A comparison of local sea-level projections for South Asia

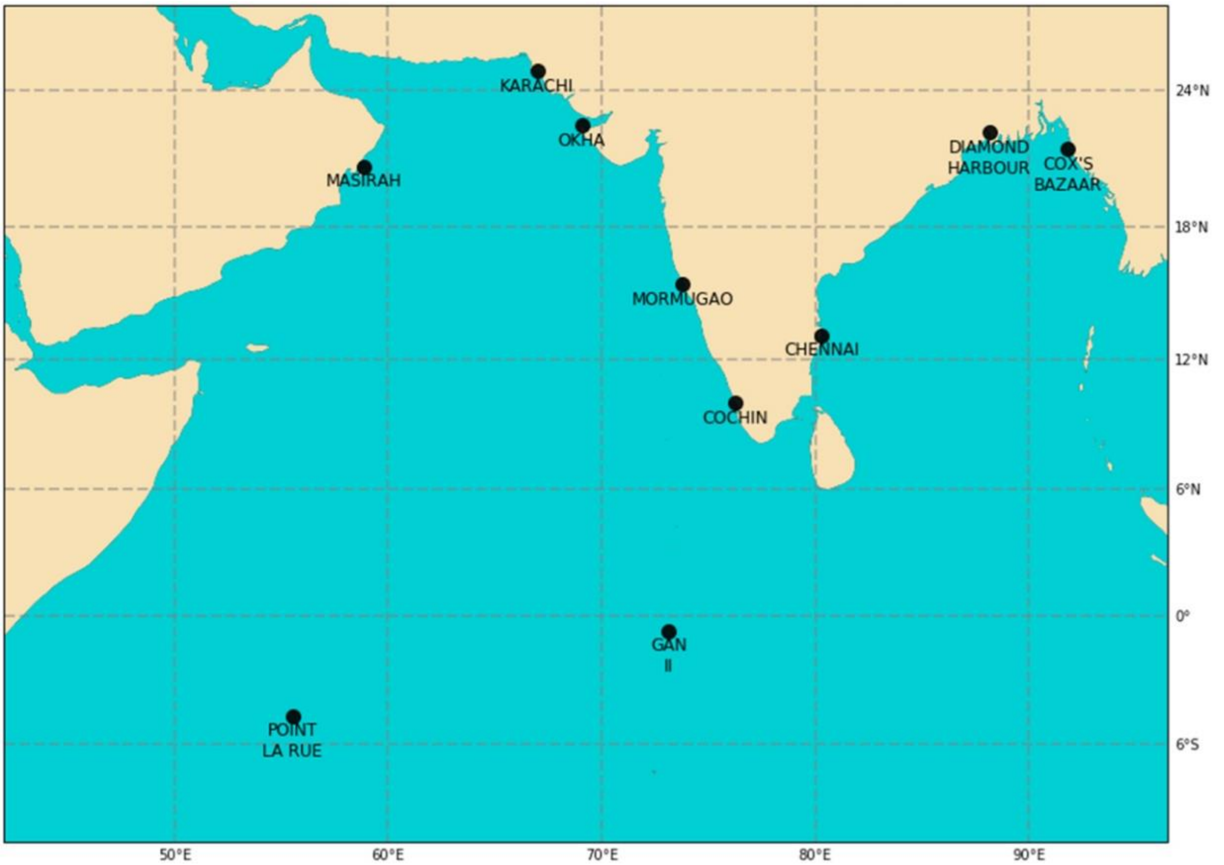

Figure 1: Map of tide gauge locations presented in Harrison et al. (2021). Hiron Point (a location used in this study) is located along the coastline between Diamond Harbour and Cox's Bazaar.

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Reviewed by Lesley Allison

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Key messages

- Stakeholders, scientists and coastal decision makers may benefit from using projections from both IPCC AR6, and those contained in Harrison et al. (2021) (which use model outputs consistent with IPCC AR5), to appreciate the full picture of local sea-level rise in South Asia

- IPCC AR6 medium confidence sea-level projections are broadly similar to those in Harrison et al. (2021) (which use model outputs consistent with IPCC AR5), at selected tide gauge locations over the 21st century. However, the IPCC AR6 projections show higher sea-level rise at Hiron Point, Diamond Harbour, Okha and Karachi.

- IPCC AR6 low confidence projections include low-likelihood high-impact outcomes which give substantially larger sea-level rise than the likely range projections, exploring the 'worst case scenario'. Since high-end projections were not presented in Harrison et al. (2021), a direct comparison cannot be made here. The IPCC AR6 low-confidence projections may be desirable for decision-makers with a low risk tolerance.

- The IPCC AR6 projections are available to 2150, yet a change in methods used to generate these projections introduces a 'step' in the timeseries. This may present confusion for stakeholders looking to use projections beyond 2100 to make decisions, giving the false impression of a period where sea-level could decrease sharply before rising again.

- The different treatment of vertical land motion and landwater storage between studies can cause discrepancies between sea-level rise projections. This is influenced by both data derived from tide gauge records and the landwater-population relationship used in AR6 respectively. The Antarctic Ice Sheet and sterodynamic components also cause differences in sea-level rise between the studies.

- The uncertainty range has generally reduced in IPCC AR6 relative to Harrison et al. (2021), particularly when comparing the Antarctic Ice Sheet component under RCP8.5/SSP8.5. The uncertainty is broader for vertical land motion processes and in some cases (e.g. Karachi), the uncertainty spans both positive and negative values.

Delivery Partners:

Introduction

The Asia Regional Resilience to a Changing Climate (ARRCC) Programme has been working closely with partners and stakeholders in South Asia to provide climate information which could help manage coastal climate risks. A key part of these coastal climate services has been the development of new local sea-level change projections for the South Asia region, following the methods used to generate the latest UK national sea-level projections (UKCP18). These projections have been published via an online report[1] (Harrison 2020) and a peer-reviewed journal article[2] (Harrison et al., 2021), hereafter collectively referred to as Harrison (2021) (or 'H21' in figures). These studies provide local mean sea-level projections over the 21st century centred at selected tide gauge locations along Indian Ocean coastlines (Figure 1), including the Bay of Bengal, Arabian Sea and Equatorial Region. The data for this study is available for use by regional stakeholders and scientists can be found on the ICIMOD Regional Database System[3].

The release of the Working Group I (WG1) Sixth Assessment report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) in August 2021 also delivered new global and local sea-level projections, available through the online Interactive Atlas[4] and the NASA sea-level projection[5] tools, for each 1x1 degree latitude and longitude point and for specific tide gauge locations. Hereafter, these projections are referred to as IPCC AR6 (or 'AR6' in figures).

This report provides an overview of how the local mean sea-level projections presented in Harrison (2021) compare with the latest projections provided in IPCC AR6, and the implications and recommendations for use of these projections in research, policy, and planning. This report works as complementary note for use alongside the projections presented in Harrison (2021).

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[1] Harrison (2020) *Sea level projections for South Asia – report on main findings*. Available at: https://www.metoffice.gov.uk/binaries/content/assets/metofficegovuk/pdf/business/international/report-on-regional-sea-level-projections-for-south-asia---arrcc-report---external-1.pdf

[2] Harrison et al. (2021) *Future sea-level rise projections for tide gauge locations in South Asia. Environmental Research Communications*, 3(11), 115003. Available at: https://iopscience.iop.org/article/10.1088/2515-7620/ac2e6e/meta

[3] https://rds.icimod.org/Home/DataDetail?metadataId=1972957

[4] https://interactive-atlas.ipcc.ch/

[5] https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool

Comparison of methods

The key methodological similarities and differences used in the studies are as follows:

- Harrison (2021) use the Representative Concentration Pathway (RCP) emission scenarios, whilst IPCC AR6 makes use of the new Shared Socioeconomic Pathway (SSP) scenarios, the latter incorporating socioeconomic factors over the next century such as population, economic growth, and education. The SSPs have been matched with the appropriate RCP radiative forcing targets to explore climate mitigation
- The projections presented in Harrison (2021) are based on the methods used to develop the United Kingdom Climate Projections in 2018 (UKCP18, Lowe et al., 2018) marine component (Palmer et al. 2018), extended to tide gauge locations across the world (Palmer et al., 2020). These build on the Monte Carlo process-based GMSL projections presented in IPCC AR5 (Church et al., 2013) using climate simulation outputs from Coupled Model Intercomparison Project phase 5 (CMIP5). The main advances on IPCC AR5 include an updated Antarctic ice sheet dynamics contribution (Levermann et al 2014), and Harrison (2021) include updated global and local estimates of landwater storage (using data from Wada et al. 2016, following Slangen et al. 2014). A physically based emulator is used to generate extended projections to 2300 (included in Harrison 2020 report only).
- The projections presented in IPCC AR6 are also generated using physically based emulators, available to 2150. These are based on the response of the latest state-of-the-art climate model projections in CMIP6, which include improved Earth system and ice model simulations. Physically-based emulators are used to constrain an assessed climate sensitivity range, bringing down the higher warming found in some CMIP6 models, whilst ice sheet emulators are used to ensure inter-scenario consistency
- IPCC AR6 presents two types of projections: *medium confidence* and *low confidence*. The *low-confidence* projections include low-likelihood high-impact outcomes which give substantially larger sea-level rise than the *likely* range projections, exploring the ‘worst case scenario’ high-end space. Harrison (2021) did not present high-end scenarios, and therefore this space cannot be compared in this report.
- IPCC AR6 and Harrison (2021) use different methods for vertical land motion (VLM). Harrison (2021) projections include VLM based on Glacial Isostatic Adjustment[6] only, whilst AR6 uses a statistical model of VLM derived from historical tide gauge records,

[6] In Harrison (2021), VLM refers to the sea-level equivalent change from glacial isostatic adjustment driven partly but not exclusively by the vertical movement of the solid earth surface (Gregory et al 2019)

which includes GIA as well as other local VLM processes, such as subsidence and tectonics.

- IPCC AR6 and Harrison (2021) use different global and local estimates of landwater storage (LWS). Whilst both studies use the same spatial patterns of change for landwater storage (based on Slangen et al., 2014), applying a 20% correction for retention of water on land (Wada et al. 2016), IPCC AR6 calibrates these estimates based on statistical relationships of both groundwater depletion and dam impoundment with population change (from the SSP scenarios). In addition, whilst Harrison (2021) assumes groundwater depletion dominates over dam impoundment in the early 21st century, IPCC AR6 applies a correction up to 2040 to account for dam impoundment based on those planned or currently under construction. This means the net driver of landwater storage is different in the first few decades of the projections.
- The baseline period, which sea-level change is projected relative to, has changed from 1986-2005 (used in Harrison 2021) to 1995-2014 (used in IPCC AR6). The baseline offset for global sea-level projections is 3cm, and the local offset generally a fraction of the global, which is insignificant compared to the total sea-level change. For this reason, a baseline offset has not been applied in this study.

In this report, we have plotted timeseries comparisons to 2100 for local mean sea-level projections at available matching tide gauge locations,[7,8] for the SSP1-2.6/RCP2.6 and SSP5-8.5/RCP8.5 emissions scenarios. We compare the 5th-95th percentiles of the underlying Monte Carlo simulations in Harrison (2021), equivalent to the IPCC *likely* range projections, with the 17th -83rd percentiles of the underlying simulations presented in AR6, also referred to as the *likely* range. Component barplots showing individual contributions to sea-level change at 2100 as well as a comparison of projections beyond 2100 are included in the Appendix (Figures A1-6).

Bay of Bengal

A comparison of timeseries for the selected tide gauge locations in the Bay of Bengal can be seen in Figure 2, comparing local sea-level projections at Hiron Point, Cox's Bazaar, Chennai and Diamond Harbour. At Hiron Point, AR6 is higher by ~20% (~17%) at 2050 and ~45% (~25%) at 2100 under low (high) emissions. At Diamond Harbour AR6 is higher by ~27% (~22%) at 2050 and ~55% (~25%) at 2100 under low (high) emissions. On the other hand, the projections for Chennai and Cox's Bazaar are broadly similar, albeit AR6 projections are slightly lower (on the order of a few cm's).

[7] Tide gauge locations are used in Harrison et al. (2021) and Harrison (2020) as familiar sites from which to project sea-level change. Data from tide gauge records are not directly used in the projections themselves.

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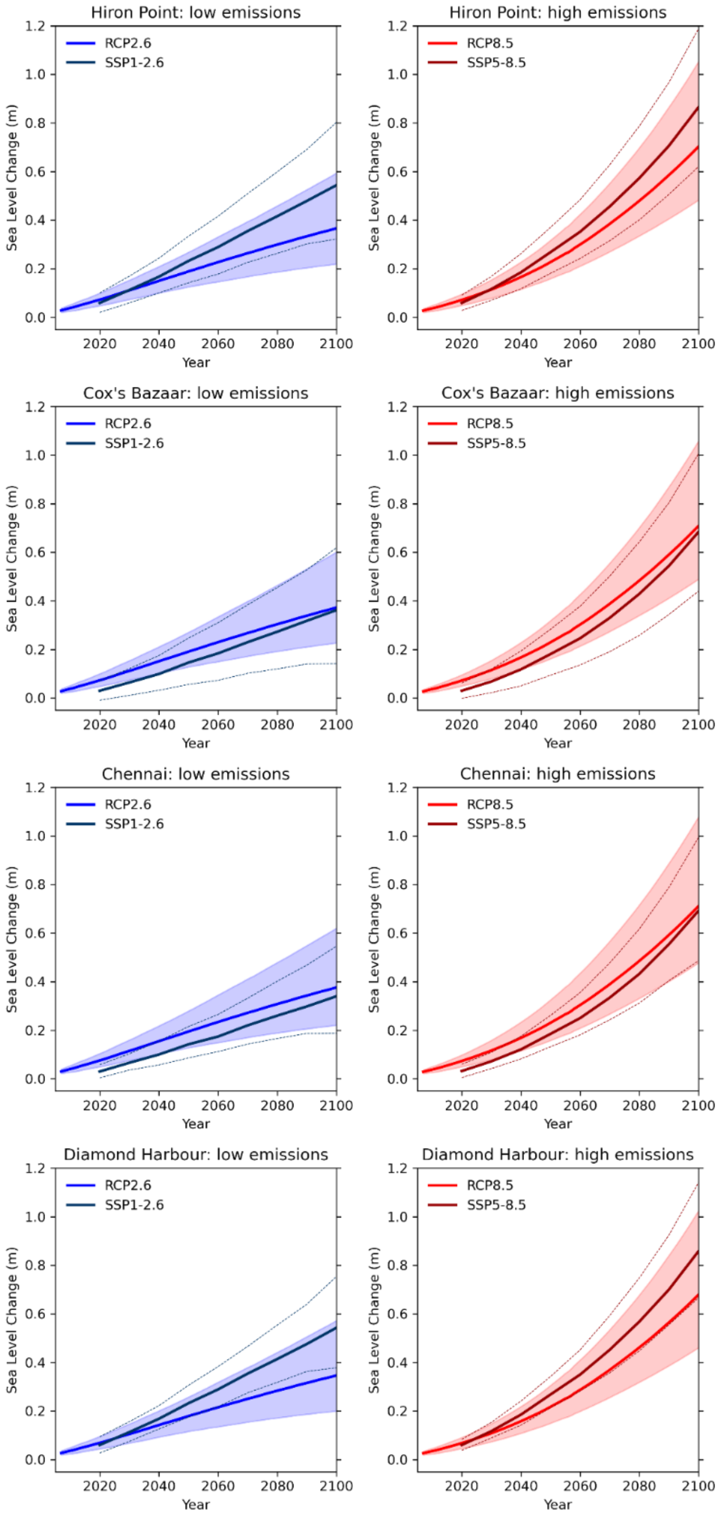

Figure 1 - Projections of local-mean sea-level rise to 2100 for corresponding tide gauge location in the Bay of Bengal, for the median (solid line) and likely range (shaded/dotted). Left: RCP2.6 (Harrison, 2021) and SSP1-2.6 (IPCC AR6). Right: RCP8.5 (Harrison, 2021) and SSP58.5 (IPCC AR6). Projections presented relative to a baseline of 1986-2005 (Harrison 2021) and 1995-2014 (IPCC AR6).

Comparing the contributions to local mean sea-level projections (see Appendix; A.1) allows us to understand that AIS and VLM components cause the greatest differences at Hiron Point and Diamond Harbour. The AIS component is generally higher in AR6 compared to Harrison (2021) by ~220% (~180%) under low (high) emissions. The higher contribution is likely due to revised estimates of the AIS dynamic contribution over the 21st century.

For VLM, the deviation varies. For Cox's Bazaar and Chennai, the VLM is 120% and 195% lower respectively in AR6 compared to Harrison (2021), which effectively balances the higher AIS component. For Diamond Harbour and Hiron Point, the VLM is ~500% higher (and positive compared to negative) which enhances the higher sea-level projections at this point. This effect is not surprising, since Diamond Harbour and Hiron Point lie by or in inland waterways of the Ganges-Brahmaputra-Meghna Delta, a region susceptible to subsidence-based VLM on mm/yr timescales, and this region is not well monitored by tide gauges. For this reason, VLM processes other than the contribution by GIA have not been included in Harrison (2021). However, these processes present broad uncertainty in IPCC AR6 estimates of VLM, which are based on tide gauge records. Removing the VLM component would bring projections between the studies more in alignment.

Equatorial

The region of Indian Ocean closest to the equator is represented by one matching tide gauge location between both studies: Gan II (Figure 3). The timeseries comparison of local mean sea-level rise here presented to 2100 show good agreement overall. AR6 is generally lower than Harrison (2021) by ~15% (~20%) at 2050 and ~2% (~3%) at 2100 under low (high) emissions. The uncertainty is narrower in AR6 at 2100 by ~35% (Table 2).

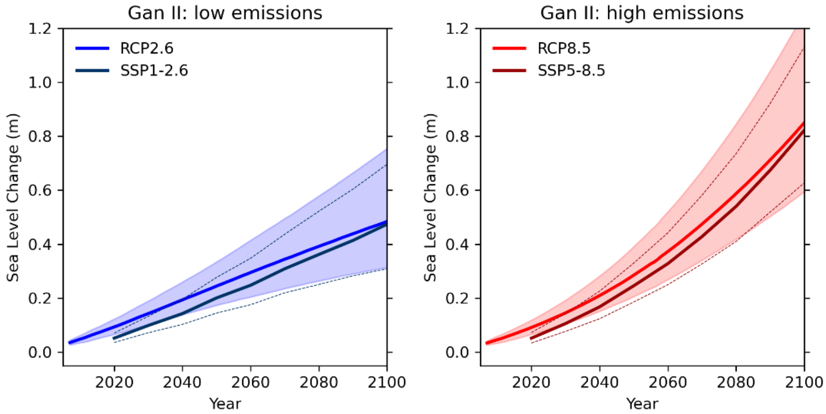

Figure 2 - Projections of local-mean sea-level rise to 2100 for the Gan II tide gauge location near the Equatorial Indian Ocean, for the median (solid line) and likely range (shaded/dotted). Left: RCP2.6 (Harrison et al., 2021) and SSP1-2.6 (IPCC AR6). Right: RCP8.5 (Harrison et al., 2021) and SSP58.5 (IPCC AR6). Projections presented relative to a baseline of 1986-2005 (Harrison 2021) and 1995-2014 (IPCC AR6).

Comparing the contributions to local mean sea-level projections (see Appendix; A.2) for Gan II at 2100, we can see that although the AIS contribution has increased in AR6 compared to Harrison (2021), this is balanced by lower contribution from the sterodynamic[9] processes. The uncertainty of AIS has also reduced, yet the uncertainty of VLM has increased. The latter spans the positive and negative range: again a result of the VLM methods used in IPCC AR6.

Arabian Sea

Timeseries for the Arabian Sea can be seen in Figure 4, comparing local sea-level projections at Karachi, Cochin, Okha and Mormugao. At Karachi, IPCC AR6 projections are generally higher than Harrison (2021), by ~90% (~60%) at 2050 and ~150% (~50%) at 2100 under low (high) emissions. At Okha, IPCC AR6 projections are generally higher than Harrison (2021), by ~6% (~10%) at 2050 and ~30% (~15%) at 2100 under low (high) emissions. The lower emissions scenario lower boundary at Karachi indicates a trend towards negative sea-level rise in Harrison (2021) whilst the timeseries shows a more definite sea-level rise in AR6.

[9] 'Sterodynamic' refers to sea-level change from variability in the ocean's temperature, salinity and circulation.

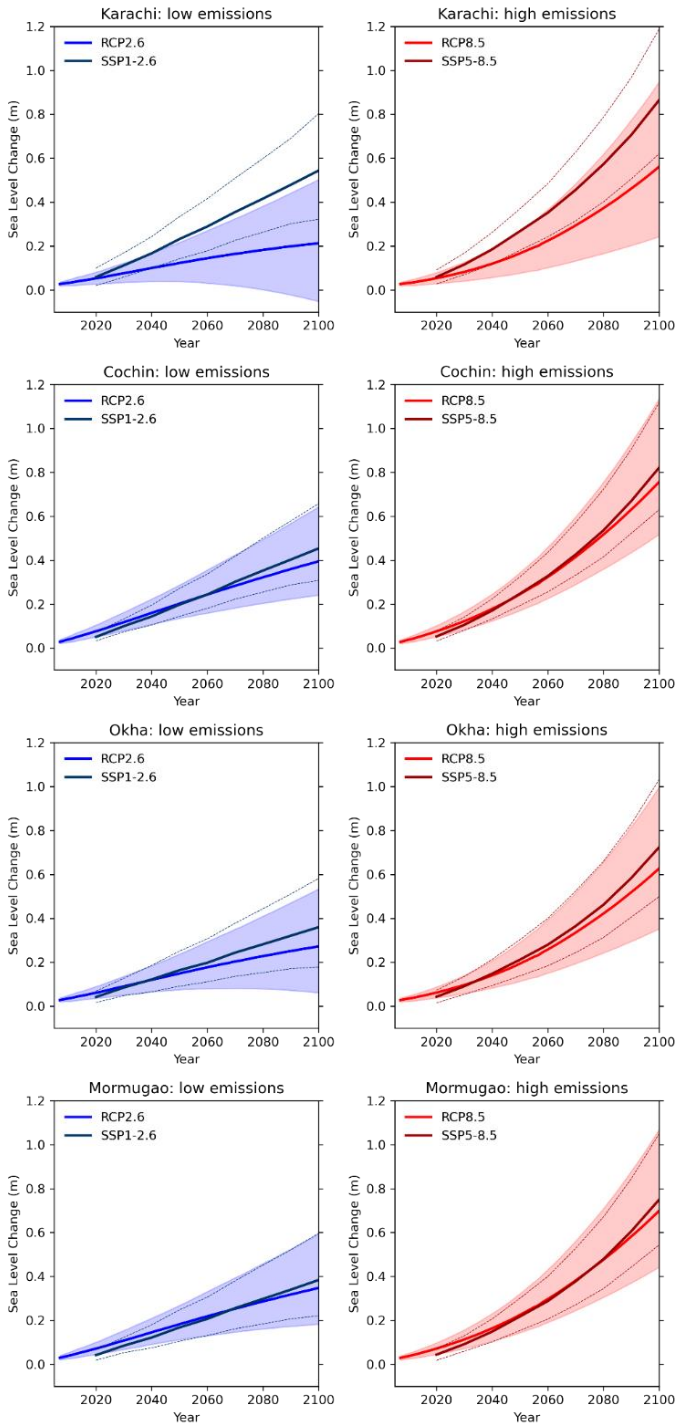

Figure 3 - Projections of local-mean sea-level rise to 2100 for corresponding tide gauge location in the Arabian Sea, for the median (solid line) and likely range (shaded/dotted). Left: RCP2.6 (Harrison et al., 2021) and SSP1-2.6 (IPCC AR6). Right: RCP8.5 (Harrison et al., 2021) and SSP58.5 (IPCC AR6). Projections presented relative to a baseline of 1986-2005 (Harrison 2021) and 1995-2014 (IPCC AR6).

On comparing the contributions to local sea-level rise at 2100 (see Appendix; A.3), we can see that the LWS component has a significant impact on the sea-level projections at Karachi and, to a lesser extent, at Okha. In AR6, LWS uncertainty is close to the zeroline, whereas in Harrison (2021), the LWS uncertainty is large (spanning positive and negative values) and the median negative (~-0.1 to -0.2m). In Harrison (2021), the strongest gravitational, rotational and deformational effects on landwater storage exist in the northeast Arabian Sea, which influences the LWS contribution at Karachi and Ohka. Groundwater depletion over the subcontinent causes negative contributions to sea-level change at these locations and in Harrison (2021) is assumed to dominate over dam impoundment in early 21st century projections. This is described in detail in Harrison et al. (2021). Whilst the spatial patterns of LWS change the same in both IPCC AR6 and Harrison (2021), IPCC AR6 instead assume that dam impoundment is still important up to 2040, to allow for recent trends in dam planning and construction. This delay in the net driver of LWS change explains why the LWS contribution at these locations is less negative in IPCC AR6.

Discussion

Overall, despite notable advances in sea-level projections since AR5, IPCC AR6 *medium confidence* sea-level projections are broadly similar to Harrison (2021), consistent with IPCC AR5, at selected tide gauge locations, when comparing SSP1-2.6/RCP2.6 and SSP5-8.5/RCP8.5 emissions scenarios over the 21st century. IPCC AR6 presents higher sea-level rise at Hiron Point, Diamond Harbour, Okha and Karachi. The uncertainty range has reduced in IPCC AR6, particularly when comparing the AIS component under RCP8.5/SSP8.5. The uncertainty is notably broader for VLM processes: for Karachi, the uncertainty spans both positive and negative values.

The different treatment of vertical land motion (VLM) between studies can cause discrepancy in sea-level rise at some locations. Removing the contribution of sea-level change due to VLM would bring these projections closer into alignment. Relative sea-level change in South Asia (how the local sea-level changes relative to land) is heavily influenced by different rates of subsidence in deltaic environments, notably the Indus Delta Region and the Ganges–Brahmaputra–Meghna delta. These rates of VLM may cause reliability issues in tide gauge records. As an area of ongoing research (e.g. Becker et al. 2020), decision-makers using projections which include processes derived from tide gauge records (i.e. IPCC AR6) may wish to review their risk contingency as new evidence emerges.

The Antarctic Ice Sheet (AIS) and sterodynamic component can contribute differences in sea-level rise between the studies, due to the improved understanding of ice sheet dynamical processes and representation of shelf-sea processes respectively.

IPCC AR6 presented sea-level global and local projections available to 2150. Whilst projections extending beyond 2100 were not presented in Harrison et al. (2021), Harrison (2020) did present projections exploratory projections to 2300 at tide gauge locations (see Appendix for comparison figures). The availability of both projections may be beneficial for stakeholders and scientists. The different time horizons used in the studies provide choice of use for coastal decision-makers and planners. For example, projections to 2300 may be useful for longer term planning, particularly of interest to the nuclear industry, whilst projections to 2150 may be useful for infrastructure planning. In AR6, a methodological change at 2100 causes an apparent 'step' in the timeseries, which might cause confusion for users as it seems like there is a period where sea-level change may sharply fall before rising again. In particular, this might be difficult when incorporating projections in an adaptive pathway approach where timing of thresholds is an important consideration, in which case the Harrison (2021) smooth projections might be preferable. This is notable contextual information for stakeholders approaching these projections.

IPCC AR6 *low confidence* projections include low-likelihood high-impact outcomes which give substantially larger sea-level rise than the *likely* range projections, exploring the 'worst case scenario'. Since high-end projections were not presented in Harrison (2021), the IPCC AR6 *low-confidence* projections may be desirable for decision-makers with a low risk tolerance (Hinkel et al. 2012) to explore the high-end sea-level space.

This report was based on a similar report produced to compare UK sea-level projections as part of the Met Office Hadley Centre Climate Programme. For more information, please contact jennifer.weeks@metoffice.gov.uk.

AR6 sea-level projection data was downloaded from https://podaac-tools.jpl.nasa.gov/drive/files/misc/web/misc/IPCC on 16th August 2021.

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Appendix

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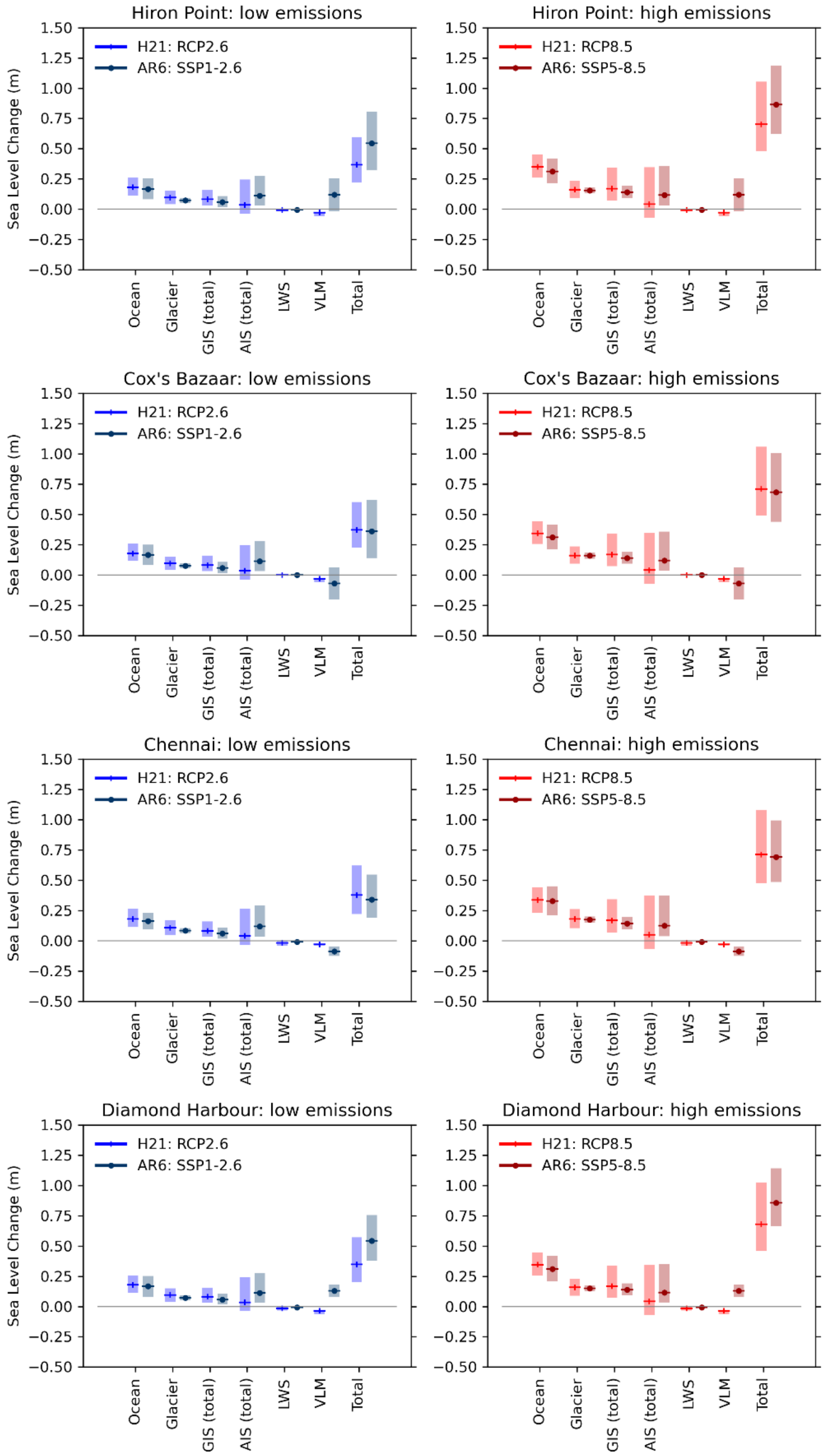

Figure A.1 - Contributions from component processes to projected local-mean sea level change (m) at 2100 for tide gauge locations in the Bay of Bengal, for the median (solid line) and likely range (shaded). Left: Low emissions - sea-level change under RCP2.6 (Harrison 2021; H21) and SSP1-2.6 (IPCC AR6). Right: High emissions - sea-level change under RCP8.5 (Harrison 2021; H21) and SSP5-8.5 (IPCC AR6). GIS = Greenland ice sheet; AIS = Antarctic ice sheet; LWS = land water storage; VLM = vertical land motion (IPCC AR6) or glacial isostatic adjustment (GIA; Harrison 2021 only). Harrison (2021) projections shown relative to a 1986-2005 baseline. AR6 projections shown relative to a 1995-2014 baseline.

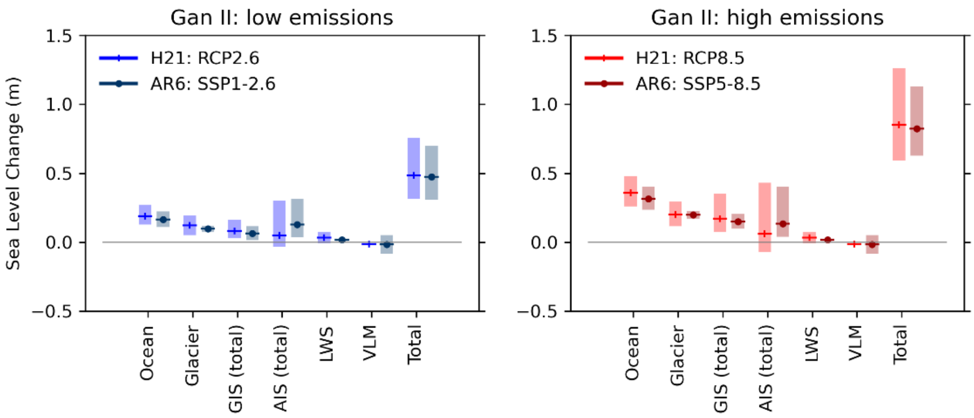

Figure A.2 - Contributions from component processes to projected local-mean sea level change (m) at 2100 for the Gan II tide gauge location near the Equatorial Indian Ocean, for the median (solid line) and likely range (shaded). Left: Low emissions - sea-level change under RCP2.6 (Harrison 2021; H21) and SSP1-2.6 (IPCC AR6). Right: High emissions - sea-level change under RCP8.5 (Harrison 2021; H21) and SSP5-8.5 (IPCC AR6). GIS = Greenland ice sheet; AIS = Antarctic ice sheet; LWS = land water storage; VLM = vertical land motion (IPCC AR6) or glacial isostatic adjustment (GIA; Harrison 2021 only). Harrison (2021) projections shown relative to a 1986-2005 baseline. AR6 projections shown relative to a 1995-2014 baseline.

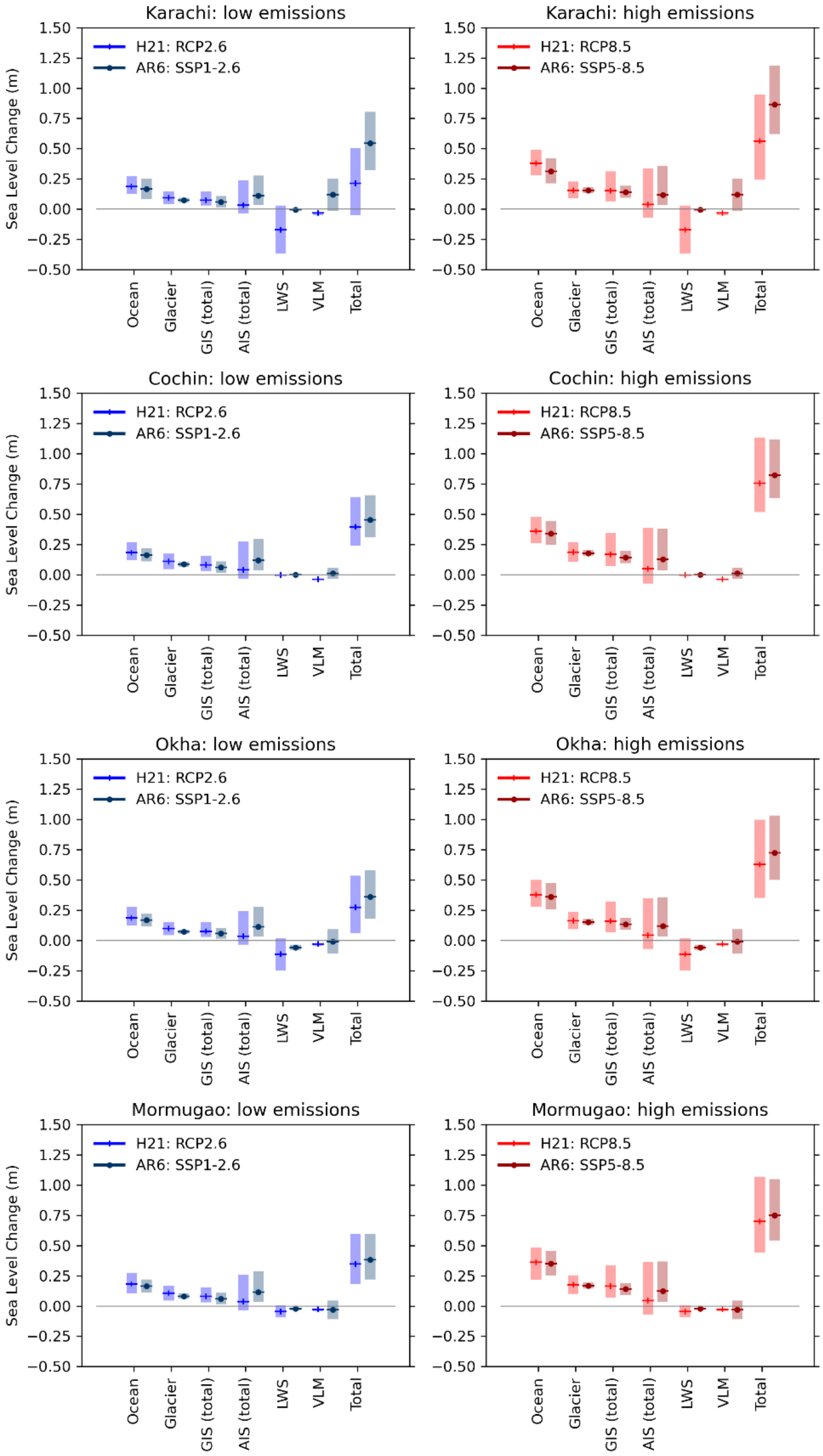

Figure A.3 – Contributions from component processes to projected local-mean sea level change (m) at 2100 for tide gauge locations in the Arabian Sea, for the median (solid line) and likely range (shaded). Left: Low emissions - sea-level change under RCP2.6 (Harrison 2021; H21) and SSP1-2.6 (IPCC AR6). Right: High emissions - sea-level change under RCP8.5 (Harrison 2021; H21) and SSP5-8.5 (IPCC AR6). GIS = Greenland ice sheet; AIS = Antarctic ice sheet; LWS = land water storage; VLM = vertical land motion (IPCC AR6) or glacial isostatic adjustment (GIA; Harrison 2021 only). Harrison (2021) projections shown relative to a 1986-2005 baseline. AR6 projections shown relative to a 1995-2014 baseline.

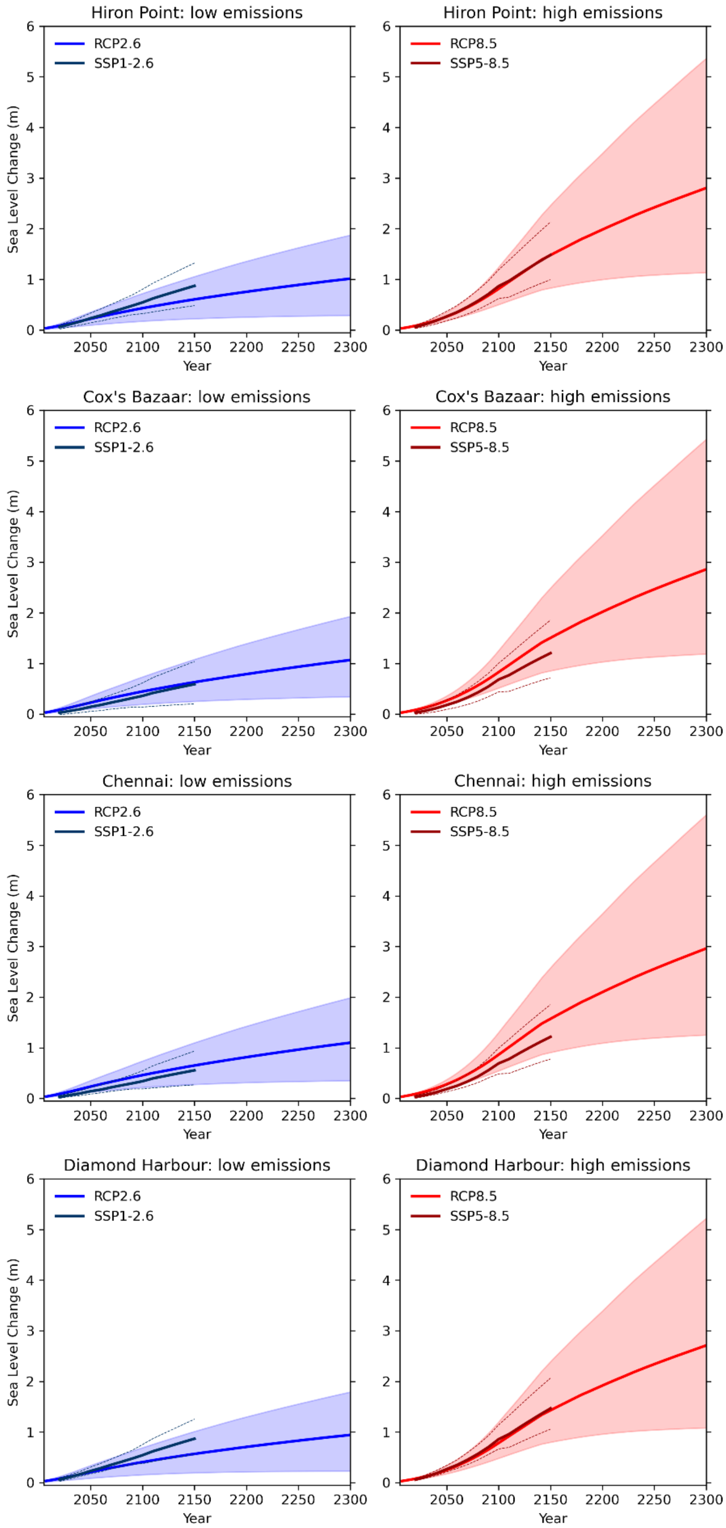

Figure A.4: Projections of local-mean sea-level rise extended beyond 2100 for corresponding tide gauge location in the Bay of Bengal, for the median (solid line) and likely range (shaded/dotted). Left: Low emissions - RCP2.6 (Harrison et al., 2021) to 2300 and SSP1-2.6 (IPCC AR6) to 2150. Right: High emissions - RCP8.5 (Harrison et al., 2021) to 2300 and SSP58.5 (IPCC AR6) to 2150. Projections presented relative to a baseline of 1986-2005 (Harrison 2021) and 1995-2014 (IPCC AR6).

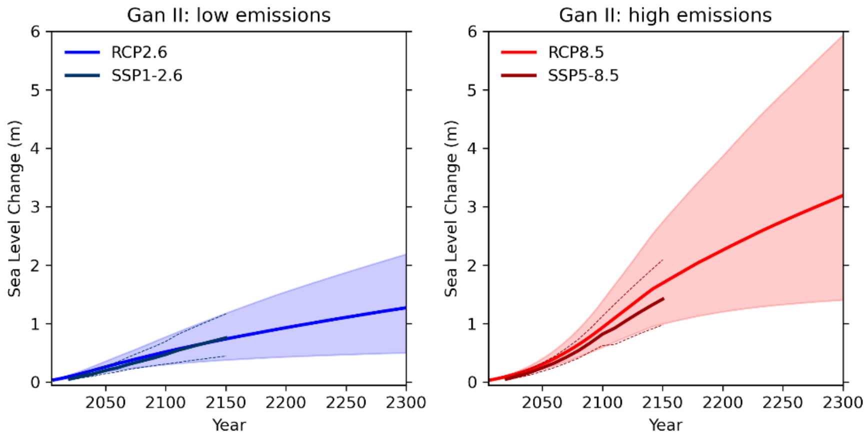

Figure A.5 – Projections of local-mean sea-level rise extended beyond 2100 for the Gan II tide gauge location near the Equatorial Indian Ocean, for the median (solid line) and likely range (shaded/dotted). Left: Low emissions - RCP2.6 (Harrison et al., 2021) to 2300 and SSP1-2.6 (IPCC AR6) to 2150. Right: High emissions - RCP8.5 (Harrison et al., 2021) to 2300 and SSP58.5 (IPCC AR6) to 2150. Projections presented relative to a baseline of 1986-2005 (Harrison 2021) and 1995-2014 (IPCC AR6).

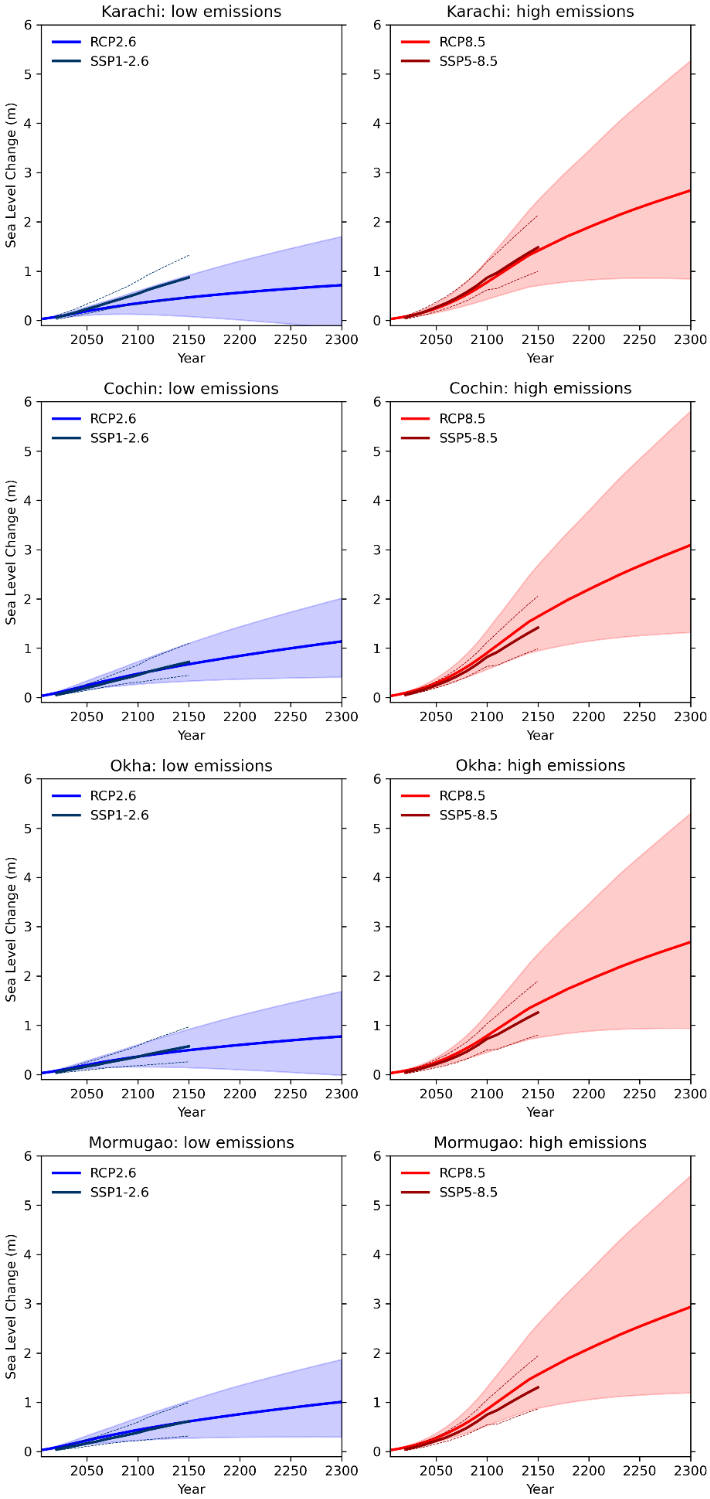

Figure A.6 – Projections of local-mean sea-level rise extended beyond 2100 for corresponding tide gauge location in the Arabian Sea, for the median (solid line) and likely range (shaded/dotted). Left: Low emissions - RCP2.6 (Harrison et al., 2021) to 2300 and SSP1-2.6 (IPCC AR6) to 2150. Right: High emissions - RCP8.5 (Harrison et al., 2021) to 2300 and SSP58.5 (IPCC AR6) to 2150. Projections presented relative to a baseline of 1986-2005 (Harrison 2021) and 1995-2014 (IPCC AR6).

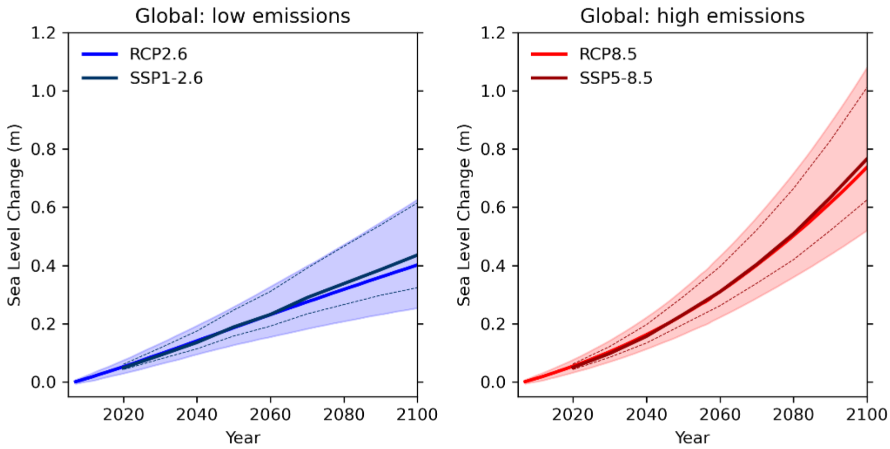

Figure A.7 - Projections of global-mean sea-level rise to 2100, for the median (solid line) and likely range (shaded/dotted). Left: RCP2.6 (Palmer et al., 2020) and SSP1-2.6 (IPCC AR6). Right: RCP8.5 (Palmer et al. 2020) and SSP58.5 (IPCC AR6). Projections presented relative to a baseline of 1995-2014.

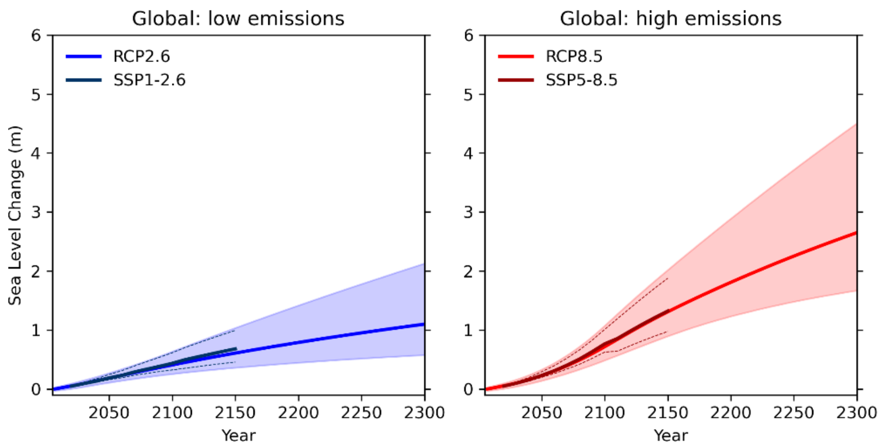

Figure A.8 – Projections of global-mean sea-level rise extended beyond 2100, for the median (solid line) and likely range (shaded/dotted). Left: Low emissions - RCP2.6 (Palmer et al. 2020) to 2300 and SSP1-2.6 (IPCC AR6) to 2150. Right: High emissions - RCP8.5 (Palmer et al. 2020) to 2300 and SSP58.5 (IPCC AR6) to 2150. Projections presented relative to a baseline of 1995-2014.

		Harrison (2021)				IPCC AR6 (2021)			
Location	Emissions scenario	2050 median	2050 range	2100 median	2100 range	2050 median	2050 range	2100 median	2100 range
HIRON POINT	Low	0.19	0.12-0.27	0.37	0.22-0.59	0.23	0.14-0.33	0.54	0.32-0.8
	High	0.23	0.16-0.32	0.7	0.48-1.05	0.27	0.18-0.37	0.86	0.62-1.19
COX'S BAZAAR	Low	0.19	0.13-0.27	0.37	0.23-0.6	0.15	0.06-0.25	0.36	0.14-0.62
	High	0.23	0.16-0.32	0.71	0.49-1.06	0.18	0.09-0.28	0.68	0.44-1.01
CHENNAI	Low	0.19	0.13-0.28	0.38	0.22-0.62	0.14	0.09-0.22	0.34	0.19-0.55
	High	0.23	0.16-0.33	0.71	0.48-1.08	0.18	0.13-0.26	0.69	0.49-0.99
DIAMOND HARBOUR	Low	0.18	0.12-0.26	0.35	0.2-0.57	0.23	0.18-0.31	0.54	0.38-0.75
	High	0.22	0.15-0.31	0.68	0.46-1.02	0.27	0.21-0.34	0.86	0.67-1.14

Table A.1 - Summary of the projected global sea level change median and likely range in metres at 2050 and 2100 used in the present study. 'Low' emissions scenario refers to RCP2.6/ SSP1-2.6 whilst 'high' emissions scenario refers to RCP8.5/ SSP5-8.5.

		Harrison (2021)				IPCC AR6 (2021)			
Location	Emissions scenario	2050 median	2050 range	2100 median	2100 range	2050 median	2050 range	2100 median	2100 range
GAN II	Low	0.24	0.17-0.33	0.48	0.31-0.76	0.2	0.14-0.28	0.47	0.31-0.7
	High	0.29	0.21-0.39	0.85	0.59-1.26	0.25	0.19-0.33	0.82	0.63-1.13

Table A.1 - Summary of the projected global sea level change median and likely range in metres at 2050 and 2100 used in the present study. 'Low' emissions scenario refers to RCP2.6/ SSP1-2.6 whilst 'high' emissions scenario refers to RCP8.5/ SSP5-8.5.

		Harrison (2021)				IPCC AR6 (2021)			
Location	Emissions scenario	2050 median	2050 range	2100 median	2100 range	2050 median	2050 range	2100 median	2100 range
KARACHI	Low	0.12	0.04-0.22	0.21	-0.55	0.23	0.14-0.33	0.54	0.32-0.8
	High	0.17	0.08-0.27	0.56	0.24-0.95	0.27	0.18-0.37	0.86	0.62-1.19
COCHIN (WILLINGDON ISLAND)	Low	0.2	0.14-0.29	0.4	0.24-0.64	0.2	0.14-0.27	0.45	0.31-0.66
	High	0.25	0.17-0.34	0.76	0.52-1.14	0.25	0.19-0.32	0.82	0.63-1.12
OKHA	Low	0.15	0.08-0.24	0.27	0.06-0.53	0.16	0.09-0.25	0.36	0.18-0.58
	High	0.19	0.11-0.29	0.63	0.35-1.0	0.21	0.14-0.3	0.72	0.5-1.03
MORMUGAO	Low	0.18	0.11-0.27	0.35	0.18-0.59	0.17	0.1-0.25	0.38	0.22-0.6
	High	0.23	0.14-0.32	0.7	0.44-1.07	0.22	0.15-0.3	0.75	0.54-1.05

Table A.2 - Summary of the projected global sea level change median and likely range in metres at 2050 and 2100 used in the present study. 'Low' emissions scenario refers to RCP2.6/ SSP1-2.6 whilst 'high' emissions scenario refers to RCP8.5/ SSP5-8.5.