



PROFF

Protection against flash floods

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Workshop 12

Flood protection measures (structural and nonstructural)

Klaipėdos valstybinė kolegija



FLOOD PROTECTION MEASURES

- ▶ Flash floods are sudden and rapidly occurring floods that typically happen within a short period of time, often within a few hours or even minutes. They are characterized by a rapid rise in water levels in rivers, streams, and other water bodies, leading to a swift and powerful surge of water.
- ▶ Reducing flood risks:

Structural measures, such as flood control dams, levees, and channel improvements, provide physical barriers and alter the flow of water to reduce flood risks.

Nonstructural measures, such as floodplain zoning, land use planning, and early warning systems, complement these efforts by guiding development away from high-risk areas and improving preparedness and response.





STRUCTURAL MEASURES



Structural measures are physical interventions implemented to manage and reduce the risks associated with floods. These measures involve the construction of engineering works and infrastructure to control and redirect the flow of water. Here are some key structural measures used for flood protection:

1. **Flood Control Dams:** Flood control dams are large reservoirs built to store excess water during periods of heavy rainfall. By regulating the release of water downstream, these dams help prevent downstream flooding and manage water levels in rivers and streams.
2. **Levees and Floodwalls:** Levees are embankments constructed along the banks of rivers or other water bodies to contain floodwaters within the channel. Floodwalls are similar structures made of concrete or steel that provide additional protection against rising water levels.
3. **Channel Improvement and Diversions:** Channel improvement involves modifying and widening natural or man-made channels to increase their capacity and improve the flow of water. Diversions are channels or canals created to redirect floodwaters away from vulnerable areas, thereby reducing the risk of flooding.
4. **Retention and Detention Basins:** Retention and detention basins are large, shallow depressions designed to capture and temporarily hold excess water during heavy rainfall. These basins help regulate the flow of water, reducing the peak discharge downstream and minimizing flood risks.



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Structural Measures



5. Floodgates and Flood Barriers: Floodgates are structures that can be closed or opened to control the flow of water through a channel or flood barrier. Flood barriers, such as removable or deployable barriers, are temporary structures erected to prevent floodwaters from entering a specific area.



6. Reservoirs and Flood Storage Areas: Reservoirs are artificial lakes created by constructing dams across rivers. They serve multiple purposes, including flood control by storing and releasing water in a controlled manner. Flood storage areas are designated spaces where excess water is temporarily stored during flood events, reducing downstream flood impacts.

Structural measures play a crucial role in reducing flood risks by altering the natural flow of water and providing physical barriers to protect communities and infrastructure. However, it is important to recognize that structural measures alone may not provide complete flood protection. They should be implemented in conjunction with nonstructural measures, such as land use planning, early warning systems, and community preparedness, to create a comprehensive flood management approach.



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Green infrastructure as flood protection measure



Implementing nature-based solutions can help absorb and manage excess water during heavy rainfall. This includes creating green spaces, parks, and urban wetlands, as well as preserving natural floodplains and restoring natural drainage systems. These measures increase water infiltration, reduce runoff, and mitigate flash flood risks.



NON-STRUCTURAL MEASURES FOR FLOOD PROTECTION



Nonstructural measures refer to strategies and approaches for flood protection that do not involve physical alterations to the natural environment. These measures focus on planning, policy, and community engagement to reduce flood risks and enhance resilience. Here are some key nonstructural measures used for flood protection:

1. **Floodplain Zoning and Land Use Planning:** Floodplain zoning involves identifying and regulating areas at risk of flooding, restricting certain types of development in high-risk zones, and guiding land use practices to minimize exposure to flood hazards. It aims to prevent or reduce the construction of infrastructure and buildings in flood-prone areas.

2. **Early Warning Systems:** Early warning systems use real-time monitoring of weather conditions, rainfall intensity, and water levels to detect potential flooding and issue timely warnings to the affected communities. These systems help facilitate evacuation, preparedness, and response, improving overall community safety.



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NON-STRUCTURAL MEASURES FOR FLOOD PROTECTION

3. **Public Awareness and Education:** Education and awareness campaigns play a crucial role in promoting individual and community preparedness for floods.

4. **Emergency Response Planning:** Developing comprehensive emergency response plans that outline procedures, roles, and responsibilities during flood events is essential.

5. **Sustainable Drainage Systems:** Sustainable drainage systems, such as green infrastructure and stormwater management practices, aim to mimic natural processes and reduce the impact of urban development on flood risks.

6. **Ecosystem Restoration and Conservation:** Protecting and restoring natural ecosystems, such as wetlands, floodplains, and forests, can have significant benefits for flood protection. These natural features act as buffers, absorb and store water, and help slow down flood flows, reducing the intensity and impacts of floods.

7. **Insurance and Risk Transfer Mechanisms:** Insurance coverage for flood-related damages provides financial protection to individuals, businesses, and communities affected by floods.

Nonstructural measures complement structural interventions by addressing societal, economic, and environmental aspects of flood risk management. They focus on reducing exposure, improving preparedness, and enhancing community resilience, ultimately contributing to more effective and sustainable flood protection strategies.





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GIS (Geographic Information System) maps are a valuable aid to be able to prepare a response.

By the use of GIS you can precisely see which areas may be affected at a given water level on the basis of the warning from the Met Office. This means that you are able to initiate the right response, at the right spot, in the right order. This can be done days in advance, before the water is coming e.g. by laying of sandbags on weak spots.



How to prepare?



- ▶ Handling a flood is a complex task to undertake, it demands that you are prepared even before the flooding hits. This can be done by being aware of the things you can and should do and prepare accordingly.
- ▶ On a local plan you might have local flood groups that are familiar with the possible affected areas. They should be contacted to collect information on the state of the area and flood defences and whether they are intact.
- ▶ At the same time, you might be able to use their help on site as observers who can report back regarding the condition at their locations during the incident. In most cases the flood groups will activate themselves.



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How to prepare? Social Equity and Inclusivity



Integrated strategies aim to ensure that vulnerable communities, including low-income groups and marginalized populations, are not disproportionately affected by floods. By incorporating social equity considerations, these strategies address issues of access, affordability, and inclusivity in flood risk management measures.

By adopting integrated strategies, communities and decision-makers can build resilience to floods by combining diverse measures and approaches that address the complexity and interconnectedness of flood risks. This holistic approach helps reduce vulnerabilities, enhance preparedness, and promote sustainable development in flood-prone areas.



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SUMMARIZING

- ▶ It's important to note that flash flood protection requires a combination of structural, non-structural, and community-based measures. These measures should be tailored to local conditions, considering factors such as topography, climate, and hydrological characteristics. Regular maintenance and updating of protection measures are also essential to ensure their effectiveness over time.



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