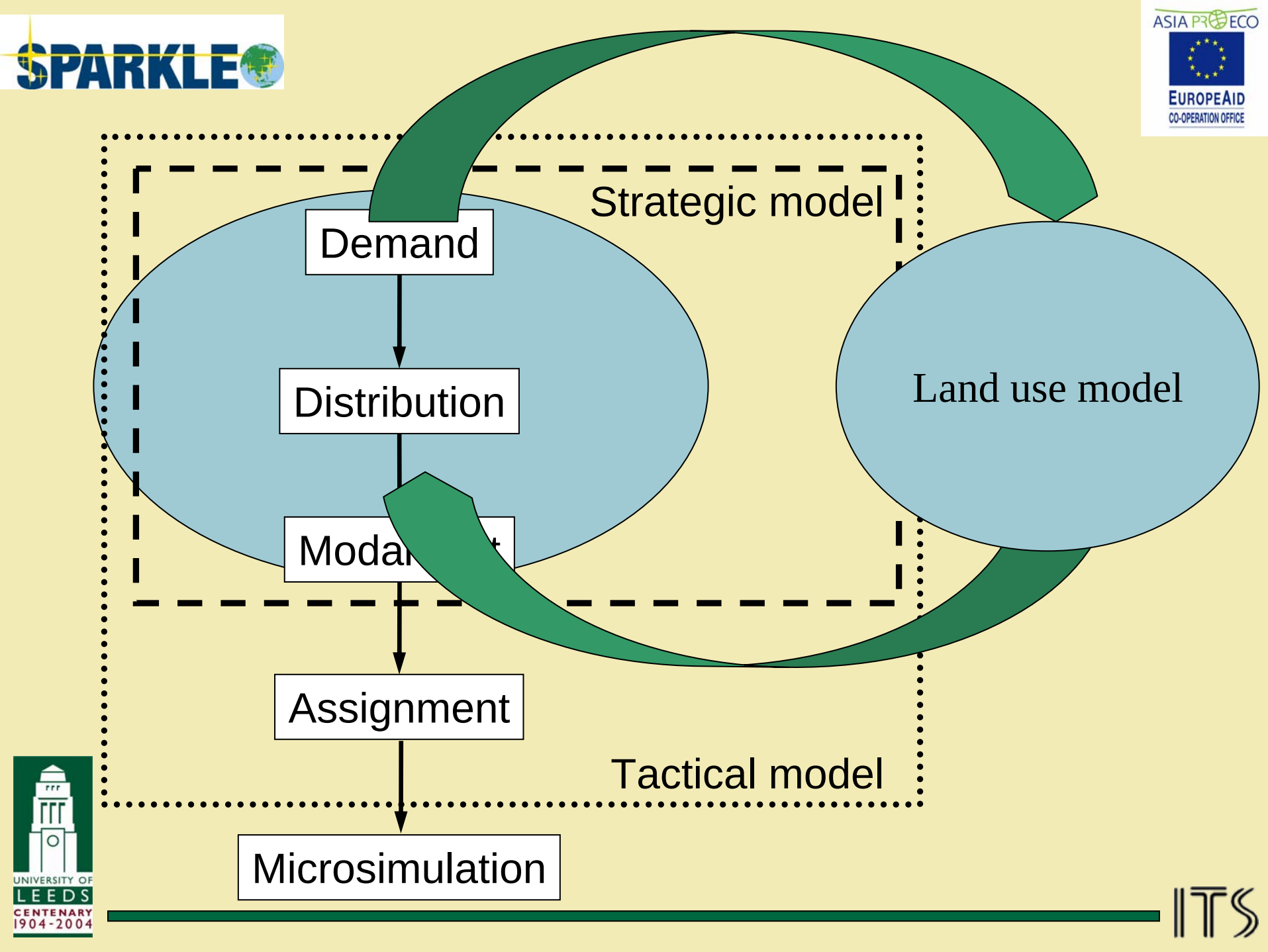
What is a model?

- Formal mathematical representation of a real world system
- Simple but not simpler!
- Capable of producing an answer for a policy

Model types



1. No model
2. Simple cost based
3. Spreadsheet model
4. Sketch planning model
5. Network assignment model without elastic assignment
6. Network assignment model with elastic assignment
7. Network assignment model in conjunction with external demand / mode-choice model
8. Four stage model
9. Land-use Transportation Interaction (LUTI) model
10. Strategic Transport/ Environment Model
11. Activity based model
12. Micro-simulation


SPARKLE
ASIA PRO ECO
EUROPEAID
CO-OPERATION OFFICE
Strategic model
Demand
Distribution
Land use model
Assignment
Tactical model
Microsimulation
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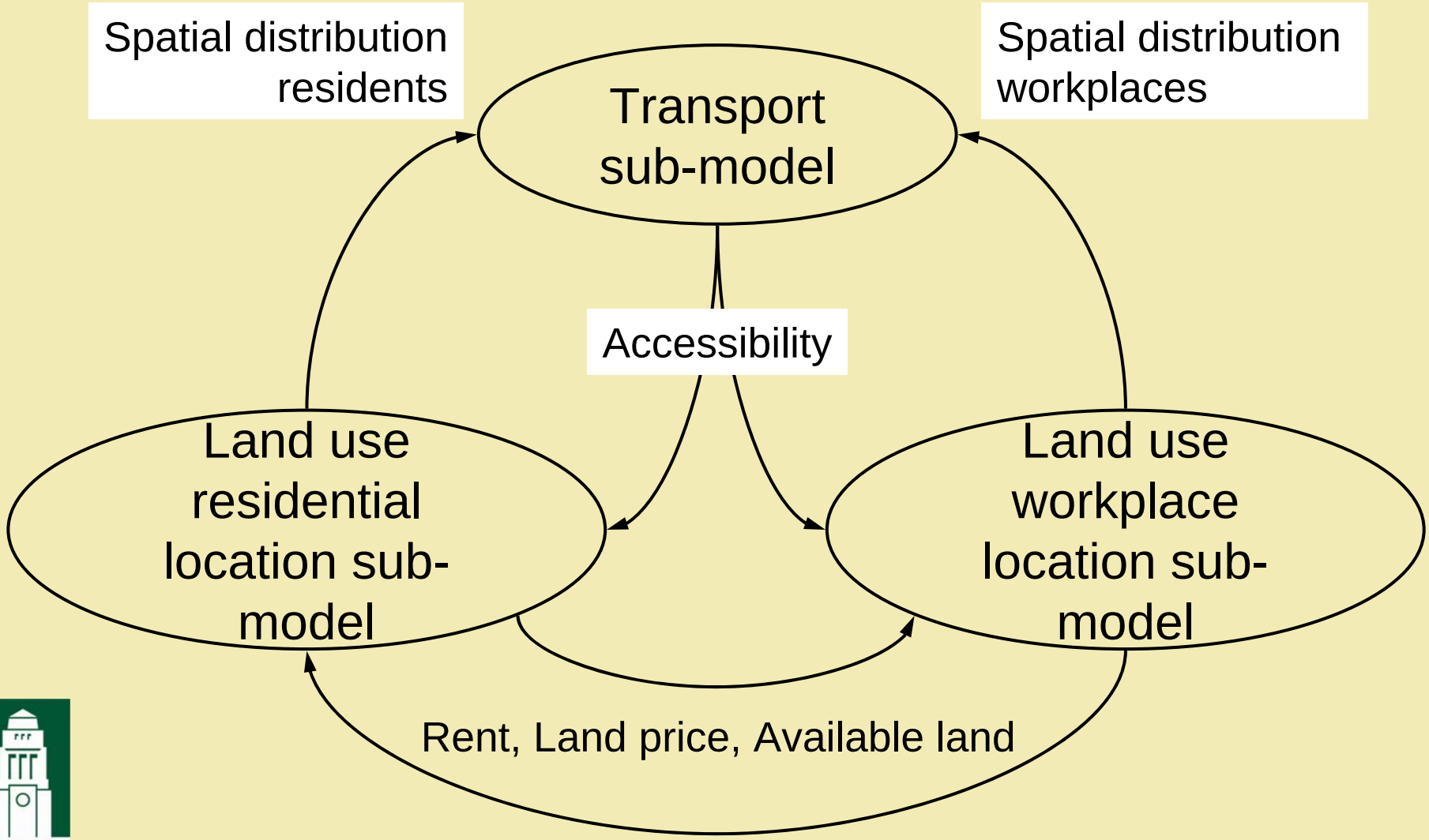
Network Assignment Model

- Provide detail network structure of the system
- Focus primarily on route choice but can also take into account elastic demand, departure time, mode choice, etc.
- Using Equilibrium assignment model
- Mainly used for a medium to long term study (e.g. new road, transit line, P&R scheme) where spatial variation and impact of policy is significant
- Many available commercialised software

LUTI


Spatial distribution residents
Transport sub-model
Spatial distribution workplaces
Accessibility
Land use residential location sub-model
Land use workplace location sub-model
Rent, Land price, Available land

Sketch Planning Model

- Represent the main interactions between demand, supply and land use at a strategic level
- Less detail as compared to LUTI
- Appropriate for quick policy test (with low cost for data collection and model setting)
- Required less technical expertise which may be appropriate for our cases

How to pick the model type?

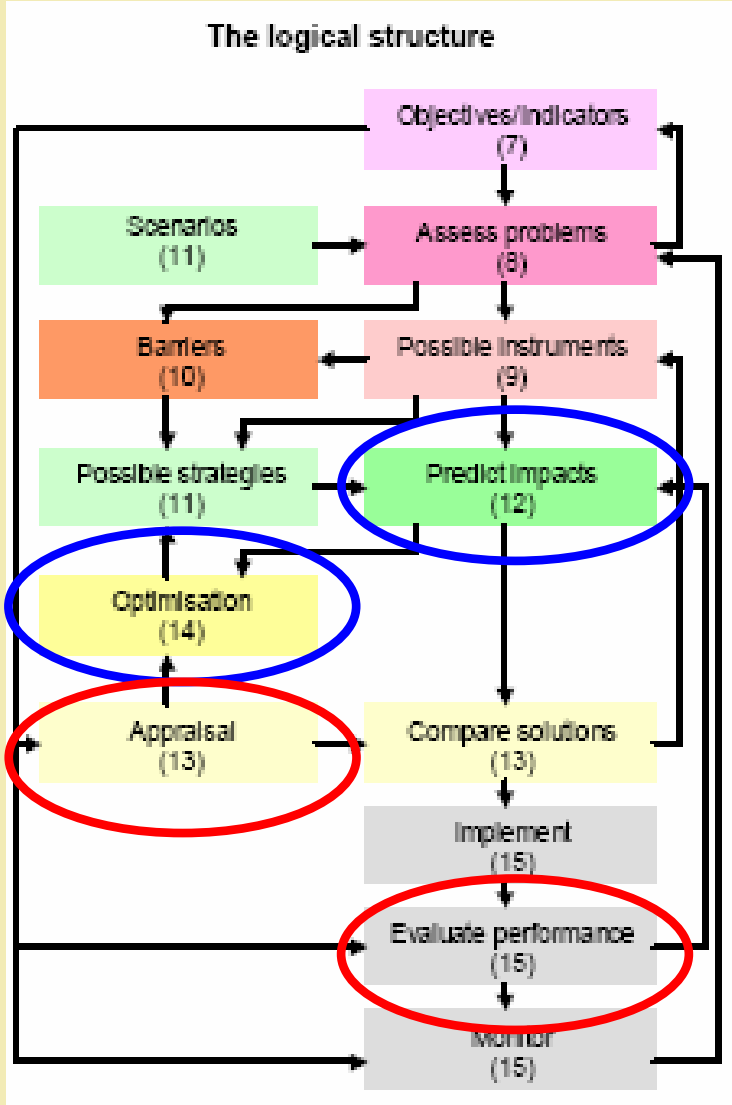
- Model should be able to represent the policy at the required level of detail
- Model should be able to forecast required level of detail and type of impact (both spatially and category)
- Data, expertise, and cost consideration
- Too detail model does not always mean better

Limitation of the model

- Model is to be used not to believed!
- Many external impacts which need expert judgment (but if possible should express the relationship explicitly in the model)
- We should see model as a tool aiding “Strategy Formulation”
- Seen as a “tool” rather than “Black-box”

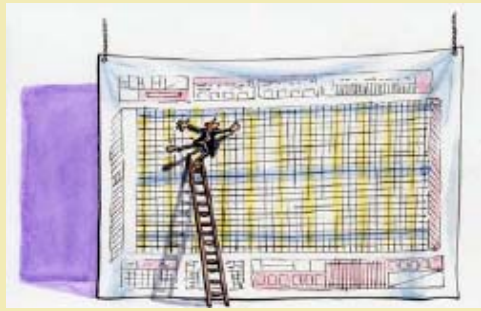
Different context = Different model

Logical structure



Appraisal & Evaluation

- Appraisal is done “before” the implementation of the policy
- Evaluation is done “after” the implementation of the policy



- In both case: “How well does this scheme or strategy meet the objectives which we have set?”

Role of appraisal

- Assessing seriousness of the problem
- Comparing possible solutions
- Improving a solution
- Choosing the best policy instruments
- Choosing between alternative designs
- Deciding how best to combine policies
- Evaluate how well a scheme has performed

Appraisal Framework

- Include each objective
- Indicators to represent objectives
- Impact groups to assess equity
- Disaggregate information to reflect problems (by geography, user class, times of day)
- Do-nothing as one case
- Discount rate (NPV)

An appraisal framework				
Options				
Objectives[1]	Do Nothing	Scheme 1[2]	Scheme 2	Etc.
Efficiency				
Environment				
Liveability				
Etc.				

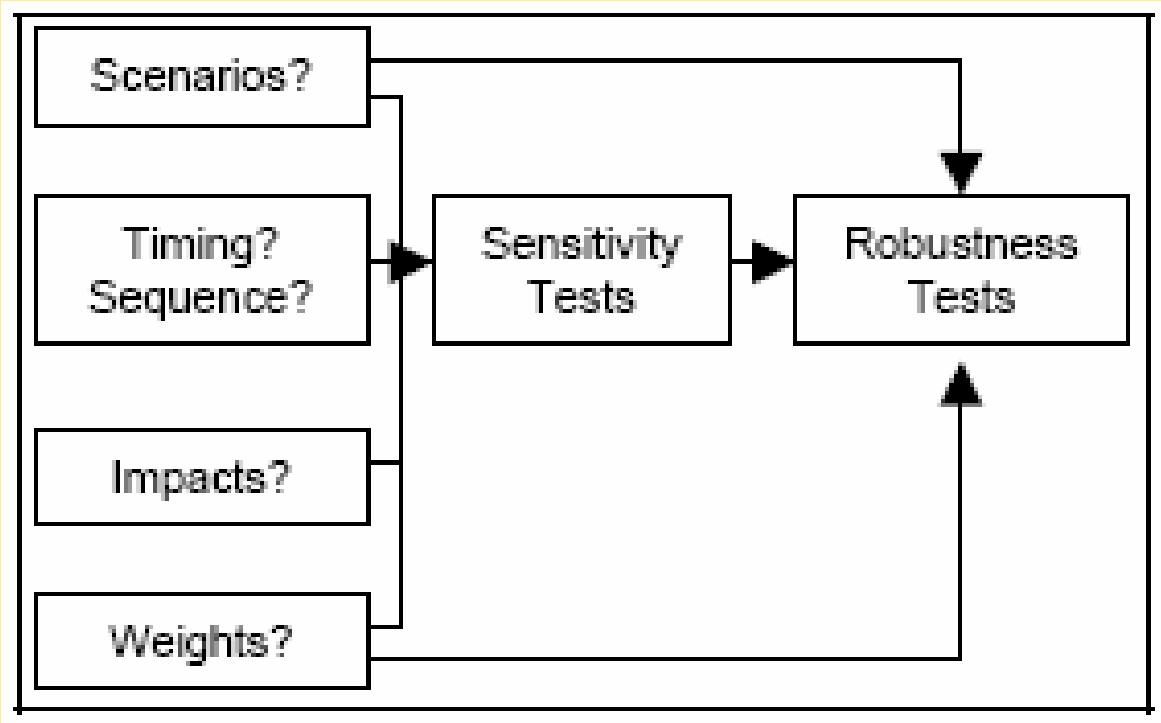
[1]Indicators can be used instead
[2]Or strategy options

Types of appraisal framework

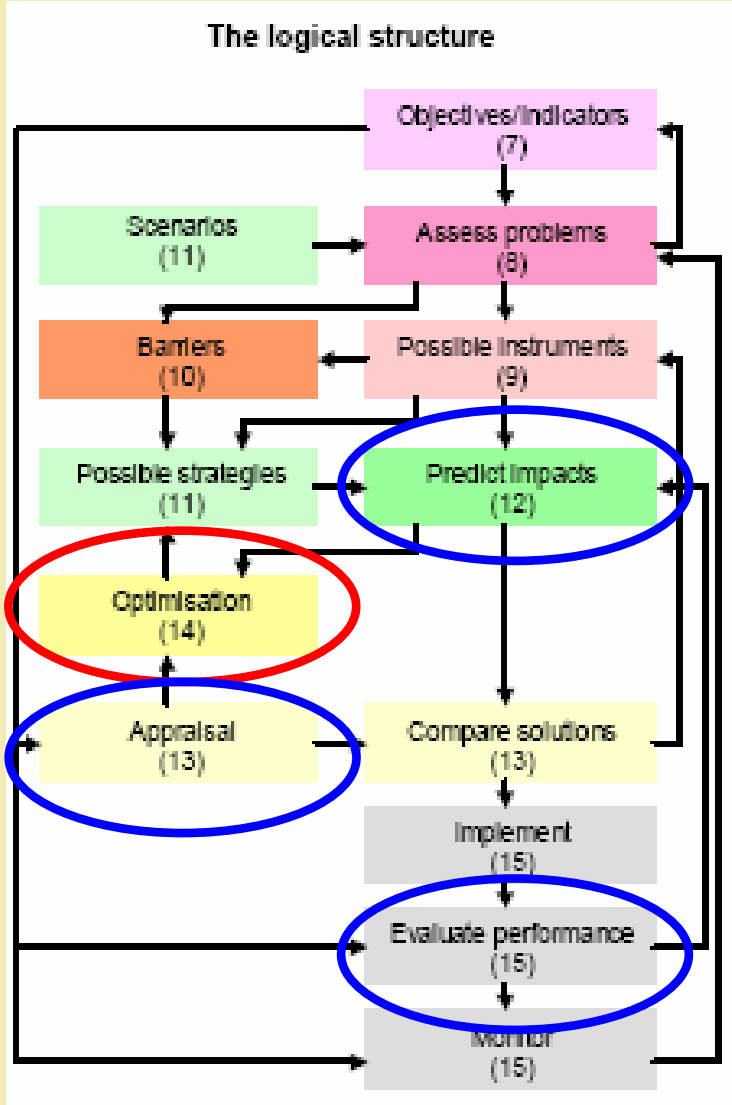
- Cost-Benefit Analysis
  - Convert all indicators by monetary value
  - Using a survey technique (e.g. SP) to define such value (e.g. value of time or value of noise)
  - Value used may be questioned sometime
- Multi-criteria
  - Allow for Decision Maker to assign weight to different indicators, objectives and impact groups
  - Can create a single unit indicator as CBA
  - Sensitivity analysis of the weights assigned can also be tested
- Etc…(e.g. Target based approach or AHP)

Strategy no.: n prices								Euros, present values, year		
	Households	**Firms**						**Government**	**External**	**Row totals**
		Public transp.	Freight transp.	Pro-perty	Transp. Users	Parking	Toll collection			
Investment costs										
Transport benefits										
Location benefits										
External costs										
Column totals	*UB*	*PS*	*PS*	*PS*	*PS*	*PS*	*PS*	*FS*	*EC*	*EEF*
Other OF indicators										
OF										
Indicators with targets										
Other indicators										

Dealing with uncertainty



Logical structure



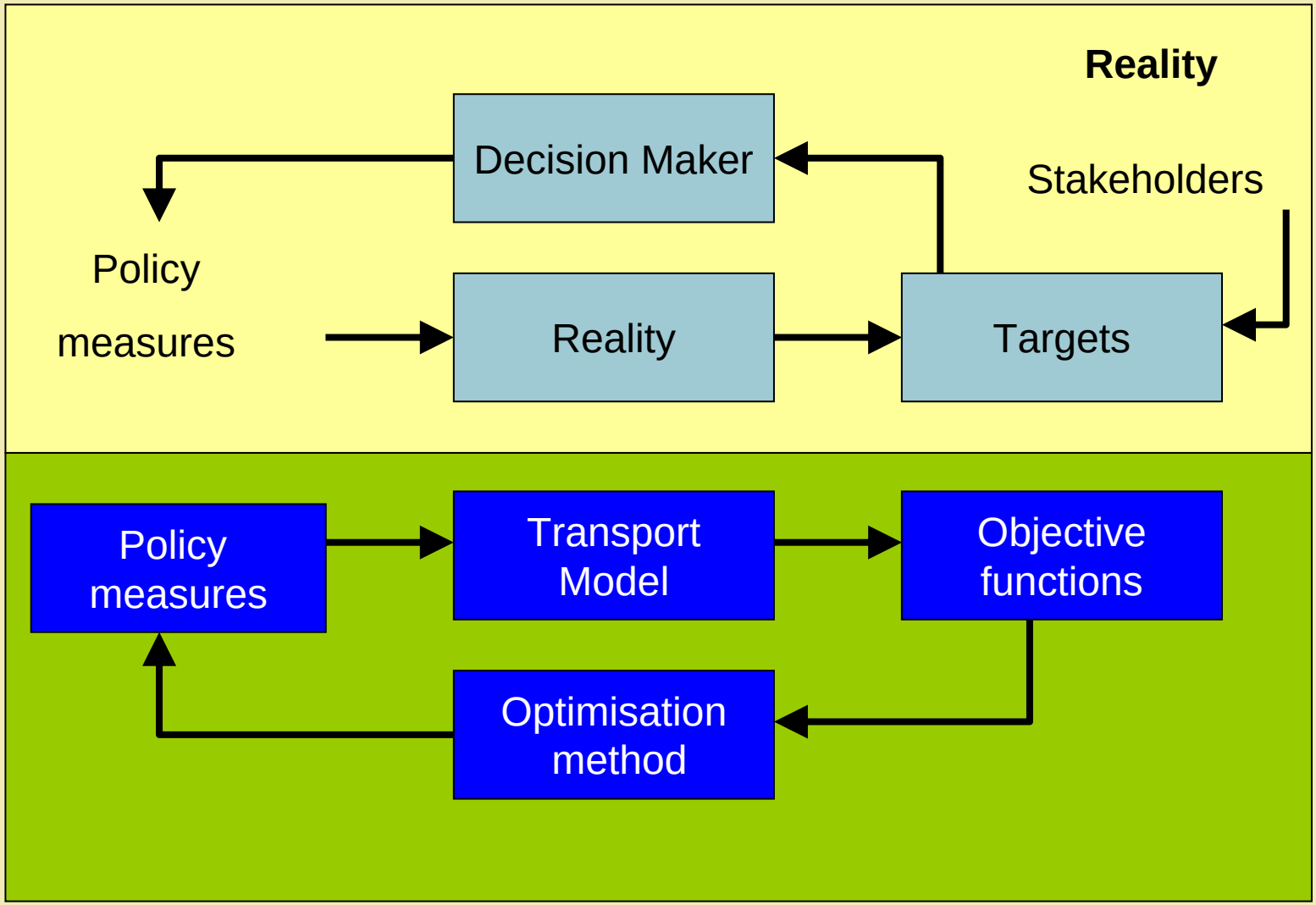
Optimisation

- Find the best solution for a given transport problem and barriers (constraints)
- Best = most hit the objective/indicators
- Develop more effective strategies in a shorter time
- Mainly should be used as a guideline

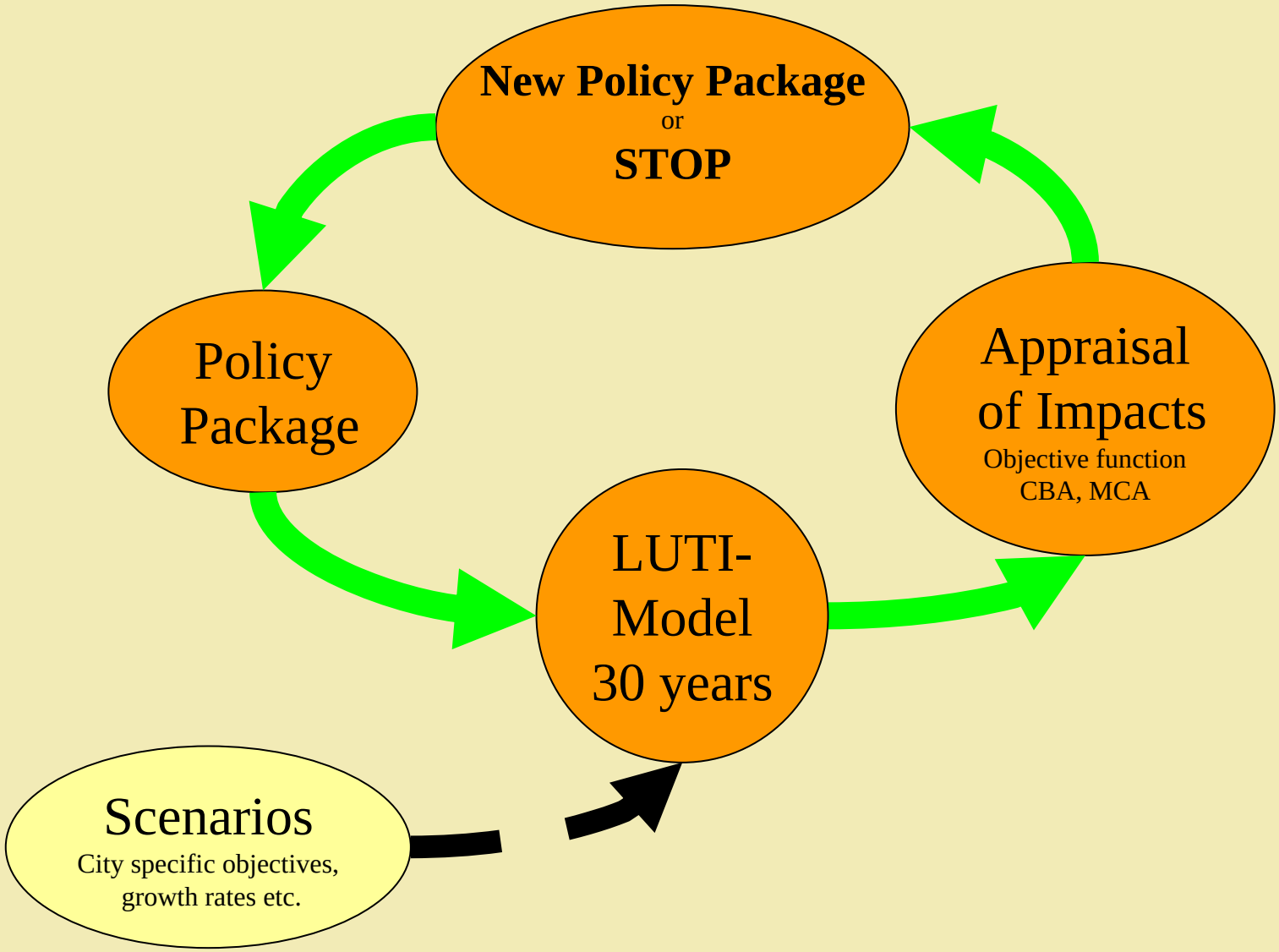
Structure of optimisation problem

- Objective functions
- Evaluation framework (in case of >1 objective)
- Constraints (Technical, Political, Financial, or Institutional) Prior, Progressive, or Posterior
- Predicting framework (model)

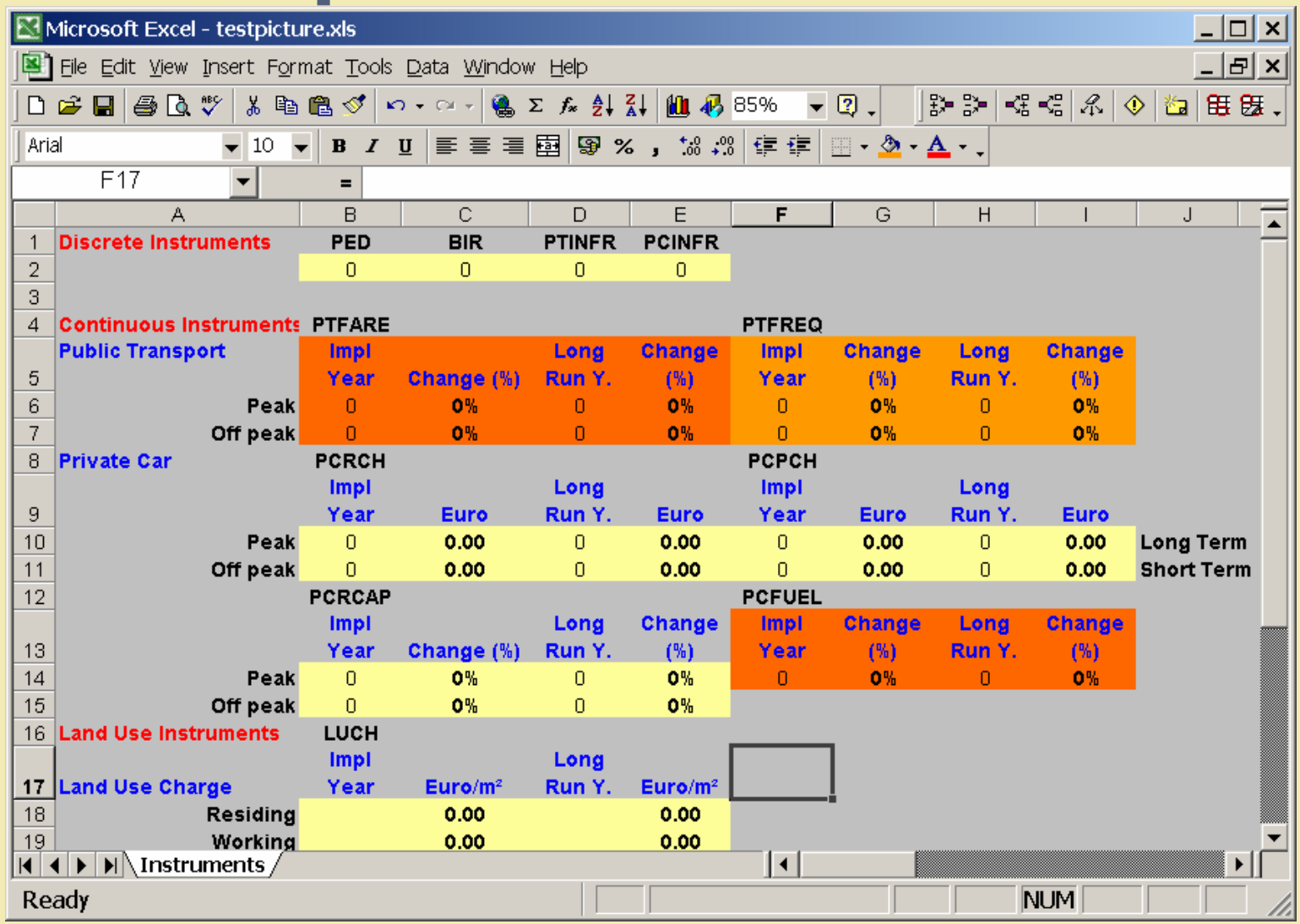
Real world and modelling world



Process with LUTI model



Example with MARS model



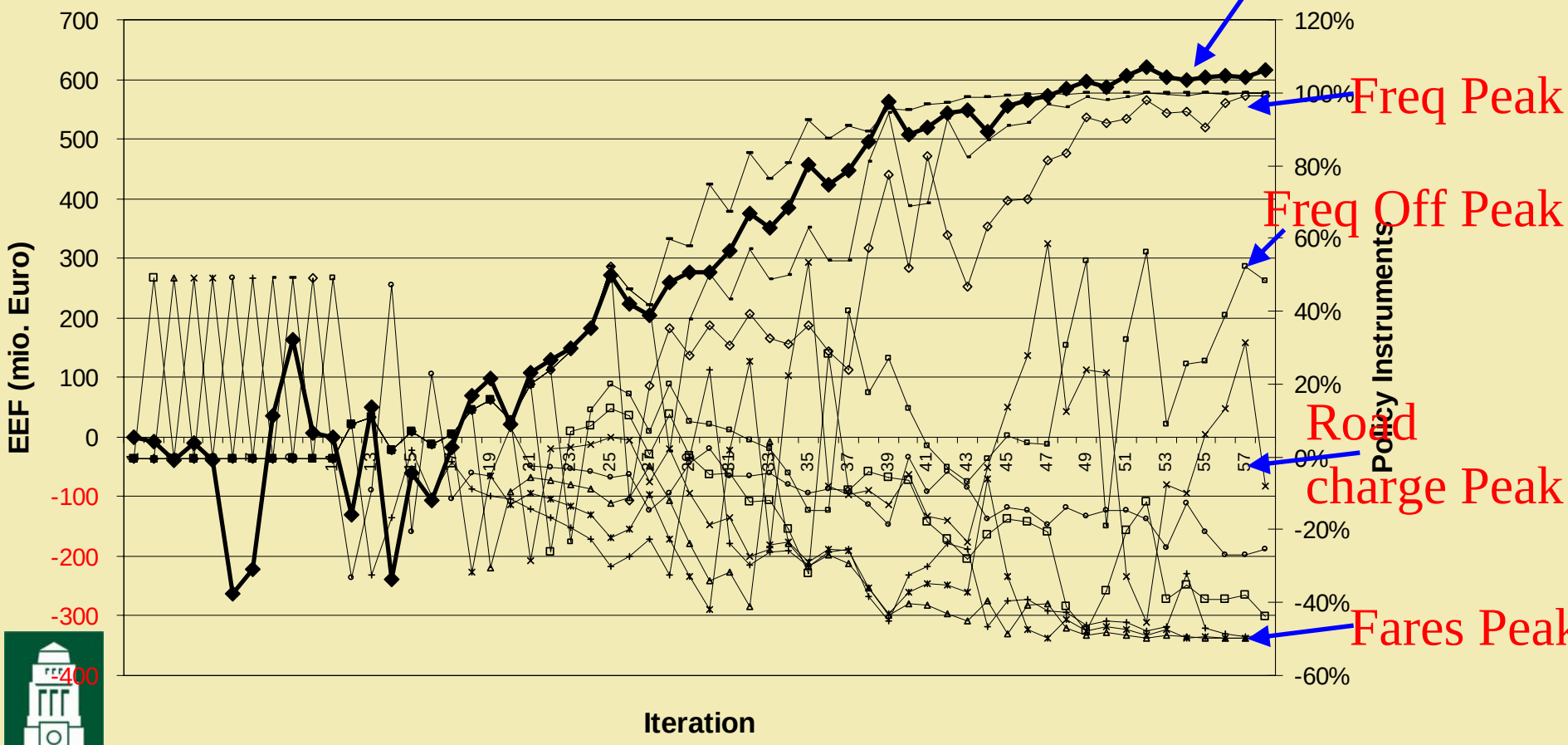
	A	B	C	D	E	F	G	H	I	J
1	Discrete Instruments	PED	BIR	PTINFR	PCINFR					
2		0	0	0	0					
3										
4	Continuous Instruments	PTFARE				PTFREQ				
5	Public Transport	Impl Year	Change (%)	Long Run Y.	Change (%)	Impl Year	Change (%)	Long Run Y.	Change (%)	
6	Peak	0	0%	0	0%	0	0%	0	0%	
7	Off peak	0	0%	0	0%	0	0%	0	0%	
8	Private Car	PCRCH				PCPCH				
9		Impl Year	Euro	Long Run Y.	Euro	Impl Year	Euro	Long Run Y.	Euro	
10	Peak	0	0.00	0	0.00	0	0.00	0	0.00	Long Term
11	Off peak	0	0.00	0	0.00	0	0.00	0	0.00	Short Term
12		PCRCAP				PCFUEL				
13		Impl Year	Change (%)	Long Run Y.	Change (%)	Impl Year	Change (%)	Long Run Y.	Change (%)	
14	Peak	0	0%	0	0%	0	0%	0	0%	
15	Off peak	0	0%	0	0%					
16	Land Use Instruments	LUCH								
17	Land Use Charge	Impl Year	Euro/m²	Long Run Y.	Euro/m²					
18	Residing		0.00		0.00					
19	Working		0.00		0.00					

Objective Function
consists of a weighted sum of

- User benefits
- Operator benefits
- Investment costs
- Changes in Land-use
- Environmental costs

over a period of 30 years
discounted to net present value

Optimisation of objective function



Summary

- Predicting impacts is crucial part of the process to formulate an appropriate policy
- Choosing the right level and type of model
- Appraisal framework should reflect the nature of the problem, policy and aim of the city
- Optimisation method can help fine tuning the strategy formulation and explore a new combination of policy

Thanks for your attention

Agachai Sumalee

asumalee@its.leeds.ac.uk

http://www.personal.leeds.ac.uk/~traas