| Challenge 1. Building the evidence base (through improved data collection and utilisation, and enhanced modelling capability) | | | |
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| **1a. Developing existing monitoring**<br>Sustaining, and expanding monitoring efforts, to continue to track the effects of climate change. | **1b. Establishing new time-series monitoring programmes**<br>Establishing new long-term datasets to start to identify climate-driven trends across physical, ecological and societal systems. | **1c. Improving process understanding and representation in models**<br>Improving representation of physical, chemical and biological processes, and their interactions, in models (including how data is assimilated). | **1d. Refining model outputs**<br>Developing improved projections, with more predictive capability, across a range of spatial and temporal scales, and future scenarios. |
| **Sustain, and expand observations of the physical environment to:**<br>*Understand large-scale circulation changes (e.g. AMOC variability vs long term decline).<br>*Monitor carbonate system change.<br>*Obtain better salinity, temperature, oxygen and stratification data to identify trends (and improve model inputs).<br>*Improve Sea-level rise data, including from tide gauge networks and the geological record (e.g. to constrain limits and rates of change).<br><br>**Sustain, and expand observations of biological systems to:**<br>*Track climate driven changes in coastal, intertidal, shelf, pelagic and deep-sea benthic communities.<br>*Track climate driven changes in birds, inc. in breeding and non-breeding seasons and on prey availability. | **Better use of autonomous observing technology to:**<br>*Improve data coverage in hard to sample regions.<br>*Compare conditions across sites (e.g. pH and oxygen measurements).<br><br>**Generate new baseline data to identify climate driven changes to:**<br>*Monitor long-term species distribution change (e.g. range shifts for marine mammals).<br>*Monitor short-term spatial and temporal shifts in species abundance and distribution (e.g. in response to marine heatwaves). | **Better spatial and temporal data resolution to:**<br>*Improve representation of biogeochemical processes in models.<br>*Inform baselines and boundary conditions.<br><br>**Better simulation of storms (and storm track), winds, surge and waves to…**<br>*Reduce uncertainty in storm and wave projections<br>*Improve projections of extreme water levels.<br><br>**Better representation of biological life traits, and trophic links for:**<br>*Higher trophic species, including fish and marine mammals.<br><br>**Better understanding of bio-physical interactions in transition zones, e.g. at the coast and shelf edge for:**<br>*Processes affecting geomorphology<br>*Processes affecting stratification and oxygen availability. | **Better predictive capability to:**<br>*Improve confidence in near term forecasts of physical change (e.g. SST) and their likely effects on biological systems (e.g. Fish, Plankton, HABs, Pathogens).<br><br>**Quantify and constrain high end scenarios to:**<br>*Better constrain likely upper limits of physical change (e.g. Sea-level rise).<br><br>**Long term coastal system response to:**<br>*Predict long-term and large-scale coastal system response to sea-level rise.<br><br>**Regional projections, that factor in other stressors for:**<br>*Assessing impacts on different habitat zones, from the coast out to the deep sea. |