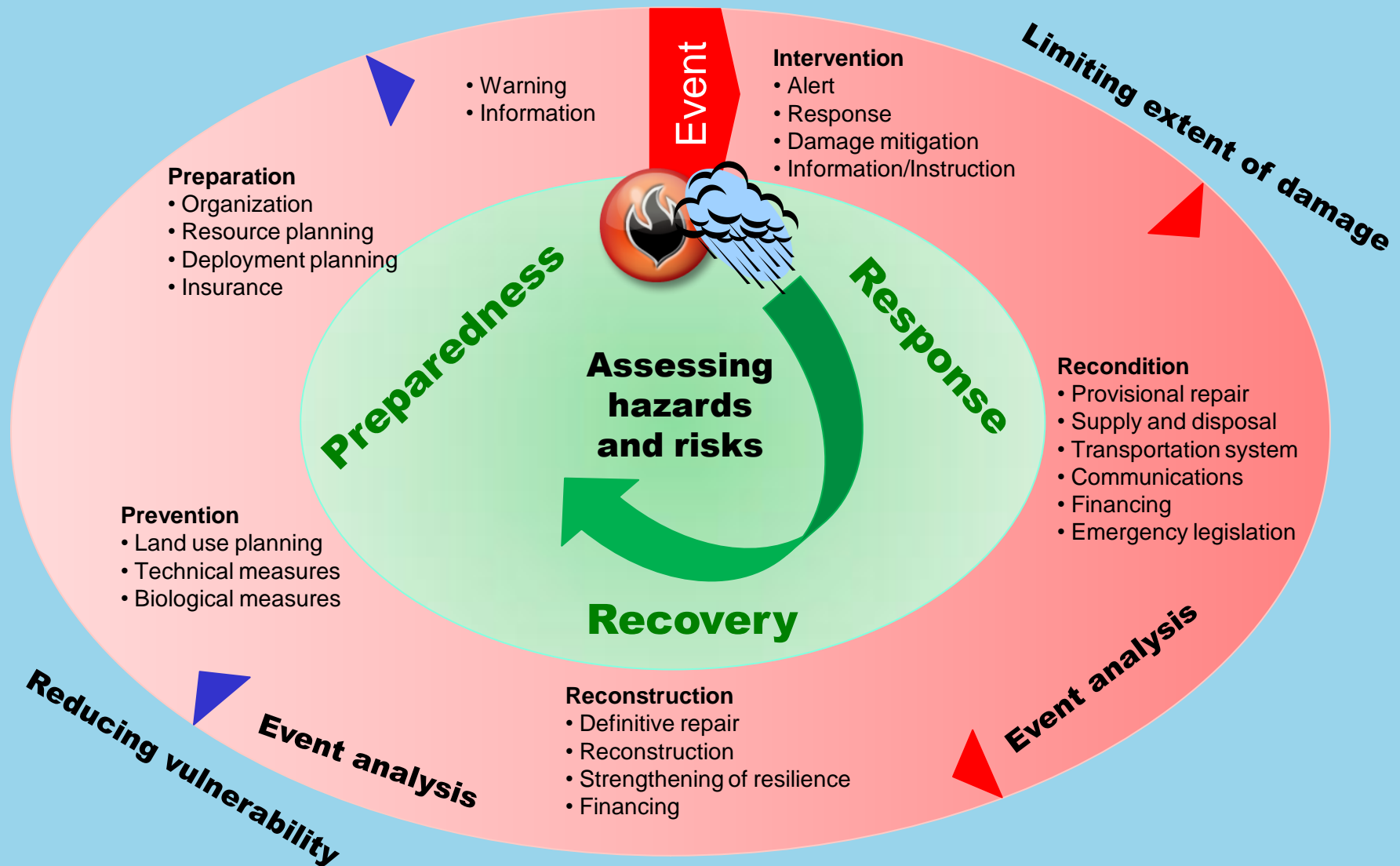


Organizational Decision Making in Crisis Management

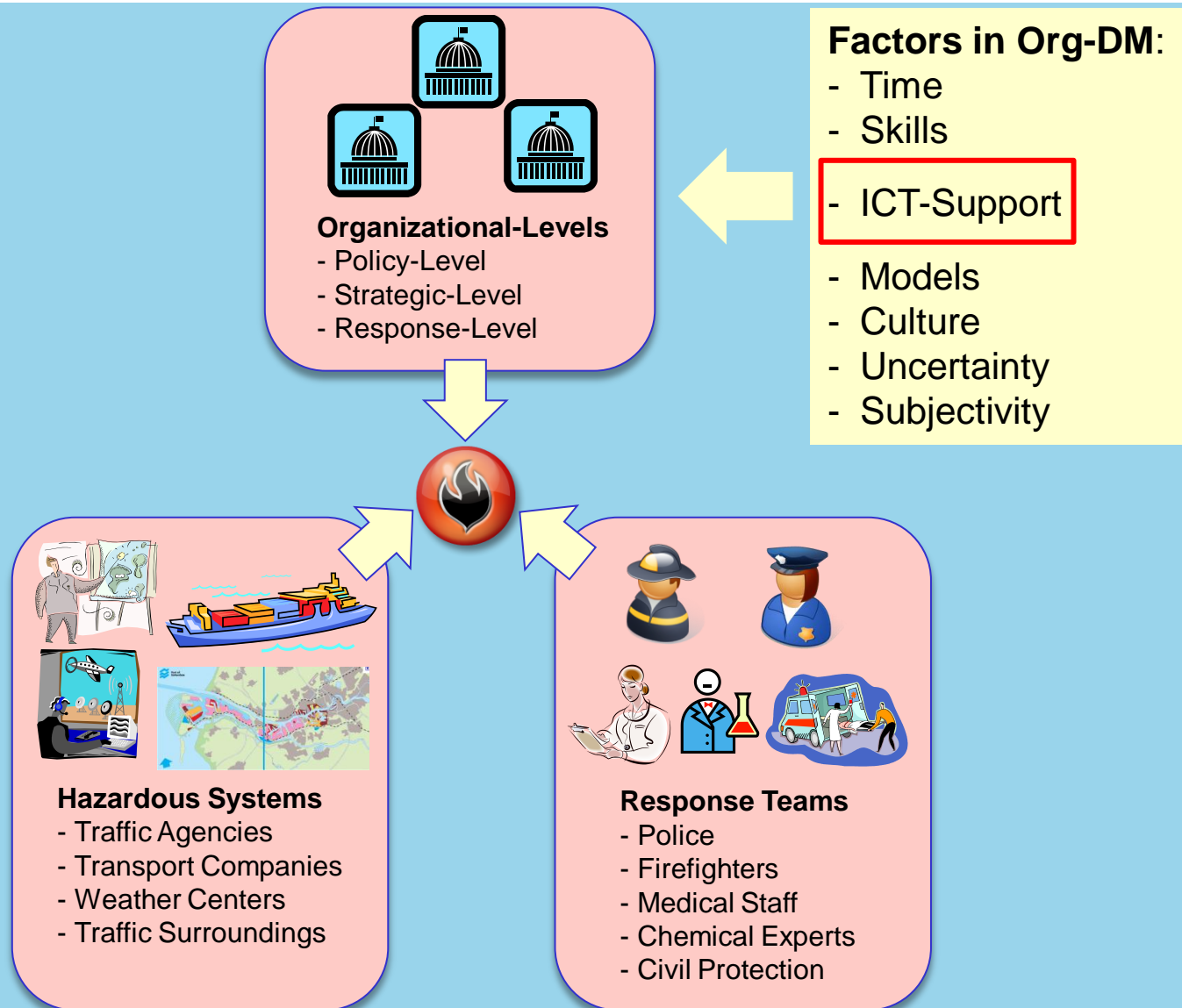
Workshop on: Organizing Emergency Management strategies for the transport sector with the use of innovative IT systems

Prof. Dr. Giampiero Beroggi, Statistical Office Canton Zürich, Feb-28-2011, EC, Brussels

Cycle of Integrated Risk Management



Organizations in EM



“Organizational effectiveness does not lie in that narrow minded concept called rationality. It lies in the blend of clearheaded logic and powerful intuition.”

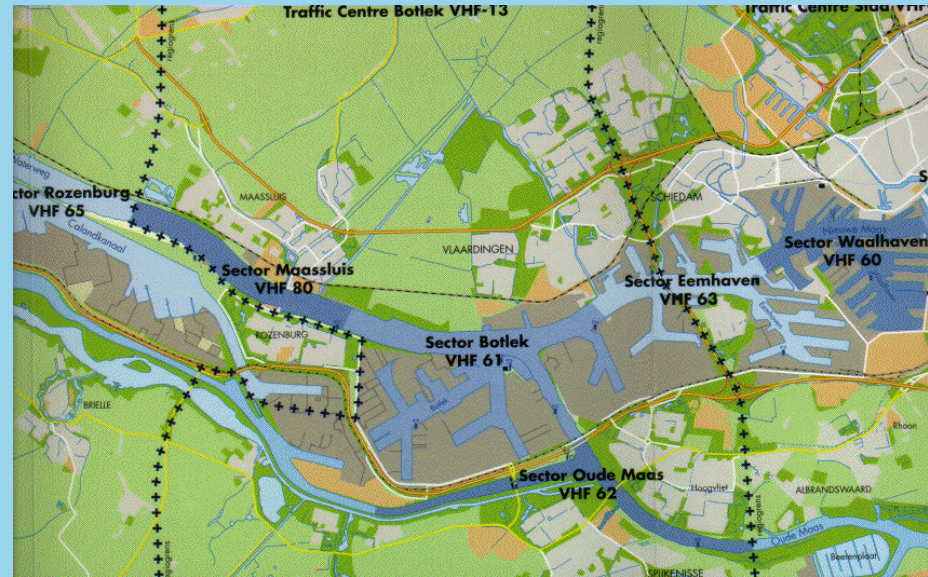
Henry Mintzberg

Case 1: Organizations at the Response Level

Standard Operating Procedures vs. Improvisation

Emergency Management at Ports

- Ports extend over several miles, cover large inhabited areas and stretch over multiple local authorities.
- Hazards are activities with hazardous materials, traffic accidents, storm surges, and subsequent hazards.
- Ports have standing response units and well defined C3 rules.
- Technical units interact with civil authorities and non-port related activities in the port.
- Safety planning can be in conflict with spatial planning.
- Port activities are tradeoffs between risk and benefit.



Port of Rotterdam:

- one of largest cargo/container ports
- up to 40 km long
- hazard area of over 600 km²
- about one million people
- 5000 field and command personnel,
- command Incident Place (CIP) for EM

The Organizations at the Response Level

- Police Department (PD), Fire Department (FD), Chemical Advisor (CA), Medical Officer (MO), and Port Management (PM).
- These organizations have own Standard operating Procedures (SOP) and differ significantly in culture.
- During EM, they gather at the Command Center at the Scene (CCAS).
- They might know what to do for their organization but not how to interact and coordinate.
- They must regularly train inter-organizational EM.
- How can they be supported in using concepts of improvisation to complement their SOP?

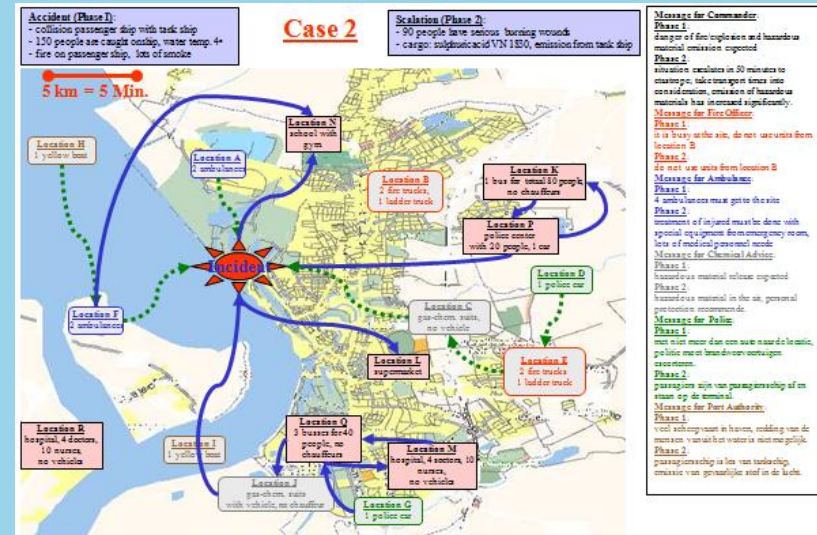


Organizations differ with respect to:

- SOP
- Support means
- Culture
- Communication
- Hierarchical structure

The Models and Support Systems

- Study typical organizations which use improvisation as their main model: e.g., jazz musicians!
- Derive rules for improvisation and inter-organizational roles of teams.
- Formalize rules for EM organizations.
- Implement them into group decision support system (GDSS).
- Result: EMPROV (EM improviser).
- Define relation between SOP and EMPROV.
- Formalize roles of organizations and communications with EMPROV.
- Test EMPROV in trainings using gaming.



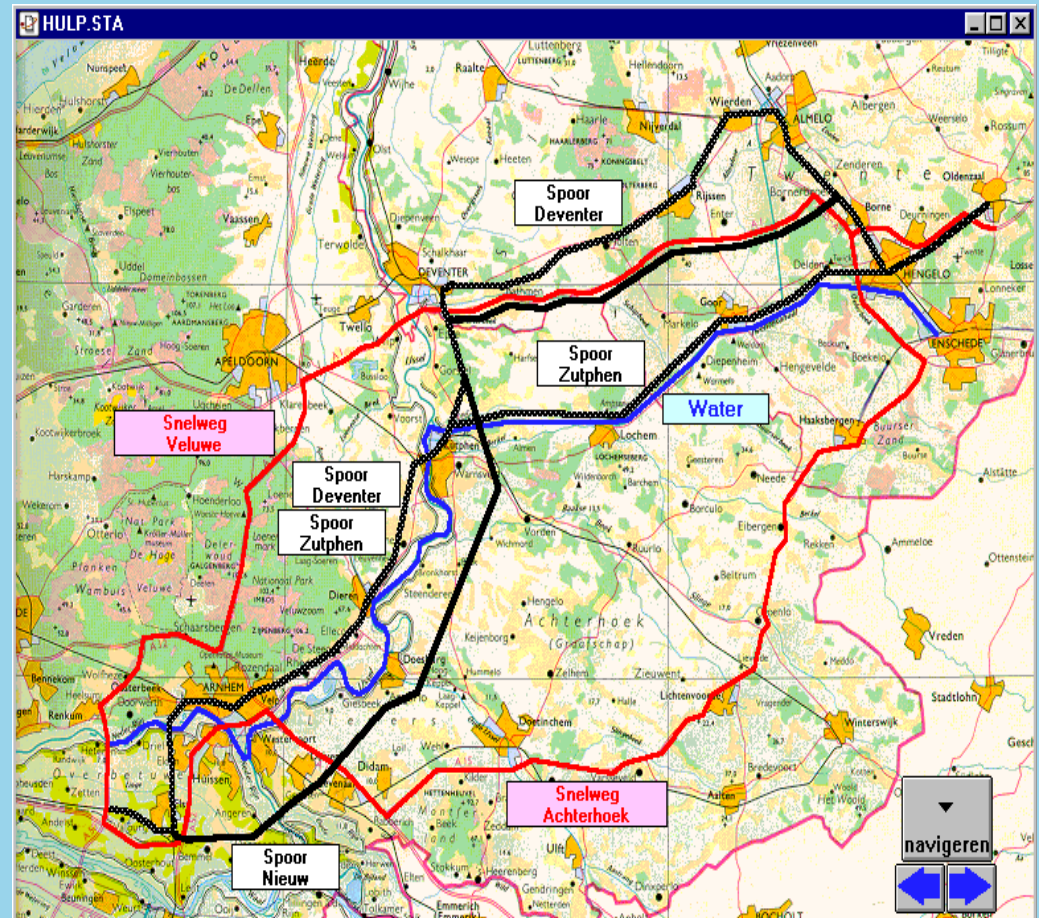
Key Points for Response Level

- Standard operating procedures can be counter productive in inter-organizational settings.
- CCAS have restricted information and communication means to their organizations at the scene.
- CCAS have little decision support in communications and decision making.
- Using improvisation to deviate from SOP must be well defined and trained.
- Improvisation is difficult to formalize, unlike SOP.
- Improvisation must be part of mental simulation.
- Improvisation must be part of an organization's culture and requires trust across organizations.
- Improvisation support:
 - can replace commander
 - speeds up decisions
 - stimulates teamwork
- Legal issues must be addressed prior to deviating from SOP.

Case 2: Organizations at the Strategic Level Consensus Reaching among Safety Experts

Emergency Management along Transportation Routes

- Transportation planning decisions in densely populated areas with high exposure to natural hazards require special attention to safety.
- Safety aspects are usually treated with lower priority in the planning process.
- Safety experts want to strengthen their position by finding consensus vote.
- Willingness to accept consensus result is present.



The Organizations at the Strategic Level

- Participative safety planning across organization with Vroom–Yetton model (Daniels et al., 1996).
- Public involvement must be considered to different degrees in the decision making process depending on: (1) quality requirements, (2) amount of available information, (3) structure of the problem, (4) expected public acceptance, (5) decision competence of the Ministry of Transport, (6) goals, and (7) expected conflict.
- The issues refer to fairness, discourse techniques, problems of legitimization, citizen juries, regulatory negotiation, environmental mediation, voluntary hazard acceptance and compensation, and direct participation.



Decision Makers:

- Fire Brigade
- Spatial Planning
- Infrastructure Planning
- Envir. Planning

Indicators:

- Response Time
- Response Needs
- Risks
- Life Quality
- Costs

Various Strategies to overcome Cross-Organizational Differences in Preferences

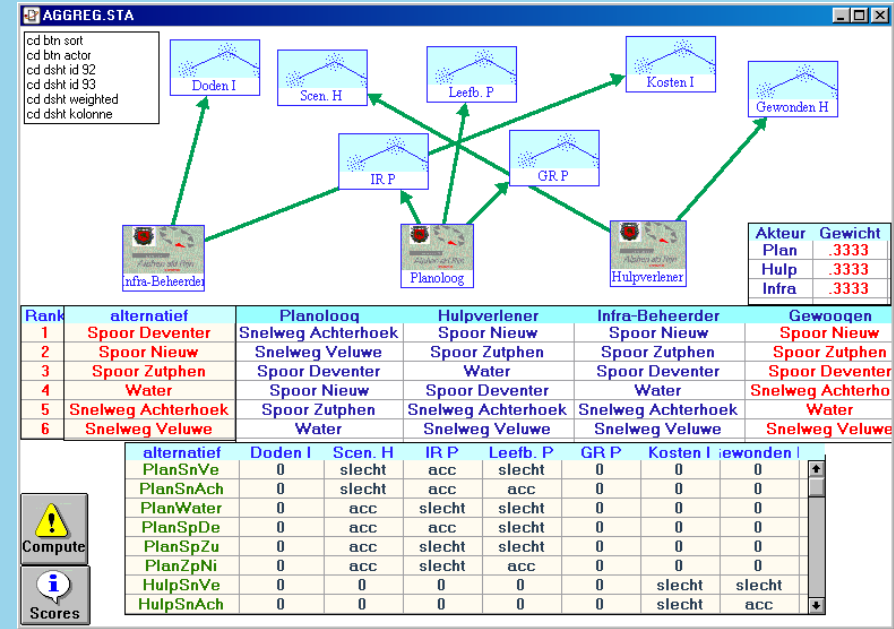
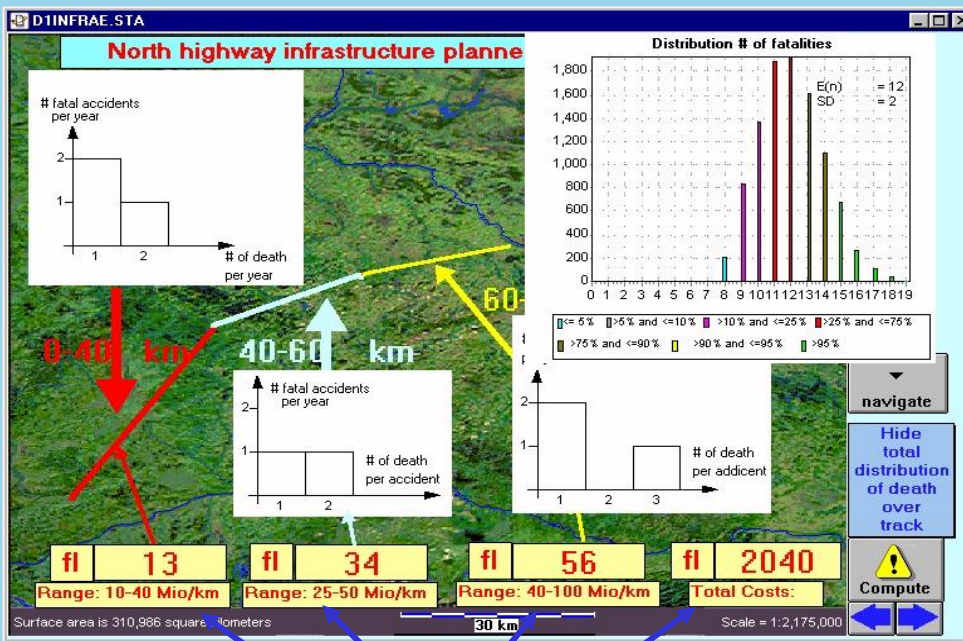
(A) Non-compensatory strategies: where only the order of importance of indicators is adjusted:

1. Each stakeholder determines an order of importance of his/her safety indicators (prioritizing).
2. Each stakeholder evaluates alternative plans using qualitative scores for his/her indicators.
3. The group of stakeholders generates an order of importance of all indicators used by the group of stakeholders (prioritizing).
4. A ranking of alternatives for the group of stakeholders is generated using the results of 2. and 3.
5. Various multi-criteria strategies (basically: different evaluation rules) are employed to generate additional rankings of alternatives, in order to analyze the robustness of the rankings.

(B) Compensatory strategies: where scores of an alternative on an indicator can be compensated by the scores of the same alternative on other indicators:

1. Each stakeholder pairwise assigns importances to all stakeholders (importance).
2. A single weight per stakeholder is calculated (using AHP) based upon the output from (1).
3. A value per alternative per stakeholder is calculated based upon the multiplication of the rank order values of alternatives (assumed to be on an interval scale and obtained in step 2. of the non-compensatory strategy described above) and with the importance per stakeholder (the output from b).
4. A ranking of alternatives for the group of stakeholders is generated based upon the summation of the weighted values per alternative per stakeholder (the output from 3).

The Decision Support Models and Systems



Aggregation of Individual Assessments to Group Assessment and Model Sensitivity Analysis

Assessment and Aggregation Process across Organizations

- Onsite or distributed decision making
- Online or offline communications
- Facilitated or unsupported process
- With different amounts of real-time and simulated data

Key Points for Strategic Level

- Experts should only address aspects of safety for which they are qualified for: e.g., asking a fire brigade officer to include PRA results in his/her preference assessments for alternatives might result in objection or disinterest in the process; instead s/he should be free to choose the safety indicators with which s/he wants to assess the alternatives and for which s/he is an expert.
- Preference aggregation across the experts must be done from different points of view: instead of using just one aggregation method, several methods should be used and the experts should be confronted with the possibly different results.
- The ranking of the alternatives by the group of stakeholders is discussed rather than the rankings of individual stakeholders; it makes less sense to let the group of stakeholders discuss a ranking of an individual stakeholder knowing that this ranking is exclusively based upon that particular stakeholder's safety expertise. Rather, it is more useful to discuss aggregated rankings of the group of stakeholders to find out which alternative plans are from a safety point of view fruitful for further analysis.
- An integral approach comprising multiple safety indicators and stakeholders contributes to a shared view of safety aspects for alternative line infrastructure plans.

Case 3: Organizations at the Policy Level

Exchanging Power and reaching Control-Equilibrium

Emergency Management for Regional Transportation

- Regional planning process has reached dead-lock.
- Many Actors are disputing over multiple issues.
- Willingness to move on is present.
- „Exchange of control” problem is too complex to be solved in a face-to-face setting.



Issues at Stake

1. Environmental protection against noise impact, pollution, and esthetical degradation.
2. Economic sustainability, assuring the longevity of economic investments, financing of project development and maintenance.
3. Social sustainability, assuring that the aspired social status of the area will not change and that the function as region will be maintained.
4. Technological safety, in terms of transportation accidents and structural failures, emergency management.
5. Social safety, with respect to social unrest, violence, theft, aggression, and threats.
6. Attractiveness for living, in terms that the investments of the inhabitants pay off.
7. Attractiveness for businesses, in terms that businesses can benefit from the area and that new businesses get attracted.
8. Attractiveness for tourists, in the sense that they will come to the area.

The Organizations at the Strategic Level

1. Public transportation system.
2. Police Department.
3. Association for small businesses and service providers.
4. Commercial planning organization for the development of the Project.
5. Local Fire Department: in charge of approving construction permits.
6. Local planning authority.
7. Environmental and Spatial Planning Department in charge of functional aspects, such as issuing permits, recreational functions of the new city center and their environmental compatibilities, and the integration of this new endeavor into the local spatial planning objectives.



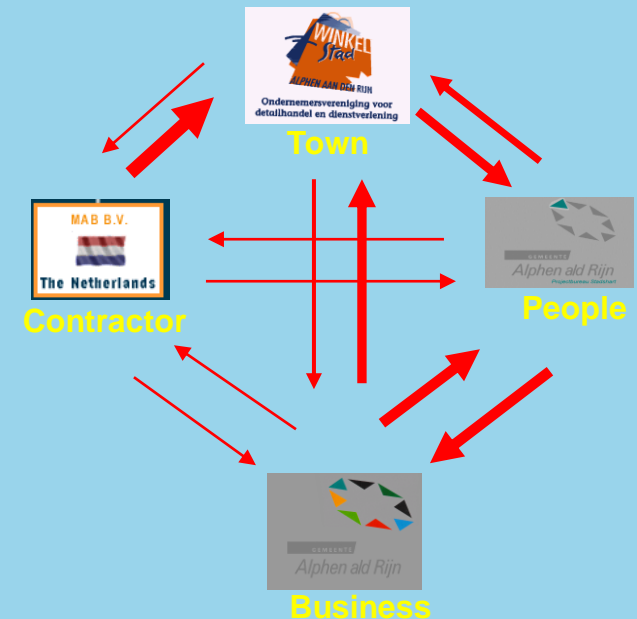
- Communication in face-to-face setting as well as through group decision support room.
- Facilitation by facilitator and IT-system.

Modeling Interests, Control, and Dependencies: Coleman's Linear System of Action

Interest: I	Town	Contractor	People	Business	
Sustainability	50	10	20	50	
Economy	10	60	0	0	
Transportation	10	30	0	0	
Living Quality	30	0	80	50	
Total	100	100	100	100	

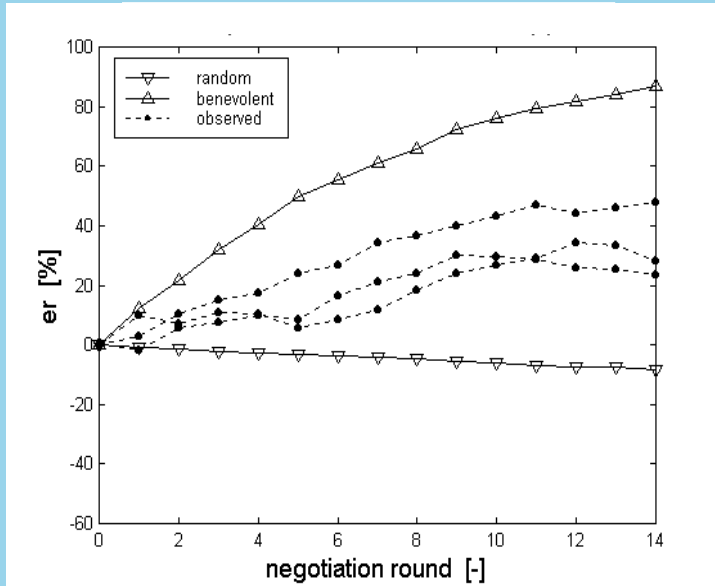
Control: C	Sustainability	Economy	Transportation	Living Quality	Total C
Town	50	50	50	20	170
Contractor	0	50	50	0	100
People	50	0	0	30	80
Business	0	0	0	50	50
Total	100	100	100	100	400

Dependence: D	Town	Contractor	People	Business	
Town	41	50	26	35	D=C*I/100
Contractor	10	45	0	0	
People	34	5	34	40	
Business	15	0	40	25	
Power	0,69	0,82	0,52	0,33	



1. Each organization identifies own interests over issues and control of all organizations over all issues.
2. Interests and control result in dependencies, which are visualized in a dependency graph.
3. With Coleman's Linear System of Action we compute the equilibrium control.
4. Two organizations with highest exchange potential over most critical issues negotiate first exchange of control.
5. Process is repeated until equilibrium control is reached.

Reaching Equilibrium Control



Equilibrium Control: EC	Sustainability	Economy	Transportation	Living Quality	Total C
Town	62	48	65	36	211
Contractor	2	52	35	0	89
People	10	0	0	39	49
Business	26	0	0	25	51
Total	100	100	100	100	400

Demand for Control: DC	Sustainability	Economy	Transportation	Living Quality	Total C
Town	4.84	-0.23	1.14	-5.75	0
Contractor	0.91	0.23	-1.14	0	0
People	-16.13	0	0	16.13	0
Business	10.38	0	0	-10.38	0
Total	0	0	0	0	0

1. Reaching equilibrium control must be done in small steps.
2. Equilibrium is reached if nothing is left to exchange; i.e., no negotiation is left.
3. Demand for control is satisfied; e.g., nobody wants anymore construction permit, or safety experts do not want any other safety measures to be implemented.
4. Equilibrium control is a dynamic goal that changes as the process goes on.

Key Points for Policy Level

- Separate gaming from real-world decision making.
- People/organizations drive process not the models.
- Any number can be a good stimulator.
- Who talks to whom about what is crucial.
- Local solutions feed global solutions in problem solving.
- No contracts will be signed.
- Establish mutual trust with key DMs.
- Participatory or solution driven?
- Identify drivers and breakers.
- Identify fears and bravery.
- Identify „träge Masse“ and resistances among organizations.
- Introduce an active information tactic.
- Introduce milestones.
- Balancing act.
- Avoid becoming the scape goat.

Lessons Learned in Org-DM for EM

- In IT-based Org-DM, facilitator is more crucial than models/systems.
- Individual members of the organizations affect decision process.
- Don't under/over estimate decision makers and group dynamics.
- Avoid "Problem Errors" (model push).
- Models must be easy to use (keep a step-out option).
- Models must make sense, be transparent and intuitively sound.
- Model results are mere suggestions, leave space for improvisation.
- Pure number crunching is suspicious.
- Ordinal instead of cardinal scale.
- Suggestions instead of crisp solutions.
- Wrong models can be good stimulators for communication and consensus reaching.
- Models make suggestions, people make decisions
- Numerical & model sensitivity analysis.

Future Research in IT-supported Org-DM for EM

- Consideration of different organizational cultures.
- Cross-org-DM between different org. levels.
- Integration of EM issues in spatial planning from an org. perspective.
- Reduction of group dynamics in Org-DM and focus on problem solving.
- Face-to-face communication vs. ICT-based communication.
- Robots and agents as members of Org-DM.

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