



- Structural measures in the Swiss prevention framework
- Types of structural measures
- Flooding structural measures
- Landslide structural measures
- Main points

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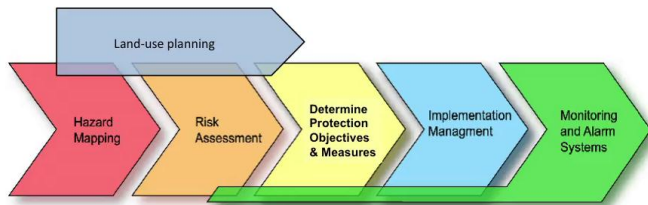
Hi. In this video I will explain and give a few examples of the types and techniques of structural measures that can be implemented to mitigate floods and landslides. I will place structural measures in the Swiss prevention framework. I will explain the types of structural measures that can be passive, active, or organizational. Then I will give examples of structural measures to mitigate floods and landslides. And I will conclude by giving you the main points that are to be remembered.

Notes

Summary



0m 04s



(1)

Structural measures can only be implemented after mapping the danger, integrating danger into land-use planning, and assessing risk

Risk assessment allows us to determine the protection objectives (or lack of protection) in a specific context and is mandatory for choosing and designing structural measures

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Here, I would like to place structural measures within the prevention framework. Structural measures can only be implemented after mapping the danger, integrating danger into land-use planning, and evaluating risk. Risk assessment allows to determine the objective for protection (or lack of protection) in a specific context and is mandatory for choosing and designing structural measures.

Notes

Summary



0m 37s

The prevention framework

1. Land-use planning
2. "Avoiding" strategy
3. Structural measures
 - a. Building in an appropriate manner (organizational and passive measures)
 - b. Protection measures (active measures)



aster Risk Reduction

Structural measures are only the last solution to mitigate natural hazards. The first step for natural hazards mitigation is land-use planning. You can please refer to my previous video for more information. This solution is very effective, especially in zones free of construction. The second step is the "avoiding" strategy. This means that you want to evaluate if the project could be developed outside of the hazard zone, or in a zone with a lower hazard-- meaning a zone with a lower intensity or higher probability of occurrence. Only when those two first steps are not sufficient to mitigate the hazard you have to analyze the third solution which is structural measures. There are two types of structural measures. a) building in an appropriate manner-- this means that you want to take into account organizational measures or passive measures on the object you want to protect; and b) protection measures, also called active measures. Before we move on I would like to emphasize on the fact that authorities are responsible for the prevention framework and its implementation.

Notes

Summary



1m 06s

Types of structural measures

- Individual measures are implemented at a project or plot level
- Collective measures are implemented to protect at a local or regional level. They require the coordination of multiple stakeholders and authorities

	Active	Passive
Individual		
Collective		

(3)

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There are three types of structural measures. Passive measures reduce the scope of potential damage without influencing the course of events. Active measures reduce or avoid potential damages by influencing the course of events. Organizational measures are used to limit the residual risk. Individual measures versus collective measures. Individual measures are implemented at the project or plot level. On the other hand, collective measures are implemented to protect at local or regional level. They require the coordination of multiple stakeholders and authorities.

Notes

Summary



2m 23s

Types of structural measures



Measures are chosen and designed based on:

- Level of risk → lack of protection
- Hazard intensity
- Hazard probability of occurrence
- Social, economical and ecological criteria

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To choose adapted measures for a specific context a few parameters are key: the risks involved, or the lack of protection; the intensity of the hazard- for instance, movement velocity for a landslide; the probability of occurrence of the hazard; and finally, the local context meaning social, economical and ecological criteria.

Notes

Summary

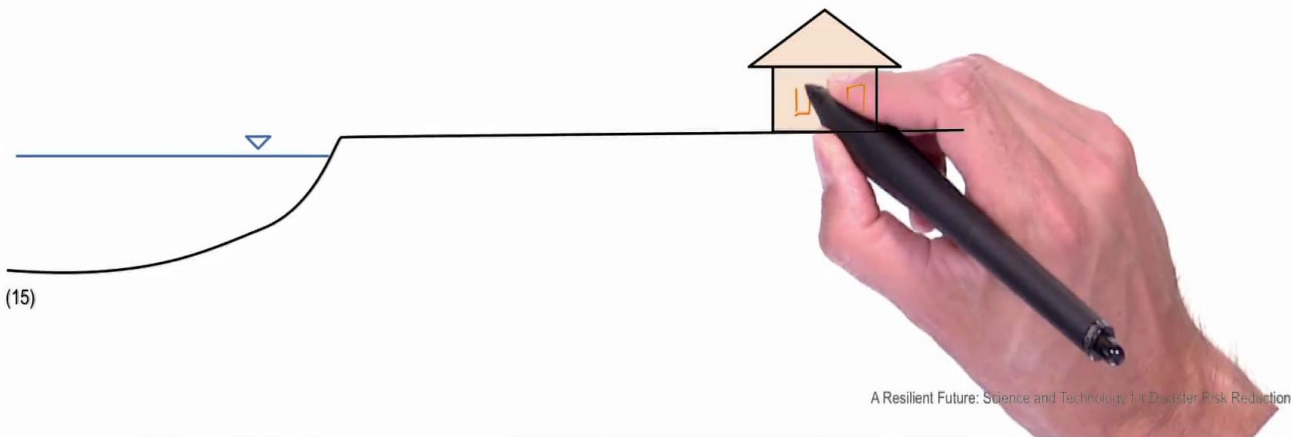


3m 03s

Flooding structural measures: Doors and windows

FLOODS	Active	Passive
Individual		X
Collective		X

(16)



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I will now give illustrative examples of possible structural measures to mitigate flooding. Note that hydrological models are key in determining danger and assessing risks and impacts of measures. As you will see, most structural measures against flooding are collective measures. River bed deepening is a measure that allows to deepen the river channel over a given period of time. It allows a higher flow rate at a specific location. This measure is usually not sustainable. River channel widening has the same goal as the previous measure-- that is to say, allowing a higher flow rate. And this is usually not a sustainable measure either if it's not considered at a catchment management level. River embankments are measures that are frequently used especially in urbanized areas. This measure will have to be considered at a catchment management level. In certain cases, local embankments can be considered for a single building or a single plot protection especially at lower and medium danger levels. Heightening of doors and windows allows a local protection especially in case of static flooding with low water levels. This means that the water level will not reach the bottom of the doors or windows.

Notes

Summary

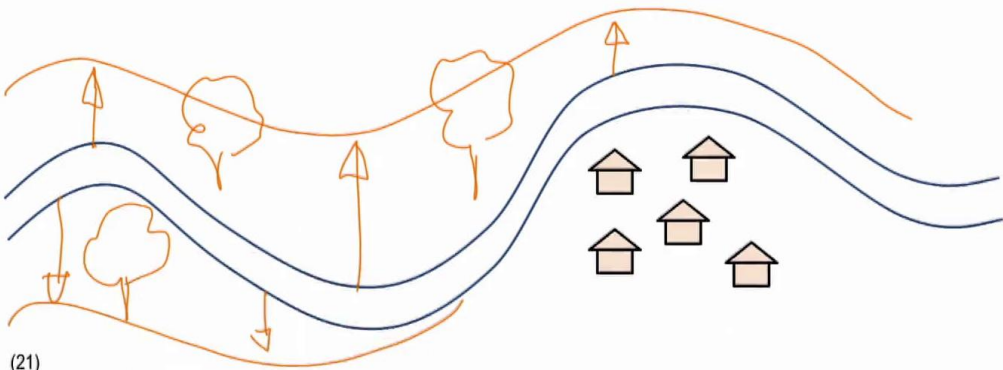


3m 28s

Flooding structural measures: Bed channel management

FLOODS	Active	Passive
Individual		
Collective	X	

(22)



(21)

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Retention dams are useful to guarantee a flow rate that avoids floods downstream of the dam. Flood corridors are often used in rural or peripheral areas where non-build land can be used to divert flooding outside of towns and villages. This is implemented by construction of either a triggered embankment or a preferred outlet zone where risks are under control. Bed channel management refers to rethinking the planning of the bed channel by implementing widening and ecological measures that will allow it to absorb a higher flow rate.

Notes

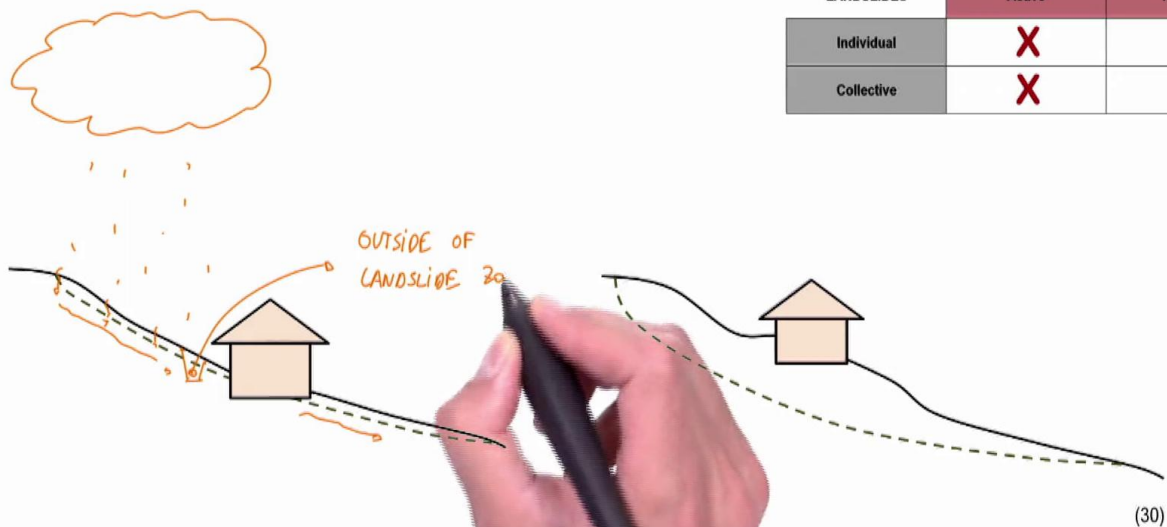
Summary

4m 53s



LANDSLIDES	Active	Passive
Individual	X	
Collective	X	

(31)



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I will now give illustrative examples of possible structural measures to mitigate landslides. Prior to any planning and designing of measures a very good understanding of the landslide's processes and parameters are mandatory, as well as danger and risk assessments. We will only address permanent landslides in this presentation. Spontaneous landslides call for different types of structural measures. Note that a combination of measures is often used to lower risk to an acceptable level. Reinforcing building foundations or walls can be a solution to prevent the structure being damaged in the case of shallow landslides. For deep landslides, this measure can only be implemented in case of low velocity or in case of no differential movements environments. Run-off water management is an effective and relatively cheap measure to implement. It is a very used solution combined with other measures. Excavation management refers to avoiding overloads within the landslide area. Drainage is an effective measure in most situations. It will stabilize the landslide by lowering the water pressure in the landslide surface rupture. This measure is effective at different depths but its cost will increase accordingly.

Notes

Summary

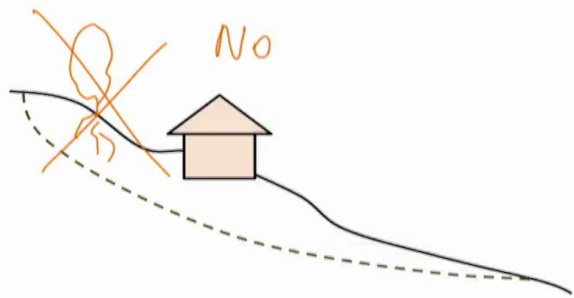
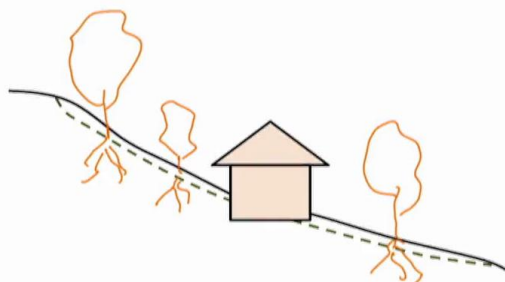


5m 46s

Landslides structural measures: afforestation

LANDSLIDES	Active	Passive
Individual	X	
Collective		

(35)



(34)

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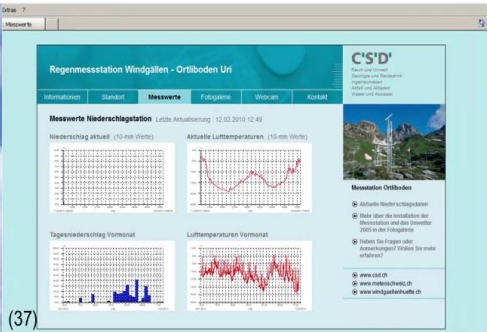
For more detail concerning this measure you can refer to the Swiss Federal Office for the environments publication that you will find in the reference list. Constructive measures such as retaining walls or similar structures are solutions that can block a landslide if properly executed. The price of this measure is quite high and will increase with the landslide thickness. Afforestation implies tree plantation. It will be very good for water run-off management and particularly effective in shallow landslides and spontaneous landslides mitigation.

Notes

Summary



7m 51s



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Monitoring has an essential role, especially in two situations: One, for residual danger management where measures are too expensive to implement against the low level of risk; and two, for extreme occurrences where no protection can be provided or when structural measures would be way too expensive.

Notes

Summary

8m 35s





- Structural measures should ideally be implemented when land-use planning, the “avoiding” strategy and building in an appropriate manner are not possible or sufficient
- Structural measures can be active or passive and individual or collective
- Context and personal assessment are key

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It could also be used combined with all other measures in specific cases. The main points that are to be remembered in this video are the following: Structural measures should ideally be implemented when land-use planning, the "avoiding" strategy and building in an appropriate manner is not possible or sufficient. Structural measures can be active or passive and individual or collective. Context and personal assessment are key. Thank you for watching.

Notes

Summary



8m 57s

- FOEN (2016) Protection against Mass Movement Hazards. The environnement in practice, p. 52-54

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Notes

Summary



9m 31s

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