Vulnerability of small rivers coastal part due to floods: the case study of Lesvos West - North Coast

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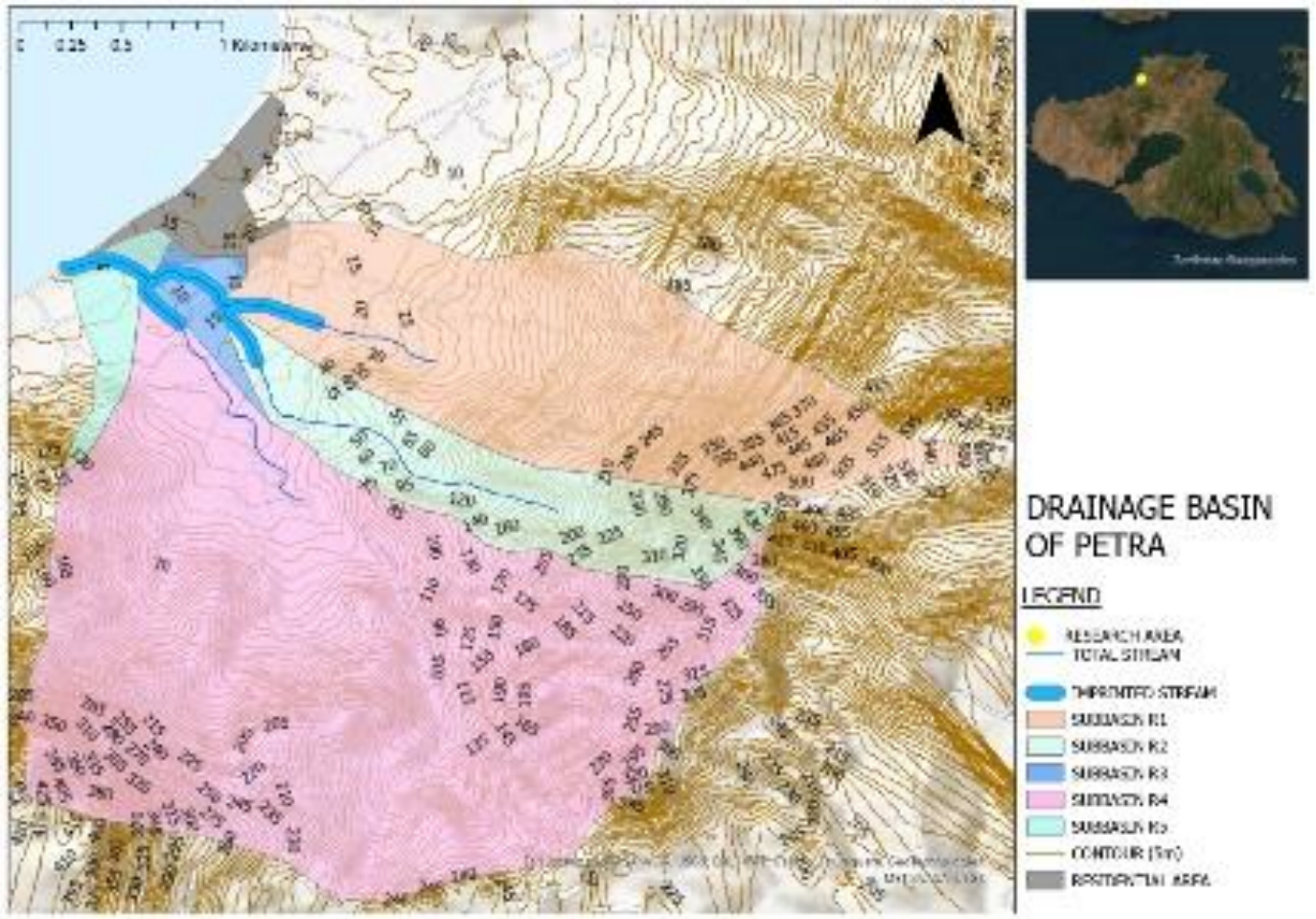


Climate Parameters	
Precipitation	545 mm
Temperature	17.39 °C
Wind	N-NE, 5 bft
Hydrologic parameters	
River length	1.75 km
Catchment surface	7.97 km^2
Mean slope	1.03 %
Mean width	6.15 m
Mean depth	1.63 m

Methods and Materials

COASTAL VULNERABILITY

InVEST Coastal vulnerability model

Physical characteristics (wind, wave, bathymetry, catchment surface)
Natural habitat (seagrass)
Population data
Topography (DEM)

$$CVI = \left(R_{Habitats} R_{Shorline\ Type} R_{Relief} R_{Waves} R_{Surge}\right)^{1/5}$$

The coastal exposure index: **very low exposure (rank=1) - very high exposure (rank=5)**

HYDRAULIC PROCESSES

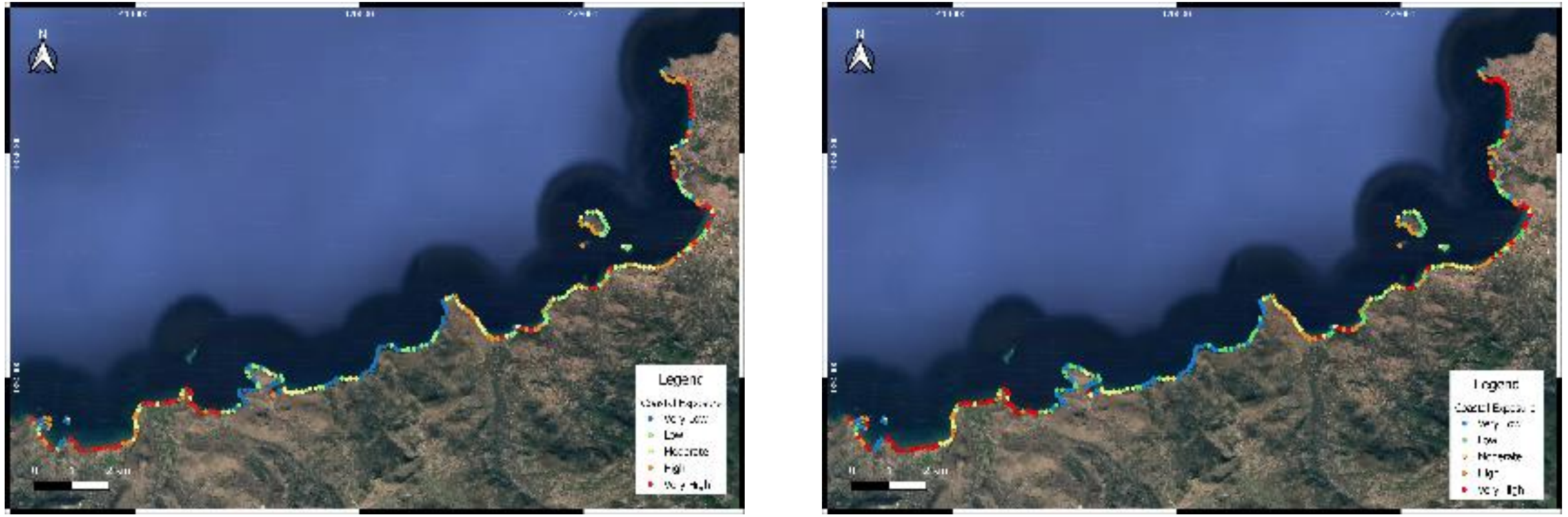
HEC-RAS

One steady flow

Climate data (P, T, Q)
Topography (DEM)

Critical cross sections

Results



(a) (b)

Figure 2: Map of Petra – Molyvos exposure to erosion (a) with Habitats variable, and (b) without Habitats variable

Results

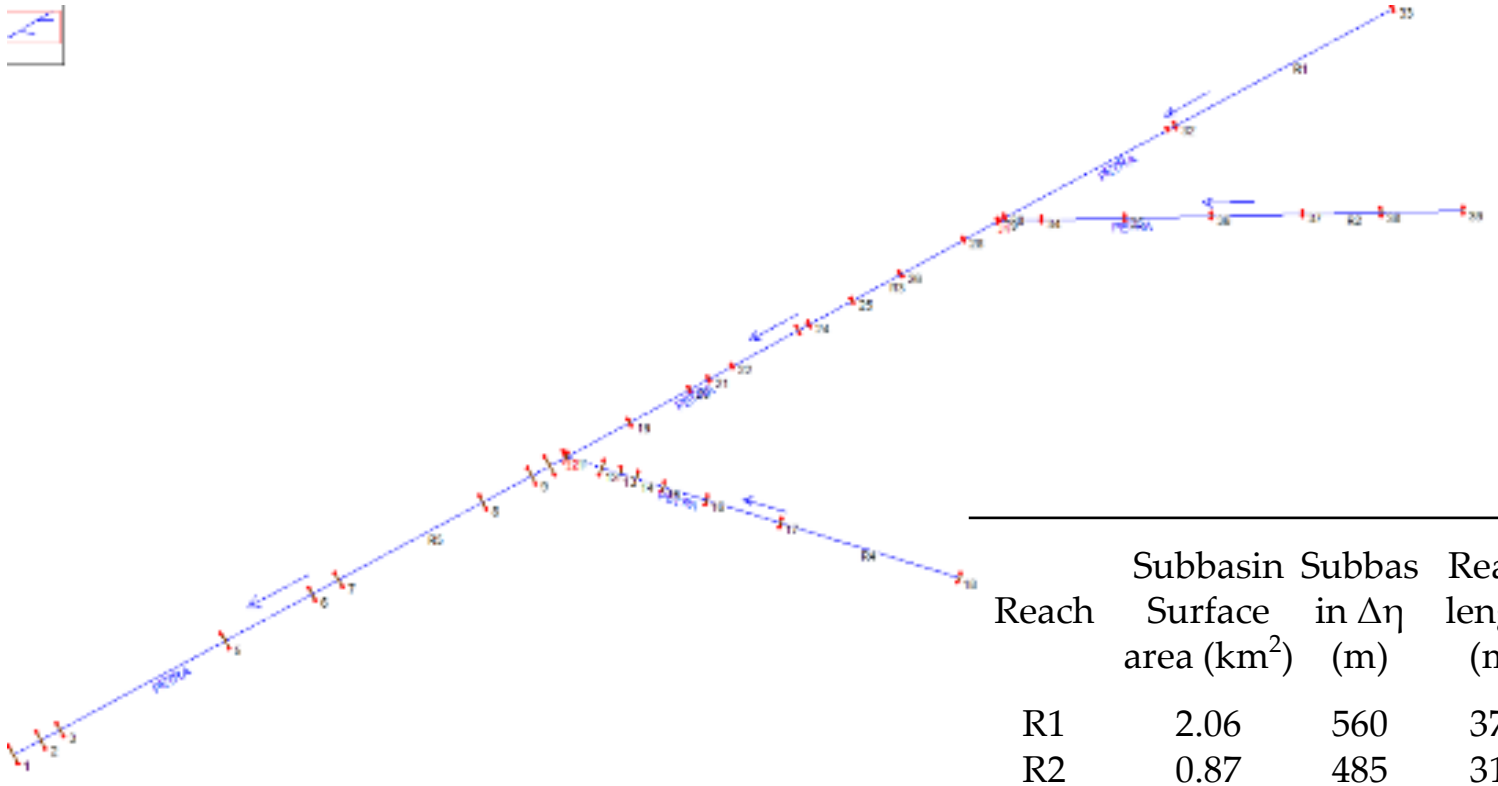


Figure 3: The Petra stream plot

Table 2: Stream flow of Petra.

Reach	Subbasin Surface area (km^2)	Subbasin Δη (m)	Reach length (m)	Flow Q (m3/sec)	Overflow section	Froude Value	Velocity (m/s)	E.G. Slope (m/m)	Average Branch Velocity (m/s)
R1	2.06	560	375	2.15	S32	0.27	0.66	0.001856	1.42
R2	0.87	485	317	1.40	S37	0.43	0.99	0.006421	1.25
R3	0.14	15	399	1.55	S26	0.44	0.87	0.0059	0.90
R4	4.65	345	258	3.90	S18	0.14	0.48	0.0005	1.10
R5	0.20	145	367	8.50	S2	0.15	0.57	0.0005	1.33

Conclusion

- This study combines the main results with an analysis of floods and flush rain episodes and the coastal erosion vulnerability of the sandy and rocky beaches. The habitat is an important part of the coastal zone, which reduces coastal exposure to erosion. The vulnerability scenario with habitats gave a 53% of coastal protection, and the CV index gave moderate risk (rank = 2 to 3). Additionally, the results from the CV index showed low exposure (rank = 1 to 2) to rock beaches and high exposure (rank = 4 to 5) to sandy beaches (Figure 2).
- The hydraulic analysis of the Petra River, during the rainy events, showed low velocities in geometrically small cross-sections and the simulation results show that under flashy rain events, several cross-sections of the stream are overflooded. Anthropogenic activity in the river's hull negatively affects sediment transport to the coastal zone

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