A Multi-model Assessment of the Changing Risks of Extreme Rainfall Events in Bangladesh under 1.5 and 2.0 degrees’ warmer worlds

RUKSANA H. RIMI¹,²(rimi_esc@yahoo.com), Karsten Haustein¹, Emily Barbour¹,³, Sarah Sparrow⁴, Sihan Li¹,⁴, David Wallom⁴, and Myles Allen¹

¹Environmental Change Institute, School of Geography and the Environment, University of Oxford, Oxford, UK
²Environmental Science and Resource Management, Mawlana Bhashani Science and Technology University, Santosh, Tangail, Bangladesh
³Commonwealth Scientific and Industrial Research Organisation, Land and Water, Canberra, ACT 2601, Australia.
⁴Oxford e-Research Centre, Department of Engineering Science, University of Oxford, Oxford, OX1 3QG, UK.
Global Warming Index (aggregate observations) - updated to Feb 2020

- Monthly observations
- Human-induced warming
- Natural warming and cooling
- Combined response

GWI on 15 Feb 2020: +1.1416°C
• Geographical location: downstream country of the GBM basins
• Riverine environment: ~700 hundreds of rivers and their tributaries
• Physiography: ~ 80% of the land is flat and forms mostly floodplain
How would the risks of extreme rainfall events in the pre-monsoon (MAM) and monsoon (JJAS) seasons change across Bangladesh under 1.5 and 2.0 degrees’ warmer world conditions?
Vulnerability map for different natural hazards (MoEF, 2008)

1. Northwest – Drought or, low flash flood prone
2. Northeast – Severe flash flood or, severe river flood
3. Southwest – Tidal surges or, low to severe river floods
4. Southwest – Moderate flash floods
Figure: Comparative return periods of MAM daily rainfall (mm/day) during 1986-2015 as per (a) HadRM3P, (b) MIROC5, (c) ETH_CAM4, (d) CanAM4 and (e) NorESM1 models. ACT, NAT, GHG-only, plus 1.5°C and 2.0°C model ensembles are shown in black, green, orange, blue and red colours respectively (for more see Rimi et al., 2018, HESSD, doi:10.5194/hess-2018-400).
Comparative return periods of JJAS daily rainfall (mm/day) during 1986-2015 as per (a) HadRM3P, (b) MIROC5, (c) ETH_CAM4, (d) CanAM4 and (e) NorESM1 models. ACT, NAT, GHG-only, plus 1.5°C and 2.0°C model ensembles are shown in black, green, orange, blue and red colours respectively (for more see Rimi et al., 2018, HESSD, doi:10.5194/hess-2018-400)
Key Messages

• Human influence on climate is already increasing the risks of extreme rainfall events in Bangladesh

• Reaching 1.5 and 2.0 degrees’ warmer world would mean experiencing further increase in the risks

• Nature and severity of the impacts would depend on both GHGs and anthropogenic aerosols

• Policy-makers need to step up to avoid such impacts that would be beyond adaptation capacity