

Land-use planning and physical infrastructure: Planning for increased or decreased climate change vulnerability?

Presentation at workshop 6 “Innovation linked to the management of natural hazards” under Session 4 “Good Practices of adaptation and mitigation to make the best of climate Change” during the X European Mountain Convention “Mountains’ vulnerability to climate change: how can people and territories adapt and mitigate its effects?”

4 October 2016

Teatro Municipal de Bragança, Bragança, Portugal

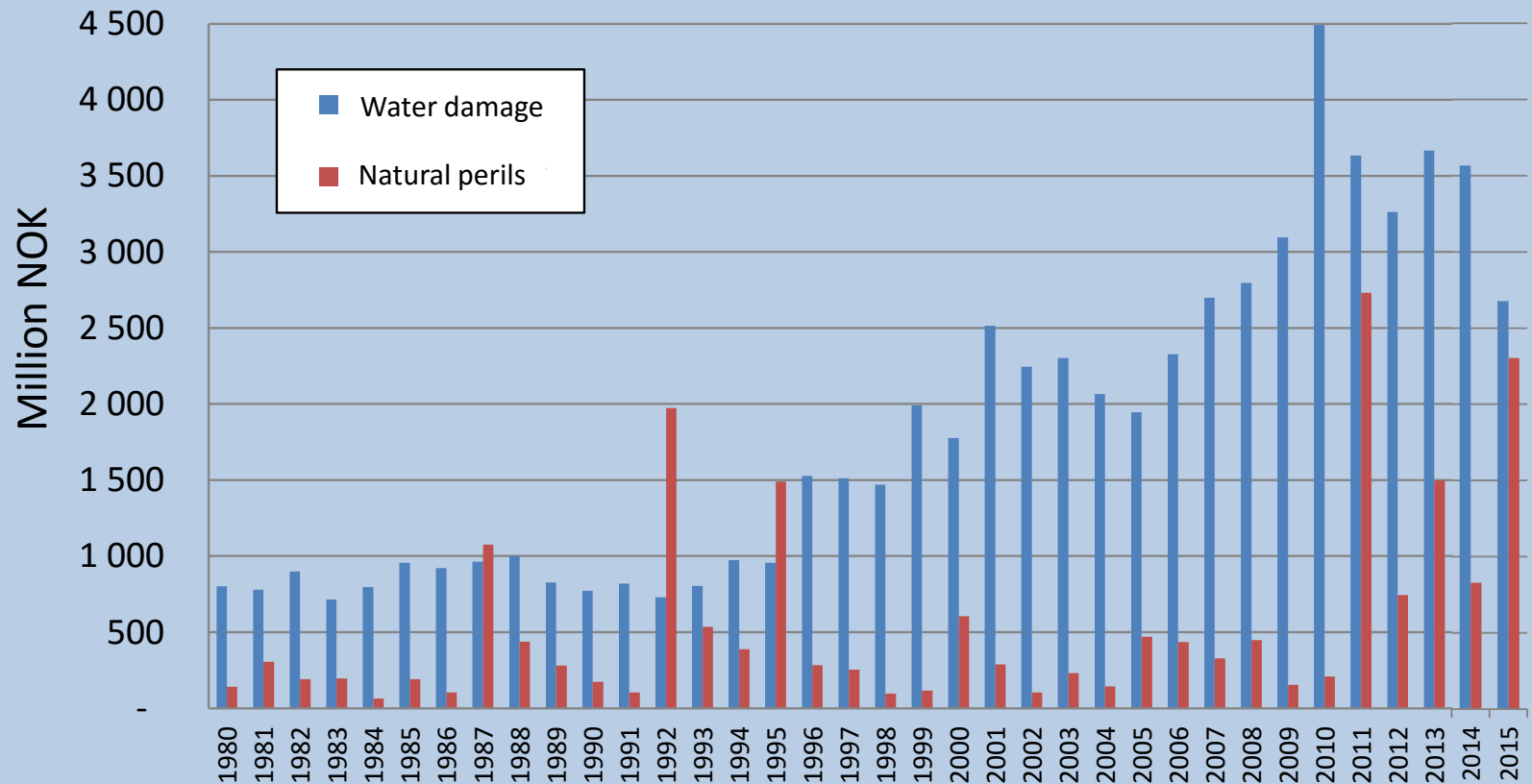
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The mountains and the Sognefjord on Sunday the 2nd of October!



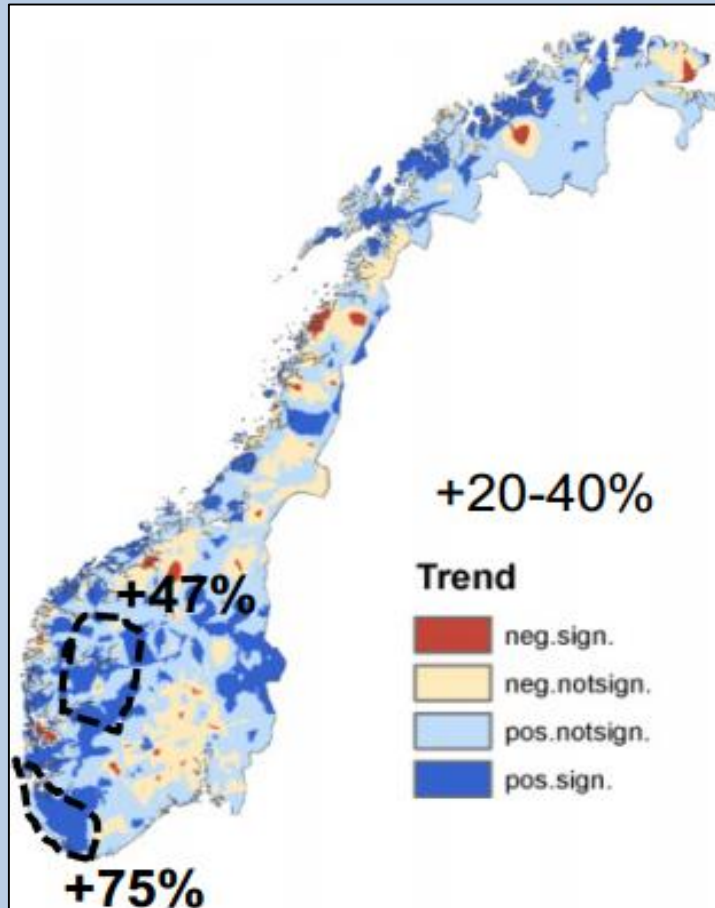
Natural hazard events are changing



Source: Finance Norway

The climate is changing

Increase in annual events with five-day precipitation of 40 mm during the period 1957-2010 (Dyrdal et al 2011)



The actual increase in precipitation is currently 6x higher than what was forecasted to happen in 2016 by the climate models in 2001

Some areas of Norway are already experiencing levels of precipitation that are predicted to occur in 2100 according to the climate models

Land-use planning is changing

- Supporting the capacity of climate change adaptation
 - A number of adjustments during the last decades of the Planning Act in order to increase the ability to prevent damage from natural hazard events by means of better land-use planning
- Decreasing the capacity of climate change adaptation
 - A decrease in the land-use planning capacity in many small and medium sized municipalities the last decade
 - Increasing share of land-use planning is initiated by private developers and land-owners at the expense of local authorities

The AREALKLIM Project (2012-2015)

- **The project**

- Co-funded by the Regional Research Council of Western Norway and regional and national authorities
- Analyzing 10 former and 4 ongoing land-use planning processes in which weather related natural hazard events have taken place or major such risk have been identified
- Limited to the region of Western Norway

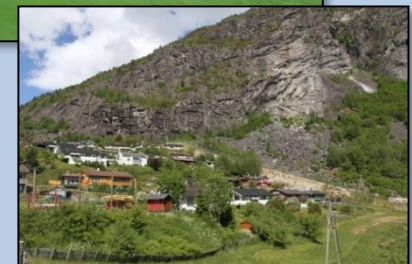
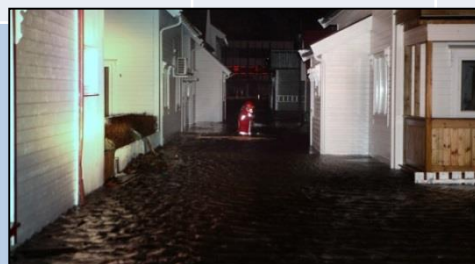
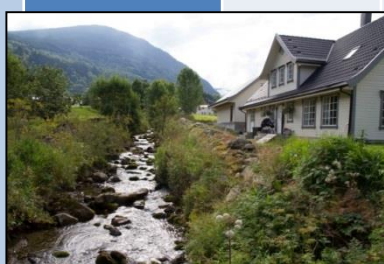
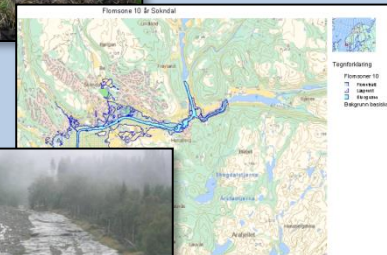
- **Research questions**

1. What to blame when natural hazard events occur?
 - Bad planning
 - Current climate
 - Climate change
2. How to be better prepared?
 - Suggested improvements in land-use planning



The analysed historic events

County	Municipality	Time for incident	Weather category (name of event)	Kind of natural hazard event	Description of event
Hordaland	Bergen	14.09.2005	«Kristin», extreme precipitation	Water saturated landslide	Hatlestad, row house hit by landslide, 4 lives lost
Hordaland	Sund	12.01.2005	«Inga», storm	Wind, storm surge	Destroyed boat-house
Hordaland	Voss	15.11.2005	«Loke», extreme precipitation	Landslide / flood avalanche	Evacuated houses
Møre og Romsdal	Midsund	05.03.2012	Extreme precipitation	Landslide	New housings exposed to landslide, road erosion
Rogaland	Sokndal	5.-6.10.2010	Extreme precipitation	Riverine flood	Inundation
Sogn og Fjordane	Luster	Several times during the 1990s	Freezing/thawing episodes	Rock fall	Detached houses hit by rock fall
Sogn og Fjordane	Stryn	14.11.2005	«Loke», extreme precipitation	Mudslide	Mudslide damage
Sogn og Fjordane	Balestrand	21.03.2011	Intense rain and melting in dry snow	Slush avalanche	Tuftadalen, house taken by slush avalanche, 2 lives lost
Sogn og Fjordane	Nordfjordeid	25.12.2011	«Dagmar», storm	Storm surge	Stormflo over delar av Eid sentrum
Sogn og Fjordane	Vik	Risk, last mudslide took place in 1897		Mudslide	Tenål, domestic houses raised in hazards prone area



Examples

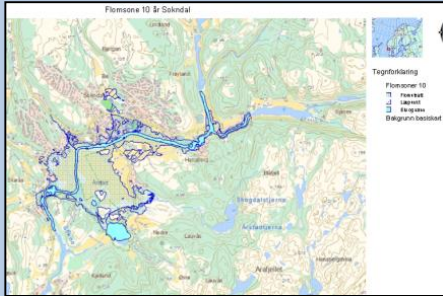


- Bergen
 - Mud slide resulting in 4 people died
 - The cause: ‘Climate change’
 - Precipitation above natural variability of current climatic conditions
 - Municipality not to be blamed for not taking the danger of mud-slide sufficiently into account

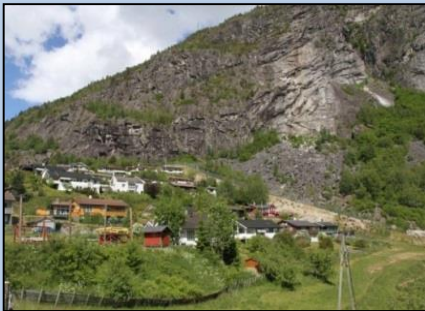


- Balestrand
 - Slush avalanche resulting in 2 people died
 - The cause: ‘Bad planning’
 - Local land-owner wanted to put up a residential house on a location with a barn very close to the river
 - The municipality asked the land-owner if he thought there were any natural hazard risks involved – he said “no”, and the municipality did not take any further action

Examples



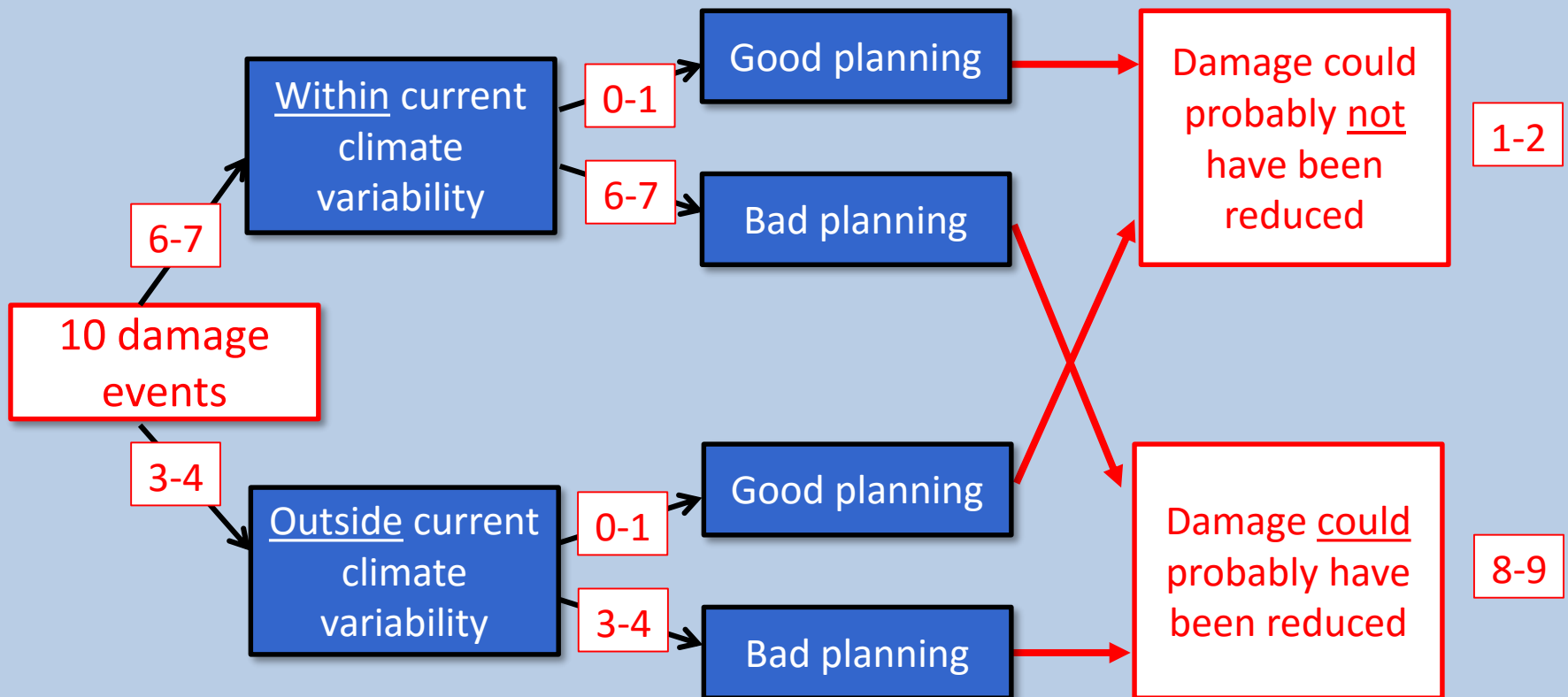
- Sokndal
 - Frequent inundation flooding of residential homes
 - The cause: ‘Bad planning’
 - Municipality allow to put up residential homes in flood prone areas
 - Calculated risk!



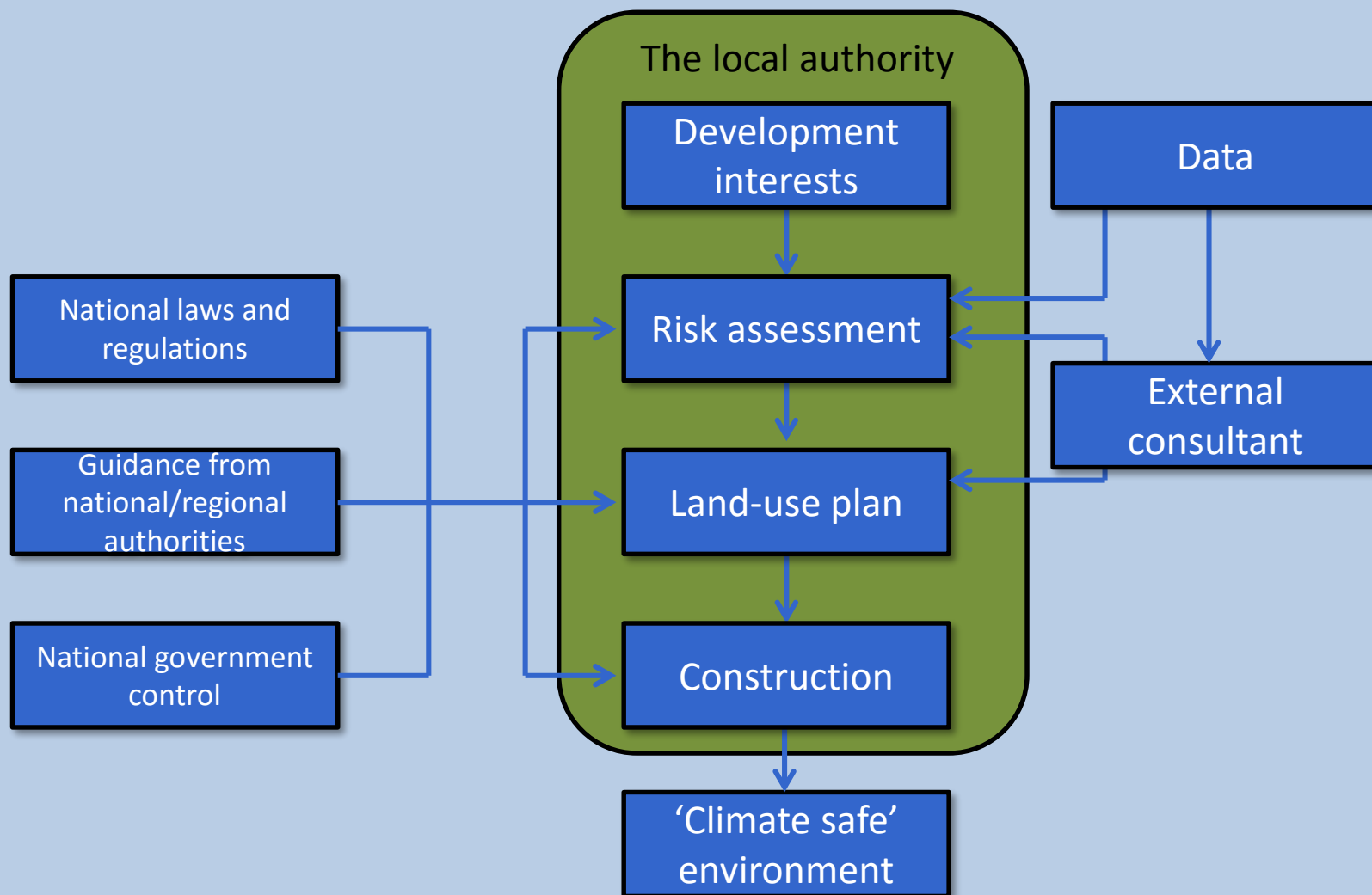
- Luster
 - Four residential homes tared down due to risk of rock-fall
 - The cause: ‘Bad planning’
 - Municipalities did not do thoroughly enough risk assessments in the land-use planning process
 - Had to pay 4 households for moving their homes to a ‘safe’ area

Who to blame?

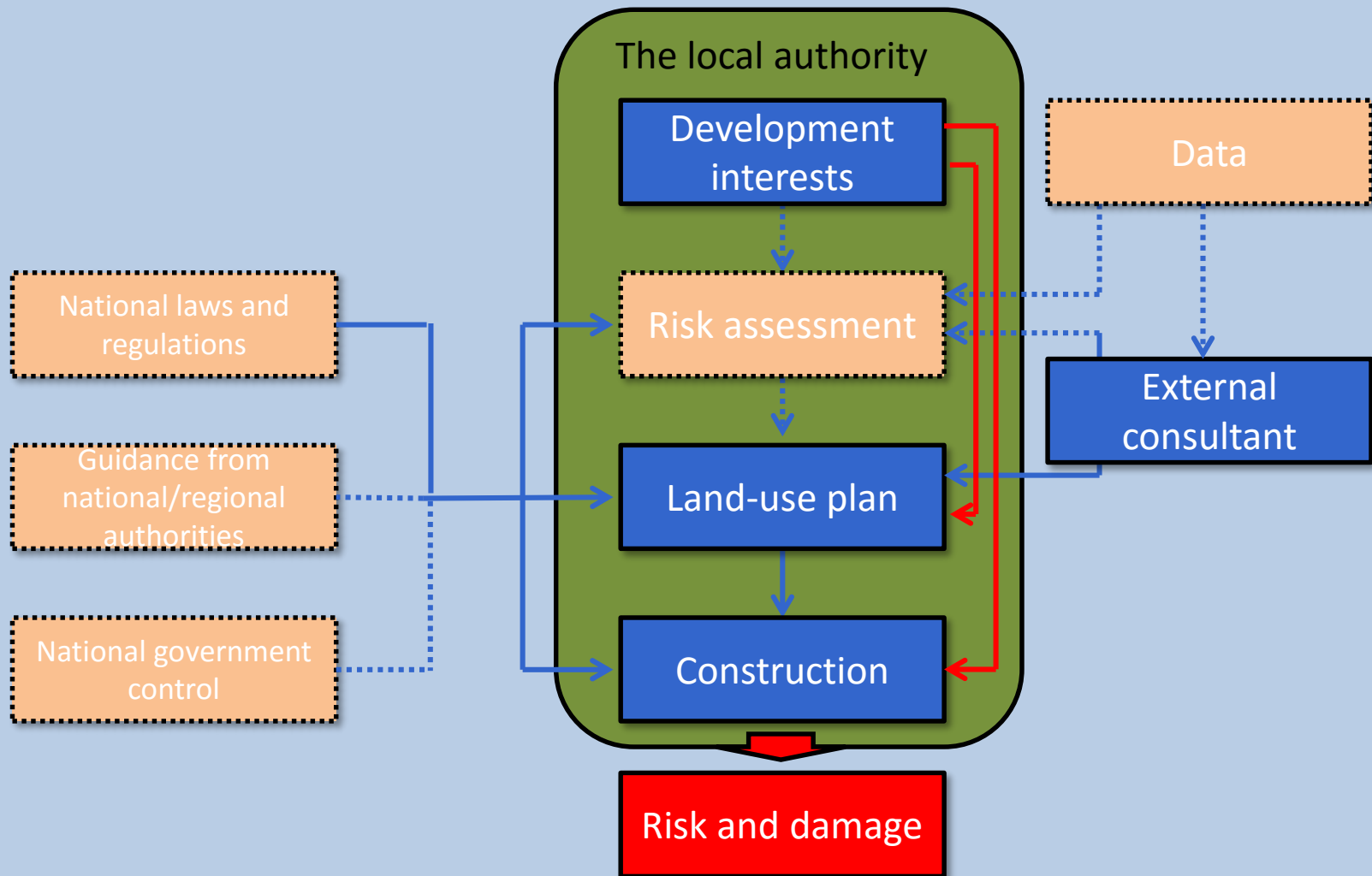
Potential for improvements



Planning “by the book”



Summing up the observed “bad planning practices”



How to be better prepared?

- Adapt national laws and regulations
 - Current national laws and regulations are not adopted to cope with the challenge of adapting current infrastructure and old land-use plans to climate change
- Increase government capacity on local guidance and control
 - Currently there are large regional variations on this matter
- Increase local planning capacity
 - Small and medium sized local authorities are under-staffed and under-budgeted when it comes to map vulnerability and conduct land-use planning
- Increase data quality
 - Local authorities lack sufficient data to assess climate related natural hazard risks
- Change political priorities
 - National and local politicians have to take more account of climate change concerns in land-use planning
- Increase knowledge
 - Knowledge is lacking on how to assess and prevent “new risks”, in particular slush avalanches, landslides and flash floods linked up with climate change



Thank you for your attention!

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