Title & key research questions/approach	Sectors & experiments	Interested author(s)	Progress (time line)
Synthesis across sectors			
Zoom in: Difference between 1.5 and 2°C for important or iconic systems			
This can be multiple papers, one per system/place: ● Identify places or systems where the additional half degree is expected to make a substantial difference. Could be based on previous literature (e.g. Schleussner et al., 2016, ESD) or intuition. ● Then quantify the difference, based on GMT bins. ● Examples (just for illustration, not based on science): Himalayan ecosystems; water availability or drought in Central America, the Mediterranean, Middle East; margins of permafrost areas; fisheries in reef-based marine ecosystems; ...to be extended.	II and/or III experiments all sectors		
Hotspot of climate change at 1.5°C (update of Piontek et al. 2013)			
● Consider thresholds for each sector and calculate the number of sectors where this threshold is exceeded. ● Calculate frequency of extreme weather/climate events in each grid cell and compare to frequency of threshold-crossing impact events. ● Look at timing of events in different sectors: are there many in one year? ● How does the multi-sectoral, spatio-temporal distribution of impact events change under climate change? Maybe this could be done with some kind of network analysis	I, II and/or III (and/or 3) experimentsA LL sectors		
Comparing impacts of climate change and other human influences (at 1.5°C?)			
● Calculate pure climate effect against background of socio-economic changes ● Is the impact of land-use changes bigger than the impact of climate change (e.g. RCP6.0 includes less bioenergy than does RCP2.6)? ● Trade-off with bioenergy: are land-use changes better/worse than climate change?	Group 2 & 3 experiments: Water, Biomes, Forests, Crops, … needs group 3 experiments	yes	
Climate change and El Nino			
● Consider how CC amplifies disparities between La Nina & El Nino years. ● Compare group 2 and group 1 simulations: for each avg. damages for El Nino & La Nina years ● Quantify CC effects in units of historical avg. difference between El Nino & La Nina years.	Biomes, global water...	Zhao, Veldkamp, Funk, Greve, Wada	
Climate change impacts on human migration/population distribution			
● Impacts in different sectors can erode (or improve) livelihood conditions and make certain places less (or more) attractive for human habitation. ● Comparison with no-impacts counterfactual can identify potential areas of anomalous out- or immigration. ● Start with set of countries where drivers of migration are relatively well known empirically	Group 3 (or 2) experiments: Water, Crops, Fisheries, Health, potentially Biomes, Energy, Forests	J. Schewe	
Arctic systems and 1.5°C and 2°C warming			

● Warming in the Arctic is predicted to proceed at a faster rate than the global average: i.e. more vulnerable. ● Comparison of the impacts between 1.5°C and 2.0°C cases show the importance of mitigation. ● Long-term responses of vegetation and soil carbon stock would be addressed. ● Inter-sectoral aspects such as carbon and water budgets and ecosystem service-related properties should be assessed.	Biomes, others (e.g. water, forests)	A. Ito	
Economic costs of climate change			
Process-based damage functions			
● Use impact simulations to derive relationship between historical monetary costs of weather extremes and impacts, i.e. damage functions. ● Also quantify in terms of 'additional people affected'. ● Compare CC direct damages to money in the GCF. ● When is a threshold reached where countries can no longer recover from extreme events? ● Quantify changes in CO_2 emissions from forests or land-use changes based on carbon price and include in overall damage costs.	Water (flood events), Tropical Cyclones, biomes	K. Frieler, T. Kahil, Y. Wada,	yes
Historical responsibility			
National contributions to direct damages			
● Attribute direct damages from CC based on historical national emissions.			
The contribution to CC from national-level biosphere sinks			
● Include climate-change induced-biosphere sink change in calculations of historical emissions. What fraction of changes in ecosystem-based emissions is due to climate change?	Biomes		
Model evaluation			
Evaluation of model behavior in presence of low-level CO_2			
● How do the models perform under low, pre-industrial CO2 compared to biogeography/proxy data? ● What is the influence of the rate of change of CO2 (between RCP2.6, RCP6.0 and the CO2 sensitivity runs) (if we include Group 2) ● Investigate differences between pre-industrial and present-day conditions to quantify impacts of climate change that has already occurred.	Group 1 & 2 experiments: Biomes, Water	M. Dury, A.-J. Henrot, L. François A. Pourmokhtarian	
Impacts of extreme events			
Compound impacts of extreme events including heatwaves, different types of droughts, water scarcity, and water storage changes			
● Express impact on food security in terms of lost edible calories ● Impact of lack of water on power-plant cooling ● Impacts of compound extreme events compared to single extreme event	Fisheries, Crop, Water, Energy needs Group 3, not feasible	P. Greve, Y. Satoh, E. Byers, T. Veldkamp, Y. Wada	

• Multi stressors on different sectoral impacts • Compound impacts of extreme events under different scenarios (group 1, 2, & 3)	without future socioeconomic scenarios		
Drought & adaptation			
• Calculate lower and upper bounds of costs of droughts: Lower: cost of extracting groundwater, upper: loss of yields due to lack of water	Crop, Water needs group 3 (or more general extremes & adaptation)		
Changes in occurrences of extreme events			
• How does the occurrence of climate extremes change with 1.5°C (2°C) warming (look at TCs, floods, extratropical storms, droughts?) • Same question but for impact extremes. • Do the impact extremes always coincide with the climate/weather extremes? • can also be applied socio-economically with reversed argument: How does probability change to affect the same number of people (by event, annually) for cc only, soc only, cc+soc? • Relate to societal tipping points (COPAN)? • Describe Earth as 'aging quickly' E.g. 1 in 500 years becomes 1 in 100 years -> aging 5x more quickly than without CC.		T. Geiger, K. Frieler, L. Warszawski, S. Lange, J. Volkholz, T. Veldkamp	
Drivers of forest productivity changes			
Interactions of impacts across sectors			
Impact of agricultural fertilizer use on fishing			
• Using fertilizer-input projections and hydrology (global or regional?) models, investigate transport of chemicals to the sea and subsequent impacts on fisheries.	Water, Fisheries, Crops		
How irrigation contributes to sea-level rise			
• Use land-water storage to calculate contribution of irrigation to sea-level rise for 1.5°C warming and other CC scenarios.	Coastal Infrastructure, Water, Crops		
Climate change impacts on ecosystems and food: exploring marine-terrestrial links through diets			
Combining climate change impacts from fisheries with fast track agriculture results for crops, grasslands and previously published livestock outputs with country-level diet portfolios.	Agriculture, Fisheries	Julia Blanchard et al.	
Fish as a nexus for global food production, biodiversity and climate change			
A review paper focussed on fisheries but contrasting with agriculture to address SDGs, uses fish-Mip and ag-Mip (fast-track) results in a cross-sectoral map of climate change impacts and vulnerability	Agriculture, Fisheries	Julia Blanchard et al	
Adaptation			
Role of adaptation in reducing impacts			
• By how much does adaptation reduce impacts within & across sectors and how cost-efficient is this?	infrastructure, (health, other sectors?)	Jochen Hinkel	
Adaptation space to cope with impacts of a 1.5 °C warmer world			
River regime shifts in highly valued ecosystems under 1.5 and 2 degree climate change			
Quantify how many rivers (share of river stretch) experience river regime shift due to 1.5 and 2 degree climate change and evaluate how many of	Water, biomes?	Veldkamp, Mueller Schmied	

these river (stretches) are located in highly valued or protected ecosystems. 1) How many rivers (stretches) experience river regime shift under 1.5 and 2 degree CC, how many of these stretches are located in highly values areas (e.g. RAMSAR) 2) What is the difference between the 1.5 and 2 degree CC conditions: i.e. what is the added value in terms of avoided river regime shifts 3) Up to what level do different 1.5 degree worlds result in different outcomes in terms of river regime shifts?			
Sector-specific impacts			
1.5°C vs. 2.0 °C warming impacts on global terrestrial primary production and carbon budget			
● Comparison of 1.5°C vs. 2.0 °C warming impacts on NPP and carbon storage ● Climate extreme impacts on NPP and carbon storage ● Climate warming interaction with other drivers (land use, CO2 and N deposition)	Biomes Crops	Hanqin Tian	
Impacts of temp change on energy demand			
● How does warmer winters and hotter summers affect overall demands for heating and cooling? ● Use advanced degree day method to determine the impacts for energy demand between 1.5/2.0 C. ● Use ensemble of GCMs to establish where uncertainty dominates ● SSP population datasets to highlight socioeconomic impacts	Energy	Ed Byers, Alessio Mastrucci	
Hotspots of hydroclimate variability on the power sector			
Analysis that identifies critical areas where significant changes in hydroclimate variability can be expected to impact power sector Considers peak flows, low flows, variability, air temps Difference between 1.5/2.0	Energy, Water	Ed Byers, Matt Gidden	
Projections on temperature-related mortality impacts under climate change scenarios consistent with the Paris Agreement			
● To estimate projections on temperature-related mortality impacts under scenarios consistent with Paris Agreement (1.5°C, 2°C) and more extreme (3°C, and 4°C increase in GMT). ● To compare future impacts, in terms of attributable risks for non-optimal temperatures and for cold and heat separately, computed across the selected climate change scenarios. ● To assess the geographical distribution of these impacts.	Health	Antonio Gasparrini, Ana M. Vicedo-Cabrera	
Impacts of climate and land use change on global biodiversity of vertebrates			
Assessment of impacts of different warming scenarios (1.5° and others), especially with regard to spatially interacting threats of climate and land-use change (if possible, special focus on bioenergy crops) for global hotspots of vertebrate biodiversity, e.g. hotspots of species richness, richness of threatened and range-restricted (endemic) species	biodiversity. biomes, agriculture	Christian Hof, Thomas Hickler, Alke Voskamp, Matthias Biber, Katrin Böhning-Gaese et al.	

Water resources volatility: Estimating the adaptation space to cope with water scarcity under different climate mitigation pathways			
In this contribution we quantify the (temporal) window of opportunity for water managers to implement adaptation strategies dealing with water resources scarcity. In doing so, we evaluate when water scarcity becomes critical in terms of volatility using three critical thresholds: (1) the frequency of water scarcity events; (2) the (accumulated) annual average affected GDP/GVA, (3) the annual average population affected. Subsequently, we compare the difference in timing and range of these windows of opportunity when following different climate mitigation pathways (RCP2.6 and RCP6.0). In parallel, we estimate how exposure to water scarcity differs under different 1.5 and 2 degree worlds. Using multiple GCMs and GHMs we test, finally, the sensitivity of timing and severity of water scarcity as well as the variation in window of opportunity to cope with water scarcity, to the use of different datasets and models.		Veldkamp, Greve, Byers, Wada, ISIMIP 2b Modelling Teams	