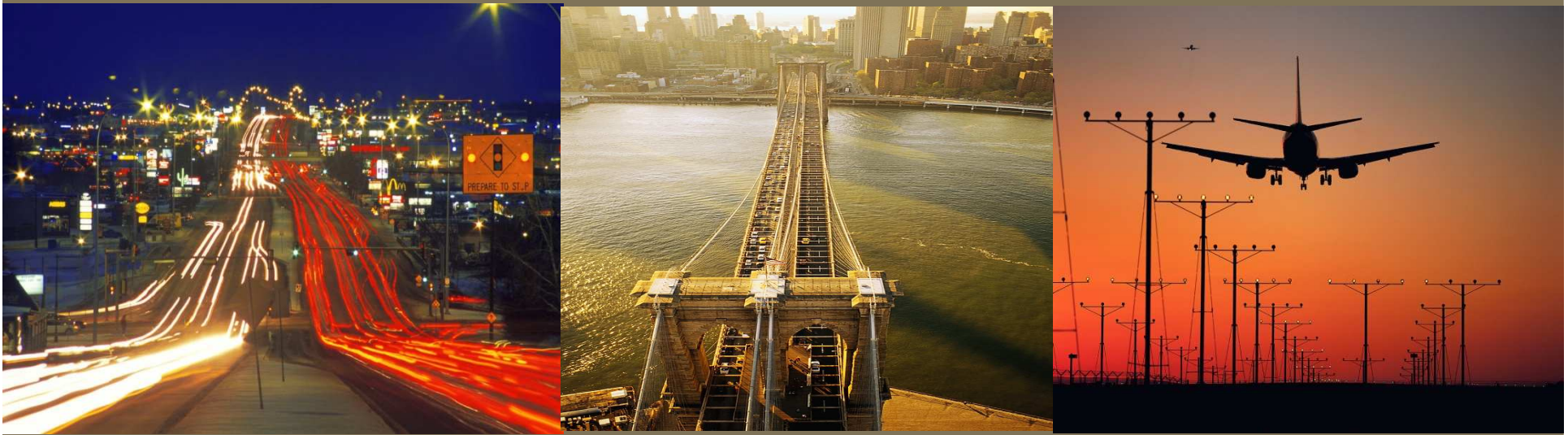


The Multi Actor Multi Criteria Analysis (MAMCA) methodology

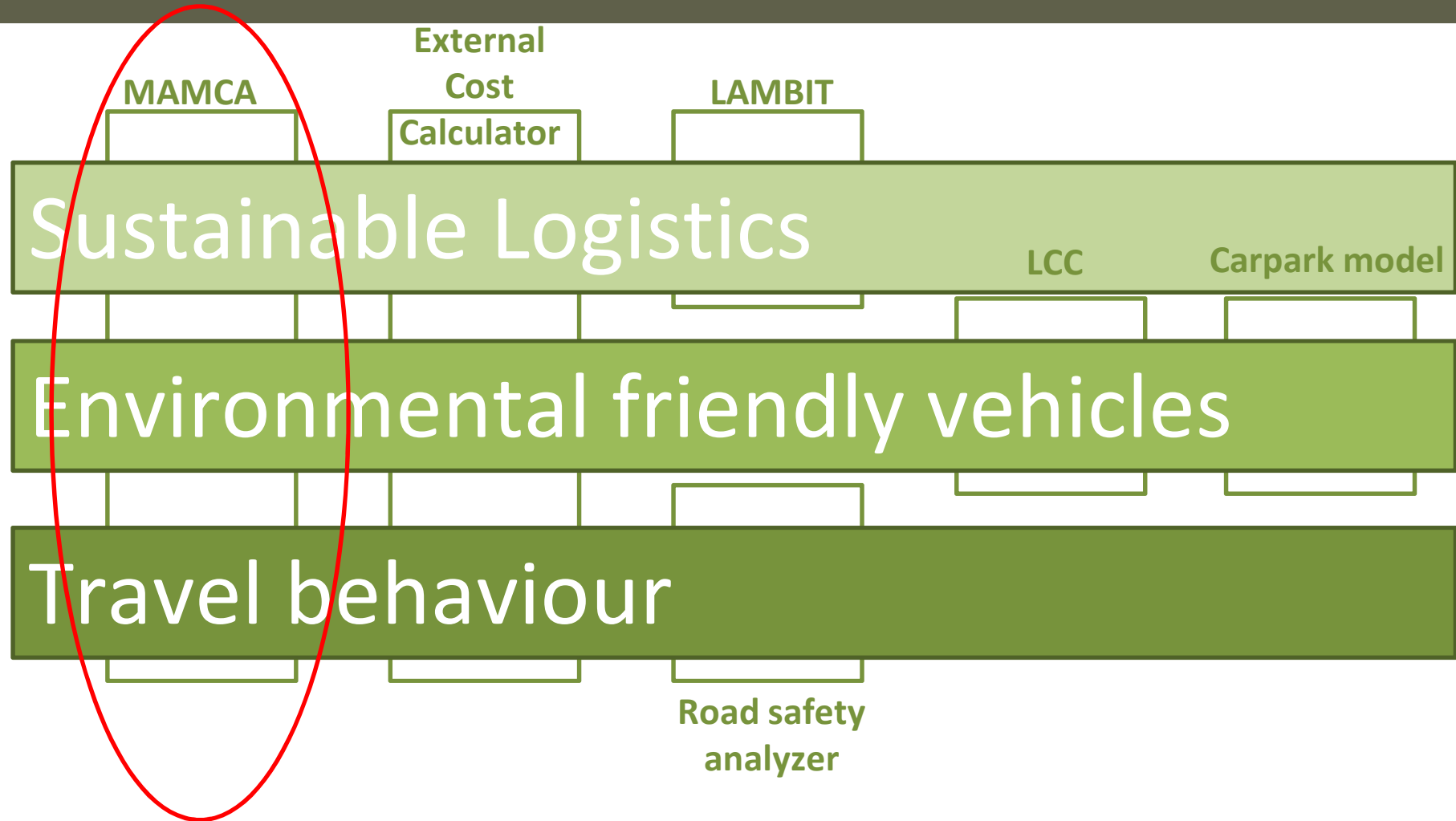


Prof. Dr. Cathy Macharis (VUB)



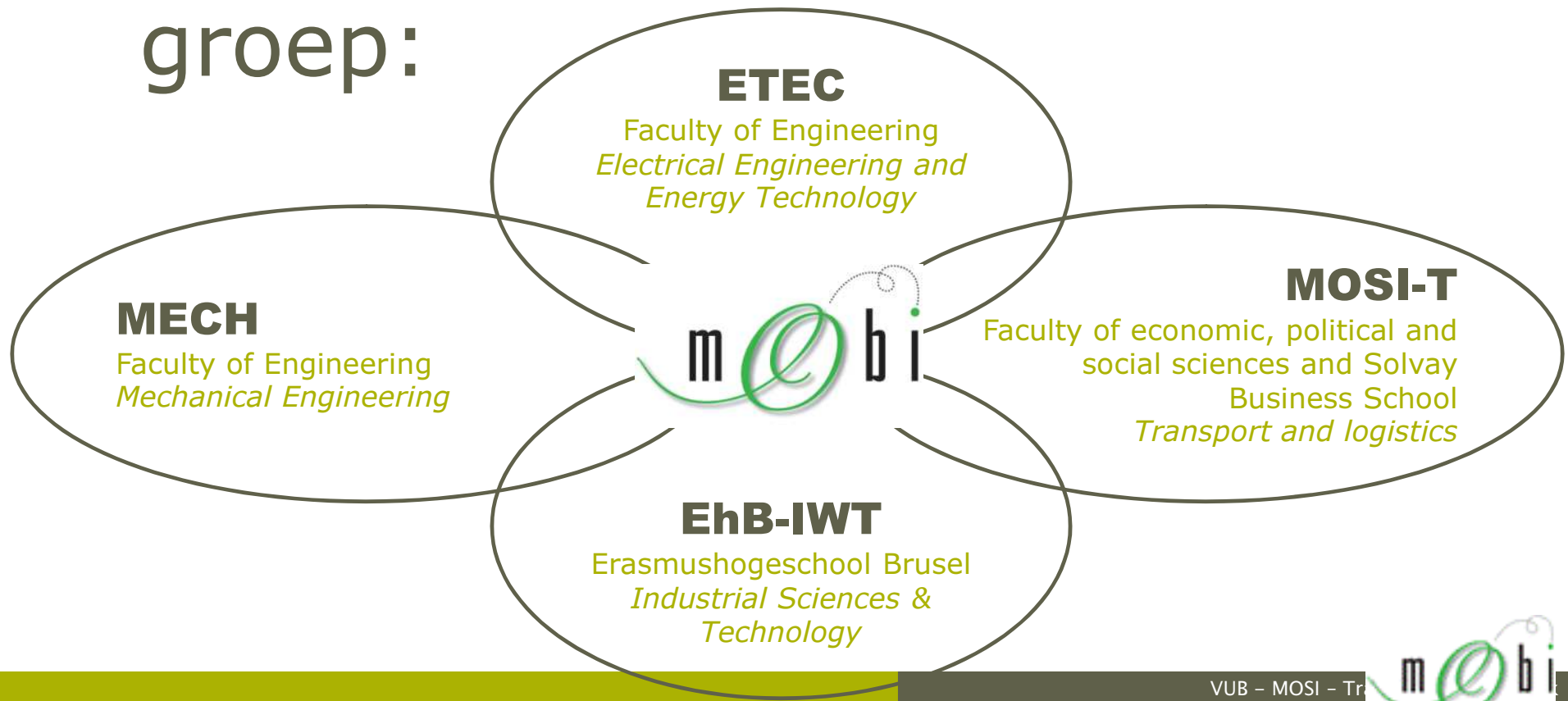
Vrije Universiteit Brussel
MOSI – Transport en Logistiek

MOSI – T: Domains and models



MOBI: Mobility and Automotive Technology

Multidisciplinary research
groep:



Structure of the presentation

- Assessment methods for transport project appraisal
- MAMCA
- Case
- Conclusions

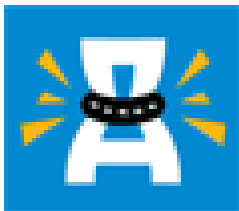
Evaluation methods

- **Social cost-benefit analysis (SCBA)**
- **Multi criteria analysis (MCA)**

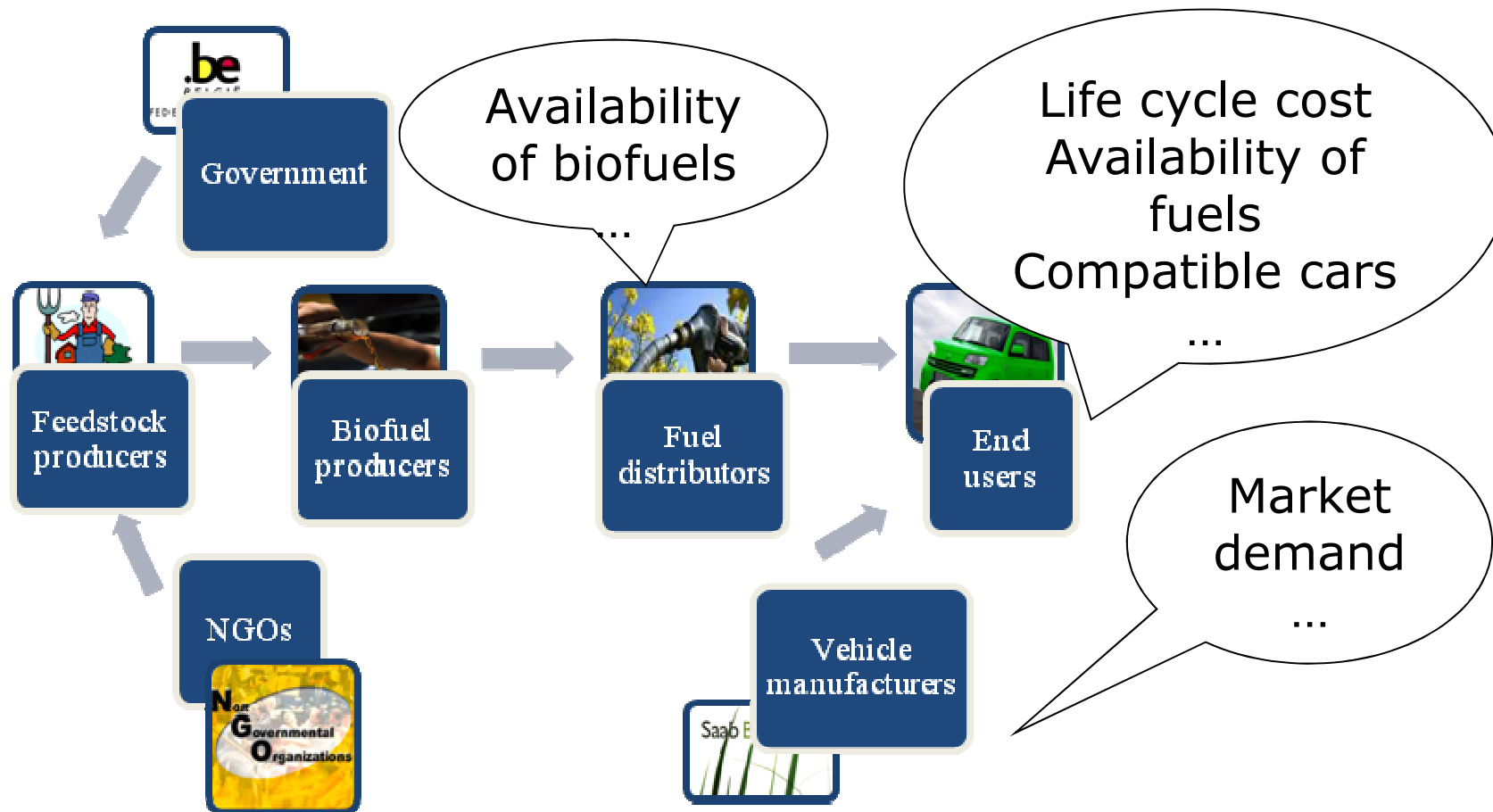
Others:

- Private investment analysis (PIA) or Private cost-benefit analysis (CBA)
- Cost-effectiveness analysis (CEA)
- Economic-effects analysis (EEA)

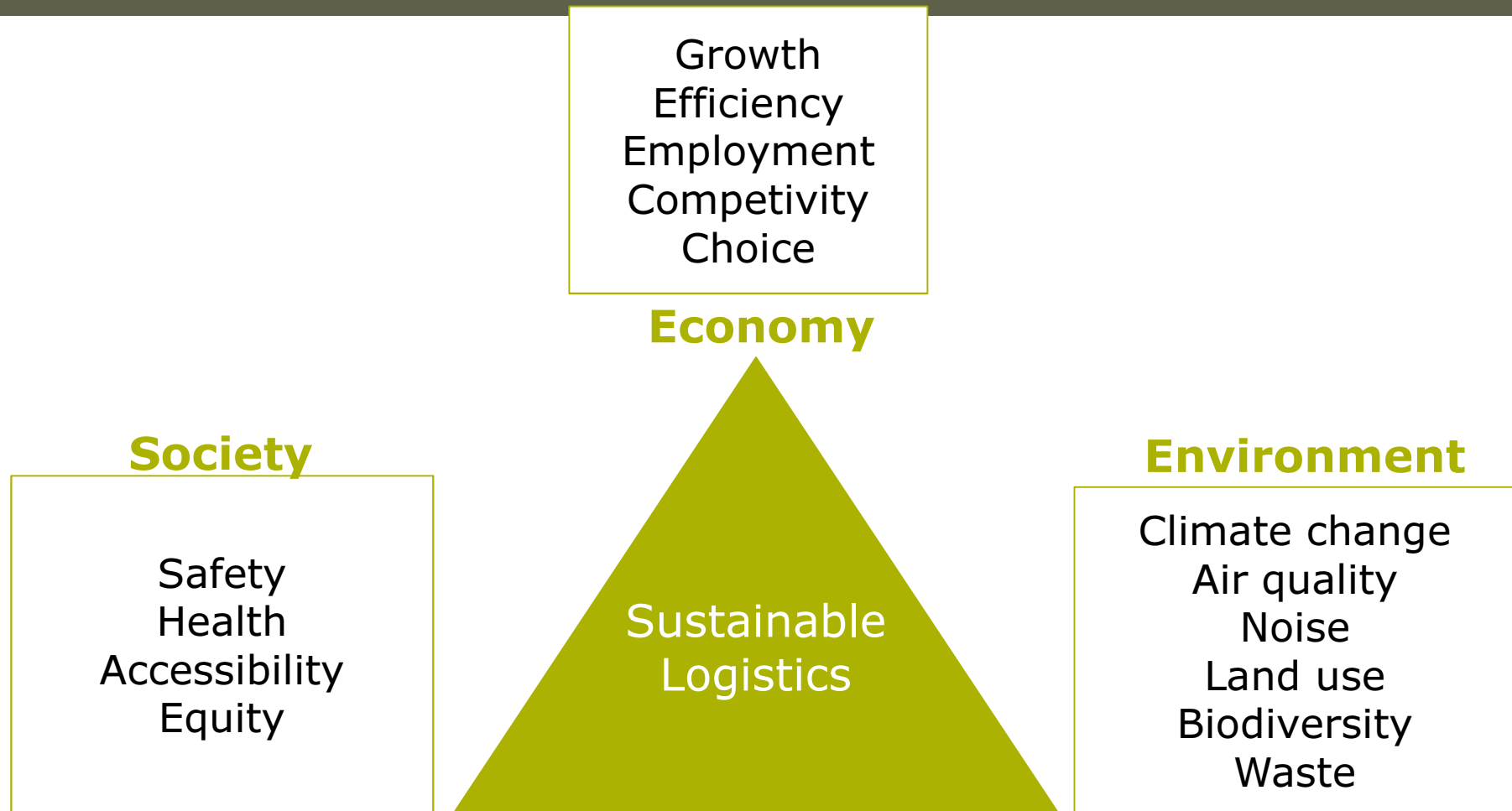
Stakeholders Oosterweel



Introduction of Biofuels



Sustainable Logistics





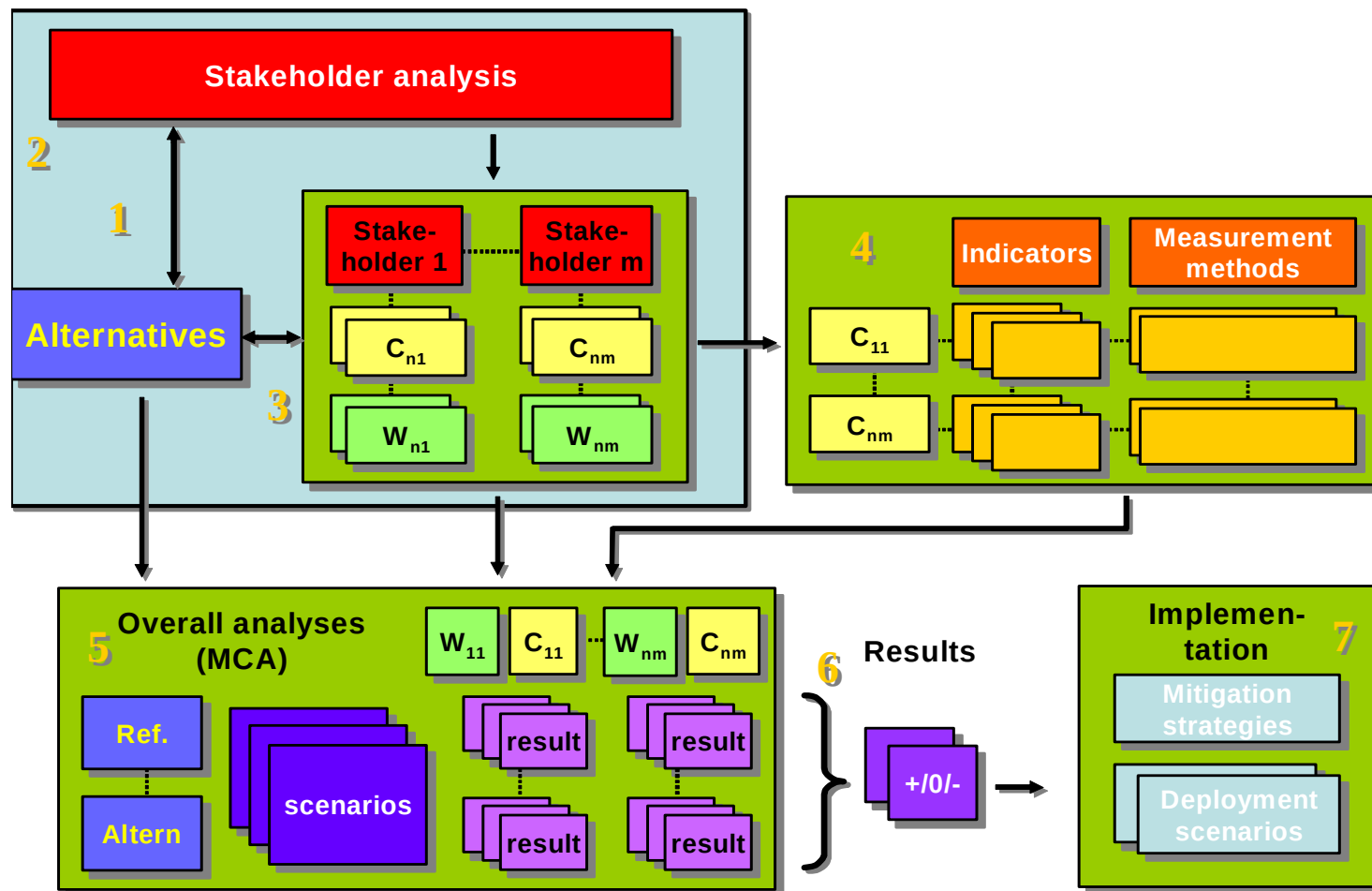
MAMCA Lausanne

Transport projects

- Multi actor: different stakeholders
- Multi criteria: different criteria, often difficult to monetarize

 MAMCA

MAMCA (Macharis, 2000 en 2004)



Evaluation instruments

Private cost-benefit analysis (CBA):

- Point of view of one single actor

Cost-effectiveness analysis (CEA):

- Uni-criterion, Uni-actor (government)

Economic-effects analysis (EEA):

- Uni-actor (government), a few criteria:
employment, added value and fiscal revenue

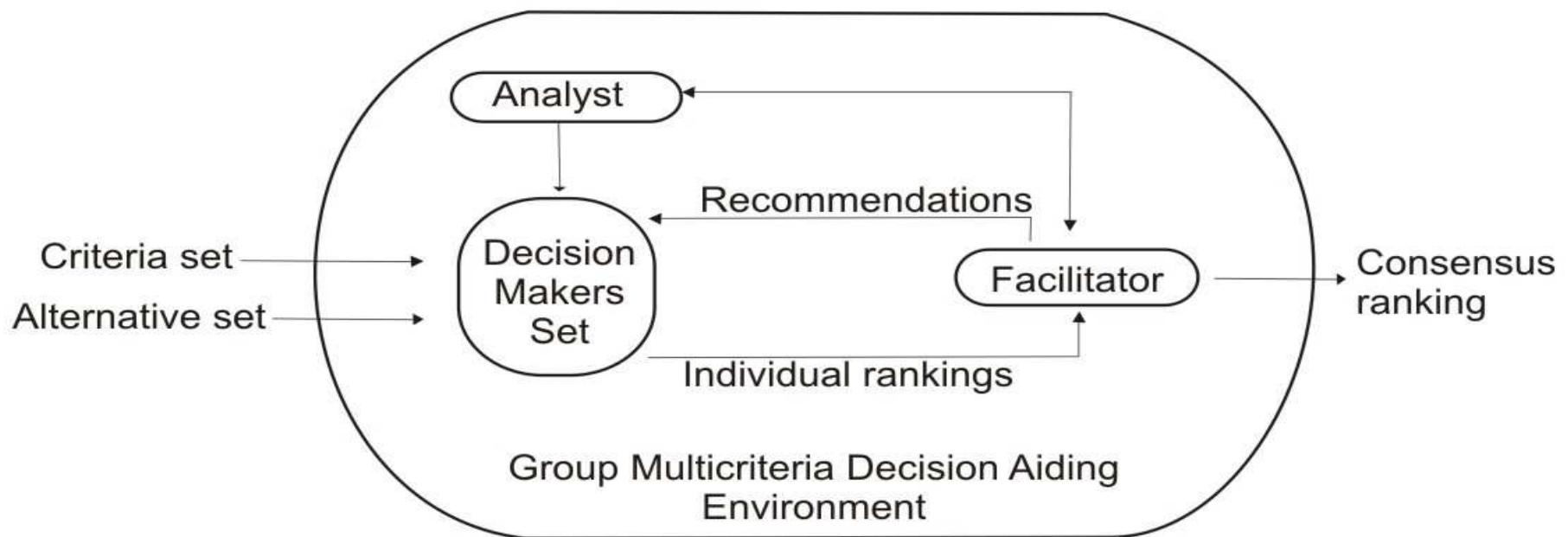
Social cost-benefit analysis (SCBA)

- Multi-actor, multi-criteria possible, but...

Multi criteria analysis (MCA)

- GDSS?, multi-criteria

Consensus reaching process in GMCDA



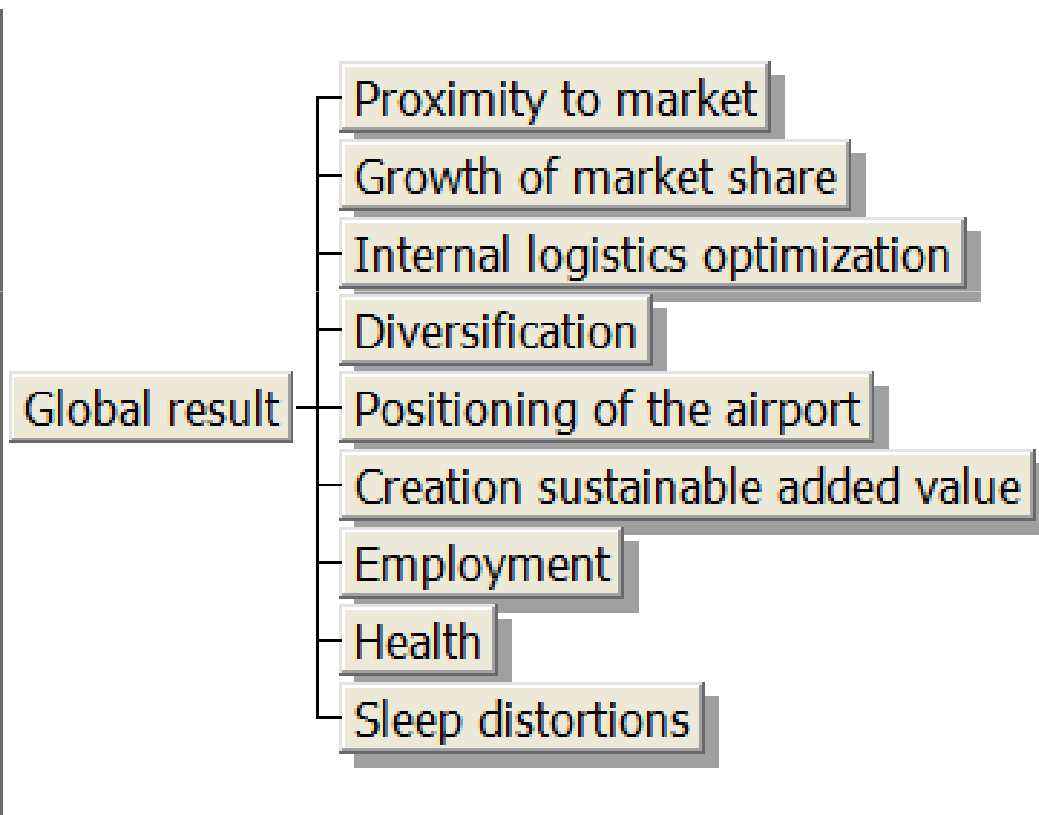
Source: Juan Carlos Leyva López, 2010

GMCDA: Chronological listing

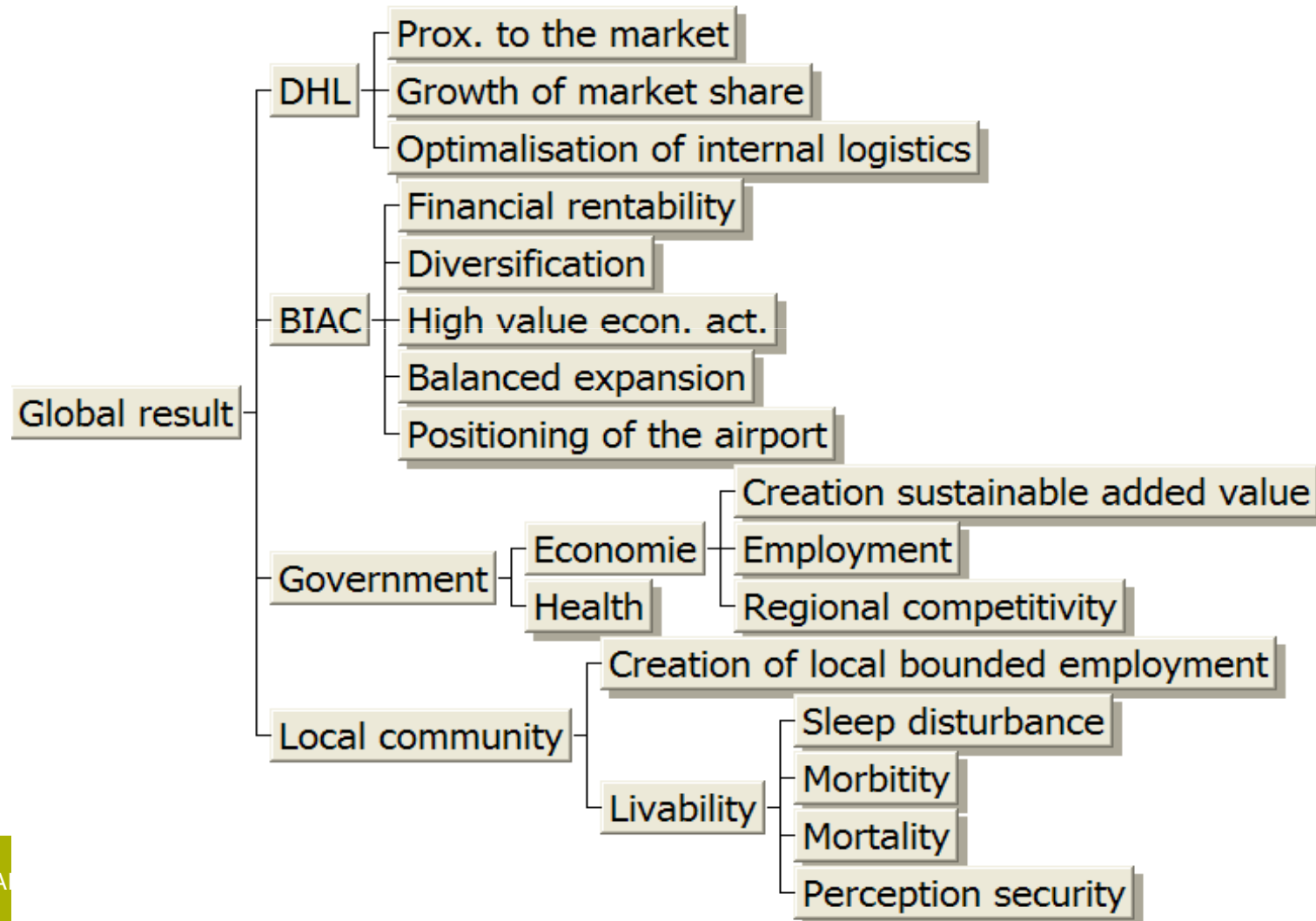
Author	MCGDSS
(Saaty, 1980)	Team Expert Choice system with AHP
Buik y Jarke (1986)	Co-oP
Dennis et al. (1988)	PLEXSYS
Nunamaker et al. (1991)	GROUPSYSTEMS
Carlsson et al. (1992)	ALICIA Y SEBASTIAN
Colson y Mareschal (1994)	JUDGES
Csaki et al. (1995)	WINGDSS
Macharis et al. (1998)	PROMETHEE
Etc.	

Source: Juan Carlos Leyva López, 2010

One value tree



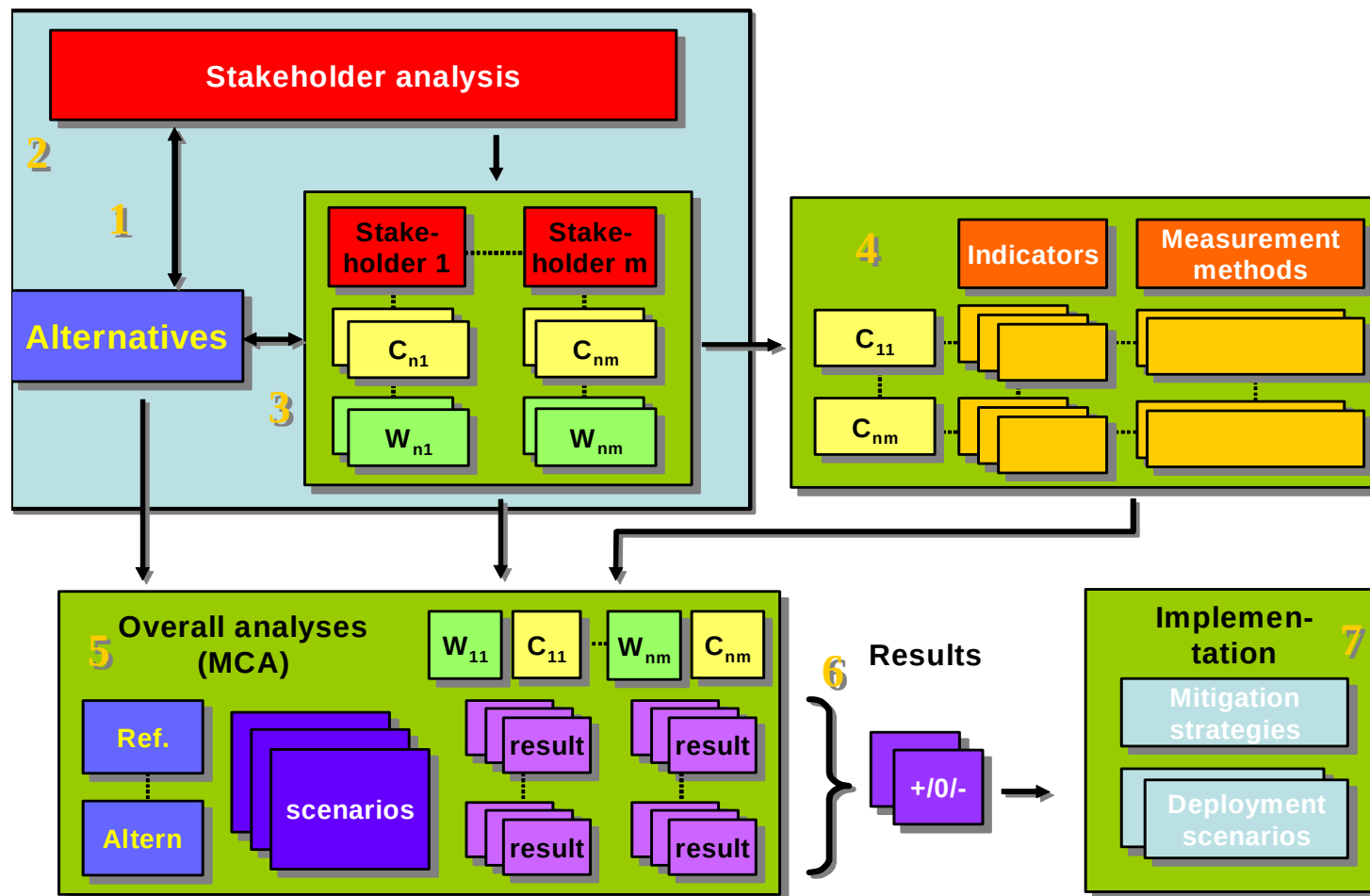
For each actor a value tree



Classification GMCDA

	One value tree	For each actor a value tree
business	Most of the applications and methods	
social	SEA, SMCA	MAMCA

MAMCA (Macharis, 2000 en 2004)



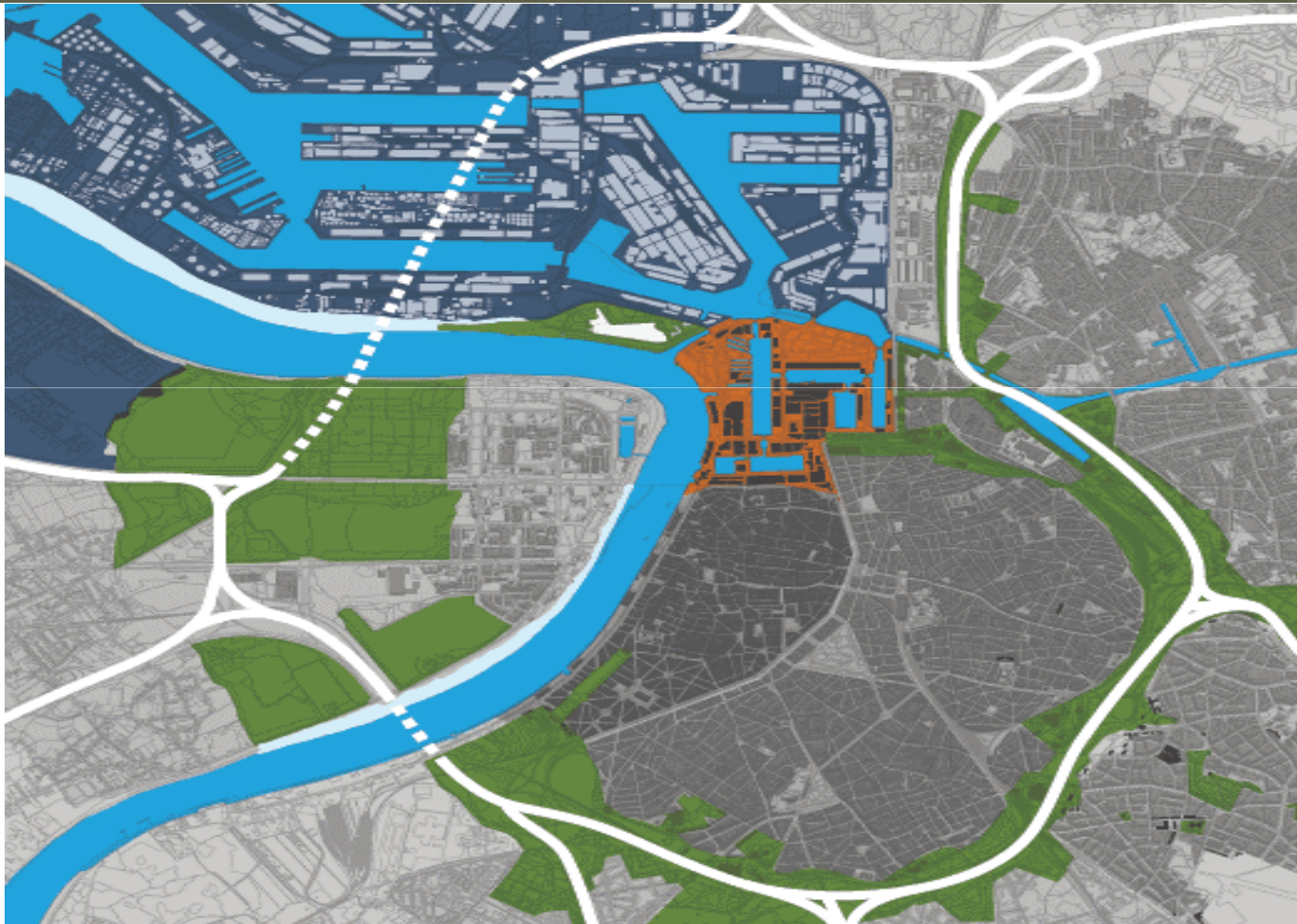
Case : The Oosterweel connection(Januarius & Macharis, 2010)



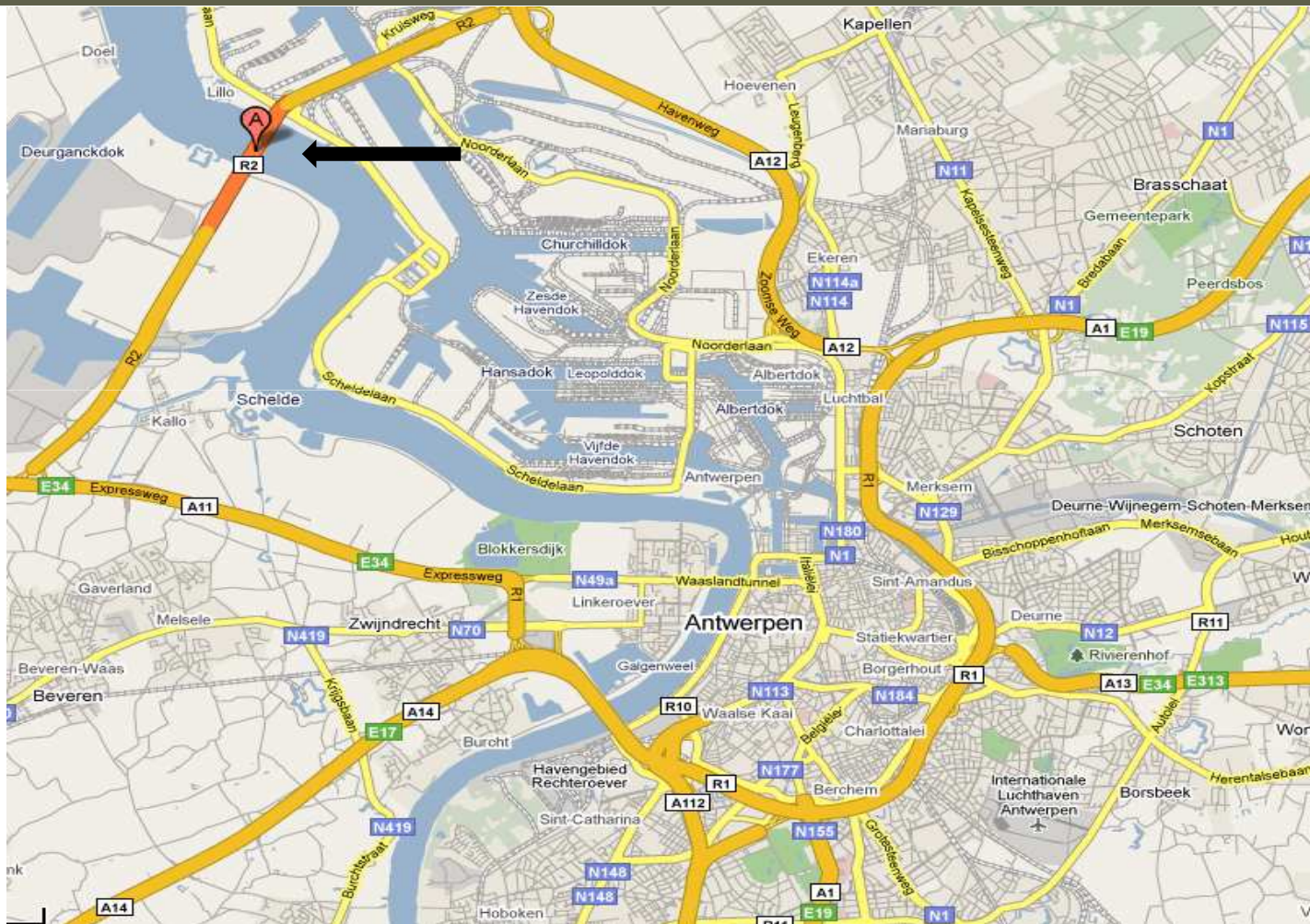
Step 1: Alternative 1



Step 1: Alternative 2



Step 1: Alternative 3



Step 1: Alternative 4



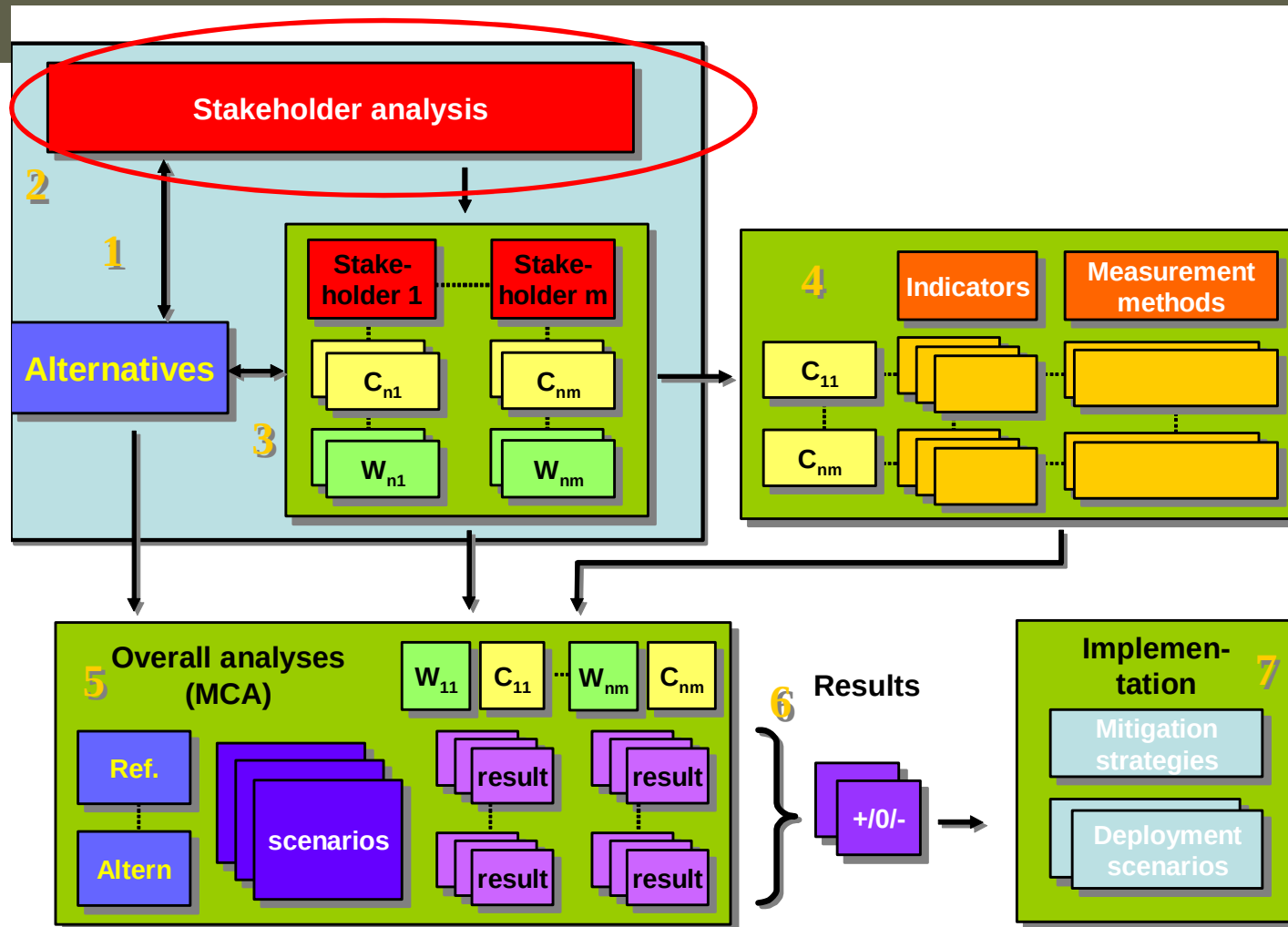
Step 1: Alternative 5



Step 1: Alternatives

- BAM route
 - Tunnel + bridge
- AS route
 - Tunnel
- Liefkenshoek Tunnel
 - Optimization of the current infrastructure
- Kennedy Tunnel
 - Optimization of Road taxes
- Going Concern
 - Benchmark

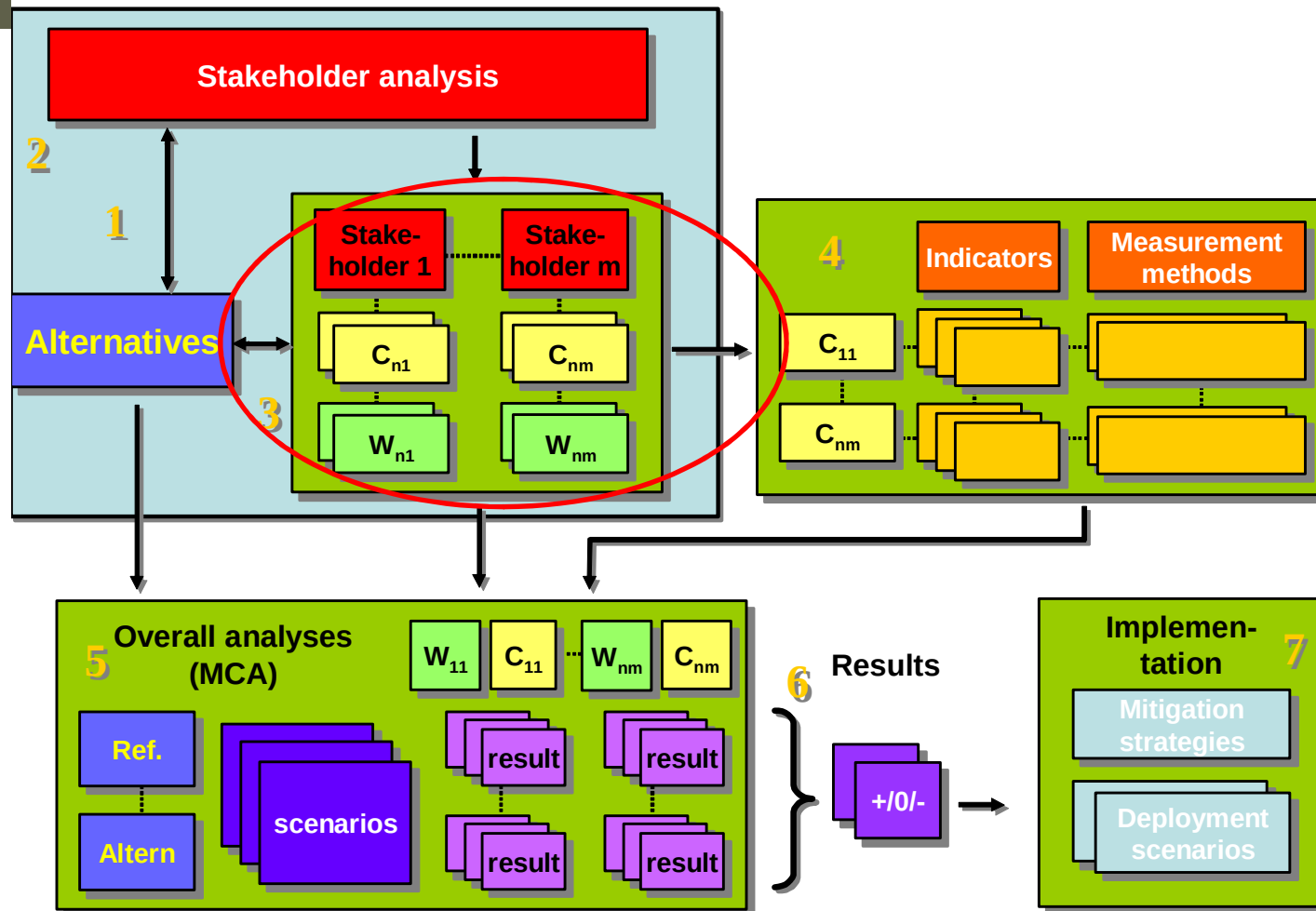
MAMCA

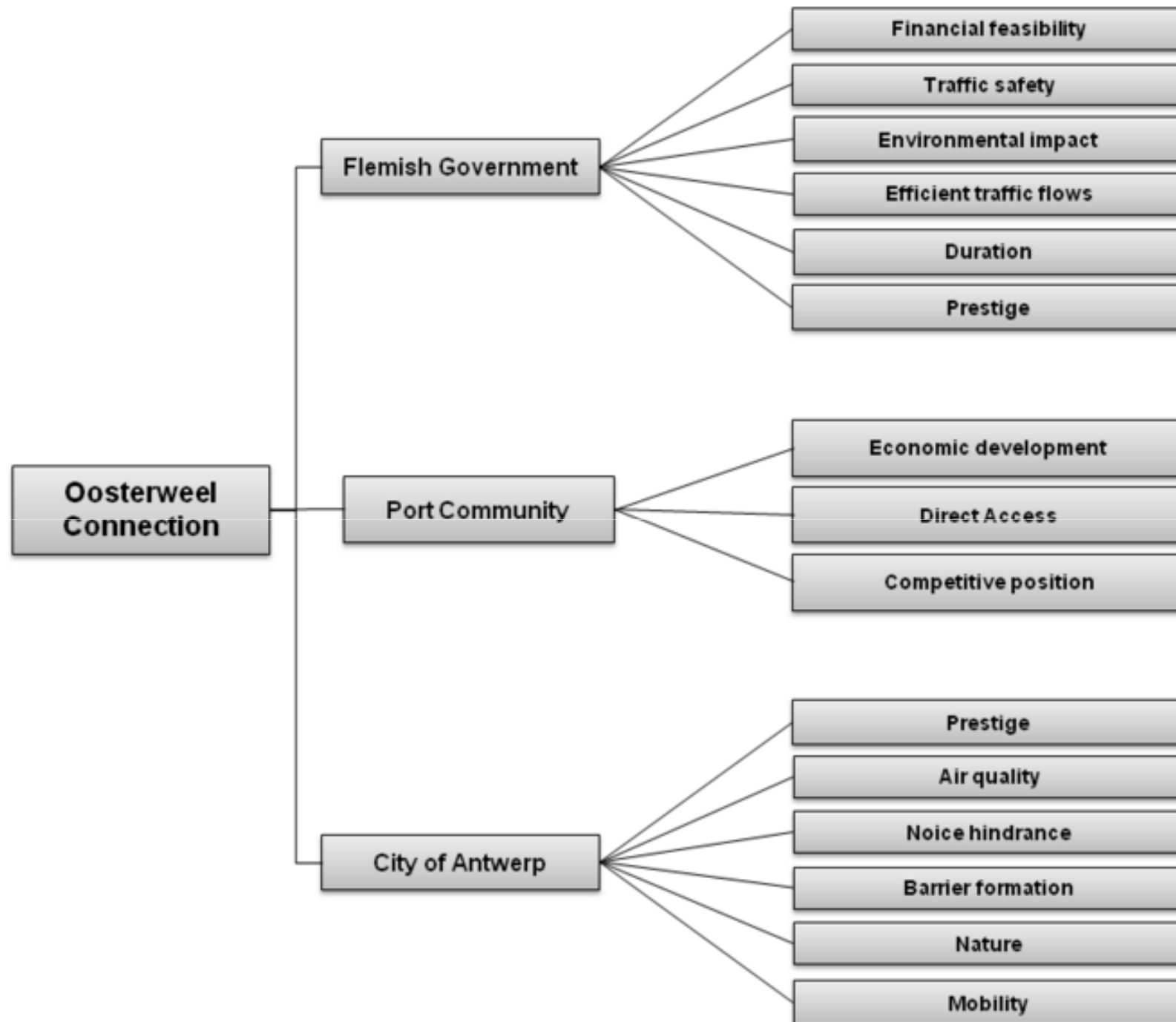


Step 2: Stakeholders

- Flemish Government
- Citizens of Antwerp
- Port community

MAMCA





Step 3: Allocation of weights

Task: Consider "the feedstock producers".

- Which of the two objectives displayed, "Income from crop cultivation" and "Sustainable agriculture", is more important with respect to "the feedstock producers"?

Income from crop cultivation

Yearly income (revenue minus costs)

the feedstock producers

Extremely Very strongly Strongly Moderately Equal Moderately Strongly Very strongly Extremely

Erase Judgment

Comment

Sustainable agriculture

Cultivating the crops without depleting the resources or polluting (soil, air, water quality conservation, pesticides, water use, bio-diversity, carbon stock)

Navigation Box

Steps: 1 2 3 4 5 6 7 8 9 Evaluated: 6/6

☐ Auto advance

Next Unassessed

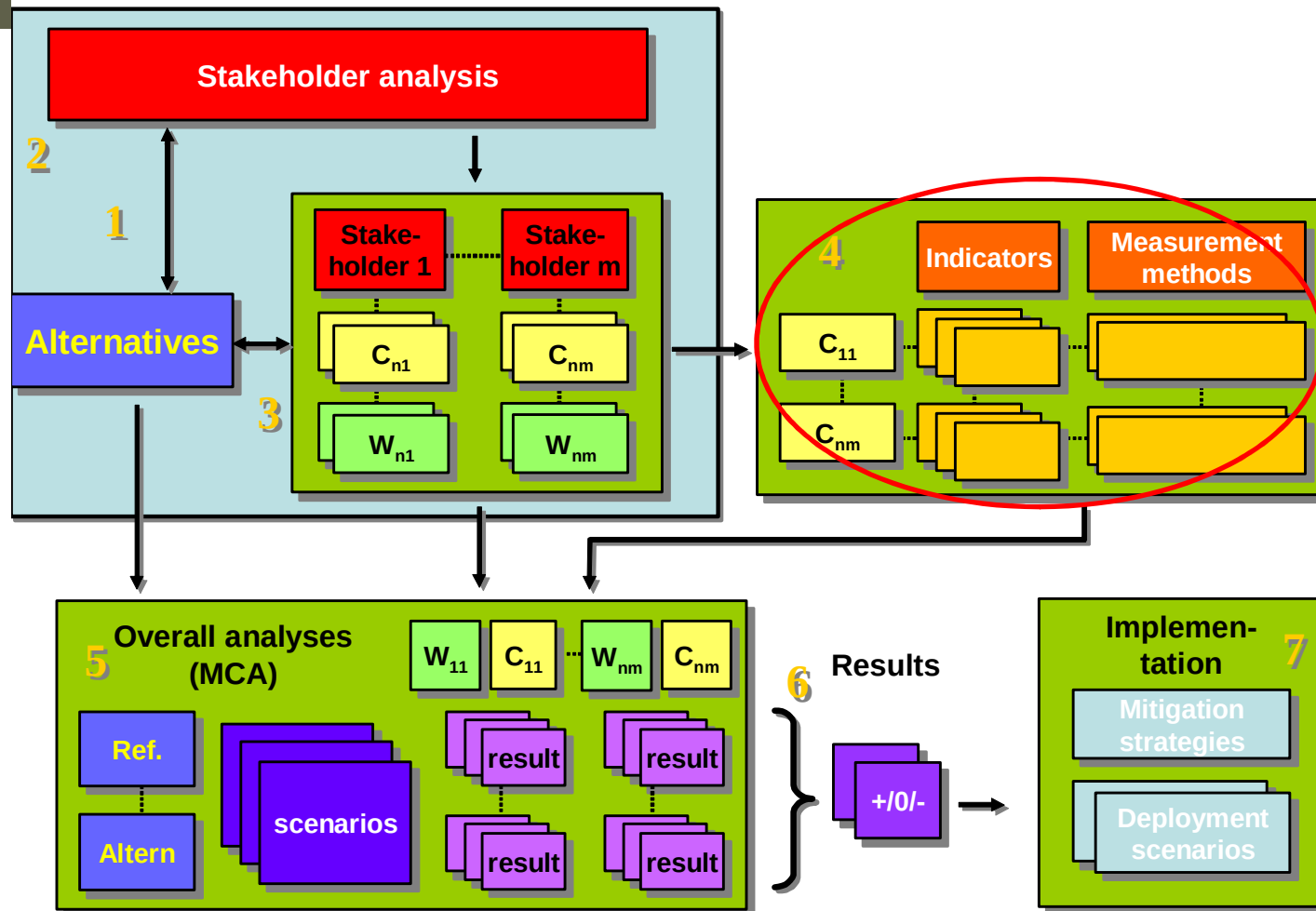
Previous

Next

Step 3: Criteria & weights

- Flemish Government
 - Financial feasibility (**35%**)
 - Environmental impact (**10%**)
 - Efficiency traffic flows (**35%**)
 - Traffic safety (**10%**)
 - Duration (**10%**)
- City of Antwerp
 - Air quality (**20%**)
 - Mobility (**15%**)
 - Noise effects (**20%**)
 - Barrier formation & visual hindrance (**27.5%**)
 - Nature (**20.5%**)
- Port community
 - Economic development (**32.5%**)
 - Direct access (**27.5%**)
 - Competitive position (**40%**)

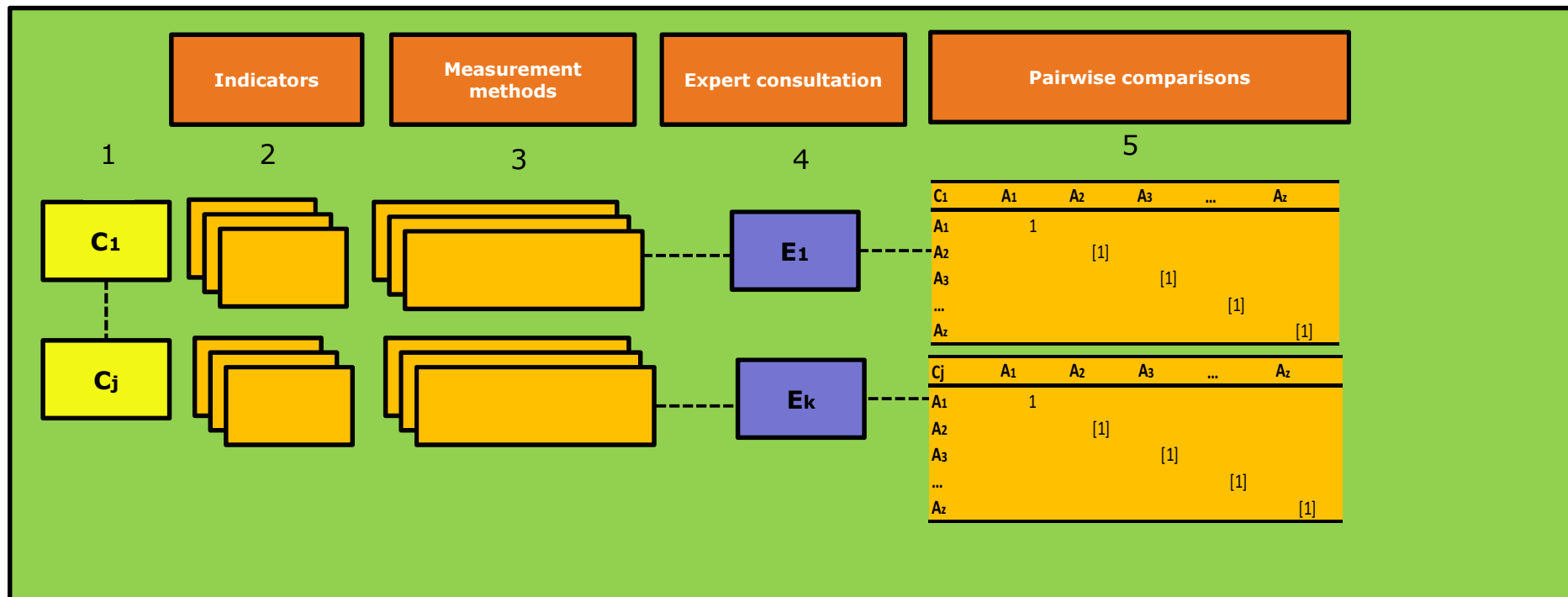
MAMCA



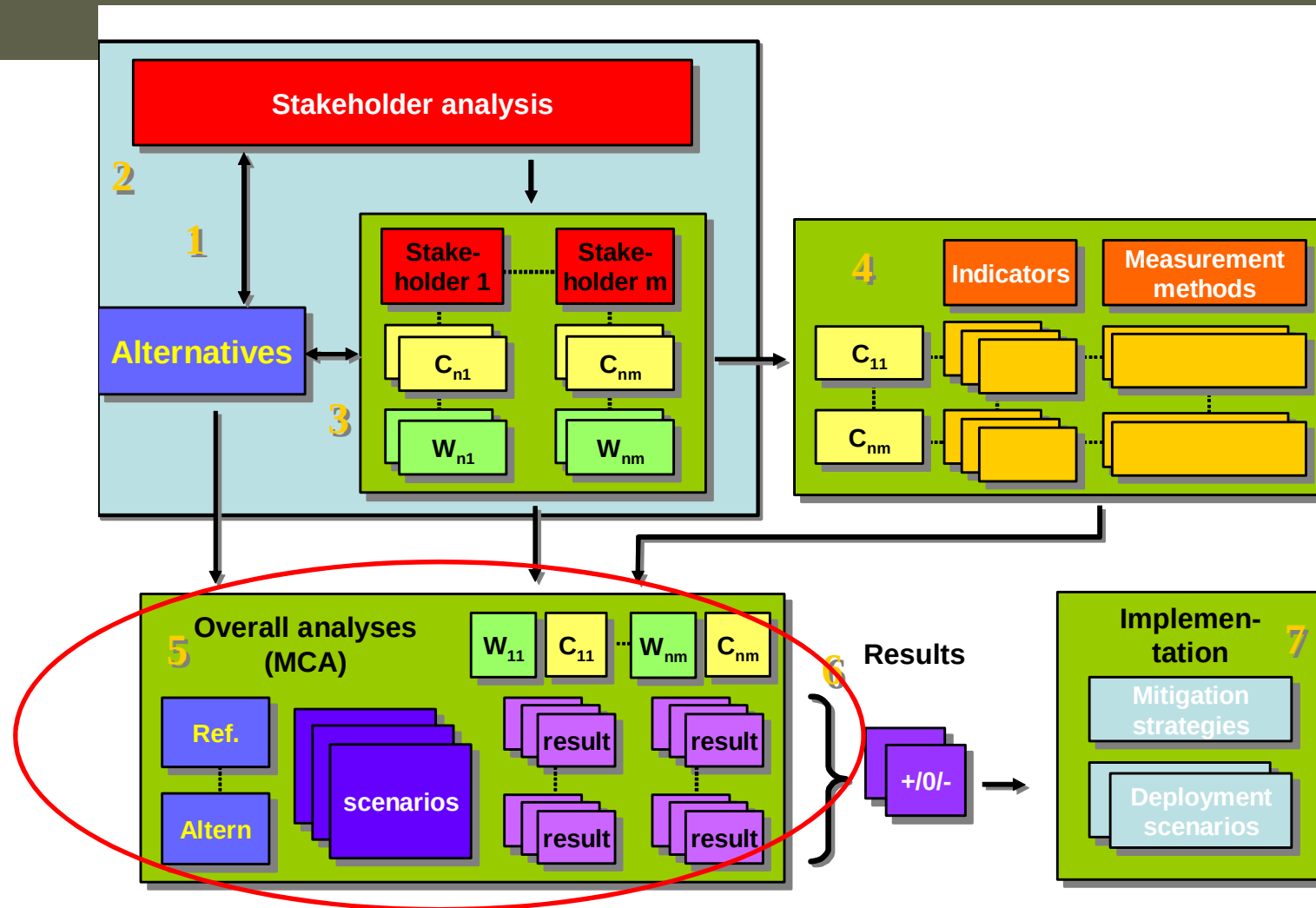
Step 4: Indicators

Table 1. Indicator(s) per criterion	
Criterion	Indicator(s)
Construction firms	
<i>Profitability</i>	Money, percentage
<i>Experience & Knowhow</i>	Ordinal scale
<i>Building and exploitation risk</i>	Money, share (in %)
<i>Job certainty</i>	Ordinal scale
<i>Duration</i>	Time
Flemish Government	
<i>Financial feasibility</i>	Money, IRR
<i>Environmental impact</i>	Particulates (PM2,5), NO _x , decibel
<i>Efficiency traffic flows</i>	Passenger car equivalent, time gains, vehicle kilometers, traffic intensity
<i>Traffic safety</i>	Accidents with personal injuries per year, money, traffic intensity
<i>Duration</i>	Time
Barrier formation and visual hindrance	Height, integration in the city image
<i>Air quality</i>	Particulates (PM2,5), NO _x
<i>Noise</i>	Passenger car equivalent, time gains, vehicle kilometers, traffic intensity
<i>Noise effects</i>	Decibel
<i>Barrier formation and visual hindrance</i>	Height, integration in the city image
<i>Nature</i>	Hectare
Port community	
<i>Economic development</i>	Capacity, traffic intensity
<i>Direct access</i>	Number of vehicles per time unit, passenger car equivalent, traffic intensity
<i>Competitive position</i>	Time gains, vehicle kilometers, money

Step 4-5: Indicators & ranking



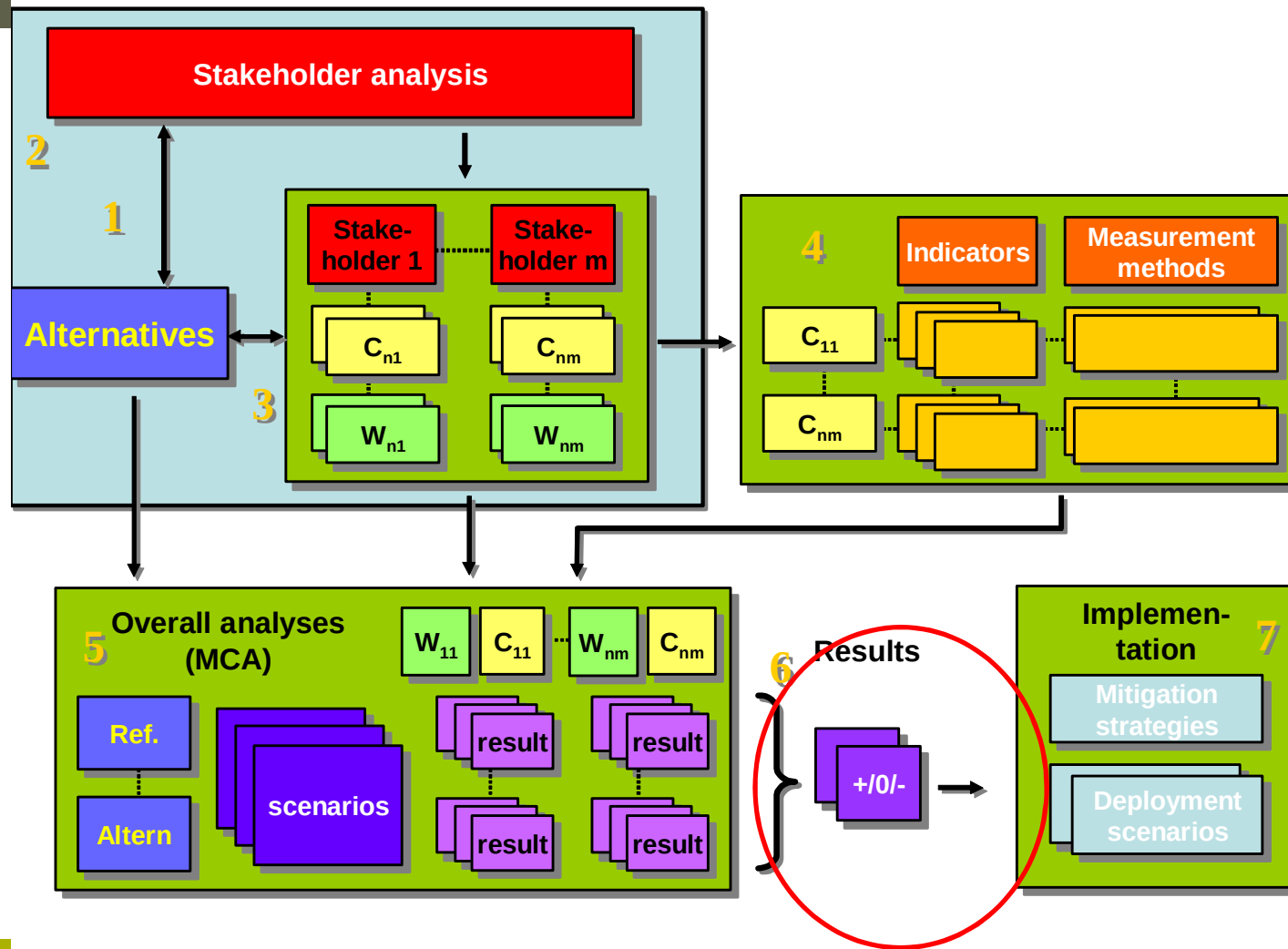
MAMCA



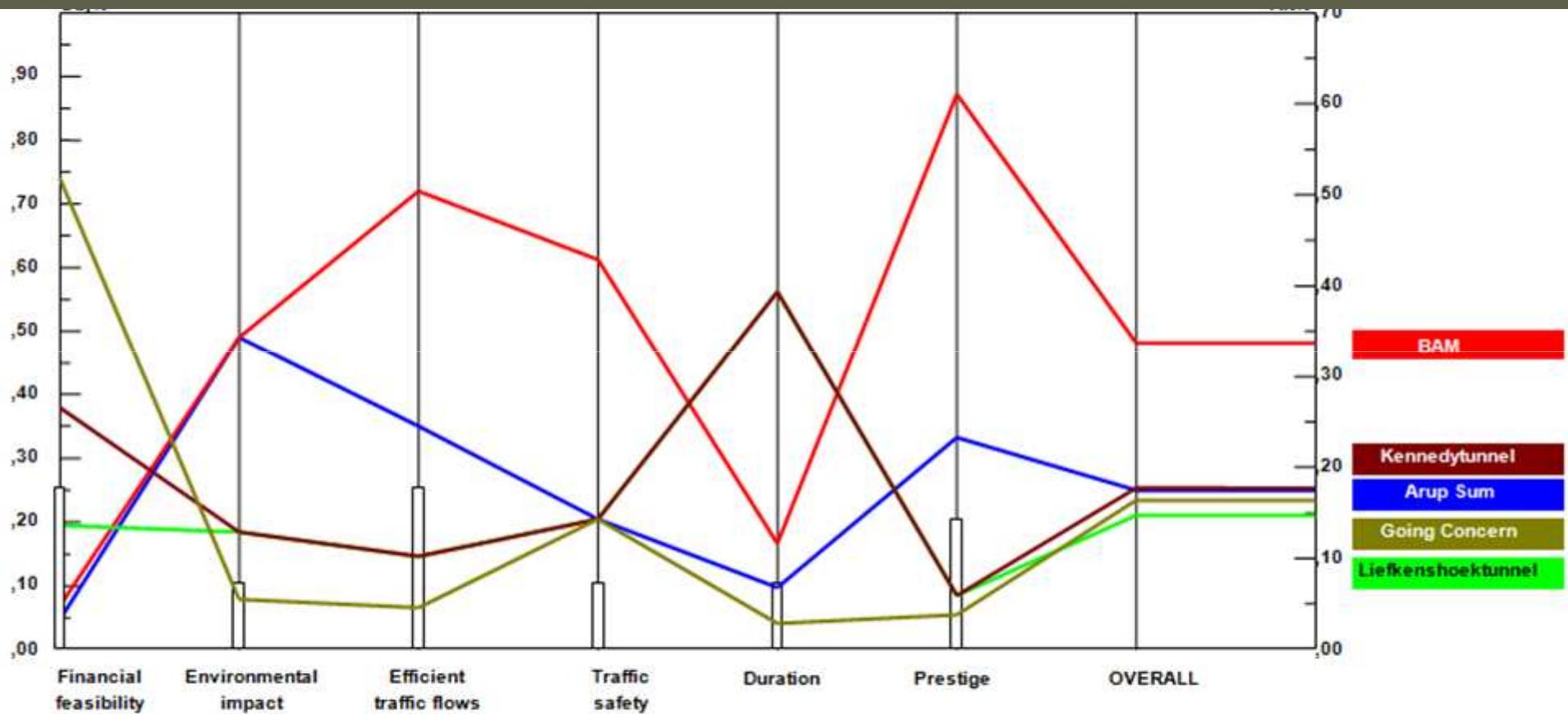
Step 5: Analysis & ranking

- Pairwise comparisons: AHP
- Decision support software: Expert Choice
- Analysis per stakeholder
- Multi – actor view

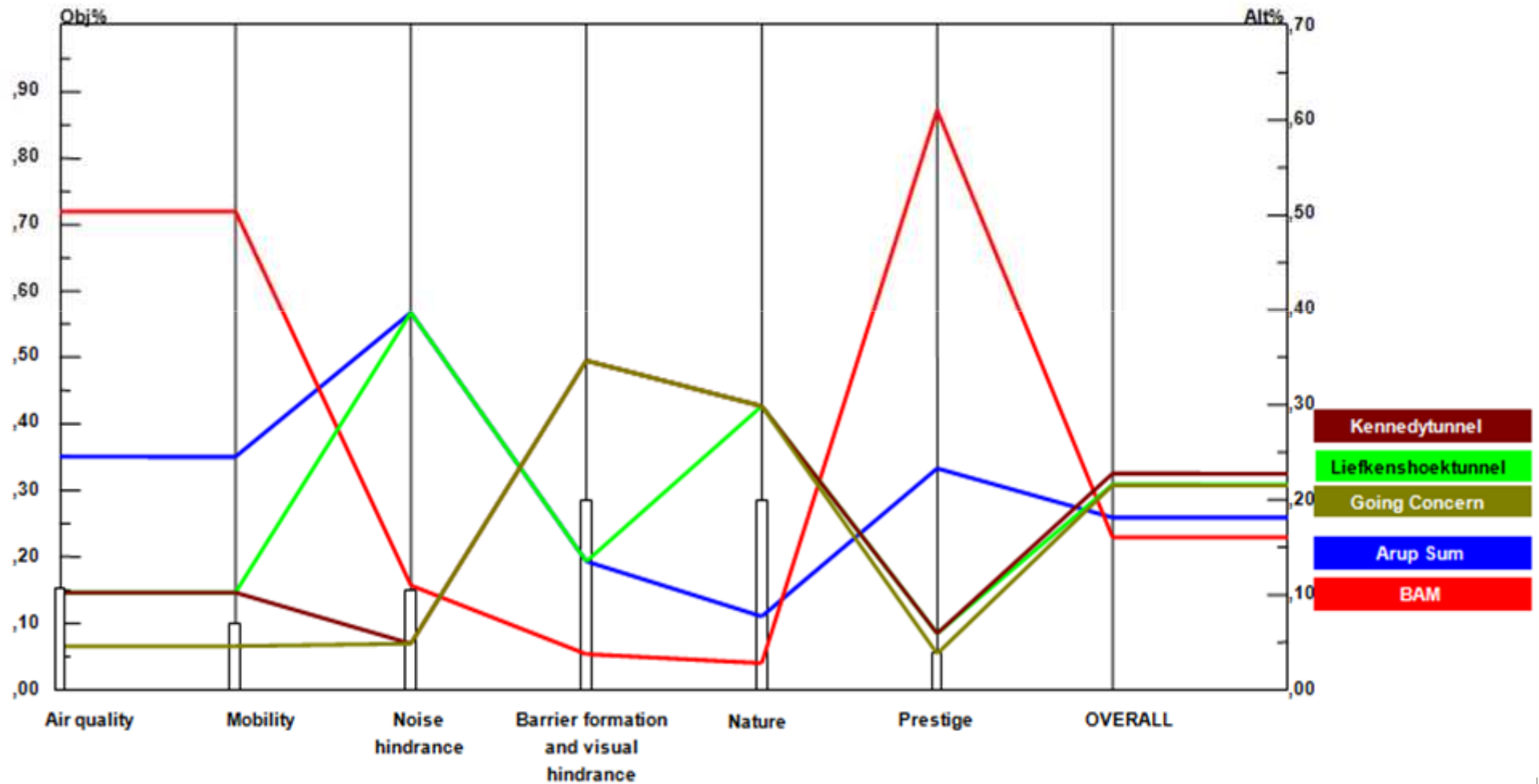
MAMCA



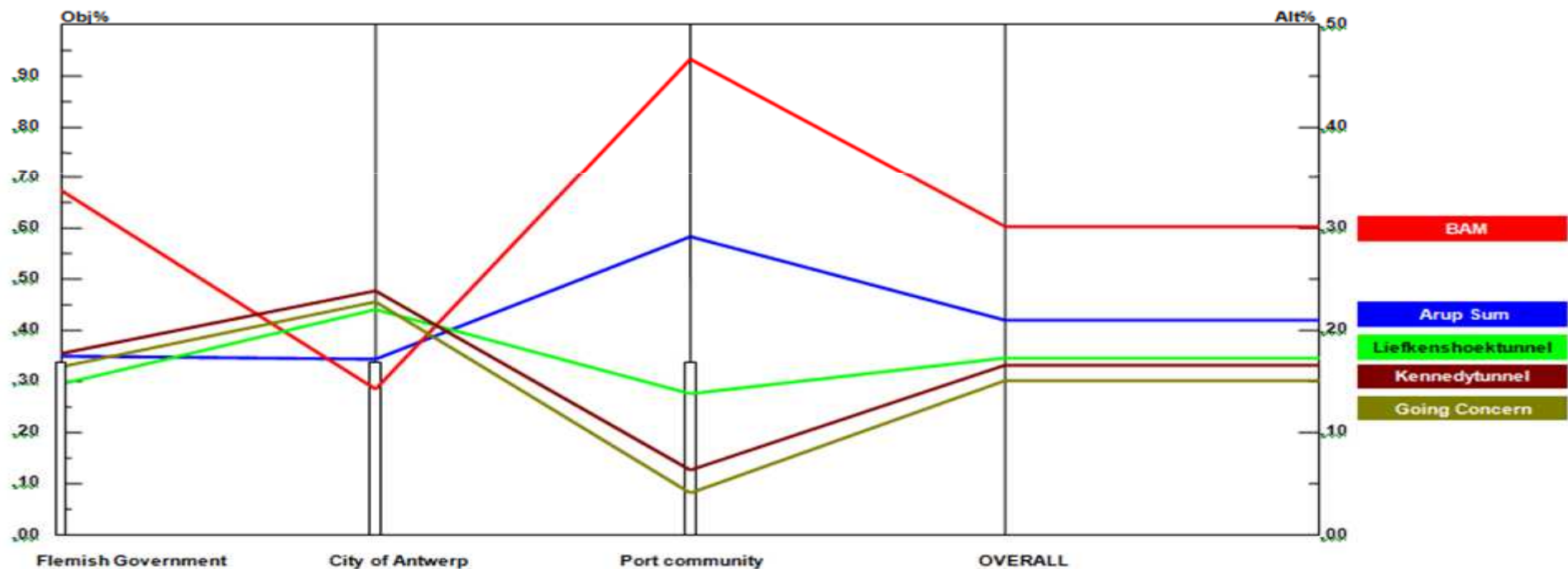
Step 6: Flemish Government



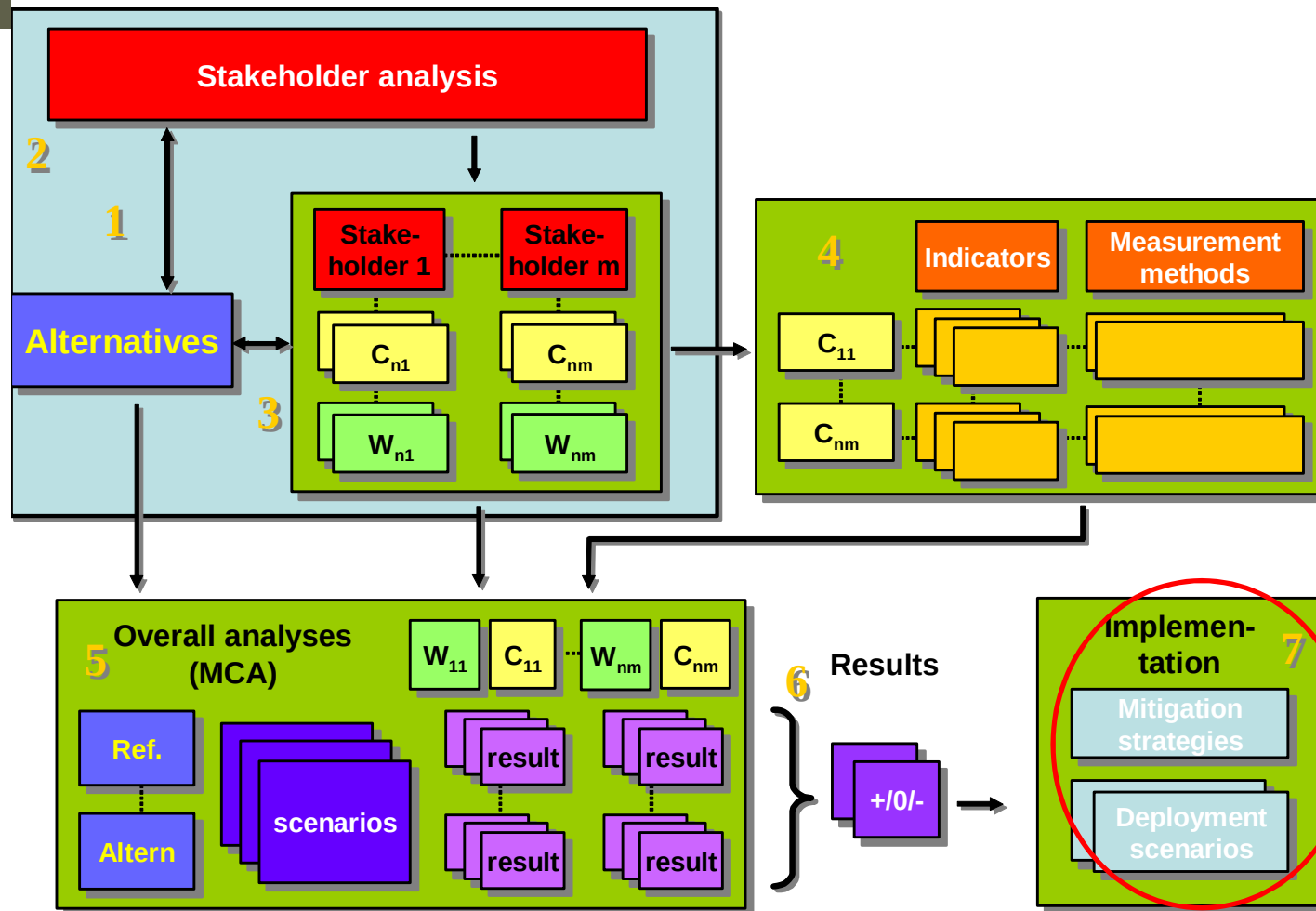
Step 6: City of Antwerp



Step 6: Multi – actor view



MAMCA



Step 7: Implementation

Point of view of each stakeholder



Identification of adequate policy measures to facilitate the introduction of the chosen alternative

Applications

- Intermodal terminal location decision problem
 - (Macharis, 2000)
- Waste transport alternatives in the Brussels region
 - (Macharis & Boel, 2004)
- Location choices of a new high speed train terminal
 - (Macharis, & Dooms, 2004)
- DHL's hub strategy at Brussels airport
 - (Dooms & Macharis, 2005)
- The evaluation of different night distribution scenarios
 - (WCTR 2010)
- Flanders in Action Process: logistics and mobility
 - (Macharis, De Witte & Turcksin, **Journal of Transport Policy**, 2010)
- Spatial Data Infrastructure scenario's
 - (Geudens, Januarius, Macharis, 2010)
- Environmental vehicles (Lebeau et al., 2010)
- Biofuels (Turcksin et al., 2010)

Overall conclusions

- The MAMCA offers an extra dimension to the evaluation process
- Tool for policy makers to evaluate complex projects
- Stakeholder involvement will become more and more important in the future

References

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Thank you for your attention!



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