

# Sea-level rise trajectories by 2200 with warming of 1.5 to 2°C

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NATURAL ENVIRONMENT RESEARCH COUNCIL



Jakarta already experiences significant coastal flooding due to seasonal high-tides coupled with subsidence





The sea level you see anywhere in the world is the sum of a set components:





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Where you are matters: each component has a unique spatial pattern



### Making projections for Paris





Select temperature pathways from CMIP5 models (RCP 2.6 and RCP 4.5) conforming to Paris thresholds by endof-century Jackson et al. (2018)

# Global sea-level projections for Paris





Jackson et al. (2018)

# Global sea-level projections for Paris





Each component contributes to a different amount of uncertainty

Jackson et al. (2018)

### Regional sea-level projections for Paris





Jackson et al. (2018)

### Paris versus Business-as-Usual





### Paris versus Business-as-Usual





Deep uncertainty about the future of the polar ice sheets for high-end projections

### Paris versus Business-as-Usual





Estimate country level coastal flood damages using global average sea level rise and present-day local extreme sea levels





#### UK flood cost in 2100 (no further adaptation)

US\$ 241 billion per year (2.5 % UK GDP) with warming of 1.5 degree (median, 0. 5 m sea level rise)
US\$ 619 billion per year (6.5% UK GDP) with RCP8.5 (median, 0. 8 m sea level rise)
US\$ 1.1. trillion per year (11.1 % UK GDP) with RCP8.5 (95%, 1.8 m sea level rise)









Transport and Communications infrastructure

[e.g. Internet infrastructure:Durairajan et al.2018]







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Combined mitigation and adaptation strategies [e.g. Blue Carbon: Doughty et al. 2017]







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Transport and Communications infrastructure

[e.g. Internet infrastructure: Durairajan et al. 2018]



Human health and well-being [e.g. Patz et al. 2005]



# Conclusions



- Sea-level rise is already affecting many coastal populations worldwide
- Future sea-level change is intrinsically linked to our current and future climate.
- Sea-level change is a long term inertial process that is likely to continue rising well after 2100, even under strong mitigation.
- There is consensus across scenarios that global sea level will rise by ~25 cm (rel. to 1995) by mid-century.
- There remains deep uncertainty about the future mass loss of the polar ice sheets.
- As sea level rises, coastal flooding will become more intense, more frequent and more costly (up to 11% UK GDP without further adaptation).
- Implications arising from present and future sea-level rise include
  - Territorial definitions
  - Damage to coastal infrastructure
  - Adaptation strategies that embed mitigation
  - Human health and well-being





Jackson, L.P., Grinsted, A. and Jevrejeva, S., 2018. 21st Century Sea-Level Rise in Line with the Paris Accord. *Earth's Future*, *6*(2), pp.213-229. Doi: 10.1002/2017EF000688

Jevrejeva, S., Jackson, L.P., Grinsted, A., Lincke, D. and Marzeion, B., 2018. Flood damage costs under the sea level rise with warming of 1.5° C and 2° C. *Environmental Research Letters*, *13*(7), p.074014. Doi: 10.1088/1748-9326/aacc76

