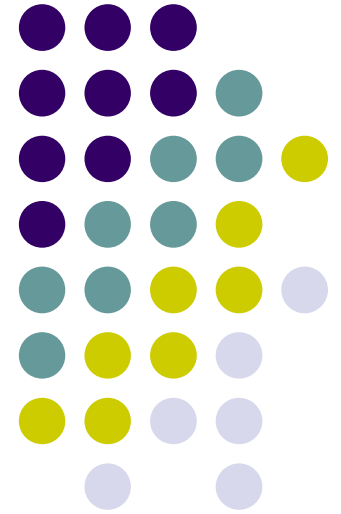
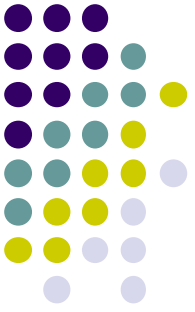


E-Democracy in Smart Cities

Love Ekenberg

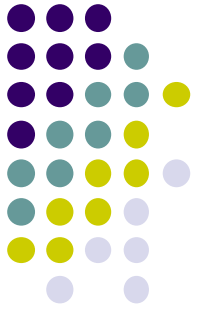
Dept. of Computer and
Systems Sciences
Stockholm University





Overview

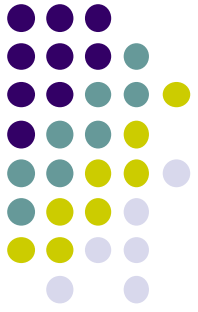
- Myself
- 3 Cases
 - Road infrastructure
 - Environmental issue
 - City planning



My Background

- Head of DSV
- Professor in Computer and Systems Sciences at Stockholm University
- Professor in Information Systems at the Royal Institute of Technology
- Professor in Computer Science at Mid Sweden University
- PhD in Mathematics
- PhD in Computer and Systems Sciences
- Consultant for EU, World Bank, Sida, WHO, Swedish Ministry of Foreign Affairs, Nuffic, CIHCD, etc

Public Decision Making - How does it look like?



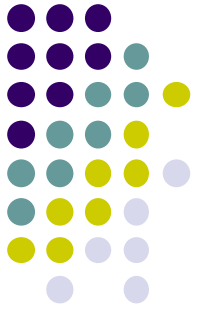
- Too simple analyses
- Often no reliable data
- Few variables
- Over confidence
- Deterministic analyses
- Extreme value analyses
- Many people do not know when it is possible to count

Regional planning



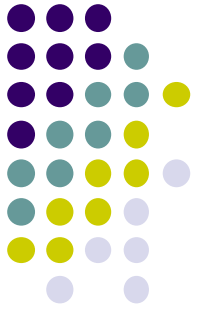
- An estimate for the Stockholm car traffic is that it will increase by approximately 40 percent during the next 15 years.
- The Swedish Road Administration investigated various options for connecting the northern and southern parts of Stockholm.

Cost



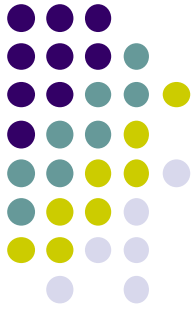
- One of Sweden's largest infrastructure initiatives
- 2-4 billion Euro

Background material



- 80 different assessments of the three alternatives from 19 different perspectives (criteria)
- ... accessibility, environmental impact, regional development, traffic safety, and economic growth...

Background

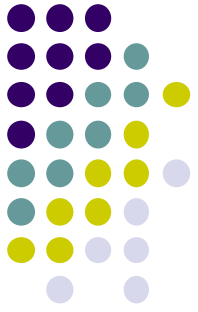


Hur uppfyller de olika alternativen målen?

Måluppfyllelse	Noll-alternativet	Förbifart Stockholm	Diagonal Ulvsunda	Kombinationsalternativet
Framkomlighet				
Tillgänglighet		Ja	Ja	Nej
Saltsjö – Mälarsnittet		Ja	Ja	Nej
Centrala delarna		Ja	Ja	Ja
Skapa förbifart		Ja	Ja	Nej
Infartsleder		Ja	Ja	Ja
Regionstruktur				
Gemensam marknad		Ja	Ja	Nej
Flerkärnighet		Ja	Ja	Nej
Ekonomisk tillväxt				
Förutsättningar för utveckling		Ja	Ja	Nej
Trafiksäkerhet				
Färre döda och svårt skadade	0	+	+	++
Jämställdhet				
Förbättra för kvinnor	0	-	0	+
Miljö				
Hälsa	0	+	+	+
Säkerhet	0	+	+	0/+
Natur kulturmiljö och friluftsliv	0	--	0	0
Klimatmål	0	-	-	+
Hushållning med mark och vatten	0	+/-	+	+
Hushållning med energi och material	0	-	-	+/-
Ekonomi				
Investering	0	--	--	--
Drift och underhåll	0	-	-	--
Samhällsekonomi	0	0/+	0/+	0/-

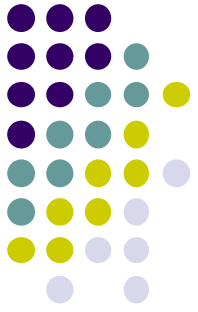
Måluppfyllelse (bästa alternativ markeras med skuggning).

Analysis



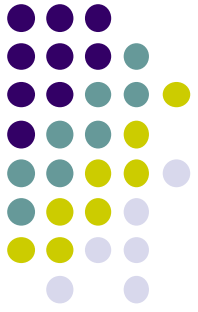
- Essential factors
- Impossible to analyse this without elaborated analyses
- Such was not utilised at all

Analysis



- Critical with criteria weights
- Was not made at all!
- Totally necessary

Analysis



- Result is totally dependent of this
- ...and how the scales are interpreted

Result



- Despite this, the politicians decided that one alternative was the best!!!
- Based on.... nothing
- Investments of this types need much more analysis than this

Alternatives



- Maybe the problem is too complex?
- Maybe there are no methods?
- Classification and structure might be a support despite all?
- No
- Exists very adequate methods



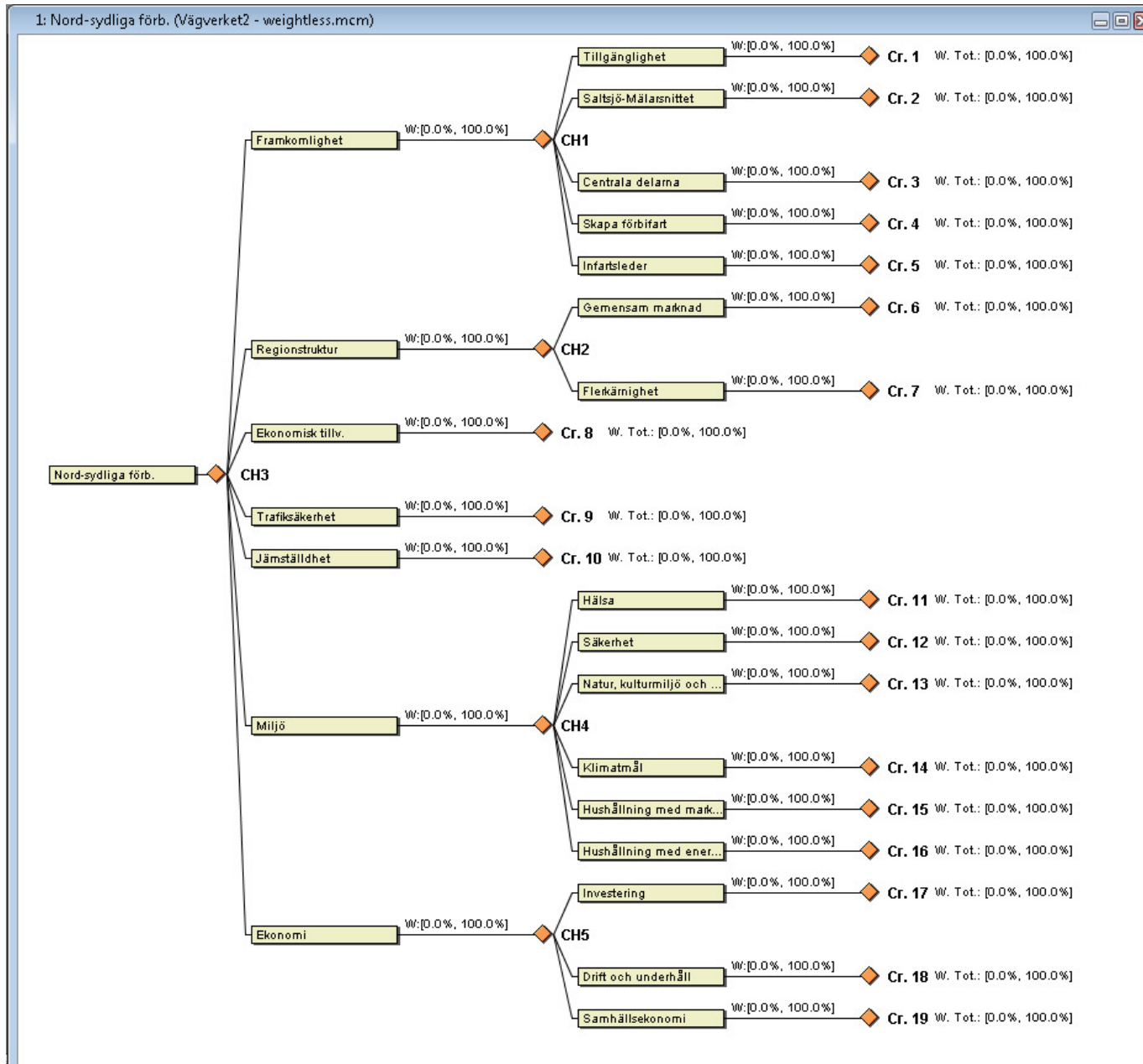
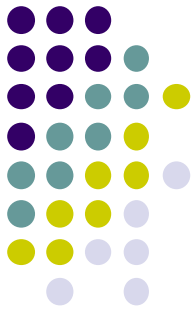
Decision Analysis

A collection of systematic approaches and formal methods in order to structure and analyse complex decision problems:

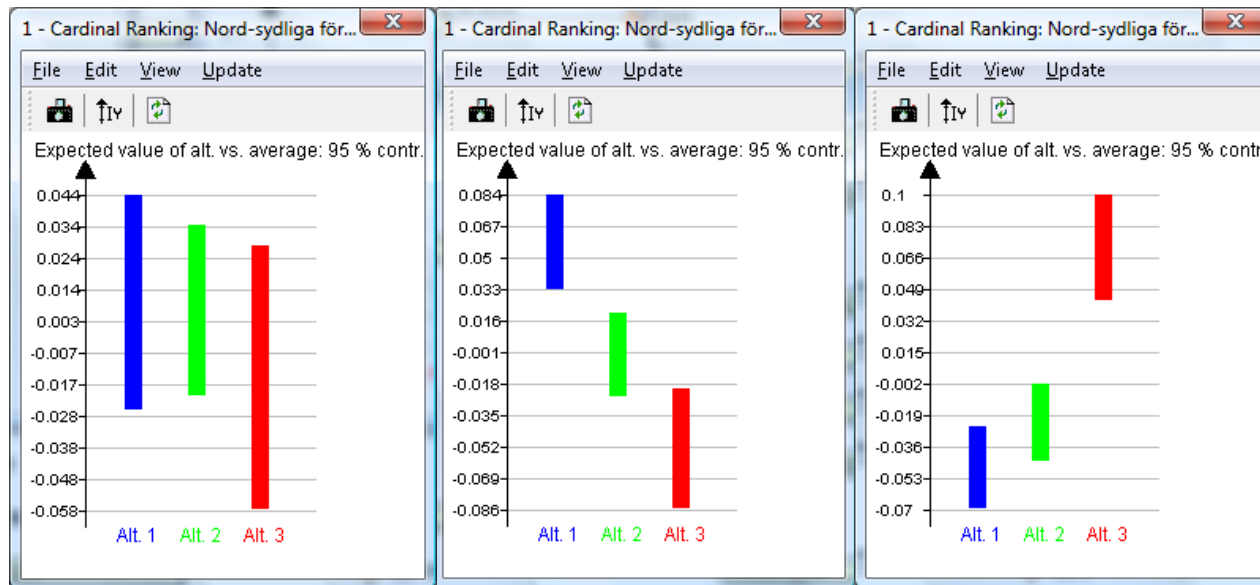
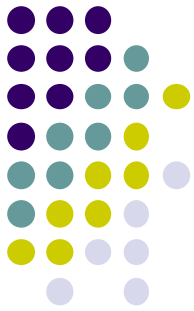
- Conflicting objectives/Multiple criteria
- Uncertainties and risks
- Multiple stakeholders

Preference modeling, decision modeling, belief modeling, risk analysis, aggregations, sensitivity analysis.

Alternatives



Alternatives



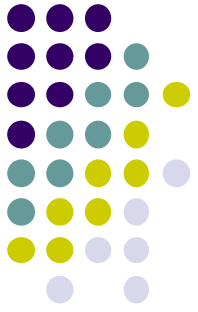
Left: Without any weight assessments.

Middle: Accessibility is considered as the most important criterion.

Right: Environmental impact and traffic safety considered as the most important criteria.

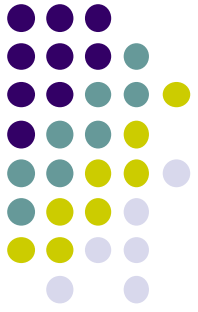
Alt 1 is *Förbifart Stockholm*, Alt. 2 is *Diagonal Ulvsunda*, and Alt. 3 is *Kombinationsalternativet*.

So this is easy



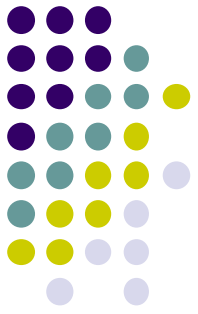
- Decisions and risks are often difficult to handle
- But they must be considered as difficult as they are
- There are methods and methods
- The keys are, not very surprisingly, structure, method and analysis

How it should be



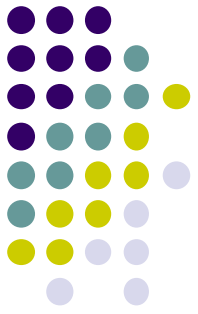
- river Svartån altered to facilitate farming and acquire more agricultural land
- has led to a significant reduction of the purification process of the water
- the municipality has for considerable time coped with problems concerning a poor water quality of the river

The River Svartån



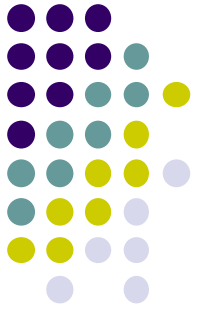
- different stakeholders, such as farmers, industries, citizens, other municipalities
- the decision-makers expressed a strong desire to obtain a sustainable and approved solution
- city council promoted actions with the public's endorsement

An Iterative Process



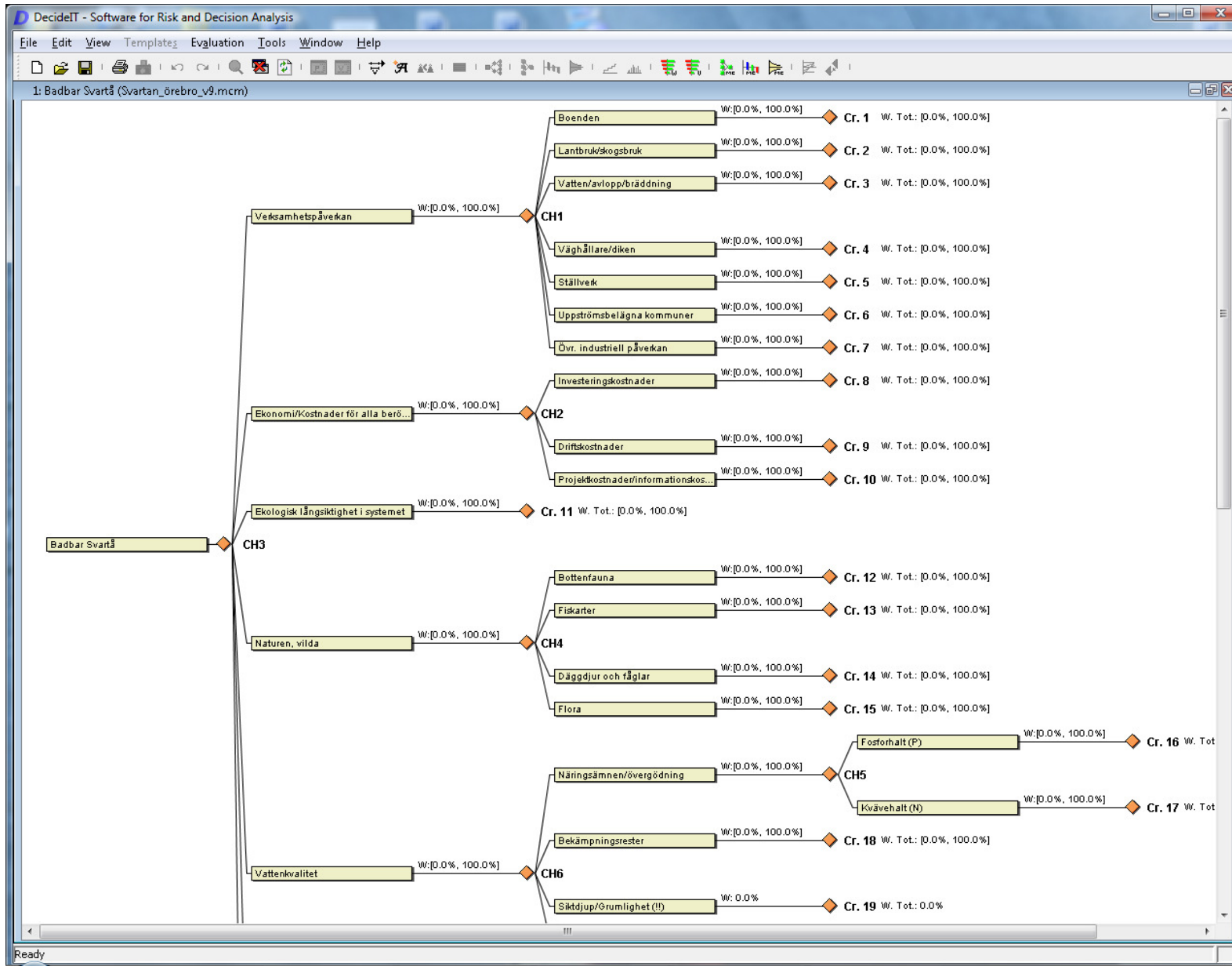
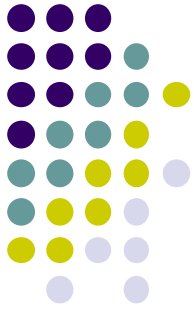
- **WS1:** Introduction to the process and the analysis in particular.
- **WS2:** Politicians identified the political (main) criteria collectively.
- **Interview round 1:** Main criteria priority weights elicitation from the politicians.
- **WS3:** Identification of the means criteria of the main criteria by the civil servants.
- **WS4:** Discussion of the appropriateness and slight modification of the means criteria by civil servants and politicians jointly.
- **WS5:** Generation of decision alternatives and assessments of their effects with respect to the means criteria. This work was completed by the civil servants with remote assistance by a facilitator.
- **WS6:** Discussion of different possible measures by civil servants and politicians jointly. As a result of discussions two alternatives were disregarded and seven remained.
- **Individual interview round 2:** Second round of weights elicitation from the politicians to check if their preferences had changed during the project.
- **WS7 and WS8:** Joint workshops to analyze and discuss the alternatives with the objective of reaching a decision.

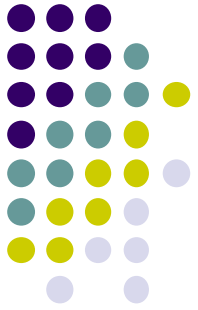
Alternatives



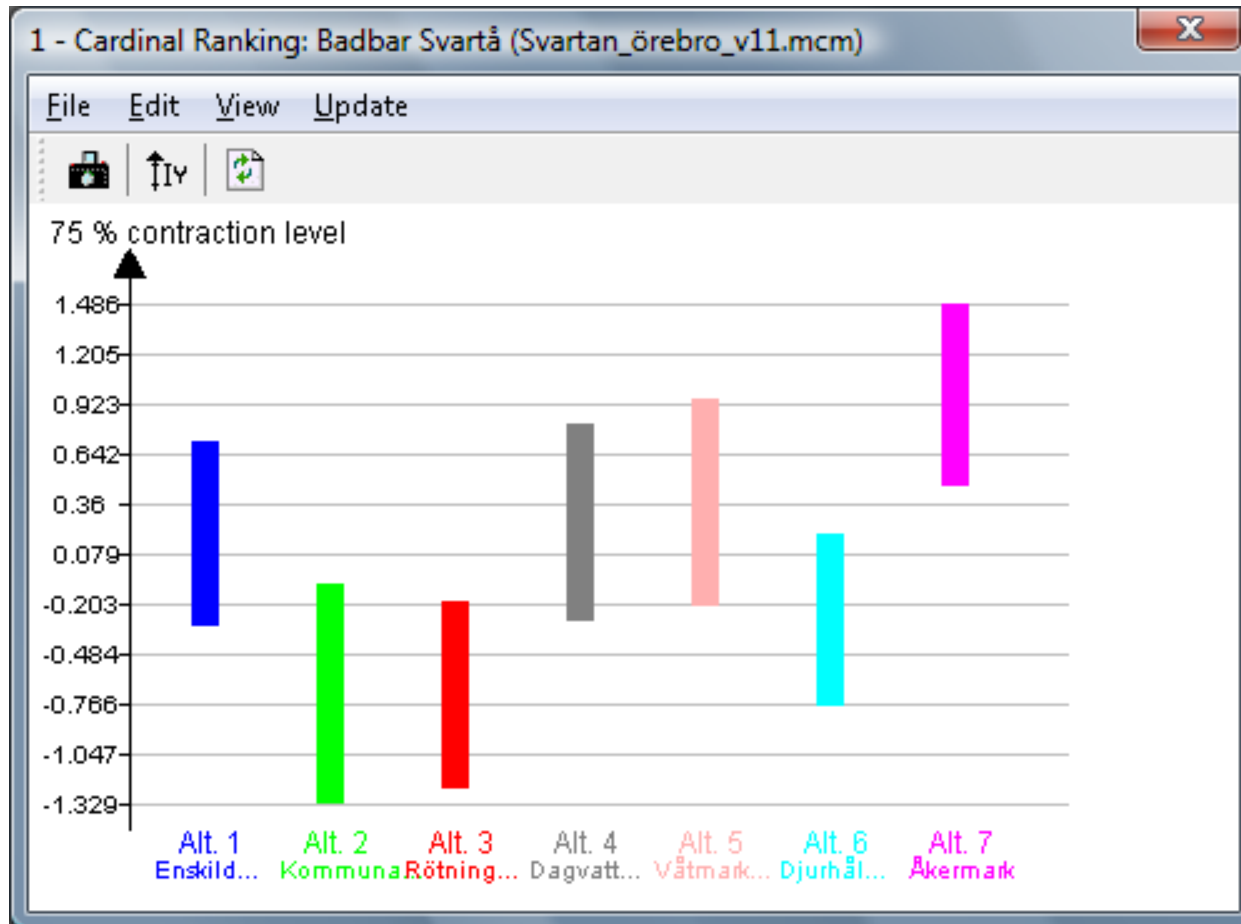
- **Alt. 1 Attend to single sewers.** The environmental office would continue to make an inventory of single sewers.
- **Alt. 2 Attend to public sewers.** A number of pump stations and public wastewater purification instalments that separate impure wastewater into dikes and water bodies within the watershed exists upstream of the city.
- **Alt. 3 Digestion of stable manure and biogas installation.** By allowing for stable manure to pass through the digestion chamber of a biogas installation.
- **Alt. 4 Rain water measures.** Measures in order to purify the rain water from bacteria may also decrease the nutrient content, heavy metals content, and petroleum content that travels to the river with rain water.
- **Alt. 5 Build wetlands.** By allowing for drainage water from the surrounding fields to pass through larger wetland areas.
- **Alt. 6 Attend to livestock farming.** Shut out livestock grazing by the watercourse.
- **Alt. 7 Vegetation zones and dikes in the fields.** Build vegetation zones along the watercourses and dikes in the landscape.

Structure

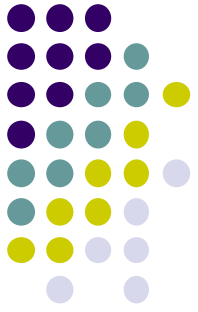




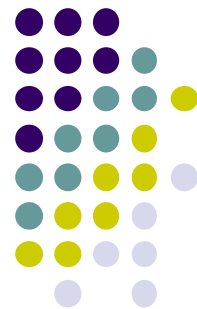
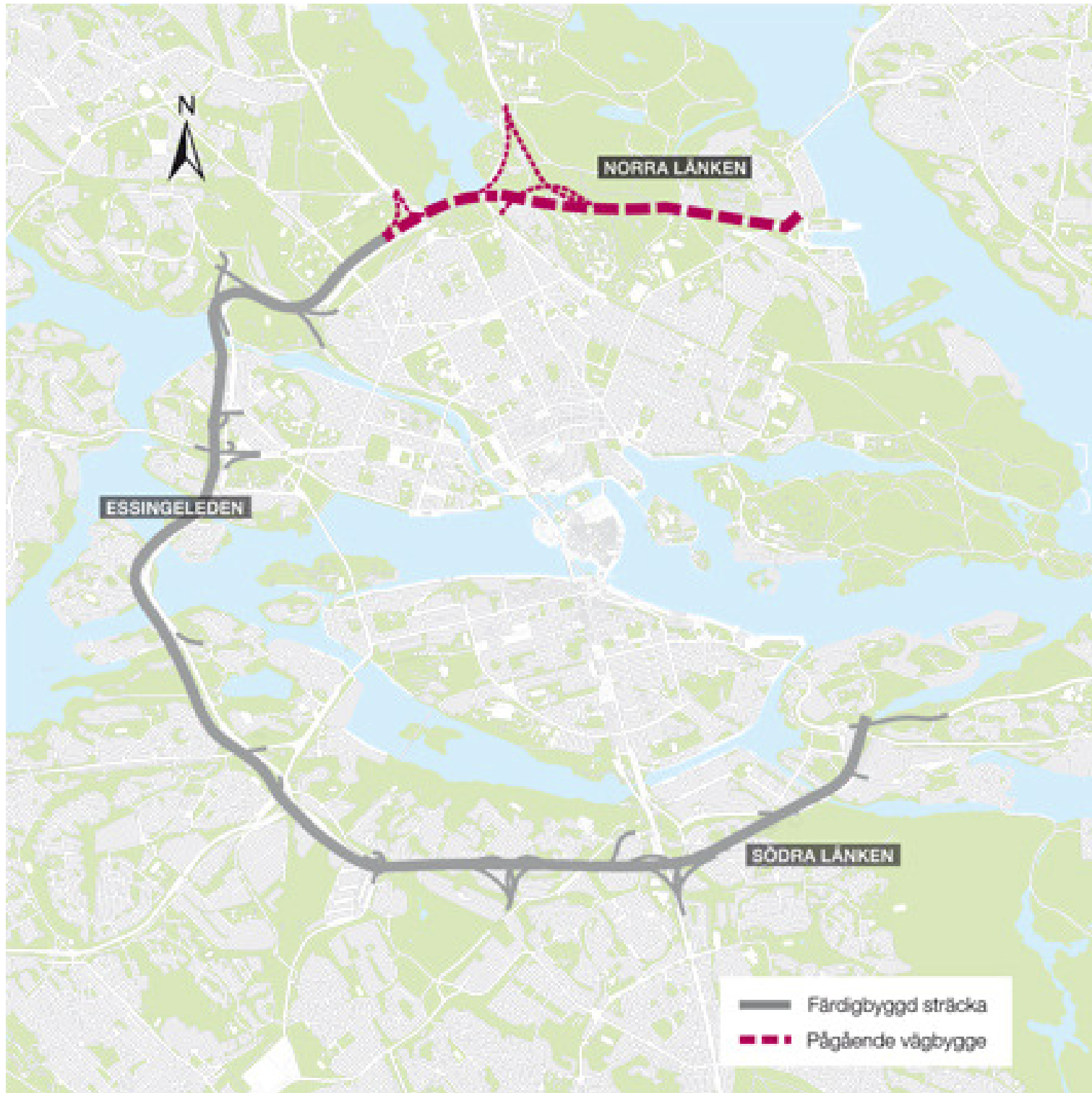
Evaluation

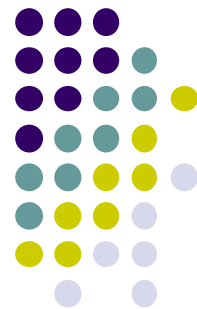
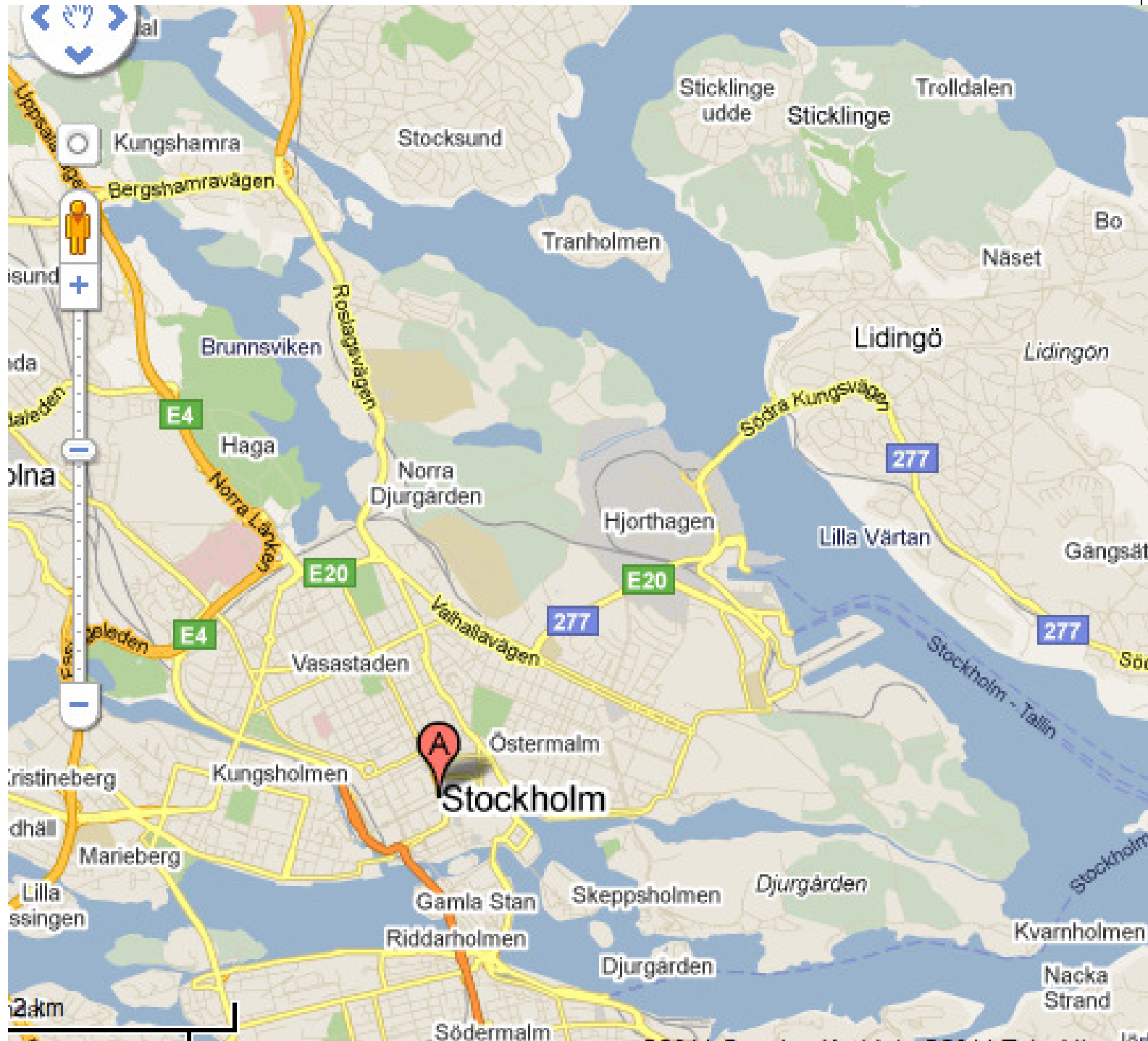


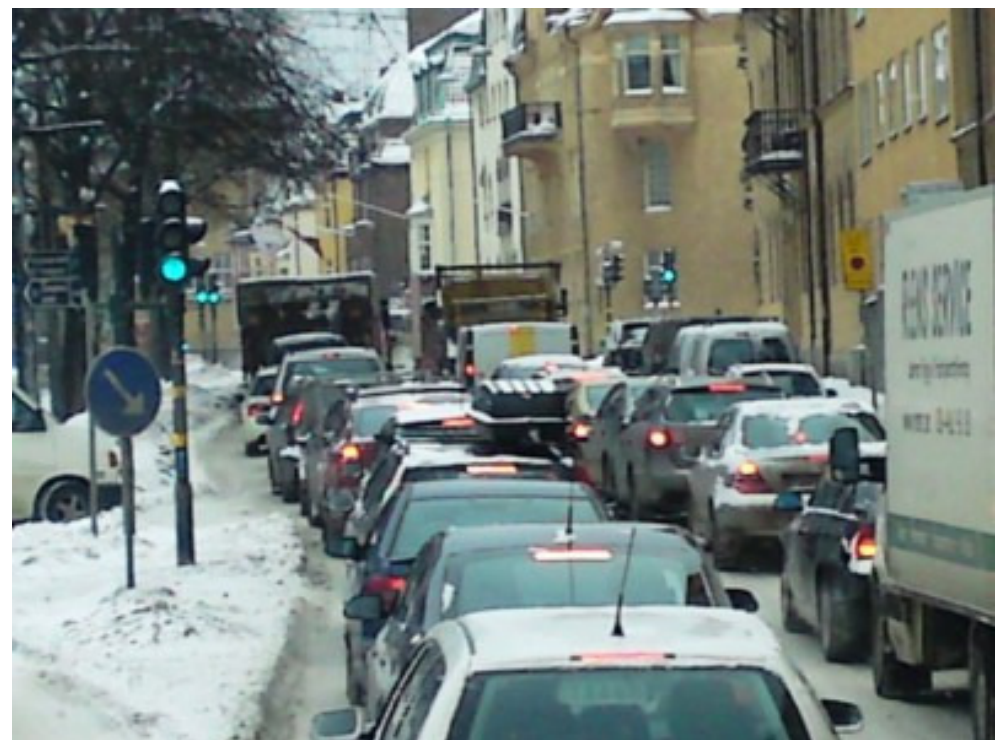
Stockholm Vision 2030



- City of Stockholm's "Vision 2030"
- Construction of "The Northern Link"
- Burden of heavy and throughput traffic will be reduced on:
 - Valhallavägen (Stockholm's only "real avenue"?)
 - Lidingövägen (Good place for new central residential areas)





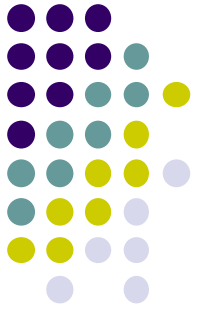


City Strategy in Brief



- Focusing growth in strategic development areas
- Integrating the city
- Creating a vibrant urban environment
- Consistent with environmental goals and sustainability issues

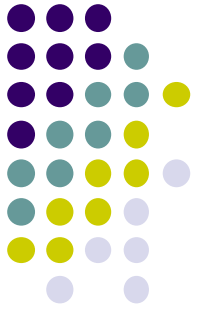
City Traffic Planning



Managing conflicting objectives and claims upon limited resources

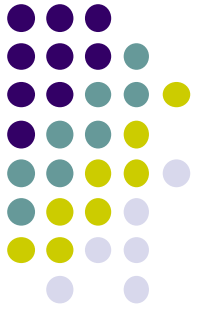
- **Link functions:** the movement of people and goods by different modes
- **Terminal functions:** parking, public transport stops, loading and unloading of goods
- **Place functions:** the role streets play within the urban structure, shaping how a city is perceived by its residents and visitors, possibilities for commercial and social functions
- **Cross-cutting functions:** such as road safety, environmental impact, rubbish collection, maintenance, emergencies etc.

Planning Decision Making



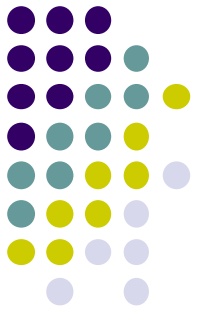
- Prioritise between different functions in different locations
- Evaluating sets of decision problems each involving a set of feasible alternatives which somehow has to be evaluated upon in terms of conflicting objectives/functions
- Care has to be taken to multiple stakeholders and governmental issues

Screening



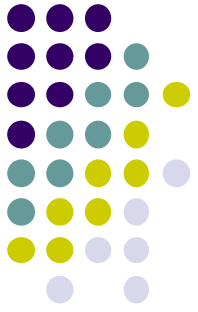
- A pre-selection phase
- Sorting out a set of *admissible* high-level alternatives that will be subject to a more thorough analysis
- Should end with a clear direction on the kinds of measures to be taken and instruments to be used
 - Communication with decision makers and consultancy/infrastructure companies and the general public

Characteristics of Planning Decision Making

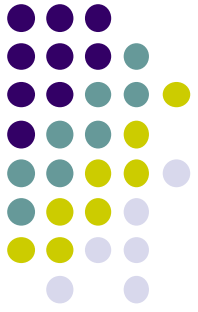


- The objectives can be derived from different levels
- Each alternative option is composed of a collection of both structural and non-structural instruments comprising a portfolio of instruments
 - Generating these portfolios is a design process
- Assessing each alternative's performance are typically done using rough estimates
 - Imprecision needs to be accounted for

Approach

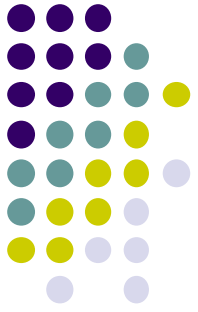


- Series of workshops with civil servants to identify:
 - fundamental and means objectives
 - a set of thematic alternatives each consisting of a set of consistent instruments
 - Car alternative, bus alternative, basic requirements alternative etc.



Approach (cont'd)

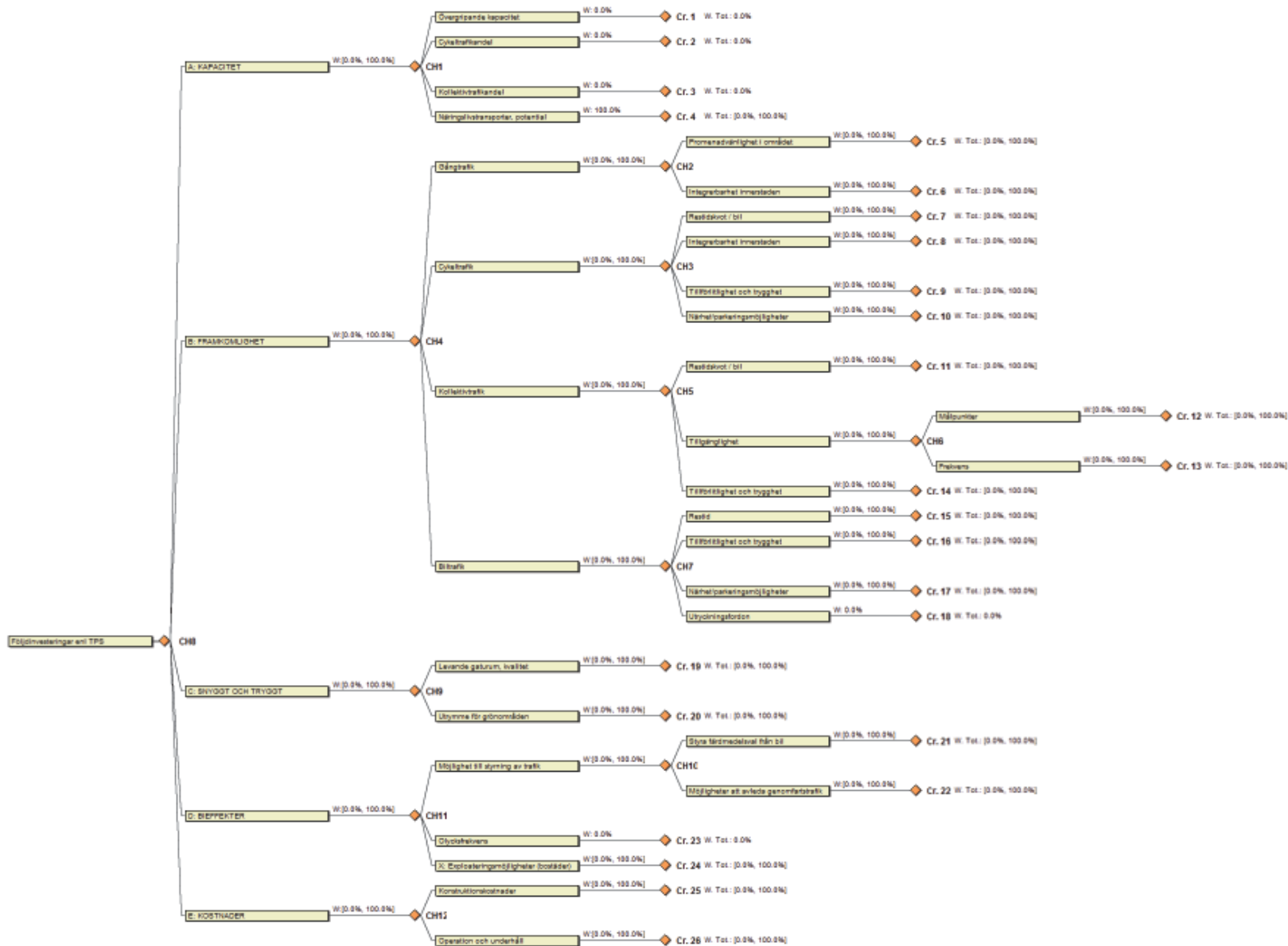
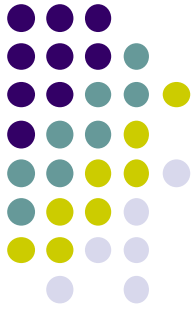
- Assess the effect of each alternative under each means objective
 - Define value scales
 - Account for imprecision by allowing for interval-valued assessments
- Suggest reasonable priorities based upon the city's vision and strategy
 - Avoid over-interpretation



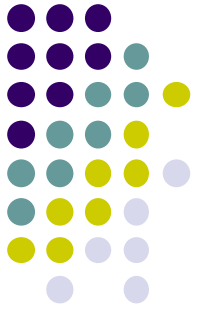
Result: Objective Structure

- An objective structure with categories as a more formal interpretation of city visions and strategies w.r.t. the traffic administration
 - General objectives
 - Derived from city vision and strategy
 - General domain specific objectives
 - Derived from traffic planning discourse
 - Case specific objectives
 - Derived from/Defined by actors in current decision problem

Result: Objective Structure

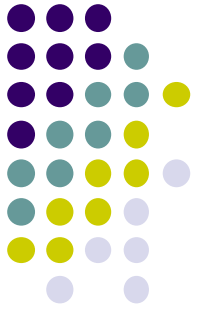


Result: Decision Evaluation



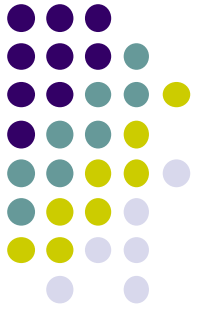
- The car-alternative was effectively removed from the set of alternatives
- The remaining four can be further analysed , investigated and communicated

Conclusions



- The perceived value of utilising a decision analysis process in intelligent city planning
 - Formalises many of the informal processes already followed by civil servants in preparing recommendations for decision makers.
 - Provides a flexible tool for analysis
 - Provides the potential for an improved communication with decision makers of the basis for recommendations
 - Decreases the risk of inconsistency of recommendations between projects
 - Prioritization between objectives beyond what can be derived from city strategies is needed

Thx



- www.preference.nu
- www.dsv.su.se/~lovek