

Erosion control with geosynthetic applications
Inland conditions rivers, slopes and embankments

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Inland conditions rivers, slopes and embankments



Content list

- 1. Introduction
- 2. Rainfall, flood and erosion conditions
- 3. System selection for erosion control
- 4. Geosynthetic applications
- 5. Conclusions



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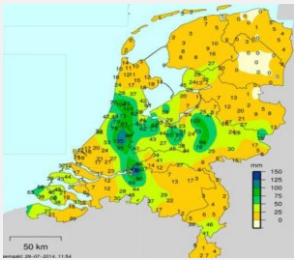
Erosion control with geosynthetic applications
Rainfall, flood and erosion conditions

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Alphen a/d Rijn, 28 juli 2014

Extreme rainfall conditions

- Rainfall in 24 hour > 100 mm
- NL insurer's loss 90 -> 250 MEUR/year
- Probability 3x more than 1950



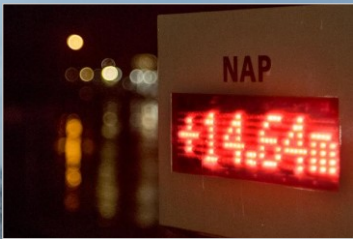
Reference: slide based on G. van der Steenhoven – KNMI 2017

Report: Deltares, 'Overstromingsrisico's door intense neerslag', 2018

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Rainfall, flood and erosion conditions

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High waterlevels January 10th 2018 - The Netherlands

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Erosion types per segment

- Slopes and embankments
 - Splash erosion - rainfall.
 - Rill and gully erosion - run-off by heavy rain.
- Rivers and waterways
 - Gradual slope erosion by high water velocities.
 - Severe slope erosion by currents, waves, storm conditions.



Splash erosion



Rill and gully erosion



Severe slope erosion



River slope erosion

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Erosion effects and dangers

1. Loss of fertile top soil / sediments.
2. Scouring of slopes.
3. Danger of mud flows (steep hills/ mountains).
4. Increasing stability problems, threatening lives and structures



Related to severe effects, measures are to be taken to reduce the risk of erosion!



Severe effects existing steep slope Museum Modern Art Arnhem NL

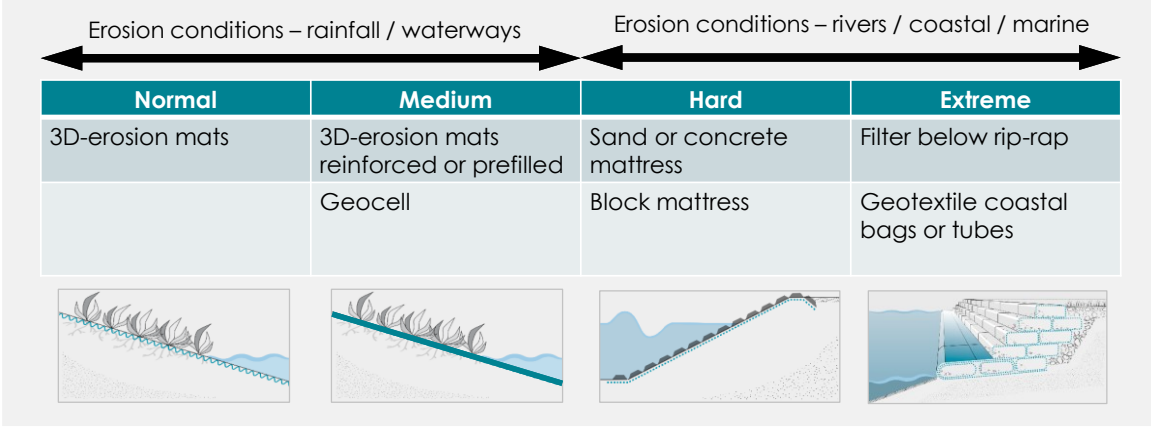
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Classification to erosion conditions

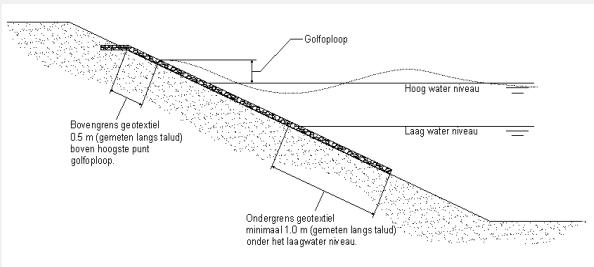


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Erosion control with geosynthetic applications
Vegetated erosion control mats

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- Erosion control mats (3D-textured mats) for natural vegetation development and reinforcement of the vegetation root zone.
- Prefilled mats applied on the slope from minimum 1.0 meter below low water level to 0.5 m above highest point wave run-up.
- With longitudinal flow mats matting should be applied to the bottom.

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Installation open erosion control mat, Houston Levee, USA

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Hydro mulching erosion control mat, Houston Levee, USA

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Prefilled erosion control mats

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Prefilled erosion control mats

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Prefilled heavy erosion control mat (A20)
vegetated slopes after 6 months, Zevenhuizen, NL

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Reinforced erosion control mat (R45) with percussive
driven earth anchor system, Quitman, US

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Erosion control with geosynthetic applications
Concrete mattress slope protection

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Concrete mattress slope protection

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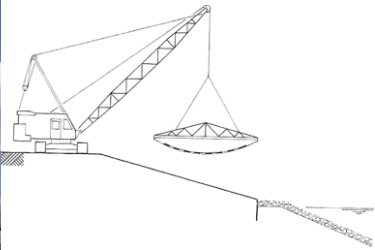


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Erosion control with geosynthetic applications
Prefabricated concrete block mattress

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- Casting concrete blocks on a geotextile carrier layer by using a looppile fabric or plastic pins.
- Installation with 1 or 2 side lifting equipment.



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Prefabricated concrete block mattress

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Armor revetment with prefabricated concrete block mattress,
Western Australia

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Erosion control with concrete block mat on
geotextile looppile fabric with 2 side lifting equipment

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Erosion control with geosynthetic applications
Geocell constructions

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- Related to extreme rainfall and floods there will be huge challenges to protect people and premises along delta-areas world-wide.
- Challenges for inland protection are at least of same size than the coastal protection due to sea level rise.
- Solutions with geosynthetics can contribute in a large segment of hydraulic engineering solutions.

Publication 'Klimaatverandering en weersextremen, toepassing van geokunststoffen bij waterkeringen en kustverdediging', [Geokunst, March 2019 \(part 1\)](#)

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Further interest in geosynthetics?

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- Become member of the NGO (Nederlandse Geotextiel Organisatie), events:
 - November 21th – afternoon lecture event W+B Deventer.
- International Geosynthetic Society (IGS):
 - Worldwide organization on the application of geosynthetics
 - 6-9th September 2020 – [Warsaw 7th EuroGeo congress](#)
- PAO-TM Post Academic Courses, events:
 - October 30/31th 2019 – [State-of-art dyke improvements techniques](#)
 - March 19th 2020 – [Geomembranes in underground infrastructure](#)
 - November 24th 2020 – [Geotextiles in hydraulic engineering](#)
- Websites for additional information:
 - www.ngo.nl
 - www.geosyntheticsociety.org
 - www.geosynthetica.net
 - www.paotm.nl

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