NORDRESS

Nordic Centre of Excellence
On Resilience and Societal Security

WORKSHOP ON RISK ASSESSMENT AND ACCEPTABLE RISK

IMO, Reykjavik 30 November – 1 December 2016

Minutes: Hans Jørgen Henriksen, GEUS, Adriaan Perrels FMI, Atte Harjanne FMI, Karoliina Pilli-Sihvola FMI and Sigrún Karlsdóttir IMO

Funded by NORDRESS mobility grant 2016 (www.nordress.hi.is)

Organized by IMO, FMI and GEUS

Agenda

30.11.16

09:00 – 09:30 Registration

09:30 – 09:50 Welcome – NORDRESS context, purpose and organization of the workshop

Social framing of acceptable risk

09:50 – 10:10 Virginia Murray, Public Health England, Consultant in Global DRR and UNISDR – video presentation

The importance of risk assessment for implementation of the Sendai Framework (20 min)

10:10 – 10:50 Jeroen Warner, Wageningen University and Research, Netherlands

Decision structures and framing issues in risk management (30 + 10)

10:50 – 11:10 Coffee break

11:10 – 12:10 Group work part 1 (4 groups) – assignment: discuss and answer:

- Which groups / organisations in society should decide on scope and level of ´acceptable risk'?
- What are the dimensions (elements) of acceptable risk?
- How to shape the decision process on determining scope and level of ´acceptable risk'?

12:10 – 12:45 Synthesis from working groups – summary presentations per group (4 x 5) + discussion (15)

12:45 – 13:45 Lunch

Implementation of natural hazard management schemes

13:45 – 14:25 Thorsten Piontkowitz, Kystdirektoratet Denmark

Coastal Flood Hazard and Risk Management in Denmark within the context of hte EU's Floods Directive (30 + 10)

14:25 – 15:10 Mark Franklin, Environmental Agency UK

Flood Risk Mapping and Forecasting in England (30 + 10)

15:10 – 15:30 Coffee break

15:30 – 16:30 Group work part 2 (4 groups) – assignment: discuss and answer:

- What gets lost and what is gained in translation from theory to practice?
- How and to what extent can we transfer lessons from one country or hazard type to another?

16:30 – 17:15 Synthesis from working groups – summary presentations per group (4 x 5) + discussion (25)

19:30 Dinner at Kol restaurant, Skólavörðustígur 40 2

01.12.16

Applying risk assessment

09:00 – 09:40 Farrokh Nadim, NGI

Acceptable risk for critical facilities subjected to geohazards (30 + 10)

09:40 – 10:20 Ruben Jongejan, Jongejan RMC Cunsulting, Netherlands

Flood risk management in the Netherlands (30 + 10)

10:20 – 10:40 Coffee break

10:40 – 11:20 Tómas Jóhannesson, IMO

Risk management: How to balance the risk of fatal accidents, property damage and social disruption in the planning of disaster risk reduction? (30 + 10)

11:20 – 12:20 Group work part 3 (4 groups) – assignment: discuss and answer:

- How do presented (and other) assessment methods fit to alternative policy and societal frames of acceptable risk?
- What are the dimensions (elements) of acceptable risk?

12:20 – 13:00 Synthesis from working groups – summary presentations per group (4 x 5) + discussion (20)

13:00 – 13:45 Lunch

Sharing responsibility and risk
13:45 – 14:25 Mia Ebeltoft, Finans Norge, Norway – via skype
Private-public-project: Can insurance data help preventing natural catastrophes and urban flooding damage? (30 + 10)
14:25 – 14:55 Jaap Kwadijk, Deltares
Tools for long term planning for climate change (20 + 10)
15:00 – 16:00 Group work part 4 (3 to 4 groups) – assignment: discuss and answer:

- How to shape the decision process on determining scope and level of ´acceptable risk'? – Revisit from yesterday – Main emphasis on this question.
- What are the lessons for NORDRESS' WP4, WP5 and WP6? – WP leaders to emphasis on how they see this workshop has helped/given an input into their work.

16:00 – 16:15 Coffee break
16:15 – 17:00 Synthesis from group work and concluding discussion – WP leaders to comment on lessons learned from NORDRESS (4x5) + discussion (25)
17:00 – 17:15 Wrap-up and closure of workshop 3

Short description of the NORDRESS project – see http://nordress.hi.is/

For analyzing purposes, the societal resilience is viewed as being composed of four dimensions: *Individuals* contribute to society's robustness with strong physical and mental health and personal preparedness while active *communities* unfold the potential of people working together informally to cope with the impacts of natural hazards on everyday life. Society is bound together by *infrastructures* that strengthen the overall societal resilience through communication, transportation, critical lifelines, energy, and logistics. In return, these infrastructures support the working of *institutions* that create formal frameworks for legal and political responsibility. → These four dimensions are all important for societal resilience.

The NORDRESS project is diviced into the following work-packages:
WP 1 Administration – Management and organization
WP 2 The Nordic Societal Security Academy (NSSA)
WP 3 Individual Resilience
WP 3.1 Long-term health following natural disasters
WP 3.2 Children in natural disasters – health and risk management
WP 3.3 Psychosocial support and intervention following natural disasters
WP 4 Community Resilience
WP 4.1 Unpacking and measuring community resilience
WP 4.2 Risk perception
WP 4.3 Participatory early warning and monitoring systems for natural hazards
WP 5 Infrastructure resilience
WP 5.1 Mitigation of risk posed by slope failures on transport infrastructure
WP 5.2 Mitigation of risk posed by snow avalanches on transport infrastrucutre
WP 5.3 Risk assessment and prevention for flooding and coastal erosion in extreme weather
WP 5.4 Arctic offshore challenges
WP 5.5 The vulnerability of air traffic to volcanic eruptions
WP 6 Institutional Resilience
WP 6.1 Review and enhancement of the institutional framework for natural hazard management
WP 6.2 The Nordic Welfare system

List of participation

Nordress vinnubúðir 30. nóvember - 1. desember 2016 "Workshop on Risk Assessment and Acceptable Risk" Vinnubúðir um áhættumat og áhættuviðmið

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Day 1 summary

Welcome:

Sigrún Karlsdóttir opened the workshop highlighting the importance of this workshop for NORDRESS and the organisers idea (IMO, FMI and GEUS) to have such a cross-cutting workshop with 50 participants and 9 international key note speakers and well prepared group works where we can have good discussions on risk assessment and acceptable risk.

Gudrún Pétursdóttir, Institute of Sustainability, University of Iceland (coordinator of NORDRESS) described the NORDRESS Centre of Excellency on Societal Resilience for the audience with the model for societal resilience (individual, informal communities, societal infrastructure and institutions/legal frameworks). Idea that at least 3 countries are represented in each WP. The Nordic Society Security Academy NSSA and the mobility grant for communication and co-work organized by members (funds for travel, venue etc.). Annual meetings organized parallel to conferences, coming conference in 2017 IDRiM (http://www.idrim2017.com/) with a NORDRESS meeting on Iceland (august).

4 presentations:

- Virginia Murray, Public Health England: The importance of risk assessment for implementation of the Sendai Framework
- Jeroen Warner, Waageningen University, NL: Decision structures and framing issues in risk management
- Thorsten Piontkowitz, Kystdirektoratet, DK: Coastal flood hazard risk management in Denmark within the context of the EUs floods directive
- Mark Franklin, EA, UK: Flood risk mapping and forecasting in England

Wrap up – what did we learn?

- **Virginia Murray** - Understanding disaster risk (priority 7 in Sendai framework - 2015-2030) is important. We should keep focus on guidance on methodologies and standards for risk assessment (disaster risk modelling and data). Who is a scientist: natural science, engineering/technology, health science, Agrisci, social science etc. UNISDR conference 27-29 January 2016. Conference in 2017: Global platform Mexico-Cancun for DRR (http://www.unisdr.org/conferences/2017/globalplatform/en). Terminology available for defining risk assessment (UNISDR definition). Annotation: Multi hazard early warning system.
- **Jeroen Warner** – Focus on cities, cultures and catastrophes (resilience/EDUCEN project - http://www.educenproject.eu/). Why people do things, celebrations/meaning to disasters (act of god or act of nature). People manage themselves, try to help each other in disasters, cooperate on a social level. Disaster: “the stars are misaligned”. Disaster is

constructed, earthquake 6 no problem in Chile but in Netherlands we are not accustomed to earthquakes. Reduce challenge or increase coping capacity? Paradox: Flood awareness culture affect the risk of late evacuation response, better dikes reduce the flood risk awareness levels (Dutch citizens are in fact not often thinking about floods, it's entirely outsourced to public authorities).
Hypothesis: Social awareness can increase coping capacity. Work with social networks rather than viewing people simply as individuals. We heard about local flood subcultures. The example of two villages near the city of Maastricht, with completely different ways to deal with floods. Low probability high impacts and high probability low impacts. We heard about Borgharen (1610 citizens) and Itteren (820) citizens and how different communities develop very different relationships to local authorities, with Borgharen relating in principle positively to public authorities and Itteren showing often more suspicion. Borgharen had informally retained the old (pre 1986) civil protection command structure[1], which is also quickly mobilized in response to formal natural hazard warnings. Itteren depends more on informal and ad-hoc response structures, yet with the local parish as a unifying element. Also more generally parishes (notably outside cities) can have a function complementary to or substituting for social services in times of crisis.
Themes of EDUCEN: culture and memory, culture and social networks, culture and infrastructures in urban areas, cultural learning and cultural empathy and serious gaming. Some groups are harder to reach: physically handicapped, street dwellers, orthodox religious groups…Final conference EDUCEN in Dordrecht NL 29-30 March 2017 (webinar). EDUCEN handbook.
Also note the EU projects: CAPFLO (https://capflo.net/), CUIDAR (http://www.lancaster.ac.uk/cuidar/en/), PLACARD (http://www.placard-network.eu/), CARISMAND (http://www.carismand.eu/)

- **Thorsten Piontkowitz** – Coastal Flood Hazard and Risk Management in Denmark within the context of the EU Floods directive. First cycle with screening 2010-11 of 10 areas and 22 municipalities (7 Jylland, 3 Fyn and 12 Sjælland). Fluvian and/or sea water (storm surge) floods. The source-parthway-receptor model for risk assessment. Risk=hazard*vulnerability capacity → risk assessment maps. Harima approach. High, medium, low probability and climate scenarios for 2050 and 2100 + 80 cm sea water rise. MIKE 21 model with standarized timeseries (cell based risk assessment 25x25, 50x50, 100x100, 200x200 and 500x500 m). Mainly focus on preparedness (plans). Protection has to be financed by landowners. Three risk classes: red: appointed significant flood risk -> maps (FRMP- flood risk management plans must be developed), yellow: moderate flood risks (authorities are not asked to develop FRMP maps, but they can do it in the municipalities). Green: low

[1] The 'Bescherming Burgerbevolking' (BB) was a typical Cold War era civil protection organisation in the Netherlands with a small central salaried staff and many local volunteers. The repute of the BB was comparable to the WOII British Home Guard ('Dad's army'), which also contributed to the termination of the BB in 1986. Yet, some local networks were in fact well motivated and capable of crisis assistance, hence the Borgharen example.

flood risk area. Legislation: Ability to force projects even though one group of landowners do not accept increase for dikes is needed. Thorsten's conclusions: Flood risk considered somewhat low in Denmark but Flood Directive has led to substantial national advancements in flood risk management.

- Discussion:
    - In practice municipalities define acceptability since they define their own risk levels and reduction measures. Potential conflicts can arise between municipal and state guidelines.
    - State does not pay for coastal protection in Denmark, it is land owners' responsibility. This has resulted in cases where some land owners want to act and others don't. A process to overcome this issue is included in legislation but it's complicated and does not always work.
    - The designation of the flood risk areas was a politically risk
        - Ex ante – worries on real estate price level responses and other economic response
        - Ex post – more worries of not being designated as flood risk area due to missing opportunity for EU / national funding
    - Furthermore now a discussion in the UK whether areas originally classified as 'high risk' can be reclassified after taking substantial measures?
    - Future needs: we need to be able to define acceptable risks, better coordination, changes in legislation, awareness increase. More focus on fluvial flood hazards in second round in Denmark. Damage functions need to be improved (assumption that flood defenses are reliable must be challenged (→ probability approach), and guidelines for the transfer of risk analysis.

- **Mark Franklin Environmental Agency (EA)**, England – Insurance has been more and more expensive in UK (new flood re-insurance-scheme). About linking Met Office-EA-Flood Forecasting Centre. Forecasts with different time perspectives: more than 3 months ahead (awareness/understanding risks but not forecasting service- 7 regional centres), 2-3 months checks for flood risk, one month: sensitivity to rainfall, 6-10 days ahead with hydrometeorologial guidance (cabin office/strategic management; understanding risk, prevent/mitigate, prepare, respond, recover, post-incident, review outcomes, feedback cycle). Acceptable risks can be viewed as the A and B zones with 1/100 and 1/1000 risks. Warnings when the first property will flood. Insurance for 1/75 years return floods.

- Discussion:
    - Mobile phone information system mentioned, does it have a participatory component or has this been planned or studied? Social media monitoring is currently in use, and a crowdsourcing pilot is ongoing. These are still in R&D phase. Challenges arise from filtering valid and useful information from the information flow overload.
    - Effect of Brexit? Most of flood directive is already part of British law, not likely to be overturned. Might affect the second round of flood directive, but even this should not have that major consequences.
    - How are the long term forecasts actually used and what's the response? Basically used as hooks to keep relevant people interested. Targeted to certain key stakeholders.
    - How is acceptable risk defined? In terms of planning, no hard or fast rules but certain guidelines.

- How is uncertainty communicated? Typically not shown as such, but best estimates and "reasonable worst cases" are visualized.

Group work:

- *Which groups / organisations* in society should decide on scope and level of 'acceptable risk'?
- What are the *dimensions (elements) of acceptable risk?*
- How to *shape the decision process* on determining scope and level of acceptable risk?
- *What gets lost and what is gained in translation* from one country or hazard type to another?
- How and to what extent can we *transfer lessons* from one country or hazard to another?

Day 2 summary

5 presentations:

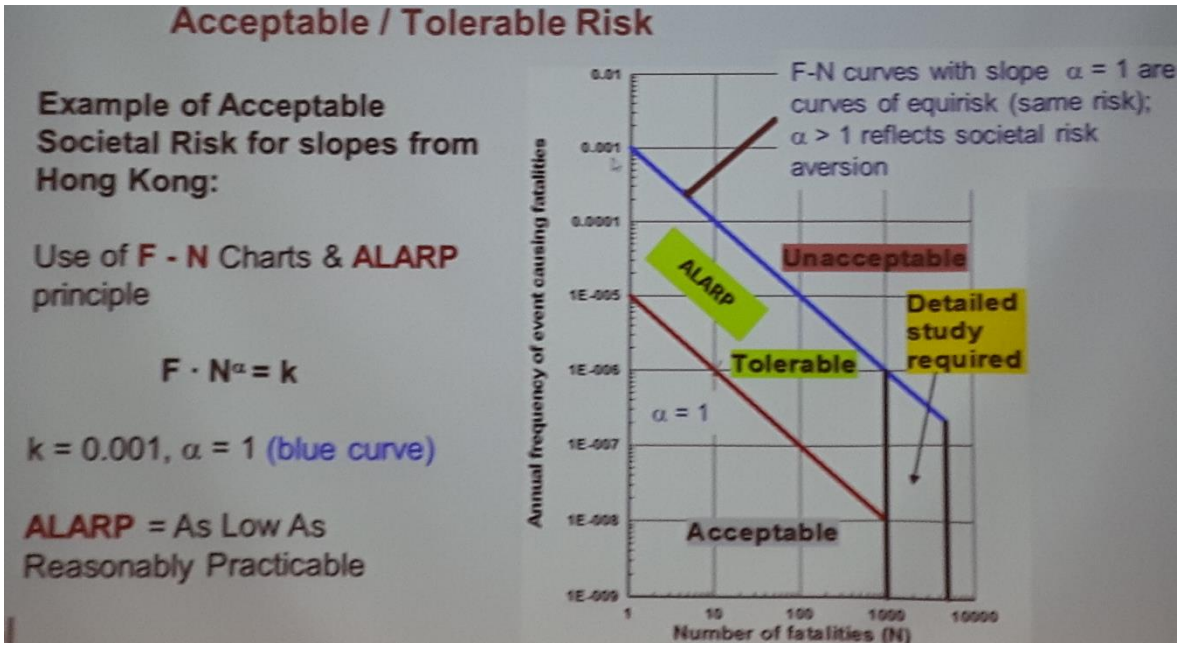
- Nadim Farrokh, NGI, N: Acceptable risk for critical facilities subjected to geohazards
- Ruben Jongejan, Jongejan RMC Consulting, NL: Flood risk management in the Netherlands.
- Tómas Jóhannesson, IMO, Is: Risk management: How to balance the risk of fatal accidents, property damage and social disruption in the planning of disaster risk reduction?
- Mia Ebeltoft, Finans Norge: Private-public project: Can insurance data help prevent natural catastrophes and urban flooding damage?
- Jaap Kwadijk, Deltares, NL: Tools for long term planning for climate change.

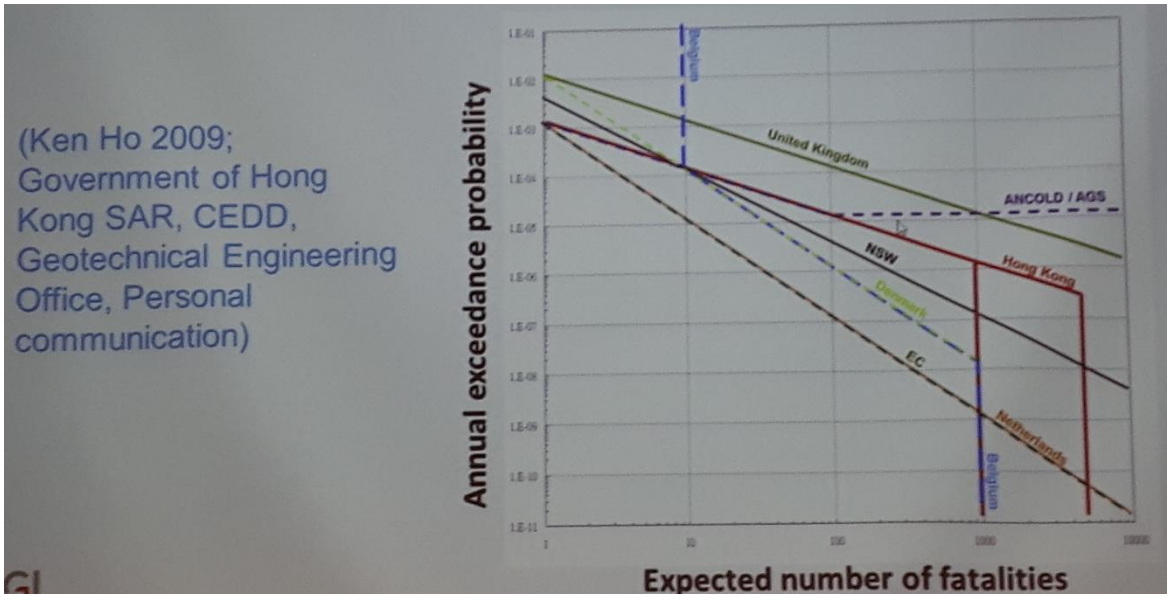
Wrap up – what did we learn?

- **Farrokh Nadim**: Risk is not constant, this may make standards tricky. Engineered, infrastructure. Codes of standard. Risk is the effect of uncertainty on objectives [Risk = f(hazard, consequences)]. Risk = f (hazard/-temporal probability of spatial risk, vulnerability, exposure, utility/value of element at risk). The difference between risk assessment (cause harm->danger, how often->hazard, work is risk->elements at risk, potential damage->vulnerability and probability of damage->risk estimation) and risk management (significance of estimated risk->risk evaluation, what should be done->do something). Hazard – consequence relationships (unsafe, safe and in between zone). How much risk are we willing to accept? Dependent on voluntary or imposed risks. Example with snow avalanches and houses, where profile of risk has changed after 1950. We tend to do the best thing with budget you have. The problem is to quantify / value of lives (one human ~ 1 mio. Dollar). Apparently, societies are less tolerant to events that hits people (if there is > 100 casualties).

  Acceptable risk is often expressed in terms of a graph showing balancing between two effects, being frequency of the event (of given severity) and the typical number of fatalities of such an event (of that severity). The 1st graph below shows the basic example (from the presentation of Farrokh Nadim). Problematic is that the approach has no standardized guidelines for comparability of areas of different size, population and wealth levels. Interesting is that (2nd graph) countries with similar wealth levels and expected lifetimes show really different levels of

official guidelines for risk acceptability. Yet, this may be partly explained by the differences referred to above.





The F-N curves are popular in Anglo-Saxon countries (10-4 for existing and 10-5 for new infrastructure). Nordic countries: It is more how to do the best thing with the budget you have. Ken Ho 2009 comparative study. Government of Hong Kong: 4 orders of magnitude difference in level of risk acceptance. No official acceptable risk in Norway. An example from traffic: 200-250 killed in traffic accidents each year ~ 5*10-5 /year acceptable risk. Plan and building act: probability of hazard for areas without building: 1/100, garage: 1/100-1/1000 and 1/1000 for build areas as acceptable risk. Observation: maps from day 1 (flooding) mainly hazard based, not consequence based. USOI Dam where early warning and tunnel reduce risk to tolerable and acceptable. A natural landslide has constructed the USOI Dam and reservoir which is huge, and with increased risk due to increasing water level in the lake. An early warning system can reduce the risk for the exposed population (elements at risk) to marginally tolerable, but a

tunnel can further reduce risks to something more acceptable. The question is whether acceptable risk concept is useful as a guide for decision making? For New Orleans, it has been calculated that risks are 3 orders of magnitude above acceptable risks. Other ideas: stress test. We always end up with residual risks. Idea is to look at your system and identify weaknesses without too much extra investment needed in order to reduce risks: a) which scenarios to stress test for? b) coping with complex systems (choice of events/cascading events) and c) are we willing to accept the results of stress tests? Advantage with stress test: you can talk about it, contrary to probability "where you are pushing the things all the time". New Orleans: instead of 540 km levees maybe better to spend money differently: evacuate/early warning system?

- Discussion:
  - One advantage of stress testing is that more people can be included in discussion, not just technical experts. Discussion of acceptance should be inclusive. Still, credibility should be assured (i.e. certain level of technical expertise)
  - Is recovery included in stress testing? Should it be? Yes, should be. New Orleans a good example (more important to evaluate successful evacuation than levee construction)

- **Ruben Jongejan,** New flood protection standards in NL strongly risk informed (1/100 – 1/100.000 per year). Very extensive multistep probabilistic multi-scenario approach, accounting for impacts (expected damage), implying thousands of model simulation runs. Crisis management and spatial planning. Consequences more realistic evaluated, including things as they are and not only as they should be (dike breeches). Presented in purple colors (neutral). Everything combined and with a strong component of including evacuation/early warning systems and their efficiency. Early warning and monitoring influenced evacuation estimates and consequence evaluations.
- Discussion:
  - Communicating models results that have some levees failing can be challenging? How was it done? (Communicating risks as-it-is or as-it-should be). Originally politicians did not want any of the results published but this changed gradually. In the end we were able to publish everything in a form that everyone accepted.
  - How were EWS modeled? Cases where EWS works but evacuation or related decision making fails were also modeled.
  - How about international co-operation in cross-boundary river management? This study had no such cases, but an on-going project on Netherlands-Germany cross-border levee system is ongoing. International cooperation exists.
  - Are safety factors included in studies? Not in probabilistic studies but in specific planning / construction decisions naturally yes.

- **Tómas Jóhannesson**, Talk about snow avalanche in the past on Iceland. Accidents on the sea (>1000, last year none). Storms on land > 100. Avalanches/rock falls > 10. Others low. Acceptable risk and hazard zoning (avalanches). Probability 0,2 *10-4 per year. Economic loss not included. Zone A-C. Exposure depending on type of building. Value of life + damages (4 mill. euro per life). Societal risk ->FN curves. Voluntary/involuntary risk. Personal control/experience. Equivalent economic losses Cost-Benefit analysis. Uncertainty obscures both types of analysis. Willingness to pay for reducing risks with single lane bridges. Common

sense is not so common, must be consciously applied. Value of human life. It is also a matter of life quality index. Basic premises still is saving human life, and maximizing life expectance of population with quality of life (~3-5 mill euro per human life).

- Discussion:
  - Is there economic assessment for protection (i.e. neglecting or not prioritizing roads with only few users) or road maintenance? This issue is typically avoided in politics.
  - Is the presented acceptable risk an official IMO policy? No, open to interpretation.
  - Monetizing human life problematic. Life quality index based measures also used (not saving lives but postponing deaths). Typically ends up with 3-5 million euros per life still. These have been discussed in IMO as well. In accidents figures like these not used, more relevant to health care.
  - Shouldn't small country like Iceland be able to do smart decision around one table? The challenges is the narrowness of perspectives. When short term business gains dominate, senseless decisions can be the result. Partial, low level optimization limits common sense on planning level.
- **Mia Ebeltoft**, Sharing insurance loss data to local and national authorities and scientists - DRR resilience work. Large increase in total water damage since 1980. Urban flooding is 70% of natural catastrophic insurance loss. The Norwegian property insurance system: Natural Catastrophs is divided into a) Premium equal and b) Solidarity system i.e. "no one's fault, an act of God"; Urban flooding is divided into a) Due to insufficient infrastructure and not an "act of God", premium is risk-based. Both of these are part of property insurance in private, commercial/industry and municipality insurance. Important to have a collaboration a cross sectors i.e. Government-Private Sector-Local Authorities-Public Agencies. In Norway a Private – Public Project regarding sharing insurance loss data to local and national authorities, as insurance loss data improve DRM. Useing insurance loss data to strengthen municipalities' efforts to prevent climate-related natural hazards. Main outcome of the project: Increased collaboration within the municipalities; Increased knowledge about risks and vulnerable areas; Improved understanding of how climate change affects society; Improved land-use planing; Improved knowledge base for construction and maintainance of water and sanitation; Improved knowledge base for risk and vulnerabitlity analysis.
- Discussion:
  - Insurance policy can give weird incentives to rebuild houses the exact same way and location.

- **Jaap Kwadijk**, What if (climate changes) according to scenario x. Scenarios. Early day. Population growth. Measures. How much climate change can we cope with. When will this occur? Adaptation tipping point. Sell-by date of tipping point for each scenario. What to do afterwards. Now. RCPs huge uncertainties. An example River Rhine scenarios has huge uncertainty. Most recent scenarios. Not sure whether it gets dryer or wetter. How to plan for a resilient strategy? Not the silver bullet. If we look back the recent years there has been a move from robust planning and decision making, then uncertainty came in and now we have deep uncertainty. Adopting in climate change has no value in itself. We have to look from investment angle rather than environmental. The example of Dutch coach Dirk Kuyt and his adaptive 'risk' management during a soccer game, where it is important to be well prepared and to be able to use different strategies during the game.

Group work:

- How do presented (and other) assessment methods *fit to alternative policy* and societal frames of acceptable risk?
- How are the assessment methods presented *(scalability/transferrability)*
- How to *shape the decision process* on determining scope and level of 'acceptable risk'? – Revisit from yesterday
- What are the *lessons from NORDRESS WP4, WP5 and WP6*? WP leaders to emphasis on how they see this workshop has helped / given an input into their work

Groupwork 1

Discussion points:

- Which groups / organisations in society should decide on scope and level of ´acceptable risk'?
- What are the dimensions (elements) of acceptable risk?
- How to shape the decision process on determining scope and level of ´acceptable risk'?

Group 1 Atte

The group had a lively discussion that revolved mostly around the challenges of defining acceptability and the responsibility related in that definition. Main points were the following:

- Idea of acceptable risk is unavoidable, since all natural hazard management involves weighing risks and not all can be completely removed
- Defining acceptable risk is a value-based judgement and as such should typically be left to politicians and not researchers. In the end it is important that acceptable risk definitions are made open and inclusive. Now often comes too often down to ad hoc calls where experts carry too much responsibility. Difficulty comes from the fact that admitting acceptable risks is often not politically correct.
- Decision-making context affect acceptability. Short and long term decisions are different (i.e. general planning and event response)
- Technical thresholds and quantifications are sometimes justifiable and useful, but it should be noted that there is still inevitable uncertainty and that methods to actually calculate such figures are often missing or incomplete.

Group 2 Karoliina

Along same line. What is the role of the general public on deciding acceptable risk level. Should be part but not necessarily the one who decide. Science provide flood risk map. GP + municipality define acceptable risk level. Scale and impact dependent (individuals accepting more risk). Role of economics in understanding risk level. Not the only tool or method to define acceptable risk level. So many other points in discussion. Uncertainty and precautionary principle. Uncertainties about the future should be incorporated. Informing the public about the risk level. Discussion on skepticism toward science. Role of media. Practical thing, level by individuals changes when actually a disaster takes place. Experience from Copenhagen. We shouldn't wait until something happens, but that is what we do.

Discussion:

- Is risk imposed or volunteer (skiing on an avalanche-prone area / building on flood risk areas)
- How often do you find yourself in a certain situation?

- Who is affected - difference in the value of life
- When something is/becomes too uncomfortable
- What is acceptable by the public /society at any given time.
- Depends what we are looking at. Legal aspects, economics --> Values (heritage, natural values) --> cannot be valued in monetary terms
- Proper risk management procedures are in place and implemented.
- Public needs to be informed. The public should be involved in the discussions/debate about acceptable risk. Also a political decision
- Acceptable risk is defined and changes after a disaster has happened
- Why people live in a risky zone - relocation of people is a very political question:
    - Example from Iceland: Earlier an adaptation strategy among farmers was that they moved (voluntary relocation) in order to adapt to adapt to changing conditions. This has been forgotten in modern days
- People who build summer houses in risky areas, often have never lived in the country side and don't have any idea about the risks there --> lack of knowledge about the risk / common sense
- Example from the Netherlands: New settlers come and build in risky areas; no one told that it's a flood prone area (lack of knowledge)
- Tourists do not know about the risk
- Norway: Flooding occurred and destroyed a house; the municipality allowed to rebuild the house in the same location because the "house was there". Two years later the house was washed away again. Insurance company is now suing the municipality.
- Recent issue with people's scepticism toward expert knowledge: use media to inform people. Possible that people do not want to be informed.

Group 3 Emmanuel

Question 1. Political process, who should decide, who bear the risk. Many stakeholders, state, municipalities, regions, juridictions, they hold the risk individually and collectively. Scientiests support this process, not deciding what is acceptable.

Different elements it is much hazard dependent. Loss of lifes. Avalances. Floods is more economic losses and disruptions that come with this economic damage. Environmental damages. Livelihood, what are we ready to do differently to reduce the risks. Locally, internationally, flights and diets. Important in defining what is acceptable.

Shape decision process and level on acceptable risk, who are the risk bearers, coping capacity and as a function of who is responsible, start working what is acceptable or not, context dependable, one size do not fit all. Perception, willingness to do something, same level of copy capacity, willingness to taking the risk (cultural, aversion to risk).

Group 4 Guðrún J

Looked at acceptable risk. Flexible concept. Risk transparency, level of preparedness, a lot that we don’t know about the risks. Hard to decide what to accept.

Framework. Can law and regulation decide. Background events look at risk is different to different people. Risk perception is important. Cronic or acute risks. System risk or individual risk. Slow onset or fast. Private or insurance.

Elected officials should give us minimum standards. Levels we should have. Experts would give advices. Stakeholders and public should have some inputs in looking at acceptable risks.

Risk communication is important. What we know about risks. Protocols, that people can use when deciding on acceptable risks. Awareness raising. Mitigation measures to reduce risk. Look at legal framework. Populism. Elected official. Everything will be compensated, even though we are not assurance. Everything will be paid. Land use planning, mitigation. UK mitigation measures, municipalities let people know about the risks. Plans to give people flood fees when living on flood prone areas.

Groupwork 2

Discussion points:

- What gets lost and what is gained in translation from theory to practice?
- How and to what extent can we transfer lessons from one country or hazard type to another?

Group 1 Atte

The discussion within the group continued quite naturally from the first session. Issues of theory and practice and knowledge transfer were somewhat intertwined during the discussion. Main points were the following:

- The line between theory and practice is not black and white. In natural hazard management nothing is purely theoretical nor is any practice completely separated from theory. Still, applying new theories in practice can be a long way due to. political, institutional and cultural reasons.
- Theory & practice –interface is also a scale issue. The more local and small scale things go, the more practice dominates. There is also more knowledge of the concrete situation and context on local level, so these should be carefully combined.
- Instead of best practices focus should be most appropriate practices.
- Knowledge transfer between different contexts is important and desirable. Freedom and flexibility is however very important in implementation. Countries differ in the scale, resources and the role of legislation (i.e. how specific the legislation is).
- When transferring knowledge it is important to first assess the current situation („Where are we?“) and desired situtation („Where do we want to be?“) before just trying to fit lessons or practices from somewhere else
- In natural hazard management many of the traditions, theories and measures are derived from earthquake management. Necessary to assess always how well this suits other types of risks.
- In cross-discipline knowledge transfer standardization of language already in education would help. All in all, language and terms are very important in successful knowledge transfer and bridging the gap between theory and practice.

Group 2 Karoliina

- e.g. Iceland can learn a lot about flood risks from other locations; Iceland only starting on floods. Best practices.
- *However, context is very important.* Iceland has some very specific features where more caution needs to be exercised and analysed how lessons from elsewhere can be used.
- With avalanches, Iceland collaborated and learned from others.

- Part of NORDRESS is on institutional structures and how to draw prognoses: how things are done in the Nordic countries; knowledge sharing. But needs to look further than just Nordic countries.
- Flood directive as tool for knowledge transfer as such as a lot of countries are following that. Before 2007 there was no flood risk maps in the NL because there was the idea that the NL will not be damaged again.
- What can be theoretically applied in one country cannot be necessarily applied in other places.
- Best practices are always good to scan - no need to reinvent the wheel. Avoids mistakes but remember the context. Do not focus only what is similar and what can be used, also analyse what is different and how and why something cannot be transferred. Also, one size fits all solutions do not exist.

Group 3 Ruben

What gets lost. Basically about reducing complexity, how do we communicate the uncertainty. How do we organize participatory processes. Processes to arrive to maps are not always transparent, there could be hidden assumptions. When communicating to risk maps, people have different assumptions about, certain risk maps are not allowed to be colored, people don't like red, yellow green maps.

Important to keep people informed. Also engaging them. Science is part of risk management process, shape. Feedback to research, essentially it is a loop.

To what extent can we transfer. There are similarities, physics is the same, we build models, tailormade solutions, difficult to transfer particular models to other countries. Broadens horizons, challenge us what we do.

Group 4 Guðrún J

Theory-practice. When looking at probability it is complex, difficult to put theory of probability into practice. Depends on how we communicate. If you educate people, they can understand how the theory is about. Give information to those who are receivers of theory. Good communication is very important. Case studies so people can understand what theory is trying to tell us. Avalanche, risk to whole family, stability of snow, what are we forecasting, what is at stage. Uncertainty comes in when we put theory into practice. We have to understand how people understand theory, complicated.

Transfer. Do we all have the same perception. India, quite a different perspective, could we transfer case studies from India, but maybe risk acceptance is not the same. Culture, can we transfer lessons to another culture? Exposure frequency, earthquakes in Chile, very common, in Iceland we have to report every earthquake over 3, this is not the case in Chile.

Trust in information transferred from one country to another. Example from the Eyjafjallajökull eruption. People from Poland living in Iceland, listened to the Polish television and trusted that information, but this was not the right information. It was very important to reach out to this group so they could get information from the right authorities in Iceland.

Transfer of ideology, similarity and use different tools. Talked a lot about Met Off. Tools to show weather forecasts. More similar. Always very difficult to transfer from one country to another. Put in to practice. A Challenge.

PKE comment. Uncertainty hidden. If you do not explicitly show how uncertain it is, but they know it is uncertain, it could provide a problem, it is a trade-off. Jeroen: Red Cross in Amsterdam has developed some games for communicating uncertainty (but end users do not want to hear about it).

Mark: You should only give people what they need to take a decision. You need to acknowledge this uncertainty.

Adriaan: Happy to see discussion. Communication of probability is a difficult issue. Very much depend on the kind of information product you want to convey. Risks can be two sided, entrepreneurs will not earn anything. Hydropower industry know about probabilities. Turists need more simple information. In transport if you inform everybody but this can then create other problems.

Day 2

Groupwork 3

Discussion points:

- How do presented (and other) assessment methods fit to alternative policy and societal frames of acceptable risk (morning sessions)?
- What are the dimensions (elements) of acceptable risk?

Group 1 Atte

In the third group session the discussion tended to flow towards concluding points and summarizing all that had been pointed out earlier as well as discussing several specific cases. The main points included:

- Communication with the wider public and even decision makers is difficult with the expert terms. Statistical frequency of occurrence indicators and return periods are difficult for people to understand. Communicating uncertainty is difficulty as well. Exact sounding figures and sharp lines can be problematic, since often there is quite a lot of uncertainty within the assumptions used, and changing the assumptions can even change the order of magnitude of the results.
- Discussion on acceptable risk should not be narrowed only on discussion about mortality. Other types of damage and risks also, measuring deaths not always relevant.
- Openness in communicating risks and risk management prioritization can be powerful and empowering. Land slides in Hong Kong are a good example, also example of having a system in place that people have learned to use and trust.
- Any natural hazard management scheme needs to be designed so that it facilitates use of common sense, instead of limiting it because of faulty incentives.
- Voluntary and imposed risks need to be separated. Society can only have responsibility up to a point.
- Tourism is a growing challenge, as it can increase risky behavior, brings people in conditions they‘re not used to and it easily increases communication challenges. Responsibilities of the home and host country should be clear.

Group 2 Karoliina

Same Norwegian case in our group. Lack of knowledge, common sense and memory. Lack of knowledge on risk and disasters, and how we tend to forget. People are building sommerhouses in an area they don’t

know (or move to one without getting information on risks). Scalability of assessment, transfer for knowledge is easy, floodprone areas, does not need to be applied in the same way as in the Netherlands. Basic planning and structural measures. Scalability/transferability of measures. Metoreologist are telling people what to do in case of an event. Recommendations in common sense e.g. snowstorm. Denmark push notifications in case of severe event forecast. What role does timeframe tell, why do people live or move to area with risk of volcanic eruption, landslide, they do because the risk is small compared to lifetime.

- How can the Nordic countries learn from the Netherlands: use of spatial planning and structural measures
- Although in the NL the attitude has been that "we can build anywhere". No proper land use planning or zoning to prevent flooding but different safety standards exist in different areas so if you build in a flood-prone zone, the safety standards are more strict
- Rock slides which cause huge floods, but with a warning system they now allow to build in the area.

Scalability of measures

- Impact-based warnings -->
    - DMI: Regional push notifications APP about warnings
- Risk thermostat: If you live in a safe area, you seek more excitement. In the NL the liberal party wants to increase speed limits.
- ICELAND: Detailed hazard zoning is not possible for the entire country, but areas with dense populations are chosen.
- Scalability of measures: nature of the hazard needs to be considered. No Early warning system for earthquakes
- Time frame: Disasters do not often happen over someone's life time and therefore not taken into account in decision making --> affects acceptable risk
- Dutch approach regarding mapping of flood prone areas is scalable, e.g. just finished a flood risk mapping for Mauritius. It can be done in any flood prone zone, but the method only works for flood hazard. Doesn't need to be applied as heavily as done in the Netherlands.
    - The problem is that ex post assessments of the flood mappings are often missing. No information about the success of the project
- However, knowledge transfer is the easy part, but what is often missing is the action.

Group 3 Haakon

Few answers and many questions. General assessment/universal is not possible. How to transfer numbers into something meaningful for general public. How much do the public need to know. What do people need to make decisions. Political economy of hazard assessment. Developers develop plans regardsless of common sense. Loss of life, or traumatized, should that be added.

Group 4 Mark

First thing high level screening. Where do we have the risks? Identifying hot spots, more effort in assessment. Highly populated areas etc. Some of the Icelandic problems, how to transfer knowledge from similar areas. Within this assessment framework you need to know how much confidence do you need. Individual and accumulated risks, transferable. Scalability of methods, each risk assessment depend of context (country, region, town/suburban etc.). Scalability of measures, recognized that with measures economics can come in, we are going to spend 6 mill pounds, then companies will deliver building blocks, there is some benefit of scale in there. Is it a policy or risk assessment, what comes first? If there is a

trigger, in UK it was 1953 coastal flooding, in Iceland the avalanche in 1995 etc. Something which kickstart society into action, you start to engage people. Why is it important to assess risk? Reputation, predictability, confidence in the future. Company, managing natural hazard is part of this. Tourists, if 200 tourists die for a tsunami, but no one feel it impact the industry.

Acceptable risk - Conclusions from Group 4

- flexible concept framed by politically defined values, limits and ambitions
- implementation framework to infer actual limits / tipping points
    - often hazard specific and regional context specific
- policy and cultural context will affect both the approaches and proposed limits
- in practice the formal decision cycle as presented in handbooks is often interrupted by extreme events forcing acute learning
    - in that case methods can both steer policy as policy steer method selection
- scalability of assessment and of measures
    - transferability (hard to assess to what extent)
    - stepwise implementation to optimize learning (can be risky)
- in western countries hazard risk management is eventually steered by the aspiration to ensure smooth continuation of daily life and business
    - hence the sensitivity to large events (which symbolically seem to threaten daily life predictability)
    - hence the different attitude in

Group 3 Hans Jørgen

Standarization of risk assessment methodologies is a contradiction. Difficult to come up with something that works everywhere. Framework: communication between levels is very important. Volcanic risk assessment in Indonesia. Without electricity and tele communication a EWS was based on their knowledge (village to village), translation of science into practice (anthropological/cultural). Important to approach the 'local' (also learned in the CATALYST project).

Whad did we not touch? Take home message. Gradual process, things are so local. Acceptable risks can be changing in time. Social aspects. Focused workshops. Trust. How do you actually change things. Willingness of opportunity. Theory to practice. To get it implemented. Are we good enough in communicating what actually is working (as part of DRR and DRM)? Institutional issues are very important.

Mindset. Want to do risk assessment before the catastrophe. Short memory. Benefits/risks. How to shape the decision process. New neighbourhoods in Selfors. Buildings cannot be put in floodplain areas. Not well defined. Hotel building near river. There is a risk that this river will flow over banks. Economics. Wealthy person build hotel. Legislation important.

WP 4.1 Haakon Lein

Communities. Part of problem or solution? Unpacking community resilience. Owership of projects and work / incolvement is key. Culture differences between / in countries east-west (bottom up).

WP 4.3 Hans Jørgen

EWS- local preparedness. Culture. People manage themselves. Multi hazard early warning systems -> local preparedness (Murray). We need approach professional and social networks and not only view people as individuals, when we construct participatory EWS and monitoring systems.

Damage functions need to be improved (early warning and monitoring systems can maybe provide that as part of risk management).

There may be different perspectives when developing early warning and monitoring systems. The UK example presented by Franklin illustrate how a step-wise real time modelling and forecast system can work with and where different communication are provided when running beyond 3 months ahead of disaster event, 2-3 months ahead, 6-10 days now including forecasts and pluvial risk assessment based on the real time situation, and guidance for measures.

Also stress tests approaches could be valuable when dealing with early warning and monitoring, in order to ask what if questions, formulate what if scenarios and model in real time and/or forecast mode, and based on monitoring, most likely upcoming risks and possible damages and consequences.

WP 5.1 and 5.2 Farrokh Nadim

Transportation problems → other petrics e.g. social consequenses should be a measure rather than fatalities. Setting a risk assessment on large areas is/can be different from smaller areas. Individual risk vs. social risk.

Wrap up

Hans Jørgen

Day 1 Understand hazard risks

- Understanding hazard risks – Multi hazard early warning systems– local preparredness (Murray)
- ”People manage themselves” - People try to help each other in disaster, cooperate on a social level – social awareness can increase coping capacity – reach out for the informal networks and challenges of communication to disabled people (Warner)
- We need to be able to define acceptable risks, better coordination, changes in legislation, awareness increase. Damage functions need to be improved (Piontkowitz)
- Forecasts with different time perspectives: more than 3 months ahead, 2-3 months checks for flood risk, one month sensitivity to rainfall, 6-10 days ahead with hydrometeorologial guidance (Franklin)

Day 2 Risk assessment and management

- Early warning and monitoring systems reduces the exposed population (risk elements) and a tool for dealing with residual risks (possible in time evacuation) (Nadim)
    - From acceptable risk toward ‘stress test’
    - Coping with complex systems
    - From acceptable risks to stress testing
- New flood protection standards NL (Jongejan)
    - Combination of probabilities and consequences (FN curve)
    - Interventions (scenarios of actions and risk of flooding)
    - Dike breeche can have very different consequences
- Jóhanneson
    - Acceptable risk and hazard zoning (avalanches/rock falls)
    - Several 100 mill. IKR per saved life/limits in willingness to pay for reducing risks with single-lane bridges (saving lifes)
    - Value of life (~ 4 million Euros)

- Private-public project on sharing insurance loss data to local and national authorities and scientists - DRR resilience work (Ebeltoft).
    - Increased collaboration within the municipalities
    - Increased knowledge about risks and vulnerable areas
    - Improved understanding of how climate change affects society Improved land-use planing
    - Improved knowledge base for risk and vulnerabitlity analysis

- Risk assessment and climate change (Kwadijk). How much climate change can we cope with. When will this occur? Adaptation tipping point. How to plan for a resilient strategy? Adopting in climate change has no value in itself. We have to look from investment angle rather than environmental.