

A transdisciplinary approach to hydro-meteorological risk reduction in an informal semi-urban neighbourhood in El Salvador

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Background

Informal neighbourhoods face numerous challenges, of which in the Colonia Montreal many have been resolved in the last centuries through an active civil society. Among others, land and water management challenges persist, with hydro-meteorological risks as the most pressing issues.



Interview with community leaders

Situated in the hilly suburbs of San Salvador, many measures cause downslope impacts due to landscape connectivity. Reduced vegetation and surface sealing combined with the lack of a sewage system leads to high surface water runoff, resulting in increased pluvial flooding, erosion, and landslides. Moreover, the effects of climate change are very likely to increase hazard intensities¹.

Objective

The analysis of the current situation describes the study area physically, the impact on residents and their role in risk reduction. During the process, it should empower residents to improve existing solutions and collect data for a hydrodynamic model, which will be developed in a later step.

Study Area

Location: Colonia Montreal, San Salvador, El Salvador
Area: ~ 1 km²
Terrain: Hillslope falling towards a ravine in the west
Climate: Tropical climate
Soil: Regosols – loose, partly loamy²



Study area within red boundary

Existing measures:	Implemented by:
<ul style="list-style-type: none">▪ Grey infrastructure▪ Nature-based Solutions (low-cost)	<ul style="list-style-type: none">▪ Individual residents▪ Communal organization▪ Development projects

Hydro-meteorological Risks

Erosion:



Landslides:



Pluvial flooding:



Participatory Methods

Why?

Stakeholders:	<ul style="list-style-type: none">• Analysis of relevant stakeholders
Local knowledge:	<ul style="list-style-type: none">• Problem definition & current solutions• Residents learn from each other during workshops:<ul style="list-style-type: none">- Hillslope processes- Improving solutions• Use for calibration of hydrodynamic model
Implementation:	<ul style="list-style-type: none">• Residents implement own solutions

First Results

Stakeholder Analysis

Local actors:	Other actors:
<ul style="list-style-type: none">• Individuals• Board of Directors of communities• Communal Civil Protection• Intercomunal	<ul style="list-style-type: none">• University (Inst. of Spat. Org.)• Social Housing NGO• Municipality• Ministry of Public Works• Spatial Planning Organisation• Development Aid Organizations

Partly active stakeholders, some important stakeholders (authorities) did not participate

Transect Walks

- General understanding of the study area
- First delineation of study area according to physical and community boundaries
- Identified risk types and current solutions



Transect walk in Paisaje Veracruz

Materials of self-constructed solutions:
<ul style="list-style-type: none">▪ Car-tires▪ Concrete▪ Vegetation▪ Plastic sheets

Participatory Mapping

Mapped information:
<ul style="list-style-type: none">▪ Public spaces▪ Problem sites▪ Current measures▪ Permeability of roads▪ Rainwater flow paths▪ Water levels in rain events



Map prepared by resident (left), by researcher (right)

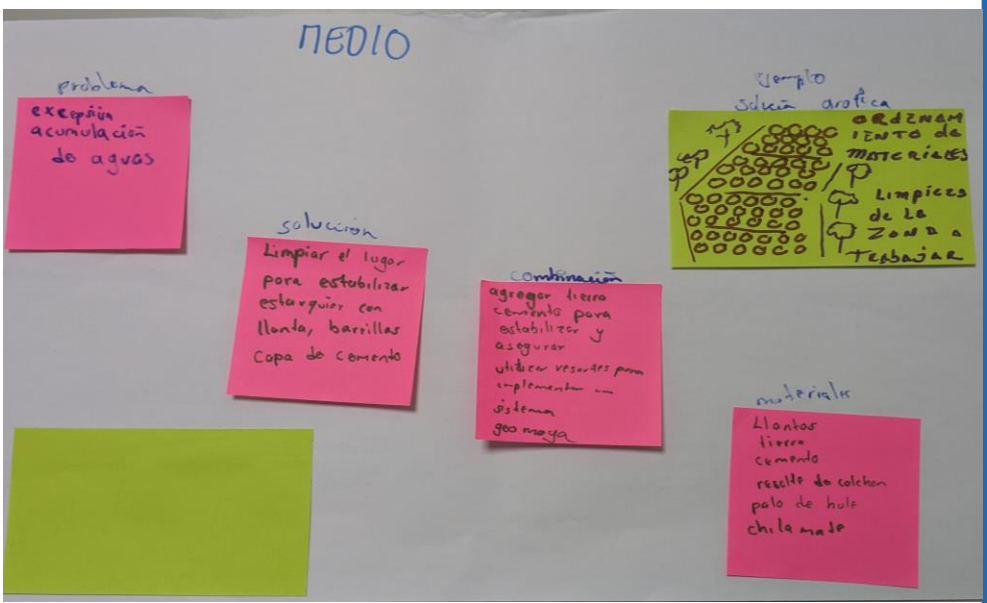
- Improved understanding of study area for residents and researchers
- Mapping surface runoff paths and water levels for calibration of hydrodynamic model

Solutions Development Workshop

After presentation of the participatory map, new input (NbS) and specific problem sites:

- Development of solutions in groups of residents for different problem sites: Near to ravine, midslope, upslope

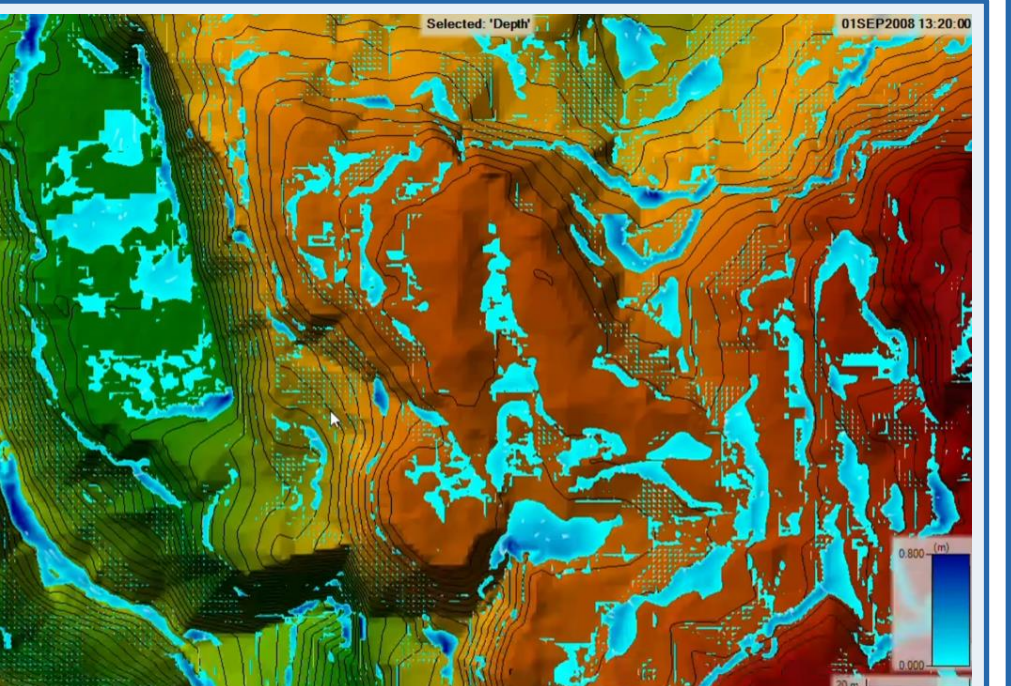
Participation: Active and diverse residents
Ideas: Using new input or combining with existing techniques
Implementation: Self-constructable or other actors required



Example of solution combining existing techniques with new input

Outlook

Next step: Hydrodynamic modelling of surface runoff
<ul style="list-style-type: none">▪ Calibration / validation through participatory map▪ Quantification of effects of proposed solutions



HEC-RAS Rain-on-Grid Model



Participants after workshop

- Outcomes:**
- Residents can implement solutions with new ideas
 - Quantification of proposed solutions effects can support urban planning and implementation by NGOs, development aid, government.

The final results are expected to demonstrate the ability of this conceptual approach to design implementable and effective NbS.