The **CLIMSAVE** Project

Climate Change Integrated Assessment Methodology for Cross-Sectoral Adaptation and Vulnerability in Europe

Summary of report describing the coping capacity index

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The report describing the adaptive capacity methodology (Tinch et al. 2011) sets out the way in which the CLIMSAVE project aimed to develop a way to define, measure and use the concept of "adaptive capacity" within the Integrated Assessment Platform (IAP). This methodology has now been implemented with some adjustments as the work has co-evolved with the method for defining and measuring vulnerability and the further development of the IAP. This summary explains how the final coping capacity index has been derived.

The CLIMSAVE IAP models future land use and climate, allowing for a range of long-term adaptation options, but does not account for the ability of future societies to cope in the immediate/short term with climate-related events such as floods and heatwaves. Hence, a model of this 'coping capacity' was developed, because it is an important buffer between changed conditions and vulnerability to unavoidable impacts.

A conceptual model of coping capacity as dependent on four types of capital stocks: human, social, financial and manufactured was developed. Societies can draw on these stocks in order to adapt, but they can also decide to invest in building up these stocks in order to be better able to cope with future events.

There are some existing methods for measuring these capitals in societies today. For projecting these measures in the CLIMSAVE scenarios, a combination of data analysis, stakeholder scenario development and expert judgement was used. For each capital, indicators were assessed that could be linked to the CLIMSAVE socio-economic scenarios. This assessment considered the suitability of each indicator for the capital type and as a component of coping capacity. It also looked at the quality of the data available, including

the spatial resolution, the completeness of coverage across study areas and the length of time series available. This led to a long-list of candidate indicators.

To narrow the list down to our final choice of indicators, correlations across the data were analysed in order to avoid the 'redundancy' of selecting two indicators that are highly correlated together. For each capital type, two indicators were selected that had high-suitability data and that were not strongly correlated. The long lists of indicators, and the final choices, are shown in Table 1

Table 1: Indicators for human, social, financial and manufactured capital.

EUROPE			SCOTLAND		
Human	Life Expectancy	✓	Human	Life Expectancy (CA)	✓
Human	Tertiary Education	✓	Human	Tertiary Education	✓
Human	Long-term Unemployment		Human	Life Expectancy (IZ)	
Human	HRST (HR in Sci-Tech)		Human	Employment Public & Private	
			Human	Employment Deprivation (%)	
			Human	Education (O+)	
Social	Income Inequality	✓	Social	Income Inequality	✓
Social	Help when threatened	✓	Social	involvement (Fair+)	✓
Social	At-risk-of-poverty		Social	Community involvement (Some+)	
Social	Corruption Perception				
Social	Trust				
Social	Volunteering				
Financial	Household Income	✓	Financial	Household Earnings	✓
Financial	Financial Assets		Financial	Savings (Corrected)	✓
Financial	Household saving rate		Financial	Savings (raw)	
Financial	Net household savings rate	✓	Financial	Income Deprivation (%)	
Financial	Financial Assets (% of GDP)		Financial	Regional GVA per capita	
Financial	Net Foreign Assets				
Financial	Net National Assets				
Financial	GDP				
Manufactured	Transport (Density)		Manufactured	Road Length (by density)	
Manufactured	Transport (Area)	✓	Manufactured	Road Length (by area)	✓
Manufactured	Transport (Pop)		Manufactured	Road Length (by population)	
Manufactured	Produced Capital	✓	Manufactured	Capital expenditure	✓
Manufactured	Construction		Manufactured	Manufacturing GVA (perEmp)	
			Manufactured	Construction GVA (per cap)	
			Manufactured	Hospital Beds	

In order to develop scenario-specific projections for the capitals, the indicators were standardised on a 0 to 1 scale. Initially, the data were transformed to near-Normal distributions and standardised using their own maximum and minimum values. However, in several cases this resulted in ranges that were too narrow for the scenarios – life expectancy, for example, would be considered 'very low' at 70 under this method. Therefore, 'absolute' maxima and minima were determined based on the scenario descriptions and expert judgement. Different functional forms relating an indicator to its standardised index were also considered, so that the indices could reflect non-linear relationships with the capitals - for example, moving from 0% to 5% with tertiary education represents a much more significant increase in human capital than moving from 45% to 50%.

To build the capital estimates and the overall coping capacity index, equal weights were used within capital categories and in calculating overall coping capacity. This could easily be altered later, following IAP testing and user feedback, if it is thought necessary to put more emphasis on a particular capital type, and/or to vary the weights according to the threat faced. The results for the current European situation are shown in Figures 1 and 2.

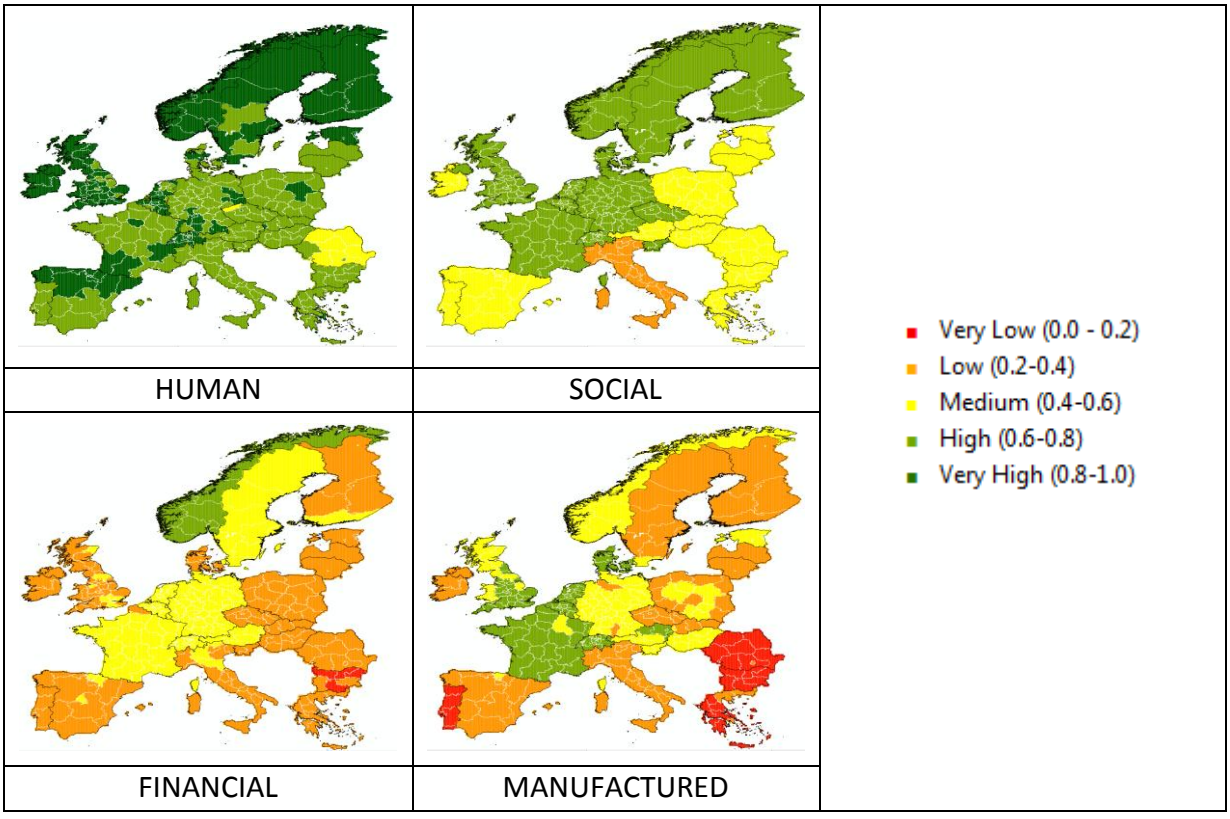

Figure 1: Baseline capital estimates for Europe.

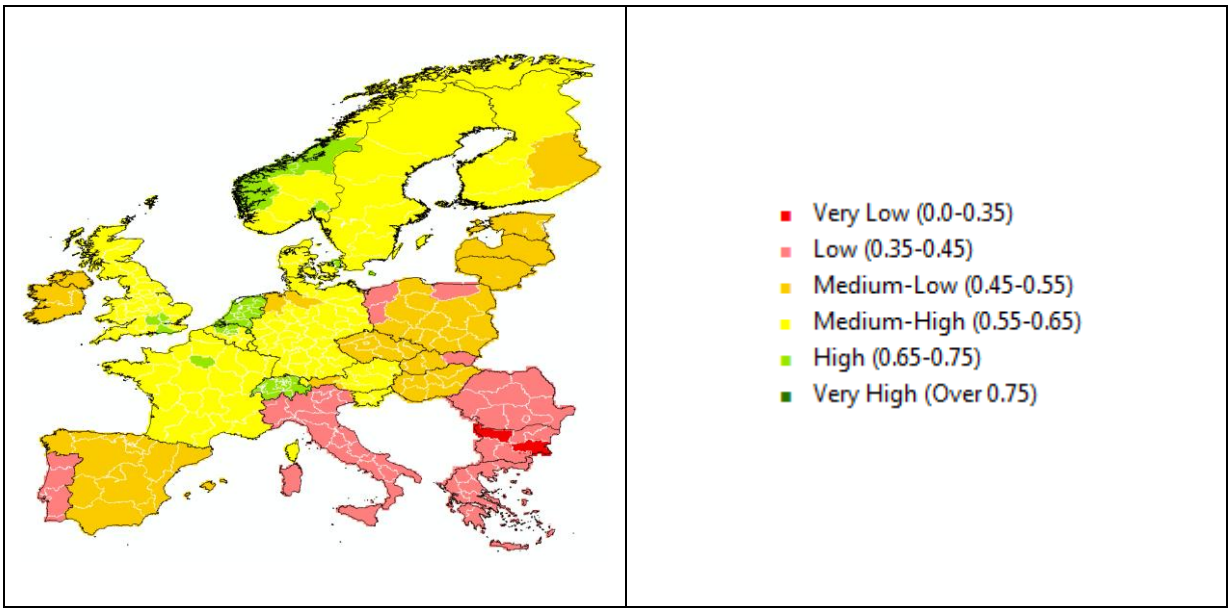

Figure 2: Baseline coping capacity for Europe.

The results are broadly similar to those of other work such as the ATEAM (http://www.pik-potsdam.de/ateam/) and ESPON (http://www.espon.eu/main/) projects. Details can vary within individual countries, but in broad terms, the North and West tend to have generally higher coping capacity, driven by healthy, educated populations, relatively even income distribution in wealthy and developed economies, while the South and East tend to have generally lower levels of all capital types and consequently lower coping capacity.

The stakeholder scenario development workshops included work on estimating changes in capital types under the different scenarios. We drew on this, and the IAP outputs, to derive maps of available capitals and overall coping capacity for the 2020s and 2050s time slices in each scenario. Results are shown in Figure 3. There is a clear split between scenarios that build up high levels of coping capacity across the board, leading the whole continent to a strong position for coping (for Europe, the 'Riders on a storm' and 'We are the World' scenarios), and scenarios that lead to generalised decline in ability to cope, and a worsening of existing imbalances leading to very low coping capacity in particular in the southern and eastern parts of Europe ('Icarus' and especially 'Should I stay or should I go' scenarios).

It should also be noted that these changes do not reflect the full impacts of climate change but rather the ability of the societies to cope with these. Thus, Figure 3 does not suggest that there would be no climate impacts in the Riders on the storm scenario, but rather that societies in such a socio-economic future world would be well equipped to cope with whatever climate impacts arise, and so would be less likely to be vulnerable to impacts. Conversely, Figure 3 does not necessarily imply that climate impacts would be severe in a Should I stay or should I go scenario, but rather that societies would be ill-equipped to deal with any impacts that did arise, and so would be likely to be vulnerable.

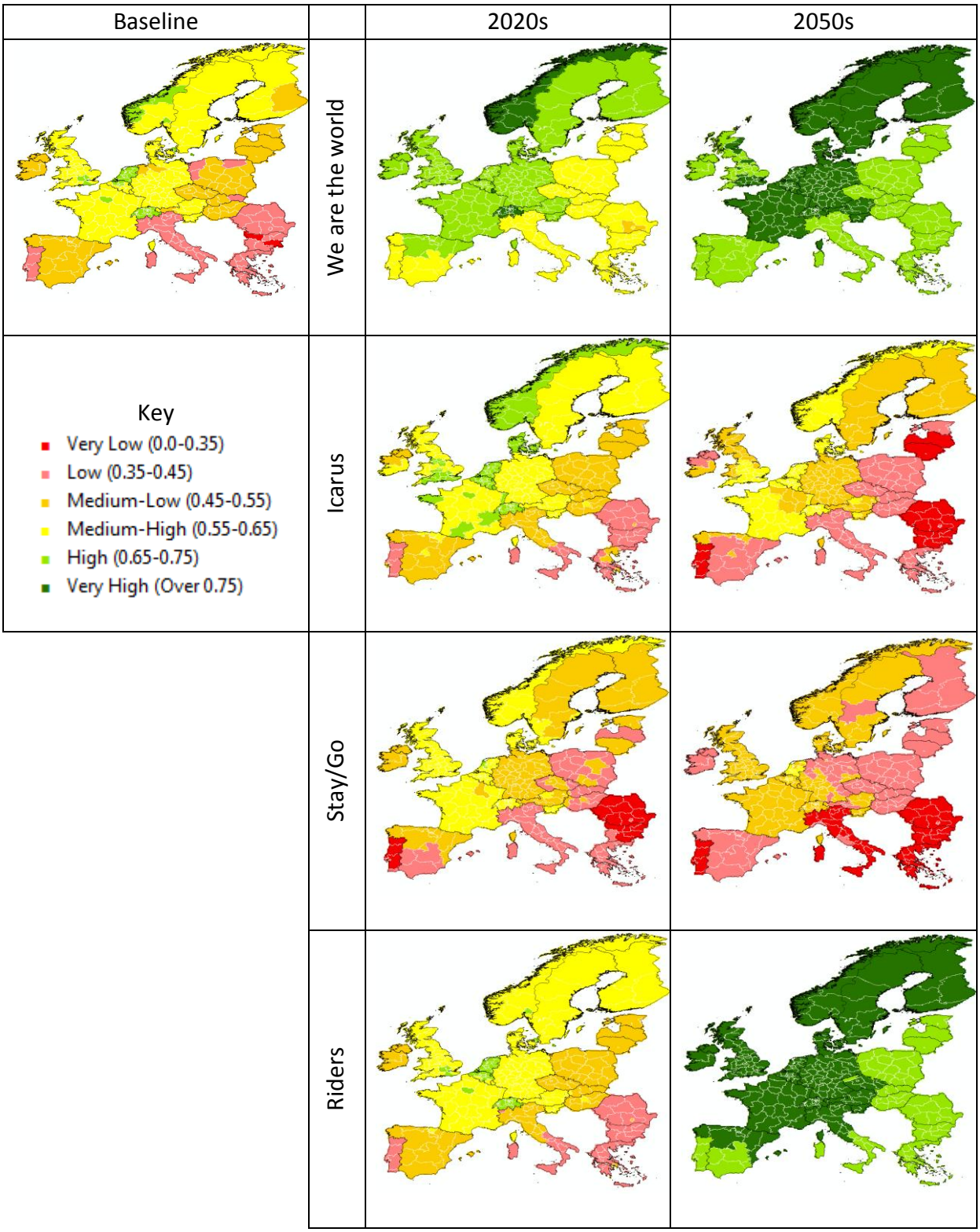

Figure 3: Changes in the coping capacity index in Europe for the CLIMSAVE socio-economic scenarios in the 2020s and 2050s. Note that "Stay/Go" refers to the Should I stay or should I go scenario and "Riders" refers to the Riders on the storm scenario.