



KlimaGrunn dialogkonferanse

26. November 2018

Bjørn Kalsnes og Bjørn Kristian Bache NGI

NGI forskningsprogram på klima- og miljøvennlige skredsikringsløsninger

➤ PHUSICOS (2018-2022) – EU H2020

- NGI er koordinator
- Naturbaserte løsninger

➤ Klima 2050 (2015-2023) – NFR SFI

- SINTEF er senterleder
- NGI ansvarlig for arbeidspakke 3 Vannutløste skred

PHUSICOS - 'According to nature' in Greek

- The main objective is to **demonstrate** that nature-based/nature-inspired solutions for **reducing the risk of extreme weather events** in particularly vulnerable areas such as rural mountain landscapes, are technically viable, cost-effective and implementable at regional scale. Furthermore, they **increase the ecological, social and economic resilience of local communities**.



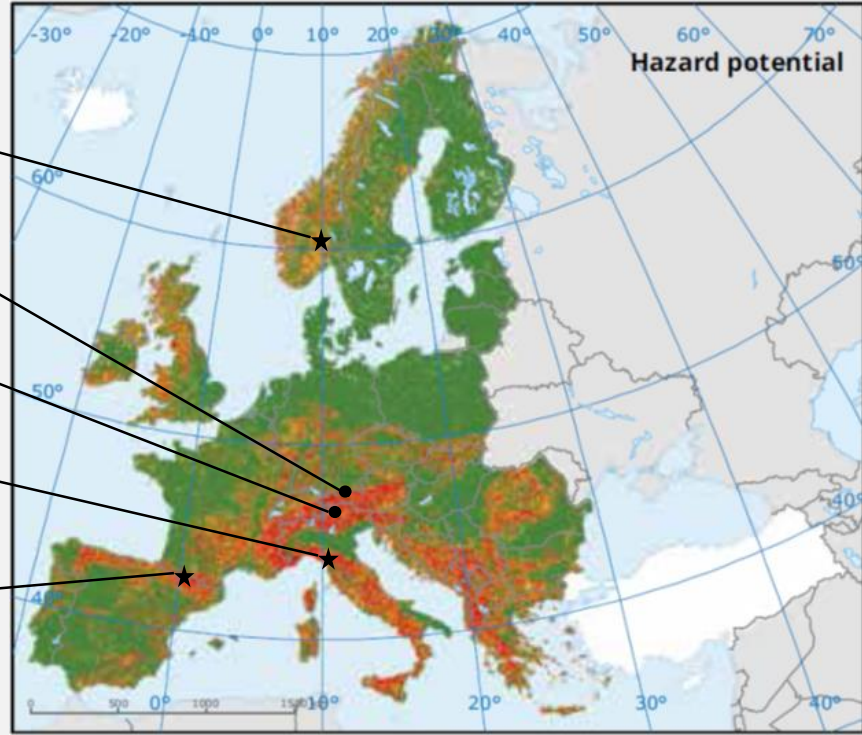
Natural hazard risks from extreme weather events

- Damage costs from extreme weather events (floods, droughts, landslides, storm surges) are very high, and increasing.
- Impact from climate change and other changes (land use change, demography) are likely to worsen the situation.
- **Traditional engineering concepts (dikes, retention dams) are costly, take a lot of space, lack flexibility and may have negative impact on the ecosystem.**
- Nature-based solutions are available on small-scale but need upscaling.

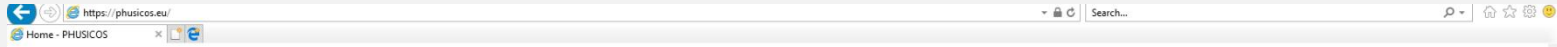


PHUSICOS Case study sites

- Valley of Gudbrandsdalen, Norway**
Flooding, landslides and debris flows
- Isar River Basin, Germany**
Flooding and erosion
- Kaunertal Valley, Austria**
Landslides, rockfall and debris flows
- Serchio River Basin, Italy**
Extreme drought and flooding
- The Pyrenees, Spain-France-Andorra**
Landslides, rock falls and flash floods



<https://phusicos.eu/>



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PHUSICOS

Solutions to reduce risk in mountain landscapes

PHUSICOS – “According to nature” in Greek – is funded by the EU Horizon 2020 program. It will demonstrate how nature-based solutions provide robust, sustainable and cost-effective measures for reducing the risk of extreme weather events in rural mountain landscapes.



News



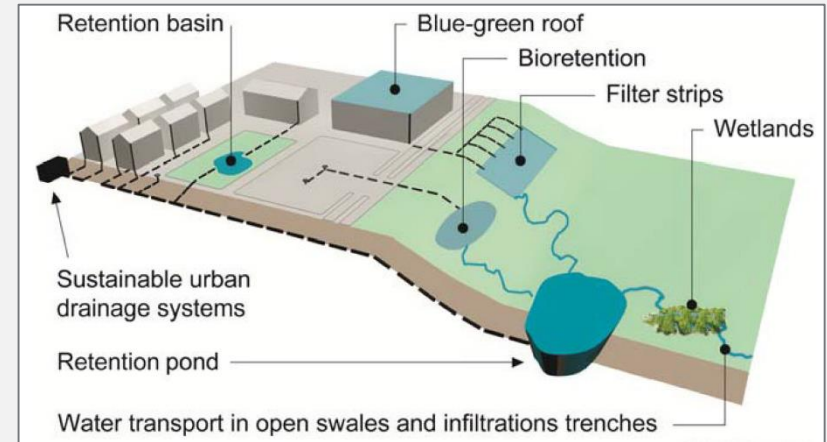
RCN: Center for Research Based Innovation (SFI): 'KLIMA2050'



- WP 1: Climate adaptation of buildings
- WP2: Urban flooding
- WP3: Water triggered landslides(NGI)
- WP4: Management and decision processes

NGI www.klima2050.no

- Risk reduction through climate adaptation of buildings and infrastructure
- 20 Partners from research, public sector, and industry.
- 8 years; 2015-2023
- Total budget NOK 221 mill. (24 mill. EURO)



WP3 Goals

Klima 2050 will develop principles, methods and solutions for reducing the risk posed by water-triggered landslides on populated areas and transportation infrastructure in a future climate regime, through development of:

- Innovative structural measures for stabilizing existing slopes and embankments.
- Climate-adapted design procedures for natural and man-made slopes.
- Smart and cost-effective methods for protecting the constructed facilities and infrastructure from the impact of landslides.
- Further development of early warning systems, coupling the very short term rainfall forecasting with observations and regional geotechnical models to localize susceptible initiation of slides and debris flows.



- Et web-basert “lavterskel” tilbud for å skaffe seg oversikt over de mest aktuelle sikringstiltak for konkrete skredtilfeller
 - En “databank” over sikringstiltak inndelt i kategorier av sikringstiltak
 - En webside som tar hensyn til også andre kriterier enn de rent tekniske
 - En dynamisk webside som hele tiden vil justeres (nye ekspertvurderinger, nye tiltak) og som kan utvides til å inkludere også andre elementer (kobling mot forskning, best-practice case studier, reguleringer, data som løsmassekart, helningskart, skredtilfeller...)
- www.larimit.com



NTNU

Norwegian University of
Science and Technology

Department of Civil and Environmental Engineering
PhD Topic

Innovative protection solutions from landslides triggered by extreme weather events

Candidate: **Hervé Vicari**

Supervisor: **Prof. Vikas Thakur**
Co-supervisor: **Prof. Steinar Nordal**

GBV Grunnforsterkning



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Grunnforsterkning - utslipp

Flere faktorer påvirker det totale utslippet:

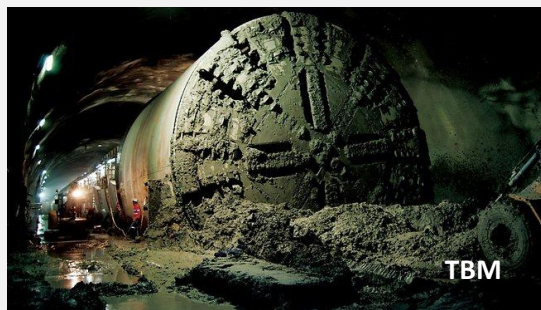
- ↗ Type bindemiddel
 - CO₂-avtrykk, forurensing
- ↗ Mengde bindemiddel
 - Type jord, herdetid, temperatur
- ↗ Konfigurasjon, dekningsgrad
 - Installasjon, samvirke, robusthet

Bedre forståelse – høyere utnyttelse – lavere utslipp

GEOreCIRC:

Hovedmål: Utvikle metoder som danner grunnlag for økt nyttiggjøring

1) Problemfraksjoner som blir ansette som rene, og som har et potensial for nyttiggjøring



2) Restprodukter og overskuddsmasse som er lettere forurenset og som i dag blir ansett som et avfall



Eksempel: KS-leire som impermeabelt tettesjikt – Case Langøya



Eksempel: Nyttiggjøring av betong – utfordring med Cr(VI)

- Målsetting: høy andel nyttiggjøring av betong
- Betong utgjør ca. 22% av avfall som deponeres i Norge
- Grenseverdi for totalkonsentrasjon av Cr(VI) i betong (uten søknad): 2 mg/kg
 - Betong med >2 mg/kg Cr(VI) blir deponert
- Testing viser at en høy andel av betongen har Cr(VI) > 2 mg/kg

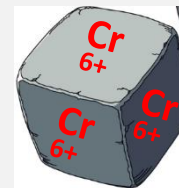


Goal to achieve a 70% reuse of materials in building and construction projects



Nyttiggjøring av betong – er utlekking av Cr(VI) et problem?

- ↗ Undersøke utlekkingspotensialet av Cr(VI) fra betong og oppførsel i miljøet relatert til nyttiggjøring
- ↗ Effekten av :
 - Gammel vs. ny betong
 - Partikkelstørrelse
 - pH
 - Organisk materiale
- ↗ Samarbeid med Miljødirektoratet



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