

# **Guidance Sheet No. 2: Climate Impacts of Ports and Harbours**

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## 1. Introduction

Ports and harbours have a significant role in the global and regional economy, they promote expansion of cities and industries around them. They are the link between several transport modes: sea, road, rails. Seaborne trade is continuously expanding (Figure 1) and represent more than 80 per cent of the global merchandise by volume.

Moreover, coastal population is growing twice as fast as global population making urban coastal zone grow and exposing more people and assets to coastal risk. In 2005, about 40 million people were exposed to a 1 in 100-year coastal flood event, in 2070, it is estimated that around 150 million people will be exposed due to population growth (Figures 2 and 3), urbanisation and climate change. Considering assets, the value of exposed assets is estimated to reach US \$35,000 billion by 2070, namely more than 10 times their current value (Nicholls et al., 2008). With growing coastal urbanisation and seaborne trade, importance of ports in regional economy is becoming more and more significant and impacts of climate change must be considered.

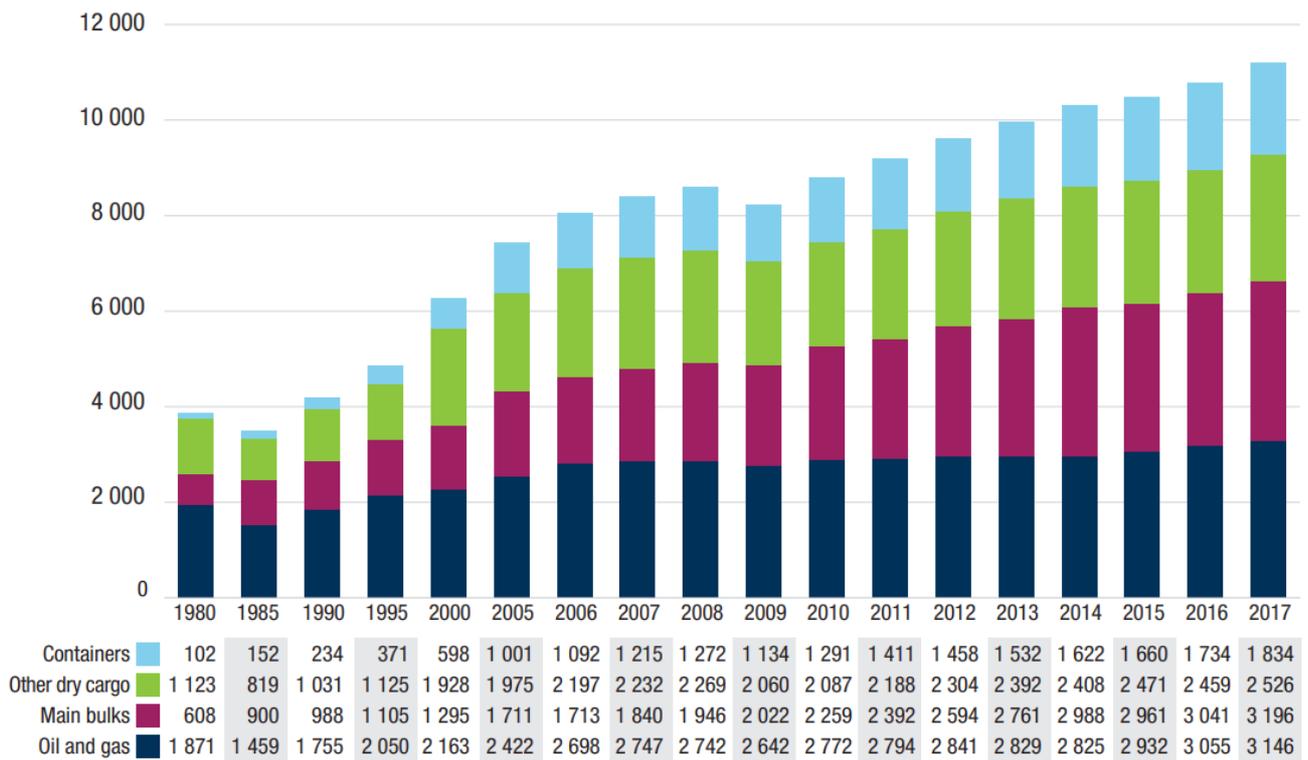


Figure 1 - International seaborne trade by cargo type, in millions of tons loaded (from UNCTAD, 2018)

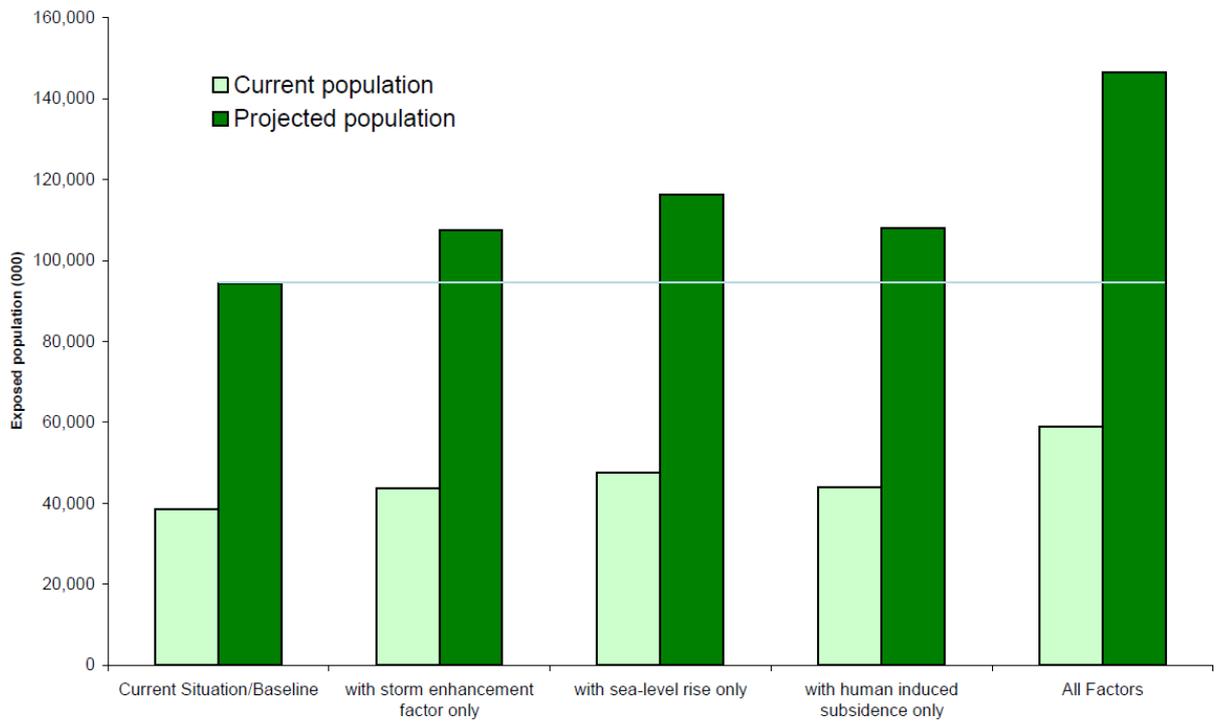


Figure 2 - Global population exposure, influence of different change factors: 2005 to 2070s (from Nicholls, 2011)

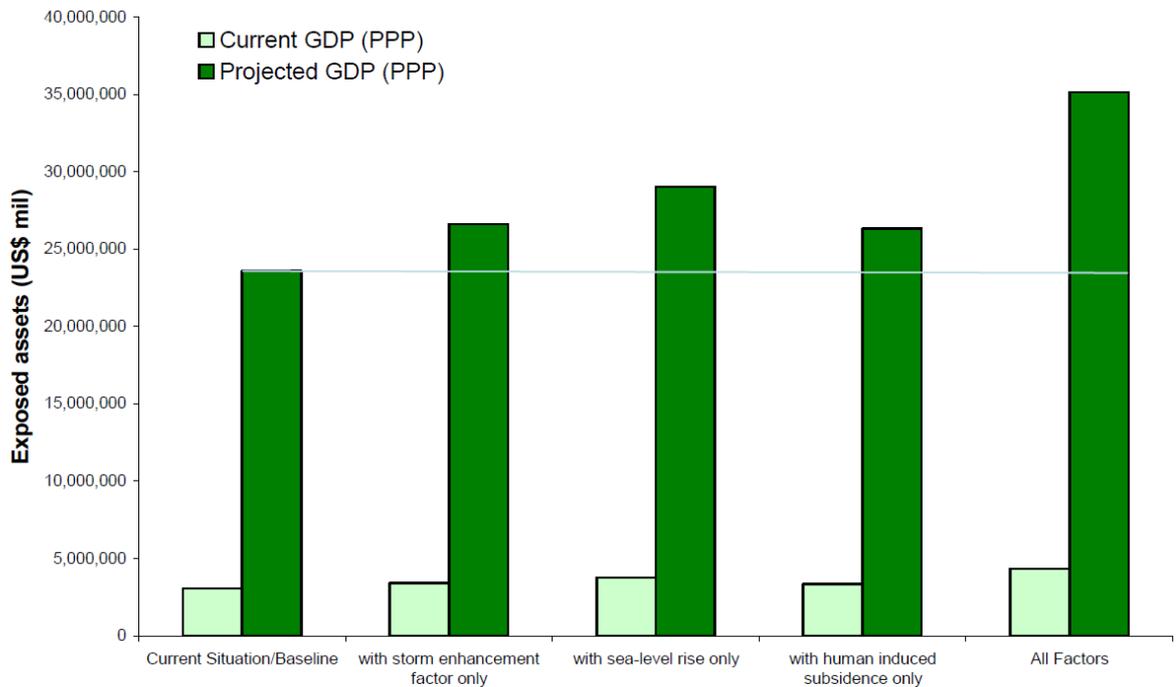


Figure 3 - Global asset exposure, influence of different change factors: 2005 to 2070s (from Nicholls, 2011)

## 2. Climate impacts on ports and harbours

- Ports and harbours are directly impacted by the effects of climate change such as evolution of mean sea level, wind, waves, precipitation or temperature.
- Climate can directly impact infrastructures, operations and services or indirectly modify changes in pattern of shipping traffic and level of demand due to external events led by climate change (e.g. trade, demography, agricultural or fishing activity).
- Climate change bring new challenges to ports like the development and maintenance of new infrastructures for the Arctic regions and new navigable routes but also challenge navigation with more frequent icebergs in certain regions.
- Permanent inundation due to sea-level rise will impact significantly the port activities and infrastructures and the technical solutions against this are expensive.
- Inundation due to storm can temporarily stop the operations by impacting the transport connections, or damage terminals and storage.
- Increase in storm frequency, change in wind and wave conditions can also make the port unsafe to access or berth, or stop the operations.
- The rise of the mean sea-level will affect the tidal regime and therefore port will need to adapt their infrastructure and operating hours.
- The increase in precipitation, flooding or drought is already affecting port infrastructures and services. Other events associated with these risks like landslides generate disruptions or delays in port transport connections and access, standing flood water can cause severe damage to assets.
- Flood can cause damage to river banks, flood protections, change in river morphology, silting and so will affect navigation and services.
- The increase of heat waves frequency will increase the demand in energy for cooling, ventilation, cause damage on pavements or tracks, and health risk for staff works outdoors.
- Most of these points are direct impacts but other indirect impacts are expected to affect ports and harbours.

### Sources:

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- Nicholls, Robert J., et al. *Ranking port cities with high exposure and vulnerability to climate extremes*. (2008).
- Nicholls, Robert J., *Extreme Flood Events and Port Cities through the 21<sup>st</sup> Century: Implications of Climate Change and Other Drivers*, 29-30 September 2011, Climate Change Impacts and Adaptation: A Challenge for Global Ports.