Supporting Early Action with a flood Impact-based Forecasting: a case study of Tropical Cyclone Idai

Margherita Sarcinella, Simon Ngorok, Benedikt Mester, Jacob Schewe, Domenico Bovienzo, Letizia Monteleone, Lisa Landuyt, Brianna R. Pagán, Jeremy S. Pal, Arthur H. Essenfelder, Jaroslav Mysiak

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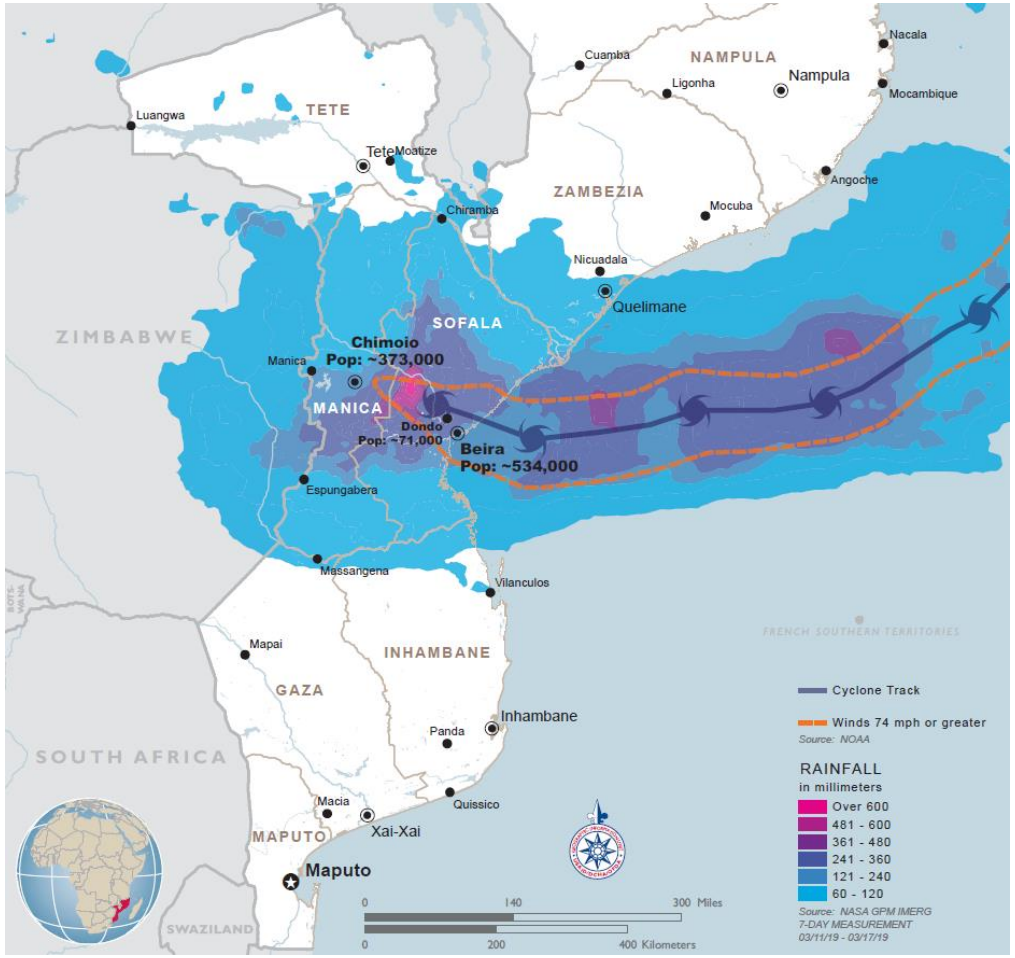
Tropical Cyclone Idai | Impacts



Fatalities
600

Affected people
1.85 M

Displaced people
478'000

Cost of recovery & reconstruction
2.9B USD

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Tropical Cyclone Idai | The storyline

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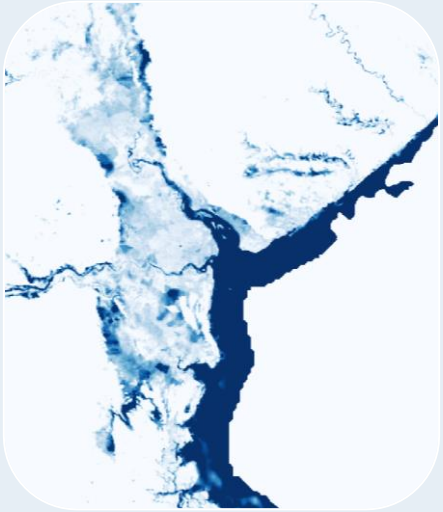
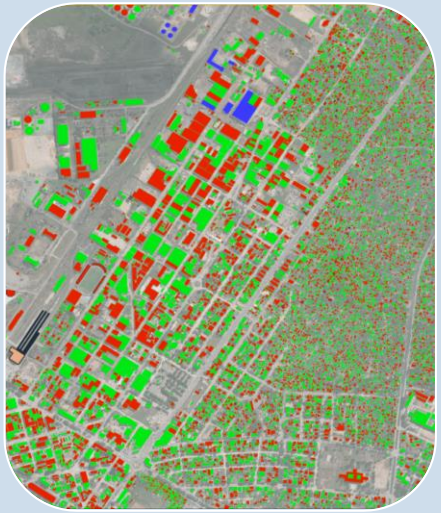
Hazard

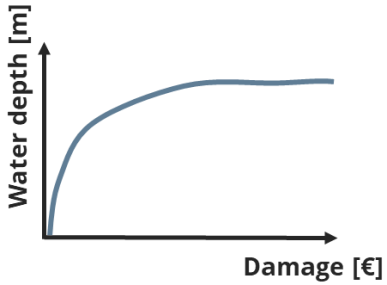
From flood depth to direct damage



Flood depth modelled by PIK (factual + scenarios)



OpenStreetMap building data



JRC water depth-damage functions

Flood direct damage at building level & aggregated

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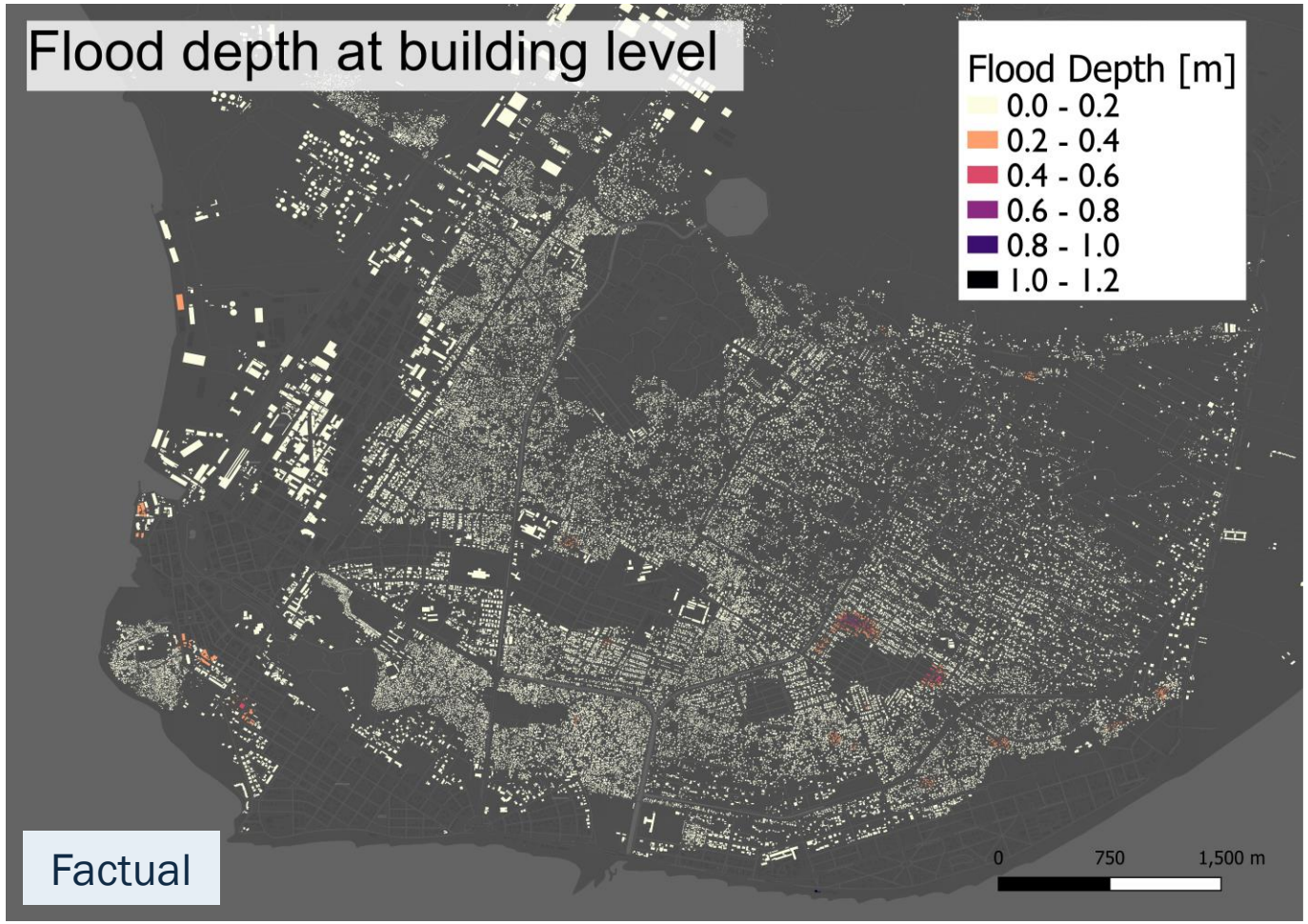
Results



Total direct damage to the buildings in Beira

Factual
257 M EUR

2050 SSP5-8.5 (high)
+19% Wind; +35cm SLR
569 M EUR

2100 SSP5-8.5 (high)
+33% Wind; +156cm SLR
871 M EUR

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- PhD Project on **Flood Impact-based Forecasting**. Pilot → TC Idai
  - Exploitation of knowledge on past events
  - Allows for multi-source approach
  - Dynamic framework and dynamic variables (i.e. population movements)

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  - Scenario-based approach & stochastic capacity (HM)

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Goals

- **Storyline** approach informs policy makers in a **tangible** way
- Ready-made & event-specific impact maps to guide **local adaptation** & **resilience** building
- Improved disaster **preparedness** to trigger informed early action

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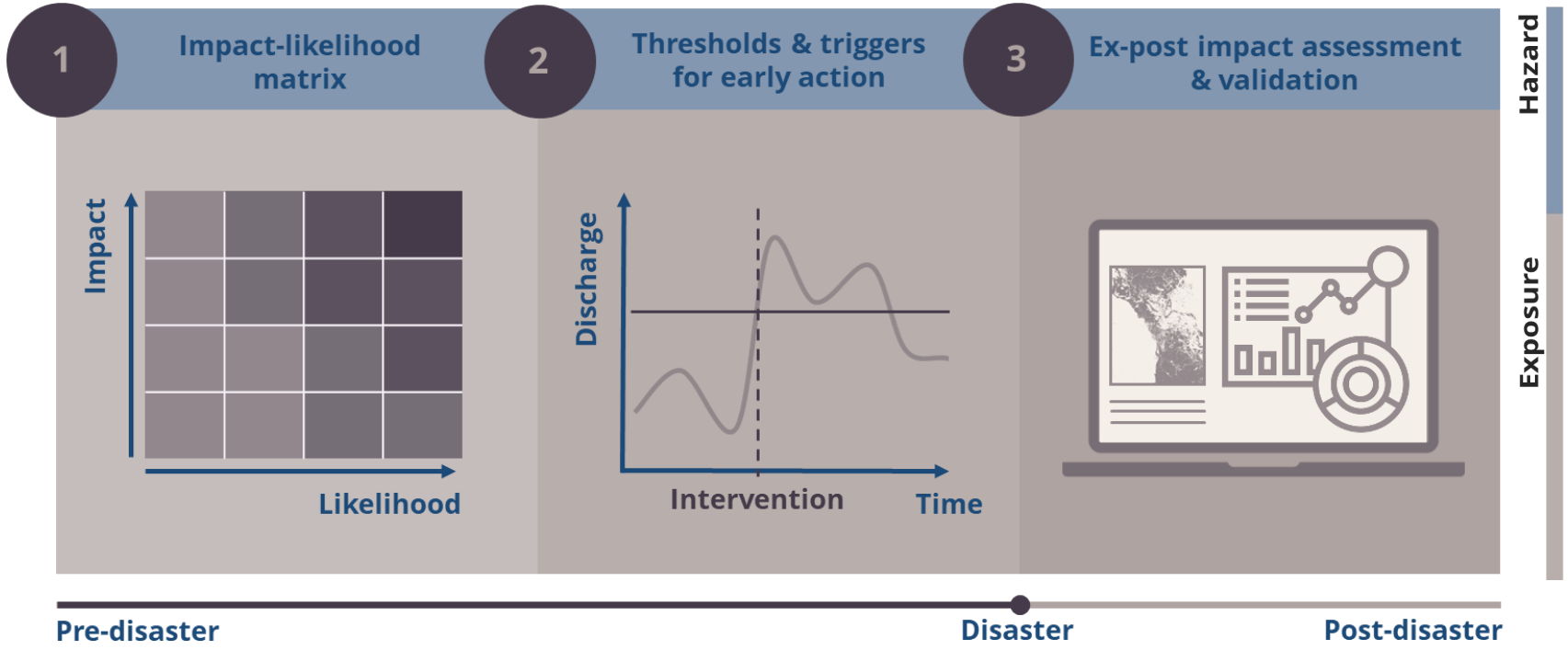
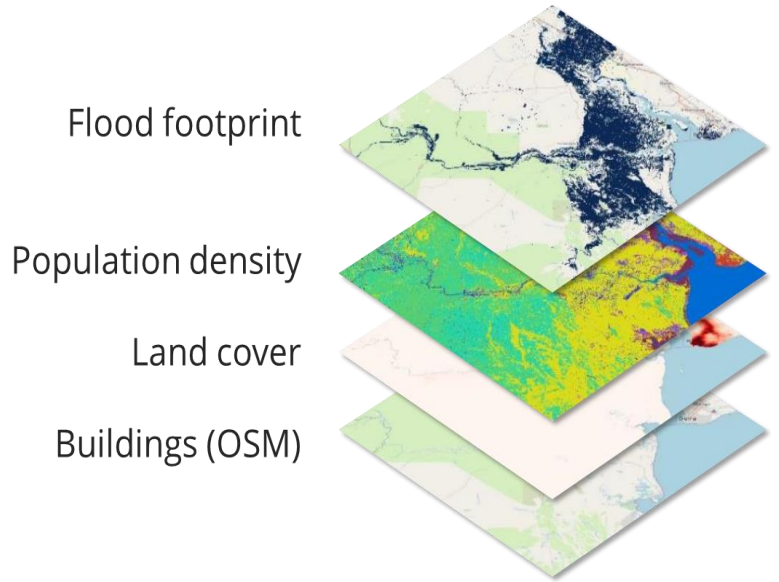
Impact-based Forecasting & Remote Sensing

"Evolving from what the weather *will be* to what the weather *will do*"



Satellite-derived flood footprint (Sentinel-1 SAR)



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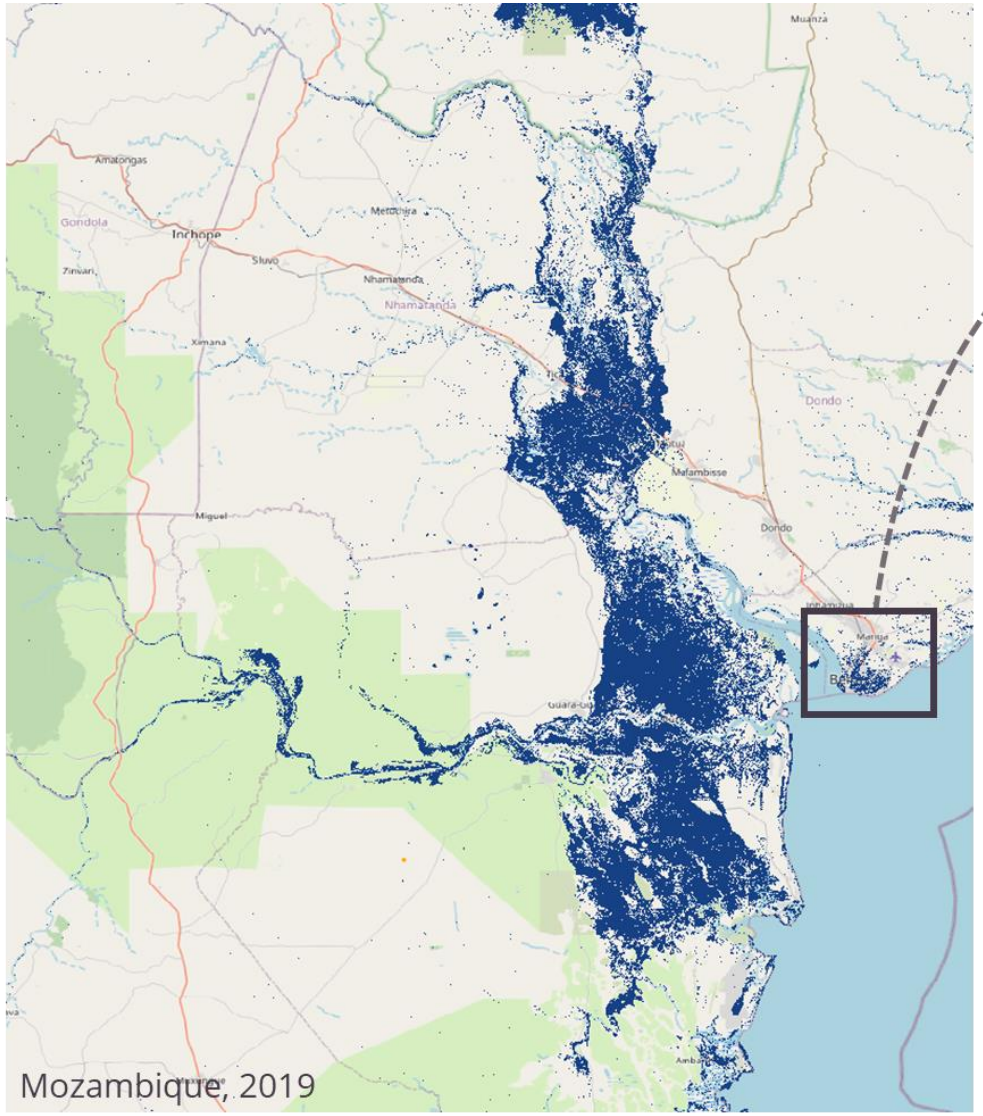
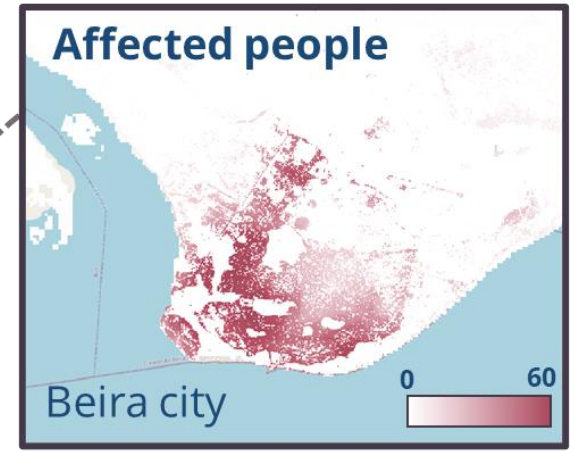
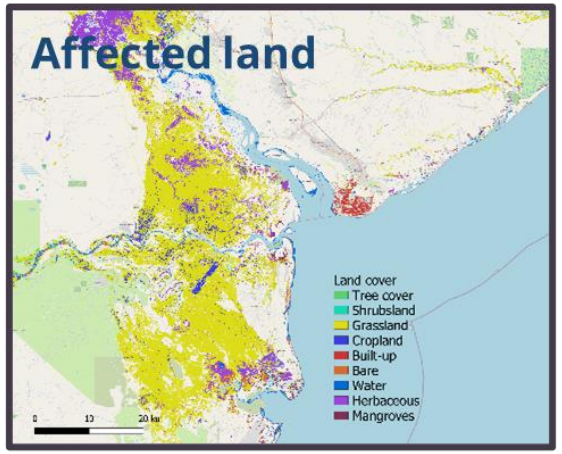
A snapshot of the results



Flooding caused by Tropical Cyclone Idai, March 2019



Affected people
Impact reports: 1.85 M (13)
Satellite-derived: 1.87 M



Affected land
Impact reports: 3000 km^2 (14)
Satellite-derived: 3600 km^2

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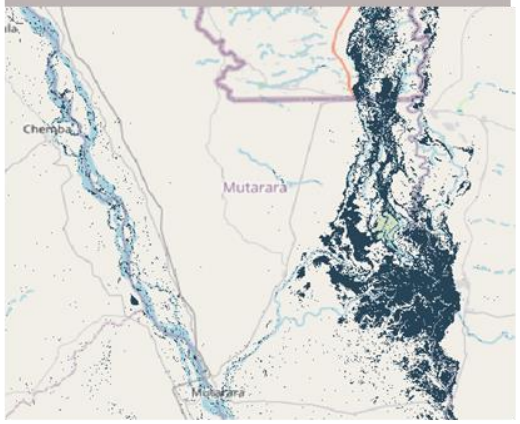
Approach replicability

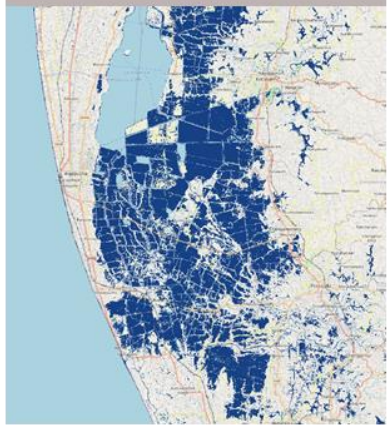
Galicia, Spain (2019)

Rhine, Germany (2021)

Zambesi, Malawi (2015)



Kerala, India (2018)



Receipt

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Modelled damage for each scenario

Climate + SSP scenario	Modelled direct damages [million EURs]	Increase	(%) Increase
Factual (modelled) 2019	€ 257.00		
Year 2050			
2050 SSP1-2.6 (low) +1.8% Wind; +1.4cm SLR (Climate only)	€ 310.00	€ 53.00	17.10
2050 SSP5-8.5 (median) +5.7% Wind;+35cm SLR (Climate only)	€ 433.00	€ 123.00	28.41
2050 SSP5-8.5 (high) +19% Wind; +35cm SLR (Climate only)	€ 569.00	€ 136.00	23.90
Year 2100			
2100 SSP1-2.6 (low) +21% Wind; +39cm SLR (Climate only)	€ 361.00	€ 104.00	28.81
2100 SSP5-8.5 (median) +33% Wind; +72cm SLR (Climate only)	€ 764.00	€ 403.00	52.75
2100 SSP5-8.5 (high) +33% Wind; +156cm SLR (Climate only)	€ 871.00	€ 107.00	12.28

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