Grant agreement no. 776479

COACCH

CO-designing the Assessment of Climate CHange costs

H2020-SC5-2016-2017/H2020-SC5-2017-OneStageB

D1.6 Protocol for impact assessment studies

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Dissemination Level		
PU	Public	X
CO	Confidential, only for members of the consortium (including the Commission Services)	
CI	Classified, as referred to in Commission Decision 2001/844/EC	

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Disclaimer

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Version log

Version	Date	Released by	Nature of Change
1.1	21/AUG/2018	PWA	First Draft
1.2	30/AUG/2018	CMCC	Final check

Summary

The aim of this task is to ensure that a set of consistent and harmonized guidance is provided for all impact and economic analysis in the COACCH project, to allow the modelling and linkages in WPs 2-4 to be undertaken in a rigorous and harmonized approach.

The deliverable discusses key harmonisation issues and puts forward recommendations for each of these. These include:

- Socio-economic data;
- Metrics;
- Time periods;
- Discounting;
- Spatial outputs;
- Treatment of uncertainty;
- Treatment of policy.

Proposals for each of these was discussed at the COACCH 2nd project meeting. The results of these discussion and agreements are included in this protocol.

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1. Introduction

1.1 Background and Task Description

The aim of this task (1.4) is to ensure that a set of consistent and harmonized guidance is available for all impact and economic analysis in the COACCH project. In turn, this should allow the modelling and linkages in WPs 2-4 to be undertaken in a rigorous and harmonized approach, allowing consistent reporting of results.

This activity is needed to ensure that all teams apply a harmonized approach at the sector level, so that:

a) Economic costs can be aggregated and compared in equivalent terms, allowing consistent synthesis (and reporting in WP6);

b) To provide consistent input data so that sector assessments can feed directly into the macro-economic models (within WP2 and WP4).

The Deliverable from WP1, task 1.4 is D1.6: Protocol for impact assessment studies. The work package description is included in the box below.

To help inform this harmonization protocol, the task draws on the stakeholder inputs from the co-design workshop (See Deliverable D1.3 Workshop Report: First COACCH Co-Design Workshop), in areas such as scenarios and data needs.

Work Package 1 Description
Work package 1 –stakeholder engagement and co-delivery - is at the core of the project. The objective of WP1 is to establish the overall co-design, co-production and co-dissemination activity of the project. This WP, driven by the interaction with the stakeholders, will run throughout the entire project, and uses an innovative science-practice and iterative policy methodology.

Task 1.4. Harmonized protocol for impact assessment studies. Lead: PWA.
The aim of this task is to ensure that the output of Task 1.2 and 1.3 are translated into guidance for the researchers in WPs 2-4 in a rigorous and harmonized approach. Building on the co-designed scenarios, this task will set out the protocol for the modelling and impact assessment teams for subsequent WPs. It will provide agreement on:

- Mitigation and adaptation scenarios
- RCP projections (now and future time periods, specified years)
- Downscaled climate models and sampling method for uncertainty
- Downscaled socio-economic data for impact analysis
- Guidance on impact quantification and valuation
- A protocol on information exchange within the project (including quality guidelines)

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2. Discussion of harmonisation needs

2.1 Outline of key harmonisation priorities

A number of previous studies have undertaken assessments of the economic costs of climate change in Europe, working at the pan European level with multi-model assessments. These projects include the PESETA projects (I and II, Ciscar et al., 2012; Ciscar et al, 2014) and the RTD funded projects ClimateCost (Watkiss et al, 2011), IMPACT2C (2015) as well as ongoing projects IMPRESSIONS[1] and HELIX[2].

These projects faced a common challenge to COACCH, namely that the impact modelling of different sectoral and cross-sectoral components was undertaken using a suite of different state-of-the-art models, operated by a range of different research teams. Therefore, in developing a working protocol for the impact assessments in the COACCH project, we have reviewed the approaches adopted by these other projects and drawn on the lessons from them.

The review has found that having a common protocol and defined assumptions and scenarios leads to a greater degree of internal consistency. It also allows more comprehensive aggregated economic costs (across sectors and impacts) due to the greater number of consistent and harmonized results. It is also clear that when there is an absence of coordinated action, individual modelling groups tend to use different assumptions and practice, which reduces model linkages and aggregation potential.

The review of the projects above, including existing harmonization protocols (e.g. IMPACT2C, 2015b) has identified the following areas that require co-ordination across modelling teams in COACCH:

- Climate and socio-economic scenarios;
- Socio-economic data;
- Metrics, including price year;
- Time periods;
- Discounting;
- Spatial outputs;
- Treatment of uncertainty
- Treatment of policy;

The first of these is a key task and is linked to the inputs from stakeholders. This is reported in a separate deliverable, D1.5, Impact and policy scenarios co-designed with stakeholders.

[1] http://impressions-project.eu/
[2] https://www.helixclimate.eu/

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The remaining issues are considered in this deliverable.

It is highlighted that this deliverable also has strong linkages with the protocol on information exchange within the project (including quality guidelines), which is included in Deliverable 2.1 (Protocol on information exchange flows and model integration).

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3. Discussion and Agreement

For each of the harmonisation issues, an initial analysis was made, based on previous projects and guidance documents. This led to a set of harmonisation protocol proposals, which were discussed with the consortium at the 2nd COACCH meeting in Graz in July 2018. The results of the agreed harmonisation areas and proposals are set out below.

3.1 Socio-economic data

A key harmonisation issue is to ensure the consistent use of an agreed set of climate and socio-economic scenarios, that all modelling teams use. This was agreed based on stakeholder input and agreement among the consortium (D1.5 Impact and policy scenarios co-designed with stakeholders). However, a further issue is to ensure that all teams use consistent socio-economic data sources for these common scenarios.

The socio-economic scenarios used in COACCH are those developed as part of the IPCC analysis and are known as Shared Socio-economic Pathways (SSPs) (O'Neill et al., 2014). The key focus is therefore to identify a common set of data for these SSPs, noting the need to have a sufficient detailed disaggregation to allow the COACCH focus on reporting disaggregated economic costs for Europe.

The proposal made at the stakeholder workshop, and subsequently to the COACCH consortium, was to utilise the data-sets held in the SSP database developed by IIASA[3]. For population and urbanisation, the database holds a single data-set for each SSP at country-level.

Population data includes a total value, as well as complete distributions by age, sex and level of educational attainment, for each year to 2100.

Urbanisation scenarios for each country, measured by the percentage of population that resides in urban areas, are available for each year to 2011.

For GDP scenarios, three data-sets have been developed for each SSP. The IIASA database guidance suggests that in the case where users can only use one interpretation of the SSPs, for each SSP a single 'illustrative' case can be used. The 'illustrative' SSP should not be interpreted as the central or representative case. In the selection of the 'illustrative' cases, IIASA has currently selected all SSPs from one team (OECD). However, IIASA recommend to use the GDP projections by all teams to test the sensitivity of the results due to different GDP assumptions.

Further quantitative data is available in the IIASA database for: energy use and supply; land-use; emissions, and; climate change policy costs. In each case, data outputs from multiple IAM runs are presented. However, where the full range cannot be utilised, IIASA suggests the use of a marker scenario. It is suggested that the marker scenarios can be interpreted as representatives of the different storylines.

[3] https://tntcat.iiasa.ac.at/SspDb/dsd?Action=htmlpage&page=about

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3.2 Monetary Metric and Price Year

In order to derive comparable sectoral impact cost estimates, the sectoral estimates need to be presented in common currency units, using a common price year in order to account for inflation.

Following discussion at the consortium meeting, the common currency is agreed to be the Euro, (€), and the common price-year is agreed to be 2015.

It is noted that different models in the consortium do have different price years and do some also work in $USD. Therefore, cost estimates derived for an alternative price-year need to be adjusted to this year. This should be done using the harmonised index of consumer prices (HICP) to be found at: http://ec.europa.eu/eurostat/web/hicp/data/database.

COACCH also estimates economic costs for multi-year time-slices. These are: 2020-2040 (near-term); 2041-2070, and; 2071-2100. It is suggested that average annual costs should be estimated for each of these time-periods. In instances where impact costs are estimated for extreme events, it is suggested that expected annual damage (EAD) costs should be estimated.

Whilst the primary aim of the COACCH project is to estimate the monetary costs of climate change impacts it is acknowledged that it can also be useful to present results in physical terms, (e.g. annual number of people impacted by flooding), or by use of indices. Given their experience, the choice of non-monetary metrics is left to the individual sectoral modelling teams.

3.3 Time-periods

The discussion of metrics above highlights the need to present results as annual averages over multi-year periods. A base-line period of 1981-2010 was agreed with the stakeholder groups as being the most meaningful. Regarding future periods, stakeholders favoured an emphasis on the near-term as a way of justifying interventions in current decision-cycles. This was agreed as being centred on 2030 (2020-2040). However, it was acknowledged that the climate do not identify strong climate change signals in this period. Consequently, two further periods in the mid-term, 2041-2070, and long-term, 2071-2100 were agreed to be used. These are likely to be of most use for decisions relating to investment decisions in assets with long life-times as well as for awareness-raising.

3.4 Discounting

Expressing climate change impacts in economic cost terms necessitates consideration of the treatment and reporting of economic values in the future

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In economic analysis, discounting is the usual technique used to compare environmental costs and benefits that occur at different points in time. Discussions with stakeholders, and confirmed with the consortium, is that results should be presented using a simple, three-tier approach.

- Tier 1: a first set of results should present all future costs in current (€, 2015) prices with no discounting.

- Tier 2: a second set of results to be presented in current (€, 2015) prices with use of the European standard impact assessment discount rate (4%).

- Tier 3: a second set of results to be presented in current (€, 2015) prices with use of alternative discount rates to be selected by the individual modelling teams to account for e.g. nationally-differentiated rates, or for declining discount rates.

Whilst it was acknowledged that other factors such as changes in values over time to reflect economic growth, changes in relative resource scarcity, etc., it was judged to be sensible to limit the use of these adjustments to sensitivity analysis on the same basis as the Tier 3 selection of alternative discount rates.

3.5 Spatial outputs

In order to facilitate aggregation of impact costs across sectors and to fit with the needs of key stakeholder groups, there was an agreement that a core set of sectoral results should be produced for the EU-28 in total and at the national scale.

It was also agreed at the stakeholder workshop that an additional set of results should be produced for the sub-national, and the local case study level, as far as the climate and/or socio-economic and impact functions allow further disaggregation.

3.6 Treatment of uncertainty

The matrix of combinations of climate and socio-economic scenarios (RCP-SSP combinations) to be adopted in the COACCH project is presented in Deliverable 1.5 and captures the uncertainties in these inputs. Furthermore, uncertainties in climate model runs within RCP-SSP combinations are also captured in the ranges suggested in D1.5.

However, further uncertainty is introduced in the impact modelling process through the specification of impact-response functions and the monetary valuation process.

It was agreed that the representation of these uncertainties should be made explicit in the reporting of the impact estimates but for ease of understanding should be limited

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to sensitivity analysis of the most significant input factors, e.g. discount rates - see previous sub-section.

3.7 Treatment of adaptation & policy assumptions

COACCH is also considering mitigation and adaptation policy (WP4) as well as the baseline economic costs of climate change.

In considering adaptation policy, there are different baseline counterfactual scenarios that can be chosen. These include the consideration of existing policy, and also assumptions about autonomous adaptation is included, as compared to pro-active planned adaptation. Autonomous Adaptation is defined (IPCC) as action that does not constitute a conscious response to climatic stimuli but is triggered by ecological changes in natural systems and by market or welfare changes in human systems. There are a large number of different types of autonomous adaptation. These will all reduce the impacts of climate change in the absence of planned intervention, and thus can be considered part of the counterfactual. They include:

- Physiological acclimatisation to future risks.
- Behavioural adaptation, such as changes in individual or household behaviour (noting that these decisions can be encouraged and facilitated through information provision and signals from the public sector).
- Technical autonomous adaptation, notably the introduction of technology, such as the purchase of air conditioning units at the household level, and the increased usage automatically through thermostatic control.
- Market autonomous adaptation. Another form of autonomous adaptation can be induced by changes in relative prices and in stocks of natural and economic resources, as well as international trade effects. This is more important in other sectors, though there are some relevant issues for health in relation to the private sector, productivity, etc.

This issue was discussed at the stakeholder workshop and then subsequently at the consortium meeting.

It was agreed that currently committed adaptation in place – such as existing investments in flood barriers – at either the EU or national scales should be included into the impact estimates as far as possible. Where this is not possible, a statement should explicitly be made as to what is or is not included.

It was also agreed that autonomous adaptation – such as physiological acclimatisation to warmer temperatures affecting health impacts - should be treated similarly, with explicit statements made where it is or is not included.

Finally, where planned adaptation is modelled, results should be shown separately from those only incorporating autonomous and committed adaptation. This is judged to be most relevant to the modelling of the coastal impacts of sea-level rise.

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A summary of the planned assumptions for adaptation are presented in Table 1 below.

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Table 1. Protocol for treatment of Adaptation in WP2 impact modelling

Sector	Counterfactual	With planned adaptation
Coastal	Current protection levels assumed with no new investment (normal DIVA no adaptation)	Maintain standards under a changing climate Optimal adaptation (planned) Dynamic adaptation (planned)
River flooding	Current protection levels assumed with no new investment (normal DIVA no adaptation)	Maintain standards under a changing climate Optimal adaptation (planned) Dynamic adaptation (planned)
Agriculture (same will apply for forestry)	PIK suggested 4 scenarios to isolate effect of climate change adaptation -SSP2 no climate impacts -SSP2 RCP4.5 -SSP2 no climate impacts reduced adaptation -SSP2 RCP4.5 reduced adaptation There is an additional issue on whether we can provide a story to DG Clima for 1) benefits of mitigation 2) benefits of adaptation There will also be discussion on planned policy (CAP)	
Energy - impacts on cooling and heating	Autonomous air conditioning / heating can be considered as an impact or an adaptation but will be assessed separately. It would be possible to do one run without climate induced changes in demand (counterfactual) There is an option to assess planned adaptation (e.g. for cooling, use building design, building codes, spatial planning etc)	
Energy – wind and hydro	Baseline	With adaptation
Health	Baseline (note issue of acclimatization) Issue if include CURRENT heat alert in the baseline – these schemes already exist.	Issue if heat alert in baseline or with adaptation. Can include additional adaptation on top of heat alert
Biodiversity and Ecosystem Services	Baseline based on climatic suitability	Will need to consider planned adaptation. This maybe on the basis of restoration costs?
Tourism	Not sure of model, but assume if beach tourism, based on change in TCI	Issue of how to factor in adaptation. Location changes. Transfers of demand or shift in seasons
Labour productivity	Baseline reduction in productivity	Behavioral change, Timing of work. Automation
Business (services)	Baseline, but not clear if provide counterfactual of impact first.	Possible supply substitution
Trade	Expectation is that we will be able to discuss adaptation for trade qualitatively, but that it will be very difficult to include that in the modelling of WP4. So would prefer a qualitative approach.	

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4. COACCH Impact Assessment Protocol: Summary of agreed steps

Following the discussion above, this section provides a concise summary of the impact assessment protocol that was agreed at the Graz consortium meeting.

4.1 The Socio-economic data

- Use the single data-set for each SSP at country-level provided in the IIASA SSP database for population and urbanisation;
- Use the "illustrative" OECD data-set provided by the IIASA SSP database for GDP in core runs;
- Use the alternative data-sets provided by the IIASA SSP database for GDP in sensitivity runs;
- Use the marker scenario data provided by the IIASA SSP database for energy use and supply; land-use; emissions, and; climate change policy costs.

4.2 Metrics

- Use Euro, (€), and 2015 as the common price-year;
- Use average annual costs and expected annual damage (EAD) costs for the three future time-periods adopted;
- Present results in both physical terms as well as monetary estimates.

4.3 Time periods

- Use the period 1981-2010 for baseline estimates;
- Use the three periods: 2020-2040; 2041-2070, and; 2071-2100 for future impacts.

4.4 Discounting

- Tier 1: no discounting;
- Tier 2: use of the European standard impact assessment rate (4%);

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- Tier 3: use of alternative discount rates for sensitivity analysis to be selected by the individual modelling teams to account for e.g. nationally-differentiated rates.

4.5 Spatial outputs

- Aggregate for the EU-28 in total.
- Present at the national scale for core results.
- Additional sets of results to be produced at the sub-national, and the local case study level, as far as data allows

4.6 Treatment of uncertainties

- Adopt RCP-SSP combinations and climate model runs recommended in Deliverable 1.5;
- Present key uncertainties arising in the impact-response functions and monetary valuation components of the impact modelling pathways.

4.7 Treatment of adaptation and policy

- Incorporate currently committed and autonomous adaptation as far as is possible;
- Clearly state what is, and is not, included in the impact modelling;
- Where planned adaptation is also modelled, results should be shown separately from those only incorporating autonomous and committed adaptation.

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