Welcome back, we will now focus on the process of decision making within the framework of complex infrastructures

So if you cannot fully understand the content of a problem, if you can't embrace all the complexity, and you want to solve it, the attention shifts to the process. From content to process. The process of interaction between the main players in this complex world. You start using your relations to solve a problem.

So, from content to process. I will give a very simple example. Suppose six or seven parties depend upon each other. They need each other's resources to solve a problem. They have different opinions on both the problem analysis and the solution. And they are faced with many uncertainties.

Can these parties or can one of these parties solve the problem by command and control? By using hierarchical power. No of course not, these parties are interdependent, no one is in charge.

Can these parties solve their problem by management by expertise? No. There are many uncertainties, so even experts will have to admit that they cannot solve the problem, or that they can solve it only partially.

Everyone will understand: in such a situation parties will have to negotiate, to interact. If no one is in charge, there is nothing left but to sit down with each other and to start a process of negotiation.

These parties are faced with uncertainties and unknowns. How will they deal with that? In the process of interaction, they will exchange information and they might learn. Party A might have information that reduces the uncertainties of party B. Or they might start a discussion on the uncertainties and reach consensus on what they think is the best problem analysis and the best solution. They might develop fallback scenarios that can be activated if the problem analysis or the solution proves to be wrong.

This is called negotiated knowledge - not objective, but negotiated.

If decisions are being made in a process of negotiation, if uncertainties are reduced in a process of negotiation, the question becomes interesting whether we can design such a process.

The answer is Yes. A process design is a set of rules of the game that will be used by the negotiating parties, to reach a decision.

What types of rules of the game are we talking about? Entry-rules: who is allowed to participate? Exit rules: under what conditions are parties allowed to leave the process? Agenda-rules: what are the issues on the agenda and might these issues change over time?

And decision rules: how do parties make decisions, by consensus only or will a majority vote do? Institutional rules: who manages the process - who, for example, chairs the meetings. The essence of all these rules is that they should give each participant a fair chance to influence the decision-making - and they should give the parties the comfortable feeling that the process is fair, that they really have an opportunity to serve their own interest.

So the essence of governance is twofold. First, acknowledge that in a complex world, no one understands or oversees al the complexity. Processes of DM are almost always incremental, a matter of muddling through. As a result of that, the structures that emerge are patchwork-like. Is muddling through a problem? No, it is inevitable - and it is conducive to learning and adaptiveness.

Muddling through is inevitable because there are so many relations - between physical systems and between actors. The more interdependent these actors are, the more incentives they might have to work together.

How can we stimulate them to cooperate? By bringing them together in a process of interaction and negotiation. Such a process can be designed - in such a way that it has

Now today's final question is, is such a process just a process? Without any substantive guidelines? Of course not. Does content matter? Of course it does. There are several mechanisms parties should be aware of in the process of interaction. Considers these mechanisms as a kind of checklist, that participant in the process can use, when making their collective decisions.

First. Multiple scaling. Infrastructure systems are always multi-layer systems. You have been told about that in earlier lectures. An intervention at one of these layers, will always have an impact on the other layers. So during the process, always discuss the question what the impact of envisaged measures is or might be on other layers. Or what the interference of layers might mean for these measures.

Second. Complex infra-systems are socio-technical systems. So always consider both the social elements (actors, rules, incentive structures) as the physical elements. Envisaged change should always meet the criteria of both elements. Technical changes that do not fit the existing incentive structures, will probably have no or a very limited impact.

Third. Redundancies. Most well functioning systems are redundant. Redundant infrastructures - you can take a flight from Amsterdam to Paris - but there is an alternative - the high speed train. Redundant technologies. What in the most future sustainable option for cars: electricity, biofuel or hydrogen? Why should we choose? Redundancy will create competition between these three and incentives for continuous innovation and may the best win. Redundant networks. Telephone calls can be facilitated by several operators, that sometime use different networks. Redundancy makes us less vulnerable? So redundancy has its advantages, it of course also has disadvantages. It can be expensive; there is the risk of over-redundancy.

Fourth. Variety and selection. Tolerate variety. A variety of types of sustainable cars, a variety of local and decentral initiatives to generate electricity, a variety of technologies etc.

Five. Give room to the actors involved to organize themselves, to take initiatives, room for maneuver. Room is always conducive to initiatives and entrepreneurship.

All these principles are based upon the idea that central planning does not work, that decision-making is often a very incremental process, that we cannot overseer the consequences. Decisions are made in a process and these principles help is to be alert - to create the optimal conditions for change in the right direction.

Thank you for your attention.