European Commission

Directorate-General Environment

Workshop Report – Assessment results and Annexes

Climate Adaptation – Modelling Water Scenarios and Sectoral Impacts (ClimWatAdapt)

2nd Stakeholder Workshop

Wednesday, March 30th – Thursday, March 31st 2011, Ministry of Rural Development, Budapest, Hungary

The project is lead by CESR – Center for Environmental Systems Research

In co-operation with

Design of the assessment exercise

In the following section the results of the assessment exercise are summarised for each measure separately. The summarised information is structrured in the following way:

1. The two set of adaptation measures adressing floods and water scarcity & droughts are summarised separately (Part A and Part B). The table below depicts which groups are summarised in which part.

2. Each measure is described by the general description as it was provided on the assessment sheets.

3. The remarks and comments from all stakeholders (all groups) are gathered and categorised into:

   - comments regarding the measure description
   - comments regarding the measure assessement;
   - other comments regarding the measure

Table 1: Design of discussion groups (with moderators) according to geographical region and impact.

Region / CC impact	***Floods***	***Water scarcity & Droughts***
Northern-EU	Group 1: Martina Flörke	Group 2: Florian Wimmer
Southern-EU	Group 3: Carlo Giupponi	Group 4: Rodrigo Vidaurre
Western-EU	Group 5: Fons Jaspers	Group 6: Cornelius Laaser
Eastern-EU	Group 7: Natasha Marinova	Group 8: Jaroslav Mysiak

General remarks and comments from stakeholders	
General comments regarding the assessment exercise	*Formulation of measure can sometimes be more precise;* *Include more levels and include measures within packages or arrangements and linked to supportive actions* *Some questions need real expert judgement, like e.g. financial , nature related issues;*
General comments regarding the use of assessment criteria	*Check: Soft measures may score higher and more uniformly than hard measures* *The "Negative side effect" criterium: low marks without explanation may actually stay for little negative effect*

Part A – Adaptation Measures on Floods: Results from groups 1, 3, 5, 7

Name of measure: *Adapt waste water treatment and sediment management to more frequent extreme situations*

General description	
1. **Description:**	The operation of sewers and waste water treatment plants will most likely face increased storm flows and more dry spells in the future. Models can be used to describe the sediment management and treatment processes and look for ways to adapt.
2. **Climate event addressed:**	flooding, water scarcity & droughts
3. Link to vulnerability indicators	
4. Character of measure:	preparatory
5. Sector(s) affected:	water management, industry, domestic/tourism
6. Time to implement	short-term
7. Administrative level	municipality / company / farm
8. EU Policy area that could be used for implementation	WFD, Urban Waste Water

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ - title and character need to be changed (confusing: measure or model?) ▪ - technical efforts are already been done ▪ *- too genera definitionl: it includes a set of measures which impact can be contradictory(3) like: uncoupling rainwater, maintenance, redimensioning,.;* ▪ *- suggestion: water treatment and related sediment management(2)* ▪ *- event: include flash floods, storm rainfalls (4)* ▪ *- sector: To which exted tourisme is included in the research? Navigation to be considered?* ▪ *-character: preparedness (4)* ▪ *- also long term if dimensions are concerne (3);* ▪ *- really farm level measure? ; suggests municipality level* ▪ *- EU: include Flood Directive (5)*

	▪ *Relatively cheap compared to sewers treatment investment (SH21)* ▪ *Measure itself doesn't reduce vulnerability but facilitate this (SH21)*
Comments re measure assessment	▪ - reduces impacts from flooding. ▪ - as this measure is to "look at ways to adapt" it is difficult to score (Urgency and priority). ▪ - measures to implement are yet to be established, so this is difficult to score (side-effects). ▪ - sediment management I would presume lower costs then treatment. ▪ - confusion over looking at the model or measures to actually adapt, so actual measures have been identified to be implemented. SUD's should also be considered for urban areas. ▪ - performance under uncertainties if just prepared action are considered. ▪ - Can be costly. ▪ - no experience with measures, I deal with the issues from the commission not at this level. My replies should there probably be disregarded. ▪ - conditions for decision making: consider in conjunction with "rainwater and stormweather management in urban areas measure. ▪ - first "measure" is to assess the increase in capacity, how this can be addressed in a way that is feasible. ▪ - this is scored assuming that it is adopting WWTW's not just assessing their capacity. ▪ - we need more separate sewerage systems for stormwaters – then this measure is not needed. ▪ - urgency and priority: implementing the measure, not only modelling.. ▪ - without knowing how the measure is implemented, it si impossible to assess correctly (2) ▪ - if economically feasible the measure is important (win-win, no regret)
Other comments ***fom group***	▪ - catchment management required, ▪ - changing paractices from water companies are key, ▪ - sedimentation with wetlands, drainage systems, ▪ - working with farmers on different schemes,

	▪ - improving water quality, decreasing water quantity to treatment plants, ▪ - not directly linked to floods, but can be, ▪ - impact on the environment -> flood risk management, ▪ - future: urban areas become more dense, infrastructural change (aging infrastructure!) ▪ - problem in Northern EU: cold rain water (storm water) prevents biological processes ▪ - Lithuania: different systems for stormwater ▪ - already standard in industrial sector, ▪ - problem: high uncertainty in climate projections, more or less rain? ▪ - adaptation measure needs to be flexible, e.g. assume a certain degree of change ▪ -Not applicable to all countries of EU as in many countries sewerage and storm water are separated ▪ Research is currently undertaking two projects relevant to this: 1. Assessing sewer network performance under CC 2. Assessing the implication of CC for waste water treatment (SH21)

Name of measure: *Buffer strips between water bodies and agricultural fields and within fields*

General description	
1. Description:	Vegetated and unfertilized buffer zones alongside watercourses act as a shield against overland flow from agricultural fields and reduce run-off from reaching the watercourse, thus decreasing erosion and the movement of pollutants into watercourses.
2. **Climate event addressed:**	flooding, water quality
3. Link to vulnerability indicators	Land use changes (Pressure, Sensitivity)
4. Character of measure:	preventing
5. Sector(s) affected:	agriculture
6. Time to implement	short-term
7. Administrative level	From “regional/river basin” to “company / farm”
8. EU Policy area that could be used for implementation	WFD, Floods Directive, WS&D Policy; Nitrates Directive, Direct Payments; Rural Development Regulation; Birds & Habitats Directives; EU Biodiversity Action Plan; Biomass Action Plan; Proposal for a Soil Framework Directive;

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ ***-title: add pollutants and sediments into watercourses; include how the measure will be implemented: incentive, charges*** ▪ ***- event: water quality mainly*** ▪ ***Urgency and priority: 5 in upstream areas, 2 in dowsntream areas (SH32)***
Comments re measure assessment	▪ - this will also impact water treatment, prevent additional costs as dealing with source of pollution rather than expensive treatment which will increase green house gas emissions. ▪ - diffuse pollution is already a massive problem and expensive for water companies (side-effects) ▪ - ratio cost to benefit depends on compensation to the farmer (2). ▪ - also impacts biodiversity and ecosystems in a positive way. ▪ - side effects through chemical pollution. ▪ - conditions for decision making: PPP Policies. ▪ - there are not buffer strips in Estonia, because current legislation does not suppport. Very strong farmers do not want to change legislation. ▪ - good for water quality, but limited benefits for flood-management. ▪ - evidence that buffer strips are effective in floot risks management is very limited. ▪ - already in use and integrated into CAP water quality is the point, not floods (2)

	▪ *- institutional obstacles if using farmers land without compensation (2)*. ▪ Side effects: 5 on adaptive capacity, 1 on economic capacity: this evaluation criterion is missing (SH32) ▪ Produces ... transfer exposure (insurance) ? to be used in combination with insurance, if buffer zones are properly selected (SH33) ▪ In a certain range of return periods at exposed cities (SH33) ▪ A typical competence for flood plain management authority (SH33)
Other comments ***From group***	▪ **- water quality measure,** ▪ **- fertilizer and nutrients prevention,** ▪ **- actually on-going,** ▪ **- key point,** ▪ **- no flood prevention (!) but reduction in flow velocity** ▪ **- indirect affect: catch pollutants; *pollutants to groundwater*,** ▪ **- from water quality view: successful implementation in New Zealand,** ▪ **- afforestation is also not a benefit, not effective,** ▪ **- changed landscape and biodiversity -> WFD** ▪ **- useful for very small floods but <u>more costly</u> to change vegetation than preventing huge flood damages,** ▪ **- no increase in flood storage (e.g. 100 years flood needs more "room")** ▪ **- forest and flooding -> United Nations paper existent** ▪ **- difficult to accept by land owners** ▪ ***- less experise on coast as we are landlocked country*** ▪ ***Only effective for summer storms, not for winter storms. Only effective if applied alongside small watercourses and extensively alon all these watercourses in upstream areas (SH32)*** ▪ ***Installing upstream – downstream solidarity schemes is a very important measure to organize as much as possible on each exposed river basin. Requires also contractual and financial engineering to compensate those who accept storage of water on their lands = see "incentives for landowners" measure (SH33)***

Name of measure: *Financial aid (loans, tax reduction, debt reduction, funds)*

General description	
1. **Description:**	Disaster loss financing can be achieved ex ante (such as through reserve funds, contingent credit schemes, subsided loans for risk adjustments) and ex post (such as through external borrowing and loan conversions). These instruments currently address lower levels of disaster risk.
2. **Climate event addressed:**	Water scarcity; Droughts; Water quality; Snow related impacts
3. Link to vulnerability indicators	Improve risk management practices (addressing *Pressure*, reducing *Sensitivity*)
4. Character of measure:	recovery
5. Sector(s) affected:	Water management; Agriculture, Energy, Industry, Forestry, Shipping, Domestic/Tourism
6. Time to implement	short-term
7. Administrative level	EU-National-Regional/River Basin
8. EU Policy area that could be used for implementation	Direct payments (cc); Rural Development Regulation; Solidarity Fund; Council Regulation (EC) N° 1083/2006 lays down general provisions of the European Regional Development Fund, the European Social Fund and the Cohesion Fund.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ **- under point 4: creating reserve funds** ▪ *- title: lower level is included in operational risks ; better focus on intermedtate level between disaster and mid level risk (6); difficul to assess as financial facilityis not lnked to a specific measure (3); what is the asked response: to put in place measures to lower risks or the accept higher risks (2)?* ▪ *- event: include floods (6)* ▪ *- character: recovery only? Recovery from exceptional cases only; Should address preparedness as well* ▪ *- sector:in this study shipping out (2); Tourism out? Include insurance sector.* ▪ ***- Title: CHANGING the financial arrangements for...*** ▪ ***- events: include floods (2)*** ▪ ***Climate event addressed: add flood (SH21; SH22; SH27; SH29; SH31)*** ▪ ***This is the role of insurance industry (SH29)***
Comments re measure assessment	▪ - urgency and priority does address climate concerns but only the impact . ▪ - effectiveness in terms of loans for risk adjustments. ▪ - it is difficult for me to comment on this measure, as I am not an expert in this area and if I consider different aids, the answers can be different. ▪ - consider insurance: trade-off over government expenditure and prevention.

	▪ - is a long-term process. ▪ - side effects: has an opportunity cost of of reduce investment elswhere. ▪ - efficiency: direct payment for damages does not contribute to damage reduction ▪ - effectiveness: benefits in quicker recovery past event. ▪ - urgency and priority: Could be an EU-level measure. ▪ - ratio cost to benefit is not relevant here. ▪ - appears key at EU level, compared to many other measures. However could need to focus more on prevention measures not only immediate response measures. ▪ *- urgency and priority more weather variability than climate related* ▪ *- side effect: negative as an euro can only be spent once.* ▪ *- Side effect: win-win if connected to measures* ▪ *- Effectiveness: meanly on reduced sensitivity; not on reduced exposure.* ▪ *-Combinability: OK as long as sources are available* ▪ ***Affordability uncertain (SH21)*** ▪ ***Effectiveness is difficult to realise (SH27)*** ▪ ***Can result in society risk averse (SH29)***
Other comments ***From group***	▪ - climate change needs to be taken into account, ▪ - EU-relevant! ▪ - dealing with flood damages (changing funds?) ▪ *- are national funds included (Netherlands: rampenfonds)* ▪ *- risk transfer to insurrance can only operate if subject to vulnerability reduction measures* ▪ *- only relevant if combined with other type of measures. like subsidies for prevention measures* ▪ ***A lot depends on insurance scheme, integration existing national schemes and market-based insurance (SH21)*** ▪ ***Insurance companies are not interested in! Government can impose an insurance because it'd sound like a new tax! So it's a delicate measure and difficult to realize (SH27)***

Name of measure: *Gather and share information on climate change trends*

General description	
1. Description:	Sharing information about ongoing impact assessments and adaptation activities will lead to a wider range of organizations who are thinking about climate-related problems.
2. **Climate event addressed:**	a) Water scarcity b) Droughts c) Floods
3. Link to vulnerability indicators	All
4. Character of measure:	Preventive
5. Sector(s) affected:	All
6. Time to implement	Medium-term, long-term
7. Administrative level	All
8. EU Policy area that could be used for implementation	All

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *- event: also water quality (2)* ▪ *- Title :better Information sharing* ▪ ***-Title better: ...possible impacts of climate change*** ▪ ***name of measure: add "future assets" (SH21), add "future expectations" (SH27)***
Comments re measure assessment	▪ - effectiveness through sharing information and adaptation measures, but depends on whether changes are implemented after this. ▪ - has to be considered with other measures. ▪ - side effects: assume this is a supportive measure, better in to make always assumed positive. ▪ - difficult to classify. ▪ - does not directly reduce vulnerability, but assists to develop other measures. ▪ - side effects (spill-over, negative) are not relevant. ▪ - should more clearly mention: 1) national portals/infosystems are in a number of countries existing already; 2) ACE being developed. ▪ *- no regret only if information is updated* ▪ *- negative: message may be too general, too compex, too much → confusion*

	▪ *- efficient if used properly: fine-tuned to the issue; proper planing in time/ support* ▪ *- efficient: no direct impact* ▪ *Measure itself doesn't reduce vulnerability but facilitates this (SH21)* ▪ *Reduce exposure and/or sensitivity: but i'd be the base for improving/projecting MA (SH27)* ▪ *It's difficult to find and share all the information (SH27)* ▪ *A central coordination is required (SH27)*
Other comments ***From group***	▪ **- sounds ok, but no idea if effective,** ▪ **- national reports on adaptation included,** ▪ **- no stand-alone measure** ▪ *- In theory should be effetcive but will require effort and may not succeed because human nature involved* ▪ *- should be required under subidiarity prunciple involving all concenred stakeholders* ▪ *- not only sharing but also analysing and sumarizing for the best fit solutions* ▪ *- share information between locations but also between levels of decision making and the public.* ▪ *Already happen, always good (SH29)* ▪ *Basic! (SH31)*

Name of measure: *Improving industry risk management*

General description	
1. Description:	Heightening requirements for industrial safety and for contingency plans to further reduce likeliness of accidents under a scenario of more frequent extreme events.
2. **Climate event addressed:**	a) Water scarcity b) Droughts c) Flooding
3. Link to vulnerability indicators	Pressure– reducing sensitivity: improving risk management practices
4. Character of measure:	preventive
5. Sector(s) affected:	Water management
6. Time to implement	Mid-long term
7. Administrative level	National
8. EU Policy area that could be used for implementation	WS&D-policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *- event: water quality also (Seveso) (4)* ▪ *- EU policy: include flood directive (5), WFD(2), Stock Company Public reporting: risk management policy(3),*
Comments re measure assessment	▪ - may hamper economic development of one region compared to a region, where risk management is not implemented (side-effects) ▪ - the measure is only robust and effective, if a range of scenarios are considered ▪ - urgency and priority: can be implemented for current risk, as well as future. ▪ - side effects: reduces current risk ▪ - assumed to involve legislation amendment. ▪ - general description: more relevant are IPPC Directive, Seveso Directive, other legislation aimed at industry. ▪ - side effects: need to avoid water pollution, especially pollution from industrial accidents. ▪ - should be added to disaster-, reduction- and industry-policies. ▪ *- urgency and priority for floods lower than for periods of water scarcity for water use for internal processes* ▪ *- urgency and priority: under economic sustainability constraints only*

	▪ ***- urgency: not oly because CC impact but for current status already*** ▪ ***- efficiency: cost of an accident hard to estimate***
Other comments ***From group***	▪ **- IPPC pollution Directive,** ▪ **- not really covered well, yet,** ▪ **- regulation has to be done on EU-level!** ▪ **- industries look at probabilities and then decide if something must be done** ▪ **- guided by Fukushima accident?** ▪ *- Incidents driven, not climate driven* ▪ *- Important measure, but difficult to adapot and to implement*

Name of measure: ***Include climate change into the Strategic Environmental Assessment***

General description	
1. **Description:**	Include climate change into the Strategic Environmental Impact Assessment
2. **Climate event addressed:**	Flooding; Water scarcity; Droughts; Water quality
3. Link to vulnerability indicators	Improve management practices (addressing *Pressure*, reducing *Sensitivity*)
4. Character of measure:	preventing
5. Sector(s) affected:	Water management;
6. Time to implement	short-term
7. Administrative level	National
8. EU Policy area that could be used for implementation	

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *- Level: also EU (6), transnational, regional(2),* ▪ *- EU: A11(?), SEA directive (2), WFD, Flood directive, WS&A policy*
Comments re measure assessment	▪ - urgency and priority: I thought, this would already be the case. ▪ - performance under uncertainties as long as different scenarios are considered ▪ - effectiveness: will helb identify areas where adaptation planning is required. ▪ - this should automatically be included in the assessment to help adaptation. ▪ - effectiveness: no direct risk measure. ▪ - has already being done. ▪ - this is already part of of any SEA so doesent need to be introduced. ▪ - general description: EIA/SEA guideline being considered now after consultation process. ▪ - institutional requirements: may take time due to long. ▪ - formal process to change directive > could be addressed through new EU guidance. See also recent IAIA conference, DK, 2010 on this topic.

	▪ *- efficiency: difficukt to say as already implemented* ▪ *- side effects: should be checked for all different climate change scenarios* ▪ ***- urgency: very important to ensure proper and timely implementation*** ▪ ***- negative: does reduce negative impacts*** ▪ ***- efficiency: hard to estimate the benefits*** ▪ ***Side effects: but depends on implementation ... (SH21)*** ▪ ***Performances under uncertainties: uncertainty, depends on implementation (SH21)*** ▪ ***Efficiency: depends on implementation (SH21)*** ▪ ***It's an addedd procedure: no side effects is expected for CC (SH27)***
Other comments ***From group***	▪ **- already been done for floods, climate change considered,** ▪ **- not explicitly integrated e.g. for building of roads,** ▪ **- risk assessment comes first, then consider climate change,** ▪ **- strategic planning,** ▪ **- guidance in EU, discussion ongoing** ▪ *- not difficult: simple formalisation of best practices* ▪ ***- It would be interesting to know when one can expect the results of this measure after implementation of the projects*** ▪ ***Already being planned/undertaken by EC? (SH21)***

Name of measure: *Protect buffer vegetation in shore zones*

General description	
1. Description:	Prevention of effect of sea level rise and increased flooding - potential for erosion in shore zones and for the impact on vegetation to worsen impacts of inundation.
2. **Climate event addressed:**	a) Sea level rise b) Storm surges
3. Link to vulnerability indicators	Pressure– reducing sensitivity: improving risk management practices
4. Character of measure:	preventive
5. Sector(s) affected:	Water management
6. Time to implement	Mid-long term
7. Administrative level	National
8. EU Policy area that could be used for implementation	WFD, Marine Strategy Directive, Floods Directive, Nitrate Directive

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ **- title: should be renamed in salt marshes in front of dykes** ▪ *- title change to(5): reduce sensitivity to sealevel rise..like, ... dampening effect of waves.* ▪ *- EU policy: include Natura 2000*
Comments re measure assessment	▪ - coastal flood risk authorities around North Sea do not reduce coastal flood risk in any way, because the buffer zone depends on regular flooting. Without tidal floodings it would stop growing (no functionality). It is often stated, that this a good measure, but they do not support this with evidence. Buffer zones (salt marshes) improve ecological quality of shorelines. ▪ - protects through reducing erosion, also impacts the biodiversity of ecosystems in a positive way ▪ - it is dificult to see, how this can be done ▪ - in Estonia we do not have it ▪ - benefit for erosion control, not prevention of sea level risk. ▪ - this measure cannot prevent sea level rise. ▪ - is not an issue in Finland. ▪ - effectiveness is low. ▪ *- side effects; much spill over like nature..* ▪ *- effectiveness: very measure specific, make measures explicit*

	▪ *- institutional arrangements more difficult in Belgium*
Other comments ***From group***	▪ **- - unfunctional to raise salt marshes to prevent shores from strom damages** ▪ **- erosion from storm events** ▪ **- not an issue around Baltic Sea**

Name of measure: *Rainwater and stormwater management in urban areas*

General description	
1. Description:	Rainwater can be used for irrigation purposes, car washing or toilet flushing. It is beneficial for (i) reducing water demand and (ii) reducing the risk of flooding during storms by storing rainwater and buffering run-off before it reaches drains.
2. **Climate event addressed:**	Flooding and water scarcity
3. Link to vulnerability indicators	Exposure to water scarcity, water quality and (downstreams) exposure for flooding
4. Character of measure:	Preventing and reactive
5. Sector(s) affected:	Water management, agriculture, industry and domestic/ tourisme
6. Time to implement	medium-term
7. Administrative level	from river basin (district) level downwards up to municipality
8. EU Policy area that could be used for implementation	The measure is explicitly mentioned as a postive adapation example in the EU CIS guidance "River Basins Managament in a changing climate" and also in the EU communication "Addressing the challenge of water scarcity and droughts in the European Union"

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *Event: also droughts* ▪ *Vulnerability: low for dowstreams flood reduction longer rivers*
Comments re measure assessment	▪ - performance under uncertainties depends what the changes measures are. ▪ - efficiency again depends on changes implemented. ▪ - many of these answers depend on what is actually implemented – this will change the cost benefit analysis or institutional requirements for example. ▪ - in Norway rain use and green roots are very actual measures, but car washing for instance seems as a little actual measure. ▪ - water consumption in sparsely popultaed areas can be already now so low, that there is a need for flush the pipelines to secure the water quality. In those areas the use of rainwater for toilet flushing just makes the situation worse. Irrigation is more relevant. ▪ - efficiency: appears low ratio, but are studies available to prove? ▪ - seems to ongoing D6 ENV project on natural water-retention and other

	related projects. ▪ *- urgnecy: on local level (wadi's)* ▪ *- flexibility: low because measure is too local* ▪ *- efficiency: varies depending on site specific facors* ▪ *Effectiveness: high for water scarcity and local floods, low for downstreams flood reduction* ▪ *- no-regret: poitive including economic effects* ▪ *- efficiency:high forn upland areas, not related to long rivers and coastal areas* ▪ *- Institutional: legal instruments exists but follow-up in tailor-made application is needed*
Other comments	▪ *- link between urban areas and irrigaion and agriculture is not always clear* ▪ *- only local effects (3) consideraitons based on local view points (2)*

Name of measure: *Awareness Campaigns to improve adaptation attitude towards climate change*

General description	
1. Description:	Actions that promote new awareness for altered conditions. The aim is to achieve a change in behavior.
2. **Climate event addressed:**	Flooding; droughts; water scarcity
3. Link to vulnerability indicators	all sensitivity and adaptive capacity indicators
4. Character of measure:	preparatory
5. Sector(s) affected:	multi-sectoral including water management, domestic/tourism
6. Time to implement	short to medium-term, depending on the specific themes foreseen
7. Administrative level	National, regional, and municipalities, river basins.
8. EU Policy area that could be used for implementation	There have been a number of "European Years", beginning in 1983 which have been designated and run directly by the European Union and its Member States; however, some (such as 2005) have been designated and run by the Council of Europe. Each year has a specific topic and adapation to CC or resource efficiency could be added. In addition to these years, the EC has several ways to set up specific "information campaigns" for specific topics.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ **Different than gather and share information on CC trends** ▪ **Reduces sensitivity (SH21)** ▪ **To be integrated in programs since the beginning but not as an urgent measure (SH23)** ▪ **It's something to be integrated since the very beginning of the plans (SH24)** ▪ **Techinical, even if simple, campaigns (SH27)** ▪ **Essential to raise public awareness (SH29)** ▪ **Awareness raising takes very long! (SH31)**
Comments re measure assessment	▪ - performance under uncertainties: but with a long time for behaviours to change. ▪ - effectiveness depends on uptake. ▪ - performance under uncertainties: risk associated with uncertainty is a degree of impact/change. ▪ - assuming CC is real. ▪ - has a relative good cost to benefit ratio. ▪ - note the commission organized a large climate change awareness campaign a few years ago which was entirely focussed on energy/CO2 of citizen actions/households. Perhaps a new campaign could focus on water and adaptation to CC (CC mitigation gets sufficient attention). ▪ - *effectiveness: practice is much more difficult than theory*

	▪ *- robustness: only if message is adopted to newest insights* ▪ *- effeciency: less efficient than many other measures if stand alone action* ▪ ***-efficiency: increases the effiiency of planning and implementation of follow-up measures*** ▪ ***-efficiency: difficult to calculate/ extimate*** ▪ ***-win-win: special support needed for tourism*** ▪ ***Nothing negative (but not positive either) (SH21)*** ▪ ***Depends on up-take (SH21)*** ▪ ***Does not really apply to .... (SH23)*** ▪ ***Ratio cost to benefit: it has, but at a long term only (SH24)*** ▪ ***To reduce exposure and/or sensitivity: it has, but at a long term only (SH24)*** ▪ ***Will raise awareness overall global change and environment (SH29)*** ▪ ***Ratio cost to benefit: low cost (SH29)*** ▪ ***Will lead to some reduction in exposure (SH29)*** ▪ ***Easy to implement (SH29)*** ▪ ***Side effects: this of course depends on the specific objectives of the campaigns (SH31)*** ▪ ***Ratio cost to benefit: it will depend on the effectiveness of the campaign (SH31)***
Other comments	▪ ***- the human nature tends to resist change*** ▪ ***- do not forgeteducation at schools*** ▪ ***Effectiveness will depend strongly on socio-culural settings (if modelled, the scenario) (SH21)*** ▪ ***Easy to apply measure. Not structural or very tecnical (SH23)*** ▪ ***It is a new techinical measure easy to aplicate (SH24)*** ▪ ***Essential anyway for problem awareness (SH29)*** ▪ ***It's difficult to judge as the measure is generic. Many of the scores will change depending on the effectiveness of the campaigns, the objectives of the campaigns, etc. (SH31)***

Name of measure: *Enhancing storage capacity of reservoirs*

General description	
1. Description:	An increase in the capacity of reservoirs means an increase in the amount of water that can be stored. It improves a region's capacity to cope with higher peaks of precipitation and river discharge as well as with water scarcity.
2. **Climate event addressed:**	a) Water scarcity b) Droughts c) Flooding
3. Link to vulnerability indicators	State – reducing exposure
4. Character of measure:	preventive
5. Sector(s) affected:	Water management
6. Time to implement	Medium to long term
7. Administrative level	Regional/river basin
8. EU Policy area that could be used for implementation	WS&D-policy, Floods directive, Rural Development Regulation, Solidarity Fund, Regional Development Fund, the European Social Fund and the Cohesion Fund.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *Title beter: enhancing/ increasing water storage capacity; concerns storage of heavy rainfall or for use in times of water scaricty; compare with Ijsselmeer.* ▪ *Character: soft and har, grey and green measures* ▪ *Sectors: include agriculture, energy, nature (forestry)* ▪ *EU policy: why all financial options only with this measure?* ▪ *capacity of existing reservoirs: add existing in description (SH21, SH22, SH27, SH28, SH31)* ▪ *Climate event addressed: assume catchment-scale reservoir (SH21)* ▪ *Considering enhancing an infrastructure (SH27)* ▪ *Urgency and priority: depends on the area (SH24); in areas where floods are probably (SH27)* ▪ *Description needs to be revised: what about new reservoir? Scale? difference with situation means in rural and urban areas? (SH25)* ▪ *Climate events addressed: can be contradictory objectives! (SH25)* ▪ *Implementation: WS&D policy? Rural development: check! EIA/SEA (SH25)* ▪ *But instead of adding reservoirs I'd rather see a changed management of existing ones (SH29)*

Comments re measure assessment	▪ - side effects: the environmental consequences can be very high. ▪ - in Norway we have many dams and reservoirs for hydrological power production, we can tap the dams in advance of a flood, but to build them higher would meet much negative responses and might have high negative impacts on the environment. ▪ - very high risk measure that could compromise the safety of reservoir structures. ▪ - this could ... to D6 ENV project on natural water retention. ▪ *- urgency ad priority: it needs long time planning brfor first stone in the field* ▪ *- win-win: low if reduced tidal areas for nature and tourism* ▪ *- no-regret: because safety* ▪ *- negative side effect: local agriculture use and nature (2);* ▪ *- efficiency very different from projct to project* ▪ *- effectiveness: especially for higher return periods* ▪ *- institutional requirements: for spatial planning* ▪ ***-urgency & priority: high ...but there are alternatives*** ▪ ***- negative: is notsufficient regarding WFD directives*** ▪ ***But could have negative effects, e.g. population movement (SH21)*** ▪ ***Side effects:*** ***a) flood and drought (SH35)*** ***b) works both in wet and dry conditions (SH29)*** ***c) beneficial for energy sector (SH29)*** ***d) negative for environment (SH29)*** ▪ ***Flexibility: if it's a structural measure (SH27)*** ▪ ***Robustness: it depends on return time used (SH27)*** ▪ ***Efficiency and effectiveness: because of benefits for water supply (SH21)*** ▪ ***Effectiveness: exposure but it depends on the CC expected: there is a limit in the enhance of existing structures! (SH27)*** ▪ ***Acceptance may be an issue (SH21)*** ▪ ***It will have effects on water quality objectives among other; can have greater effects on other sectors, but not necessarily beneficial (SH23)*** ▪ ***If predictions are not right or differ the performance of the reservoir might be questioned (SH23)*** ▪ ***Institutional requirements are already in place (SH23)*** ▪ ***Effectiveness: with a good management of it (SH24)***
Other comments	▪ *- I understand it: better management of existing reservoirs if creating new reservoirs?* ▪ ***- It should be implemented only in ase that it is necessary amd there aren't other solutions; it may be conter active towards WFD*** ▪ ***- Good experience in the Middle-Tinareservoir at the flooding in 2010*** ▪ ***I'm not very comfortable assessing this measure as I'm not sure of how it is implemented in practice. It's too general and sounds more like a goal than a***

	practical measure (SH31) ▪ ***Please note: for two stakeholders (SH28 & SH29) the scores are different depending on conditions, so they filled the scores twice, providing explanation*** ▪ ***SH28: a) increasing dam height (engineering measure), b) reservoir management (water level management)*** ▪ ***SH29: a) changing existing through management and steering rules, b) building new capacitu & changing existing through engineering***

Name of measure: *Incentives for landowners to provide flood storage.*

General description	
1. Description:	Incentives for landowners to provide flood storage, including washlands, as part of a more sustainable and integrated approach to flood management.
2. **Climate event addressed:**	High water and flood risks
3. Link to vulnerability indicators	all sensitivity, adaptive capacity indicators and downstreams exposure
4. Character of measure:	recovery
5. Sector(s) affected:	agriculture and nature mainly
6. Time to implement	medium-term
7. Administrative level	from river basin (district) level downwards up to municipality / farm
8. EU Policy area that could be used for implementation	The ERDF (European Regional Development Fund) and the EAFRD (European Agricultural Fund for Rural Development) are already providing funding for irrigation projects and the improvment of the efficiancy. Link with WFD and Floods directive.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	• **Level: agreements can be made at national level.** • **Vital to identify areas soon (SH21)** • **We can't do everything by paying directly the members of the State (SH24)** • **Different measure it is a policy ... (SH25)** • **As an instrument (SH27)** • **Incentives: instruments (SH31)** • **Overlap between rural areas and this one (SH31)**
Comments re measure assessment	• - side effects if including wetlands. • - efficiency: the question is, who carries the cost? • - efficiency: dependent on level of compensation • - without CC this measure still provides benefits. Flood plains should be protected at all costs. • *- win-win: can also help for inland navigationand local water supply (2)* • *- institutional requirements: consider new constructions by removal of old houses* • ***- efficiency: have no idea*** • ***- win-win: may be high for agriculture*** • ***Benefits biodiversity but could affect agriculture (SH21)*** • ***It can damage agricultural production (SH27)*** • ***Needs control; makes burocracy larger (SH29)***

	• ***Win-win criteria should be diveded in: (1) economic, (2) social, (3) env (SH31)***
Other comments	• *- measure to be linked or similar to 'bufferstrips' measure, e.g. 'contractual and financial engineering'* • *I don't feel like supporting a measure that if not perfectly applied, is going to spread money, maybe the state can obtain the related areas in other different ways (SH24)* • *The measure "provide flood storage" is ok, but incentives I find a wrong implementation (SH29)*

Name of measure: *Establish minimal requirements for granting of funds*

General description	
1. **Description:**	Investments granted by EU, national and regional funds should be made climate proof.
2. **Climate event addressed:**	Water scarcity; Droughts;
3. Link to vulnerability indicators	Improve risk management practices (addressing *Pressure*, reducing *Sensitivity*)
4. Character of measure:	Preventing
5. Sector(s) affected:	Water management; Agriculture, Forestry, Domestic/Tourism
6. Time to implement	short-term
7. Administrative level	National; Regional/River Basin;
8. EU Policy area that could be used for implementation	

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *Title: what means 'minimal reqirements'?* ▪ *Event: include droughts* ▪ *EU: CC strategy, WFD, FD,..* ▪ ***- events: include floods (5 all eastern europe)*** ▪ ***EU policy area that could be used for implementation: FD, ERDF (DG Regio) (SH2); Flood Directive (SH8, SH14, SH15); EU Solidarity Fund, all DG Regio funds (SH9); NA funding instruments not policy (SH11)*** ▪ ***Climate event adressed: add flood (eg civil protection funds) (SH1, SH3, SH4, SH15)*** ▪ ***There are funds allready in place for flood related extreme events (SH3)*** ▪ ***Urgency and priority: it depends on the acceptance of the population (SH4)*** ▪ ***Invesments for flood prevention or any kind of investment either vulnerable for floods, or increases flood risk? (SH5)*** ▪ ***Investments granted and co-financed (SH5)*** ▪ ***Funding from Bank (eg EIB) (SH5)*** ▪ ***Have to demonstrate to consider Climate Change (SH7)*** ▪ ***Rules to climate proof in investments (SH11)***
Comments re measure assessment	▪ - urgency and priority: to get the most out of fields – multi benefits. ▪ - depends on wheter some investments are stopped as a result (side-effects). ▪ - there is no commonly approved method for climate proofing. How we take into account the uncertainty of scenarios? ▪ *- level: at all levels* ▪ ***- urgency & priority: it si an efficient way to reach several goals and***

	make CC measures to be effective ▪ ***- efficiency: can't be answered*** ▪ ***Side effects: neutral really, but does depend on measure eg fixed allowance could be regretted (SH1)*** ▪ ***Ratio cost to benefit: But benefits depend on regret (SH1)*** ▪ ***Reduce exposure and or sensitivity: but depends on robustness (SH1)*** ▪ ***Measure as effects on other sectors (SH2)*** ▪ ***Flooding protection can eg protect, agricoltural protection (SH3)*** ▪ ***Conditions for decison-making: but it must be a generic requirement because of present uncertainty on CC prediction (SH7)***
Other comments	▪ **The African Developement Bank is doing this (SH1)** ▪ **Many additional adjustments will be needed to organize fund allocation (SH3)** ▪ **It would be interesting to look at what EuropAid and USAID have done with the topic: integration of CC into developement aid (SH11)** ▪ **Aòready considered in Flood Dir. new burden to institution without providing the tools to solve the problem (SH15)**

Name of measure: *Improve water retention in rural areas*

General description	
1. Description:	The natural water retention capacity of a landscape can be improved by several techniques including creating wetlands, water storage on farmlands, increasing soil cover, etc.
2. **Climate event addressed:**	Flood risk
3. Link to vulnerability indicators	all sensitivity and adaptive capacity indicators
4. Character of measure:	Preventing
5. Sector(s) affected:	Agriculture and other sectors indirectly
6. Time to implement	medium-term
7. Administrative level	regional / farm
8. EU Policy area that could be used for implementation	WFD, Flood Dir., Rural Development Regulation, Birds Directive, Habitat Directive, EU Biodiversity Action Plan, Solidarity Fund, Council Regulation (EC) N° 1083/2006 lays down general provisions of the European Regional Development Fund, the European Social Fund and the Cohesion Fund.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *- Title: wetlands have a permanent and storage a temporary character* ▪ *- EU: include Natura 2000,* ▪ *Also verify for water resources and quality (SH1)* ▪ *Urgency and priority: it depends on the area (SH4)* ▪ *Climate event addressed: add WS and drought (SH5)* ▪ *Sectors affected: add infrastructure (SH5)* ▪ *Administrative level: add local (SH5), add watershed, sub-basins (SH8)* ▪ *It doesn't solve the flood critical situation (SH7)*
Comments re measure assessment	▪ - urgency and priority: is a key to mitigating risk. ▪ - can reduce existing risks. ▪ - efficiency: assuming reasonable compensation. ▪ - very good measure irrespective of CC. ▪ - water storage needed for flood preventions as usually enormous - more benefits for landscape and biodiversity, sometimes relevant also in small urban catchments. ▪ *- effectiveess: high at at local level and low at basin level (however...)* ▪ *- Institutional requirements: need incentive to encourage behaviour change(2)* ▪ ***- priority: high regarding goasl of the different EU policies*** ▪ ***-win-win: balance between agriculture (low) and tourism (high)***

	▪ ***- negative: may/will not be satisfactory for agriculture*** ▪ ***- Institutional: creating these areas may need some expropriatation*** ▪ ***But some specific could have side-effects, e.g. reduced river flows (SH1)*** ▪ ***Performance under uncertainties: if designed also for water scarcity and drought (SH1)*** ▪ ***Local benefits, but unclear at larger scales (evidence from UK) (SH1)*** ▪ ***Link with water and biodiversity (SH1)*** ▪ ***It can affect floods if it's a very wet area (SH4)*** ▪ ***It can be dangerous if used in very wet areas yet collapsed by water (SH4)*** ▪ ***Efficiency: I don't know I guess it will depend on the area (SH4)*** ▪ ***At least in Spain the coordination among all the public administrations is not easy (SH4)*** ▪ ***Side effects: it could increase the natural depuration capacity (SH7)*** ▪ ***Techinically it's flexible but in term of lost agricultural production it is not (SH7)*** ▪ ***Reduces soil erosion; good for environment; increase groundwater recharge (SH9)*** ▪ ***Needs changing agricultural practice rules (SH9)***
Other comments	▪ *- linked to 'buffer strips'and incentives for landowners to provide flood storage* ▪ *- **Implementation of the measure is directly linked to theland property and success depends on the funding for compensation*** ▪ ***- It asks a change in land use and has to have the acceptance of the population (SH4)*** ▪ ***Different solutions: ... or temporarily (SH15)*** ▪ ***Side effects on agricultural production (SH15)***

Name of measure: *Management of water levels in lakes, rivers and wetlands.*

General description	
1. Description:	The management of water levels in order to improve environmental water quality, like for environmental flow.
2. **Climate event addressed:**	Floods with contamination and low flow with high concentration result in high temperatures and salinty and deterioration of biodiversity
3. Link to vulnerability indicators	all sensitivity of ecosystems and downstreams exposure
4. Character of measure:	Preventing
5. Sector(s) affected:	water management, agriculture and forestry (nature)
6. Time to implement	medium-term
7. Administrative level	from river basin to district level
8. EU Policy area that could be used for implementation	Link with WFD, Flood directive and Directive Water Scarcity and Droughts, Rural development regulations

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ ***- title: includer groundwater levels; what are the precise measures?*** ▪ ***Event: not well formulated: as water quality is concerned in fact not water level but water flow management*** ▪ ***- sector: add energy, water intake, and (if considered) waterdepth for navigation*** ▪ ***This measure is not appropriate for high flows (SH1)*** ▪ ***Environmental flow: minimum ecological flow? More realted to D (SH2)*** ▪ ***"Floods with contamination" and "low flow with high concentration result in temperatures, salt and deterioration of biodiversity" 2 different problems (SH5)*** ▪ ***"Time to implement" and "Administrative level" don't exist (SH5)*** ▪ ***The management of water levels in order to avoid hard contamination (SH7)*** ▪ ***low flow with high concentration (...) just in case of drought not flood (SH7)*** ▪ ***Floods with contamination originated from surface runoff and low flow (...)(SH8)*** ▪ ***Sectors affected: add tourism, ecotourism (SH8)*** ▪ ***Essential foe low flow management (SH9)*** ▪ ***2 measures: management of flow, management of river (SH11)*** ▪ ***Climate event addressed: not flor floods assessment based only on cases of drought (SH15)*** ▪ ***It will work out if well managed only and it's not so easy (SH16)***

Comments re measure assessment	▪ - the ratio of cost to benefit depends on, how it is implemented ▪ - urgency and priority: can reduce existing flooting risk. ▪ - conditions for decision making: environment impact with water level management in lakes is generaly not acceptable. ▪ - urgency and priority: but not just to improve water quality but all aspects. ▪ - adjustments regulation practices should be make taking into account all factors like floods and droughts, environment, energy production, restoration etc. There can be also contradictional targets. ▪ *- Urgency and priority: low because too many negative side effects possible* ▪ *- side effects negative: higher waterlevels in wetlands makes reduces options for water storage...* ▪ ***- negative: at least for energy and agriculture*** ▪ ***- efficiency: no idea*** ▪ ***But can have social consequences (SH1)*** ▪ ***Can have implications for abstraction, cooling water (SH1)*** ▪ ***Side effects: can be negative for floods (SH9)*** ▪ ***Efficiency: unknown (SH15)*** ▪ ***It works for drought, may be dangerous for floods (SH15)***
Other comments	▪ *-Interesting to also include in title : improvement of water related environment, biotopes, ..* ▪ ***- the measure has a big influenc on the water regime*** ▪ ***- if fulfilled for floods, it might be completely different for droughts*** ▪ ***- Environmental releases from reservoirs also is also good for groundwater and increases available flood storage capacity (win-win) in reservoirs but decreases stroed water for droughts (negative).*** ▪ ***Impossible to assess. What's the link with climate change? (SH11)*** ▪ ***I am not sure this is a floods related measure, it is if we can predict the floods some time in advance, otherwise we will be obliged by the situation to liberate water without any management (SH16)***

Name of measure: ***Raise level of awareness of householders and businesses in flood risk areas to the risks and possible adaptation .***

General description	
1. Description:	Awareness raising addresses the knowledge of individuals and organisations concerning flood risks.
2. **Climate event addressed:**	Flooding, too much water, snow melt
3. Link to vulnerability indicators	all sensitivity and adaptive capacity indicators; better knowledge results in viable decisions
4. Character of measure:	Preparatory, preventive, reactive
5. Sector(s) affected:	water management, industry, domestic/tourism
6. Time to implement	short to medium-term
7. Administrative level	National, regional, and municipalities, river basins.
8. EU Policy area that could be used for implementation	Stongly related to the flood directive and each year has a specific topic and adapation to CC or ressource efficiency could be added. In addition to these years, the EC has several ways to set up specific "information campaigns" for specific topics.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *Keep this one not the oral one! (SH11)*
Comments re measure assessment	▪ *- Side effects, noregret: very good measure irrespective of CC.* ▪ *- Efficiency: varies* ▪ *- Combinability: should be part of wider initiative*
Other comments	▪ *- in floodrisk areas this is more efficient than 'campaigns to improve adaptation attitude tiwards CC* ▪ *- awareness also create preparedness* ▪ *- Preparing the flood risk maps need serious institutional involvement*

Name of measure: *River restoration*

General description	
1. Description:	Increases flow capacity of the river system during flood events, and/or to reduce the speed of water flow. Helps also to increase habitat quality and groundwater recharge.
2. **Climate event addressed:**	Flooding; Water scarcity & Droughts
3. Link to vulnerability indicators	improving risk management practices (Adressing Pressure– reducing sensitivity)
4. Character of measure:	preventive
5. Sector(s) affected:	Water management
6. Time to implement	Mid-long term
7. Administrative level	National/regional
8. EU Policy area that could be used for implementation	Floods directive; WFD; WS&D-policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	▪ *- title: apparently flow capacity and increase of habitat are linked here, could also been side effect as it is a secundairy goal;* ▪ ***- Deep groundwater recharge has little connection with water flow in our area.*** ▪ ***For me it's the most important so far (SH4)*** ▪ ***groundwater recharge: not always (SH7)*** ▪ ***Administrative level. add river basin / sub-basin, local (SH8)*** ▪ ***Reduces flood risk (SH17)***
Comments re measure assessment	▪ - performance under uncertainities depends on change required. ▪ - side effects: depends on property at risk. ▪ - river restoration does not increase the flow capacity it decreases it. ▪ - side effects: e.g. tourism, agriculture, drainage ▪ *- priority: only where feasible* ▪ *- side effect negative: can be difficult to reach both at highest level; even contradictory (2); low value for concerning economic use* ▪ *- efficiency: varies* ▪ ***- urgency and priotrity: high as it is directly related to the WFD goals for good status*** ▪ ***- feasibility: depends on the compensation funds*** ▪ ***Side Effects, Spill-Over: Could Have Effects On Navigation (Sh1)*** ▪ ***Side Effects, Negative: Could Affect Artificial/Man-Made Parts Of System, E.G. Development, Infrastructure (Sh1)***

	▪ ***Robustness: But Predictability Of Performance May Be Hard (Sh1)*** ▪ ***Effectiveness: depends on situation (SH1)*** ▪ ***Feasibility: not always possible, sometimes the river margins don't allow to restore river (SH4)*** ▪ ***Institutional requirements: this is an important point, we need money and cooperation among all public administrations (SH4)*** ▪ ***Side effects: ecological valve, fruibility, tourism and environment (SH7)*** ▪ ***Costs depend on the river (SH11)*** ▪ ***Win-win difficult to assess as econ. social and env. are together (SH11)*** ▪ ***This measure is very much case specific → impossible to judge the efficiency, case specific (SH15)*** ▪ ***Side Effects: (a) can hamper shipping on rivers; (b) only in case of floods;, (c) good for environment, tourism; (d) reduces adaptive capacities for … shipping (SH17)*** ▪ ***Reduces flood risk (SH17)***
Other comments	▪ *- Improving nature rarely compatible with increasing flow capacity (apparetly no specialist)* ▪ *It is proved that in Spain the restored rivers avoid flood damages in many cases (SH4)* ▪ *Need to define the geographical boundaries for river restoration: which flood risk area? Does it go beyond good ecological states? (SH5)*

Part B – Adaptation Measures on Water Scarcity & Droughts: Results from groups 2, 4, 6, 8

Name of measure: *Develop programmes to promote the efficient use of water, so that the urban, private and public sectors reduce their water consumption*

General description	
Description:	Elaborate a communication plan devoted to an efficient use of water consistent and coordinated with the organizations working on the issue.
Climate event addressed:	a) Water scarcity
Link to vulnerability indicators	all sensitivity and adaptive capacity indicators
Character of measure:	preparatory
Sector(s) affected:	Agriculture and other sectors
Time to implement	short-term
Administrative level	municipality / company / farm
EU Policy area that could be used for implementation	WFD, WS&D-policy, Rural Development Regulation, Council Regulation (EC) N° 1083/2006, COM(2011) 21

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	**It is quite important (HUN)**
Comments re measure assessment	**urgency and priority:** - addresses carbon as well as water scarcity - low risk of water shortages **side effects:** - sewage treatment changes - potential quality deterioration due to increased distribution residence times > Cost/Unit water increases **performance under uncertainties:** - loyalty to recommentations are low if no droughts occur **efficiency:**

	- very little evidence of success of programmes **<u>effectiveness:</u>** - only effective if applied at MS level **decision making:** **-** challenge with socio-cultural acceptance - Conditions for decision making: difficult to implement but highly effective (13) **<u>general comments:</u>** - success of programmes very much depends on current weather conditions i.e. if implemented during a drought far more likely to be successful - we look at the description definition, not the title, which is broader - Leekage reduction programms / covered by title not by discription - it is important to add "best practices" to a communication plan to make it believable - we decided that this measure is only raise awareness in all water sectors - some confusion regarding the measure. Efficient use of water at point of use or in distribution of water e.g. system leakage. Answered in context of efficient use at the point of use. Sectors affected: better to mention all and not focus on agriculture alone (1) Include environment in sector(s) affected (3) The word 'sector' is too restrictive. Acquatic ecosystems are largely affected by water scarcity. They should not be forgotten. 'Uses' could be a better word to reflect on environment (8) Ratio of cost to benefit: hard to measure effects (7) Urgency and priority: not in all areas of interest (11) Efficiency: in the Alps (11) Urgency and priority: 5 for South Europe (12) Could be costly (ROM)
Other comments	**-** raise awareness - This 'measure' covers so many different possibilities that it is not possible to score. For example, water saving in building codes is a separate measure affecting public sector water consumption. This is way too broad and very similar to the demand management measure (19) **Be aware of the effect of the measure on the long term? On the long term it might be a Trojan Horse (4)** **More than a communication plan is necessary to promote efficient use, you need real change. So more drivers than awareness (5)** **It is a cross-cutting measure, therefore can have wide-spread benefits (6)** **The pricing has much more influence on water consumption than communication (HUN)** **It's "only" communication (HUN)**

Name of measure: *Rainwater and stormwater managment in urban areas*

General description	
Description:	Rainwater can be used for irrigation purposes, car washing or toilet flushing. It is beneficial for (i) reducing water demand and (ii) reducing the risk of flooding during storms by storing rainwater and buffering run-off before it reaches drains.
Climate event addressed:	Flooding and water scarcity
Link to vulnerability indicators	Exposure to water scarcity, water quality and (downstreams) exposure for flooding
Character of measure:	Preventing and reactive
Sector(s) affected:	Water mnagement, agriculture, industry and domestic/ tourisme
Time to implement	medium-term
Administrative level	from river basin (district) level downwards up to municipality
EU Policy area that could be used for implementation	The measure is explicitly mentioned as a postive adapation example in the EU CIS guidance "River Basins Managament in a changing climate" and also in the EU communication "Addressing the challenge of water scarcity and droughts in the European Union"

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	**Title of measure must be about rainwater harvesting. Management is far broader (storage, infiltration). 'Water demand' is wrong term- meant reduced use of tap water (5)** **It is very important (HUN)** **For new buildings! New living areas (ROM)**
Comments re measure assessment	**urgency and priority:** - for flood prevention reducing waste water volumes **side effects:** - see EA work on carbon + rainwater harvesting - but not so much for the North - water quality of surface water - can reduce sewer flows covering deposition solids - benefits in reducing sewage treatment volumes but increases concentration **performance under uncertainties:** **efficiency:** - carbon disadvantages significant - depends on weather at household or other level - efficient, when not considering carbon **effectiveness:**

	decision making: **general comments:** **-** generally expensive and also expensive in carbon terms (see EA water resources strategy etc.) - a better use of rainwater can also support water efficiency in agriculture - in hungary the rain water storage is not yet implemented - potential cross connection of rainwater harvesting systems with drinking water supply in domestic properties - posing health risks. Needs a robust dgree of installation standards, provides more robust benefits. Side effects: be careful of the composition of roofs (in particular Zn in source roofs) which can cause degradation (3) Urgency and priority: for new urban areas (4) Side effects: for new urban areas (4) Urgency and priority: in NL only for floods (5) Urgency and priority: Urbanization process (6) Side effects: in areas with both floooding andocean (7) Side effects: public health (8) Urgency and priority: 3, but not in all regions (11) Side effects: improvement in water quality (19) Efficiency: variable (19) Conditions for decision making: (re. a) feasibility) feasible but difficult retrospectively (19) Conditions for decision making: (re. c) institutional requirements) Planning laws to implement required. Ratio cost to benefit: for new sites! (ROM)
Other comments	**This does not reduce water demand but shifts water use from one source to another (e.g. from tap water to rainwater) (1)** **Lowering excess water threat, lowering flood threats (HUN)** **Is a measure for the future! (ROM)**

Name of measure: *Adapt management rules in silviculture to improve tree water balance*

General description	
Description:	Forest management measures to increase water yeald through (1) reduced density of stand stocking; (2) shorter leght of the cutting cycles; (3) planting hardwood species; (4) regeneration from seedlings rather than sprouts.
Climate event addressed:	Water scarcity
Link to vulnerability indicators	water availability
Character of measure:	preventive
Sector(s) affected:	forestry
Time to implement	Medium to long-term
Administrative level	Forest enterprises within river basin district
EU Policy area that could be used for implementation	Regional Development Fund, EU Forestry policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	
Comments re measure assessment	**urgency and priority:** Urgency and priority: low relevance in Western Europe (1) **side effects:** - esp. flood risk + carbon management (+ potentially reduces water resources) - less recharge to groundwater - Negative side effects: long effect on flooding (7) **performance under uncertainties:** **efficiency:** **effectiveness:** - soil erosion **decision making:** **general comments:** - likely to be the opposite of what is needed for North Europe - not an issue in north europe. In south europe: don't we need evaporation from forests to create rainfall inland?

	- For all criteria: applies in regions where this method is practiced (10)
Other comments	Low relevance and low benefits in a lot of countries (1) It is difficult to fill in this measure that I am not familiar with (3) Very high potential depending on extent of applications (7) To my knowledge, not applicable in Western Europe (9) I'm not a forestry expert, but I think it's not an important issue in Western Europe (12) It need new regulations on forestry (HUN) Especially in western Poland or/and in mountain areas may be useful (PL)

Name of measure: *Incentive schemes to promote water efficient products*

General description	
Description:	An incentive scheme to promote the uptake of water efficient products in homes and gardens. Can include labeling or rebate schemes.
Climate event addressed:	a) Water scarcity b) Droughts
Link to vulnerability indicators	improving efficiency (Addressing Pressure– reducing sensitivity)
Character of measure:	preventive
Sector(s) affected:	Water management
Time to implement	Mid-long term
Administrative level	National/regional
EU Policy area that could be used for implementation	WFD;WS&D-policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	**Has no effect on a drought (4)** **It is a measure for the future (ROM)**
Comments re measure assessment	**urgency and priority:** - already implemented for a lot of products - Urgency and priority: not priority (3) - Urgency and priority: especially in arid areas, not everywhere (5) **side effects:** - particulary where relates to hot water use (carbon savings) > EA has done work on this - Side effects: crucial that the effect on water quality not negative (5) **performance under uncertainties:** - energy, if heating is also an issue - the production of new products can use more water - too big supply systems **efficiency:** - efficiency depends very much on specific products - price - Performance depends of the political willingness (ROM) **effectiveness:** - the supply systems have to rebuild **decision making:**

	general comments: - likely to be the opposite of what is needed for North Europe - will work only , if prices are high enough - the incentive scheme has to sent on the right level - difference between saving hot or cold water - decreasing household demand, increasing price of water/unit because of the supply system is less flexible - incentive will need to be set at level that is attractive. Spill over benefits in reduced energy use for heating water. Modification in law for subsidies! (ROM)
Other comments	- either higher water cost or low product price - It is more about awareness raising (3) - It might be communication tool (4) - Equivalent to water footprint (5) - Focus on the horti/agriculture (7) - Measure is not useful in Germany because of low water use and associated problems in supply and wastewater treatment (9) - The government has to encourage the households, industries to produce more water efficient products (HUN) - Raising public awareness; combined measure to advertise efforts are doing in producting water efficient products and subsidies will be offered to do such production (ROM)

Name of measure: *Reducing freshwater demand for industrial cooling*

General description	
Description:	Using recycled water for industrial cooling reduces freshwater demand, which will make power plants less susceptible to climate-induced changes to water availability.
Climate event addressed:	a) Water scarcity b) droughts
Link to vulnerability indicators	Water withdrawals for thermal electricity production to availability
Character of measure:	preventive
Sector(s) affected:	Energy, industry,
Time to implement	short-term
Administrative level	Municipality, company
EU Policy area that could be used for implementation	WFD, WS&D-policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	It would be very important and useful (HUN)
Comments re measure assessment	**urgency and priority:** Urgency and priority: 4, but not everywhere (12) **side effects:** **performance under uncertainties:** **efficiency:** - probably very expensive where retro fitted - will depend on powerstation > recycled water resource - Ratio cost to benefit: it depends on the region (11) - Ratio cost to benefit: increasing cost! (ROM) **effectiveness:** Effectiveness: depends highly on the region (7) **decision making:** - technical problems **general comments:** - assuming that recycled water is coming from wastewater treatment plant - the costs and benefits will vary largely - recycled water from where? Cooking water that's already hot?

	- and climate change side effect is the main impact on surface natures - if recycle cooling water would require heat pump to reduce temperature
Other comments	Not all the water used by power plants is lost. Most of it goes back to the hydrological systems (1) Very important measure (2) Emergency measures and restrictions for cooling in case of drought are already in a lot of countries (8) Measure need some new facilities to subsidize some water sources (HUN) Cooling in a closed system makes the power plant use more energy which generates climate change. An alternative to this m. Could be to use the hot water for a quite different process (EE)

Name of measure: *Re-evaluate future water needs.*

General description	
Description:	Changing demographic and economic developments, and shifting values placed on various water uses are transforming the future of water management. A systematic assessment allows to better estimate the future needs and how they will be possibly impacted by climate change
Climate event addressed:	a) Water scarcity b) droughts
Link to vulnerability indicators	Water withdrawals to availability ratio
Character of measure:	preventive
Sector(s) affected:	all
Time to implement	short-term to medium-term
Administrative level	EC, countries
EU Policy area that could be used for implementation	WFD

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	- RBM authorities - regional/local level - This measure only affects water scarcity (4) - This measure really does not affect drought (7) - No impact on drought which is a natural phenomena (8)
Comments re measure assessment	**urgency and priority:** - very indirect - frequently have to do - Urgency and priority: should be done continuously, but does not reduce water use or adapt to climate change (1) - Urgency and priority: 4 when properly combined (7) **side effects:** - depends on wheter results implemented (I assume are) - that is taken into consideration in the process **performance under uncertainties:** - Flexibility, robustness: does not apply (12) **efficiency:** - probably very cheap + potentially high benefits - Ratio cost to benefit: depends in future development / investment in water sector (ROM) **effectiveness:** - depends on wheter is practically applied

	- only effective if applied at Mslevel **decision making:** - more research is needed on methodology **general comments:** - not really a measure in the same vein as the others ... (too high level and vague) - don't we already have to do this as part of WFO RBMPs ? - the measure is very different if it is at EU level or if done by the individual water authorities for management purposes. - the level of the measure has a great impact on the effectiveness. It's probably more efficient to have local/regional projects - research, not using it in WFO - problems with economic crises and political changes with mathematical and statistical methods doesn't work - high level of uncertainty in ability to predict shift. Needs to be undertaken at local level throught WRM plans. - All scores depend on the re-evaluation and the set measures (10) - Some side benefits are expected in medium terms (HUN) - Re-evaluation processes quite short and cheap (HUN)
Other comments	This is not a measure. This should be done, if necessary, before taking measures (1) The impact on deployment is not easy to observe (8)

Name of measure: *Share best practice to reduce water consumption of companies*

General description	
Description:	Implementation of specific mechanisms and tools to share best practice across companies to facilitate the reduction of water consumption at all sites.
Climate event addressed:	Water scarcity; Droughts;
Link to vulnerability indicators	Improve management practices (addressing *Pressure*, reducing *Sensitivity*) Change in preferences via providing more information (addressing Driver, reducing sensitivity)
Character of measure:	preventing
Sector(s) affected:	Water management; Industry
Time to implement	short-term
Administrative level	National; Regional/River Basin;municipal/company
EU Policy area that could be used for implementation	WFD, Water scarcity & Droughts policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	Does not address droughts (4) It's quite important (HUN)
Comments re measure assessment	**urgency and priority:** - already in place at MS level - more urgency in drier parts of Europe than NL (5) **side effects:** - sewage change, treatment efficiency **performance under uncertainties:** **efficiency:** - should be farly cheap - depending on water price - depends on the water price - Ratio cost benefit: this measure is relatively cheap it is a matter of communication (HUN) **effectiveness:** - probably not that much potential – larger water users already implemented efficiency **decision making:** - strenghten IPPC issues **general comments:** - EA will take on role of advising industry on adaptation and this will likely be part of this work

	- strong investments of industrial organisations needed. - best practice to reduce water consumption of companies could add other environmental aspects to the model (like waste issues, electricity, efficiency, fossil fuel and more) - mechanisms already in place at MS level to share best practices in short term risk of water scarcity/drought.
Other comments	International companies organize such type of good practice exchange experience between countries companies; but seeing large market competition, needs a catalizer to organize such meetings like Life-EU Programme at EC. Level (ROM) Companies already an ISO labelling or EMAS this way it should go (CZ)

Name of measure: *Water saving in building codes*

General description	
Description:	New national standard for sustainable design and construction of new homes, which places strong emphasis on water conservation in households. The Code evaluates the sustainability of a new home against nine categories of sustainable design, rating the whole home as a complete package. The Code uses a 1 to 6 star rating system to communicate the overall sustainability performance of a new home. The Code sets minimum standards for energy and water use at each level and, in England, replaces the EcoHomes scheme.
Climate event addressed:	Water scarcity and droughts
Link to vulnerability indicators	water availability, energy demand
Character of measure:	preventive
Sector(s) affected:	Domestic
Time to implement	short to medium-term
Administrative level	municipality
EU Policy area that could be used for implementation	Regional Development Fund, EU Energy policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	No affect on drought (4) Can't be fulfilled everywhere (HUN) Building green houses (ROM)
Comments re measure assessment	**<u>urgency and priority:</u>** - water scarcity and carbon - very small effect, if only new homes - Urgency and priority: not urgent for water scarcity in Western Europe, it is for energy use (5) **<u>side effects:</u>** - can make homes more expensive - should be implemented in tourism sector as well - reduced energy use in heating water **<u>performance under uncertainties:</u>** **<u>efficiency:</u>** - as water prices are so low , it ma y be not affordable - to costly for old houses - generally low cost, but not always clear on water saving

	- Ratio cost to benefit. Will increase costs in short time (ROM); support from the state - cost will increase in a short time (ROM) **effectiveness:** - because only applies during operation to new homes (with form a small part of housing stock) **decision making:** - need to get developers on board - difficult to access - Institutional requirements: new regulations and design processes (HUN) **general comments:** - this will be assed in a full impact assessment under the EU work "scarcity and droughts" - behaviour is more important than designing new homes . They are only a small part of total home stock - could be applied in all homes or restoration process - good to do but impact likely to be low particulary in Northern EU due to water availability - Needs to combine industrial process to deliver better equipment (ROM)
Other comments	I do not feel comfortable filing this measure as I am not familiar with such types of measures (3) Rejected because of overregulation (9) Not relevant for Germany (10) I don't know building codes, but my impression is that it's not an important measure (12) Institutional regulation is needed? (ROM) Water saving is less then the investment. People cannot pay for this (EE) Still not in legislation process in Poland (PL) It should be the future, but costs are restrictive for the moment, should be encouraged by the Environment Fund for water savings (ROM) Energy saving was introduced in contruction, but water not yet! (ROM)

Name of measure: *Management of water levels in lakes, rivers and wetlands*

General description	
Description:	The management of water levels in order to improve environmental water quality, like for nvironmental flow.
Climate event addressed:	Floods with contamination and low flow with high concentration result in temperatures, salt and deterioration of biodiversity
Link to vulnerability indicators	all sensitivity of ecosystems and downstreams exposure
Character of measure:	Preventing
Sector(s) affected:	water management, agriculture and forestry (nature)
Time to implement	medium-term
Administrative level	from river basin to district level
EU Policy area that could be used for implementation	Link with WFD, Flood directive and Directive Water Scarcity and Droughts, Rural development regulations

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	Description to abstract (19) Alternate title: management of water levels in lakes, discharges in rivers, and innundation of wetlands (2) It applies to EU policy areas (3) The WFD covers WS&D (4) Artificial rivers → water level; natural rivers → discharge (5) Alternate title: management of water levels in lakes, river discharges, and wetland innundation (5) Does not exactly link to the Directive Water Scarcity and Droughts (7) The answers corresponding to water quantity → discharge level (10) Land reclamation of the flood plains should take into account "space for the river" as well as restraints for divagation = costly (ROM)
Comments re measure assessment	**urgency and priority:** - unlikely to have clear enough signals from reference sites to apply this in the near term - 4, but be careful: if regulation means new dams, there should be less priority (3) - 5, in order to meet environmental demands (18) **side effects:** - also supports water qualities; impact on abstractions - more space for water - hydromorphological modification - in principle, very important to sustain environmental focus. If such a measure includes building of new dams for regulation, it may have adverse effects on the environment and

	WFD objectives (3) - a) there are not many facilities in CZ to manage water levels in rivers and lakes (natural lakes) (CZ) - c) water conservation; d) Flood control can be obstructed (EE) - positive for environment, conflicting for economic sectors (16) - win-win for biodiversity (17) - it might suppose restrictions to other sectors (18) **performance under uncertainties:** - management depends on climate change (10) - especially in transboundary rivers (16) **efficiency:** - efficiency unclear - could be expensive (10) - Ratio cost to benefit: river engineering?? Observation of the costs and benefits and regulation of institutional requirements (HUN) - requires the implementation of other measures to be achieved (16) **effectiveness:** - reduction in naturalised flows likely to be less of an issue in North Europe **efficiency:** **decision making:** - thinking still very unclear on what EFs mean -operational adjustment needed - revision on management rules might be needed (18) **general comments:** - again, we have to do this already any way under WFO - the measure is too vaguely described, are we talking about natural floodplains or about minimum flows – difficult issues! - the northern europe are not an area of priory for this? - has to be very careful not make malfunction
Other comments	- I' ve assumed we mean that we should look at how environmental flows change under climate projections - Only feasible if water quantity standards for surface water are made (1) - The best way to 'manage' the water level may be to let the nature do (12) - This is not actually a measure. This is a target/requirement that one has to meet by controlling/managing abstractions and dams operation (16) - It's a regulatory requirement not a measure, consent to abstract a certain volume- reduced volume- still requires measure on the behalf of the affected sector (19) - We should not go beyond the possible action: restoration of water use, if it's still not enough no action is better then some (CZ) - International cooperation is necessary in case downstream conflicts. Water level can be easily managed in artificial channels (HUN) - Regulation of the water levels shoud be done by reservoirs as well (ROM)

	- What do we understand by “management water levels in lakes”? Without an infrastructure (dams) it’s impossible (PL) - Similar to small levees. Was a good manageable system in Hungary on river Tisza before the end of the 19th century when the related flood control system was built

Name of measure: *Best management practices, efficient use of irrigation systems*

General description	
Description:	Best management practice is a practical, affordable approach to conserving water resources without sacrificing productivity at the farm level. It includes descriptions of practices that are qualified as best management practices by farmers, researchers, the extension staff and agribusiness professionals.
Climate event addressed:	Water scarcity; Droughts;
Link to vulnerability indicators	Improve management practices (addressing *Pressure*, reducing *Sensitivity*)
Character of measure:	preventing
Sector(s) affected:	Water management; Agriculture
Time to implement	short-term
Administrative level	National; Regional/River Basin;
EU Policy area that could be used for implementation	

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	- CAP (reform) pillar II payments - CAP Reform - No effect on droughts (4) - Time to implement: short term ?? (13) EU policy area: CAP, WFD EU policy area: CAP- agri-env measures, drought management plans?, land management regulation with respect to crop type/biofuel crops (19) Not a big deal in the CZ (all questions) (CZ) Name of measure: should be on existing irrigation system (EE) Administrative level: add local, farm level (EE) Urgency and priority: local implemented (EE)
Comments re measure assessment	**urgency and priority:** - especially if embedded in CAP - 4, with respect to agriculture in Southern Europe (19) **side effects:** - improves farm icomes + resilience - potential challenges in some parts of Europe (but probably not Northen Europe) - potential negative effect on ground water -positive just if agriculture sector does not increase the extensive crop (13) - measure brings benefit to ecologic, social and environmental objectives, although some environmental objectives may only be recognized to a limited extent or even be hampered (14) - a reduction in agricultural returns might result in a lower groundwater recharge (18)

	- likely positive overall, but issues of expansion of irrigation may arise, also potential loss of farmer income. Very much dependant on specific measures (19) **performance under uncertainties:** - if effective incentives enforcement applied **efficiency:** - potentially high costs, but neutral if part of CAP shift from pillar I to pillar II - not possible to say - 3-4, but depends on individual measure e.g. deficit irrigation (19) - probably works out to be changes to high value costs to enable the adaptation cost (14) - depends on price policy, water availability (EE) **effectiveness:** - : implementation is more effective (1) - Effective to a certain extent (4) - it is cheap and easy to implement but not the most effectice (13) - some examples where BMPs and improved irrigation efficiency led finally to increased demand (e.g. Spain) (16) - it doesn't save too much water in nice basins like Segura, where a large irrigated area is under drip irrigation (18) **decision making:** - need DG Agri to take seriously - need to think CAP payments to water efficiency and WFO - institutional requirements: people need to be encouraged (7) - Conditions for decision making: significant implementation if water for agriculture is priced adequately. **general comments:** - really needs be a part of CAP - as long as agriculture does not pay for water, this measure will not be relevant or does not pay the right cost - best management practices is a very efficient way to meet the farmer's interest - we need international exchange of best practices which make the EU level important - the implementation long-term if the CAP assure this practices - requires effective application and enforcement of CAP reform to link payments to efficient water use.
Other comments	Implementation of these best practices should be the measure- setting up descriptions is just the first step (1) Is there a lot of irrigation in Western Europe? Maybe in France but elsewhere no (12) This measure needs to be clarified with respect to irrigation efficiency (13) Very broad: should be narrowed down by categories of BMPs, because their benefits vs. costs may vary depending the specific conditions/context and regional settings (16) It's a measure already included in water management plan. SRB (Segura River Basin). The responsible party for applying this measure is the Regional Authority (18) Description should make clear that this measure relates to water once it has arrived at the crop. It should also be broken down- it is currently too broad- given the importance of

	agriculture in Souther Europe. Many 'sub-measures' exist that are of importance and should be addressed individually. Much also depends on water pricing (19) Description should be made more clear (20) Adequate irrigation system is necessary, water efficient techniques, farmer advisor system is important (HUN) No change in the system (EE) But irrigation would be applied adequatly to the type of crops CROP needs to be adequate TO THE AREA (ROM)

Name of measure: *Demand management*

General description	
Description:	Managing water demand through the right mix of restrictions, pricing and water efficiency is considered essential for ensuring safe and reliable water supplies in times of low water
Climate event addressed:	Water scarcity
Link to vulnerability indicators	all sensitivity and adaptive capacity indicators
Character of measure:	Preparatory and recovery
Sector(s) affected:	Water management
Time to implement	short-term
Administrative level	municipality / company / farm
EU Policy area that could be used for implementation	WFD, WS&D-policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	Description: add awareness raising (EE) Administrative level: add state level (EE) It is the only one feasible in emergency situations (ROM) Integrated measures on long term! (ROM)
Comments re measure assessment	**urgency and priority:** - very high priority compared to measures addressing the supply of water (3) - in NL not drinking water, but fresh surface water (5) - price as a regulator (10) - depends on sectors (CZ) **side effects:** - demand managing may affect economic and social objectives (14)

	- we can reduce demands only reasonably (HUN) - water pricing as a part of water demand has to be balanced, otherwise it could lead to "black" obstruction (EE); - in hungary it has very strong negative side effect on agricoltural production (HUN). - We save water, retain water in comunal areas, water quality in the pipeline declines if less water is used due to longer staying-fine (EE) - Pricing modification fares fine(EE) - Spill-over as an effect, but negative (PL) **performance under uncertainties:** **efficiency:** - pricing measures must be the most efficient (12) **effectiveness:** **decision making:** **general comments:** - of course demand management is very relevant – but the way this measure is described does not make it possible to assess - should be much more specific - emphasize right mix - demand management must be accompanied by Resource Development in a structured Twin Track approach
Other comments	Especially fresh water demand, drinking water supply less vulnerable (5) Is already in place through polluter pays principle and water prices (9) Too general. More specifications needed (13) This is the key strategy to sustainable management of water resources across all sectors. It's not possible or meaningful to evaluate in this way. Virtually all the other measures address demand for water (19) In general measures (demand) is important, however there should be divided in more parts (measure) (CZ) Restrictions will induced some economic losses on short time in "real time" events, but on long term could induce other adaptive measures (ROM) Applies mainly for industry and agricolture (PL)

Name of measure: *Drought risk management plans (DMPs)*

General description	
Description:	Drought risk management plans (DMPs) reduce risk and therefore economic, social, and environmental drought impacts. They emphasize efficient use of existing water supplies. DMPs contain guidelines and drought contingency plans for public water suppliers, but also restrictions on water use, rationing schemes, special water tariffs or the reduction of low-value uses.
Climate event addressed:	droughts
Link to vulnerability indicators	all sensitivity and adaptive capacity indicators
Character of measure:	preparatory
Sector(s) affected:	multi-sectoral including water management, agriculture, energy, industry, domestic/tourism
Time to implement	short to medium-term, depending on the specific measures foreseen in the plan
Administrative level	from river basin (district) level downwards up to municipality / company / farm
EU Policy area that could be used for implementation	WFD, WS&D-policy, Cross compliance, Rural Development Regulation, Solidarity Fund, Regional Development Fund, the European Social Fund and the Cohesion Fund.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	Time to implement: only short term (17) IN CZ Republic DMP consultancy documents already under preparation (EE) EU policy area: add operational programmes (CZ) It is very important to have plans for the actions (HUN) Part of RBM plans? (EE)
Comments re measure assessment	**urgency and priority:** - not so relevant - unsure of urgency in Northern Europe - relates to countries with drought problems. For Germany: 2 (10) **side effects:** - impacts on income possible e.g. farms - in RBM plans – Economic plans - if the rules are not clear for all sectors - forecasting and early warning should be included, as well as evaluation of PoMs under different CC scenarios. Negative receives a score of 5 if there is a holistic approach (16) **performance under uncertainties:** - Yes, if DPMs are adaptable (1) **efficiency:** - impossible to assess, **effectiveness:** - depends on exposure risk in region – not sure about Northern Europe - sometimes the measures are implemented too late. They should include early warning

	systems responses (13) - Effectiveness is in ratio with population affected, depends on case and region (EE) **decision making:** - challenge to include all stakeholders in development - probably needs new arrangements - not forecast yet - drought management centres - Conditions for decision making: high requirement for institutional adjustment – challenge to implement rules in the agricultural sector (19) - Conditions for decision making: coordination among different nations must be ensured (14) - Conditions for decision making: conflicts of users, prioritization/allocation (16) **general comments:** - it is essential to ensure that only part of response in combination with measures to reduce water scarcity - the plans thought, do not help, it depends how they are implemented and with what means - need to be fully integrated with RBM plans, it can not be a stand alone measure - drought risk mapping should be done - DMPs are highly effective and beneficial in high risk water scarcity and drought regions
Other comments	Implmenetation of DMPs should be the issue, not the setting up (1) Not a real problem in Germany, interpretation via WFD and RBMP might be enough (2) It could serve also for water scarcity (8) Government would need to establish a department to deal with drought management – this dept. would coordinate DMPs (14) DMPs need to be proactive (not reactive), have incorporated forecasting and early warning, correct triggers and response levels may be challenging and require scientific basis. PoMs must be very specific, not general or abstract. DMPs weak in EU, not harmonised guidelines (16) DMPs are established for crisis situations therefore they might affect negatively other sectors (mainly agriculture and industry), but really the environment water need is after drinking water the goal to achieve (17) Different things are mixed together strategic plans VS emerging plans (CZ) A plan for emergency on the long turn can have a common adaptation measure with flood management (bilding reservoirs for flood water) (EE) It is an emergency management plan, we need to prepare for prevention measures (ROM)

Name of measure: *Funding for water retention in drought-endangered agriculture and forest landscapes*

General description	
Description:	Financial support for water users to foster uptake of adaptation measures
Climate event addressed:	Water scarcity
Link to vulnerability indicators	all sensitivity and adaptive capacity indicators
Character of measure:	Preparatory and recovery
Sector(s) affected:	Agriculture and Forestry
Time to implement	short-term
Administrative level	municipality / company / farm
EU Policy area that could be used for implementation	WS&D-policy

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	The description of this measure seems a little too vague (14) Water retention?? (16) Definition too vague (18) Name of measure: water retention is a poor term, could meanmany different things (wetlands, resevoirs, improved soil structure, etc.) (19) In EU policy area: add cohesion funds, rural developement programmes, CAP, floods directive (CZ) More about national conditions (area then climate change) (CZ) Climate event addressed at flood risk reduction (HUN) It would be important to give funds to farmers to build “wetlands” (HUN)
Comments re measure assessment	**urgency and priority:** - be careful of construction of new ‘hard’ structured (3) - drought endangered agriculture in Western Europe only? (5) - not urgent in Western Europe (12) - 3 for Germany and Western Europe (12) **side effects:** - would potential reduce finance available for other areas of agricultural funding - less agricultural production - negative impact on the environment (3) - the only adverse way of the measure on other needs seems to be economic, as funds for other sectors could be reduced (14) - Flood waters may be contaminated, funding may have negative impats in form of increasing demands instead of saving it (Spain) (EE)

	performance under uncertainties: **efficiency:** not known (7) **effectiveness:** - not known (7) - Ratio cost to benefit: case depend (EE) **decision making:** - not easy to justify (13) **general comments:** - would also be good to include ability to cope with heavy rainfall – especially for Northern Europe to manage flood risk , soil erosion and diffuse pollution - it is important that other funds and financial support are used for agriculture measures , it's not possible to use the CAP for all the measures required. - drought is not a big issue in Scandinavia and therefore water retention is not an actual measure. Water retention to manage splash floods is more actual. - to be proposed as measure under the CAP Cfirst/Csecond > to be funded by CAP budget - measure should be proposed under CAP reform
Other comments	Must be related to frequency of extreme droughts, priority for extreme regions. Who is funding? EU? (5) Funding is not only necessary for retention in agricultural areas, but everywhere. We have to care that the water stored will not serve only to agricultural production (8) Ongoing study: water retention measures across EU. The measure is actually water retention. Funding for that is just an aspect of the measure (16) Strange measure: will farmers change their behaviour if you pay them enough? Yes. Will they stop farming if funding is sufficient?! (19) Problem with funding is that it is separated from the measure itself: farmers do anything if you pay them enough (measure seems to be in the drought package) (20) SCALE! I think it only works in small scale. Farms not large agricoltural fields (HUN) That depends on the regulatory timescale. Could be large volumes storages water interseasonal regulation, will be feasible (ROM)

Name of measure: *Managed Aquifer Recharge (MAR)*

General description	
Description:	MAR is a technique used in arid and semi-arid regions to recharge aquifers in a controlled way so that excess water can then be used later for water supply or environmental protection.
Climate event addressed:	Water scarcity and droughts
Link to vulnerability indicators	Increase water availability (addressing *State*, reducing *Exposure*)
Character of measure:	preventing
Sector(s) affected:	Water management;
Time to implement	short-term
Administrative level	regional/river basin, or municipality/company/farm
EU Policy area that could be used for implementation	WS&D Policy;

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	No effect on droughts (4) It would be important but the quality of the water is a big question (HUN) Specific for arid areas (ROM)
Comments re measure assessment	**urgency and priority:** - dependent on particular scenarios of higher winter rainfall to be able to provide recharge - needs very careful implmenetation. High risk of long term pollutuion of soils, surface water if not appropriately impemented (2) - urgent priority only in regions with aquifers (5) - it's just not feasible where there is water scarcity (18) **side effects:** - helps to avoide salin intrusion - relies on higher winter rainfall - supports prevention of saline intrusion - quality issue: protection of groundwater (1) - measure may address other environmental benefits beyond water scarcity and drought, e.g. saline intrusion (14) - ground water quality, reversing seawater intrusion (16) - positive in that water supply is maintained (19) - Measure improves groundwater bodies' status (18) - high risk connected to quality of water which is recharged. Water for recharging has to be abstracted from another source of water (EE) **performance under uncertainties:** - relies on changing rainfall patterns

	efficiency: - hardly dependent on sufficient rainfall to recharge - it could be costly (8) **effectiveness:** - it is difficult to control the illegal uses of the aquifers in Spain, so perhaps the saved water is captured for this use (13) - it's much better to reduce overexploitation (18) **decision making:** - limited technical capacity - a) case dependant, b) sewage treatment and disposal, c) control of quality (EE) **general comments:** - UK + Netherlands aquifer recharge significant - additional effect along seaside: decrease salt value
Other comments	This is not practical in Western Europe (10) Not relevant (15) Can be beneficial but may also deteriorate the groundwater quality if the recharged wastewater is not treated to an adequate level. Recharge area must be controlled and a safety zone defined for security reasons (16) Water quality risk. 'Negative' should allow for such environmental concerns – currently it talks only of reduction in adaptive capacity (19) Measure with possible negative effects on the ground water (CZ) It an be on the condition that the quality of excess water is question is good enough (EE) In Romania is used indirectly, after polders used during floods, water retention recharge aquifers and groundwaters (ROM) Doesn't apply for Poland in greater scale (PL)

Name of measure: *Water Recycling*

General description	
Description:	Recycling of water for non-drinking purposes. Domestic water from baths, showers and sinks can be re-used for toilets. Waste water can be used for irrigation, and industrial processes can be designed to use water in closed cycles
Climate event addressed:	Water scarcity and droughts
Link to vulnerability indicators	water availability
Character of measure:	preventive
Sector(s) affected:	Multiple sectors including agriculture, energy production, industry, domestic
Time to implement	short to medium-term
Administrative level	municipality, farm, industrial plant,
EU Policy area that could be used for implementation	WS&D-policy, Regional Development Fund, EU Energy policy, EU Climate adaptation initiative, marginally affected Urban Wastewater Directive

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	Note I have only scored for this measure (Domestic Water Reuse) Time to implement: long term Description: scope too large (17) Title: water recycling of treated water (17) EU policy area: but no policy re: standards (19) It would be very important (HUN) Valuable for urban area in water scarcity areas! (ROM)
Comments re measure assessment	**urgency and priority:** urgent need for awareness (7) **side effects:** - carbon costs, potential impacts on human health - contamination risk - negative effects on water bills (12) - recycling water is a contribution to water conservation and this is always a benefit regardless climate change (14) - it's also used to water golf courses and other uses (18) - 5s for industrial recycling **performance under uncertainties:** **efficiency:** - expensive (both in € and CO2)

	- high cost - benefits depend on the case (14) - original high cost to build the WWTP (16) - industrial examples show payback with short time period (19) - needs much infrastructure development (EE); costly (ROM) **effectiveness:** - would make a limited contribution - depends on the volume (12) - totally dependent on degree of industrial water use (19) **decision making:** - Feasibility: especially on a big scale, on building level already possible (5) - difficult to implement in countries without the water quality required by regional laws (13); socio-cultural acceptance and conflicts with legal settings may hamper the adaptation focus (14). Institutional requirements: implementation would require modification in legislation (EE); water quality for waste water irrigation (HUN) **general comments:** - water recycling in agriculture is an important development area. Research and "best practice" is needed to find the most cost-efficient measures - be aware of public health risk - too many type of recycling together should not be implemented - can be beneficial particulary at irrigation and industrial scale. Public health risks of systems are not properly designed installed and maintained.
Other comments	Attention must be given to quality issues for efficient use (1) Recycling water creates a lot of revenue for water supply companies (12) The social perception might be a problem (people hesitant to use treated wastewater). National standards regarding the quality of treated water may be too high, increasing thus significantly the production cost (16) It is necessary to define the quality parameters to use the treated water (17) In Spain, Regional Authorities ones in charge of water treatment plants (18) Water pricing and energy pricing as a driver. Potential health risk, reduction of return flows? Scoring depends on sector/which aspect of recycling (19) I think after refine of waste water, we can use it for irrigation and other areas which interest human health (TURK) Public awareness should be raised (HUN) If industry alone, it is a good option to close the water cycle (EE) Important in urban areas, but under better control monitoring system (ROM) One of the best measures in my opinion (PL)

Name of measure: *Enhancing storage capacity of reservoirs*

General description	
Description:	An increase in the capacity of reservoirs means an increase in the amount of water that can be stored safely. It improves a region's capacity to cope with higher peaks of precipitation and river discharge as well as with water scarcity.
Climate event addressed:	d) Water scarcity e) Droughts f) Flooding
Link to vulnerability indicators	State – reducing exposure
Character of measure:	preventive
Sector(s) affected:	Water management
Time to implement	Medium to long term
Administrative level	Regional/river basin
EU Policy area that could be used for implementation	WS&D-policy, Floods directive, Rural Development Regulation, Solidarity Fund, Regional Development Fund, the European Social Fund and the Cohesion Fund.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	Proposed title change to 'changing resevoir management' (10) Optimization of water reservoir system (EE) Optimizing water allocation system (HUN) Very importan measure (HUN) With limitation in exploitation rules (ROM)
Comments re measure assessment	**urgency and priority:** - high impacts of storage capacity infrastructure on ecological conditions (3) - only in countries with reservoirs (5) - not practicable concerning competition proposed (energy, drinking water, ...) (10) **side effects:** - biodiversity + creation (dependent on how constructed) - potential impact on communities - different approaches if you're considering flooding or wtaer scarcity - hydromorphological alteration - Negative impact: use of additional water (8) - negative maybe on ecosystems (12) - it increases water availability of an area but it causes environmental damage (18) - Negative environmental side effects. Hydromorphological impacts, expands supply, does not manage demand. (19) - **by enhancing storage capacity, flood protection and power producation are**

	comrpomised (EE); decreases flood reducing capacity (HUN); Flood protection function decreases; safety (EE) **performance under uncertainties:** - fixed infrastructure - dependent on particular patterns of rainfall - robust if well designed (16) - proper management of the dam is needed (18) **efficiency:** - highly variable - costly measures (8) - expensive but effective (18) - Building higher dams are very costly (HUN) **effectiveness:** **decision making:** **general comments:** - the dual use of reservoirs for storage and flooding has practical and technical issues - for flood alteration reservoirs must be empty , for water security it needs to be full. - But under strict rules for flood management safetyness (ROM) - Include costs for early warning systems; benefit could come with power prod. (ROM) - "Exploitation rules" restriction, new exploitation reservoir plan should be demanded, aswell as a better flood warning system, to be able to keep reservoir filled over the wholeyear! (ROM)
Other comments	Multifunctionality of stored water is key issue but not always possible. Capacity of resevoirs may be needed in all periods to tackle storms (like summer) (1) Again we once more in favor of prioritizing water demand measures than water supply ones (3) Very limited possibility for upstream-downstream effects (7) We have to take care that the additional storage capacity will be used for a good purpose and not for additional production which could increase water scarcity (8) Optimized, multi-purpose management is more important than enhancement (9) Climate change increases the uncertainty and this is a very unflexible measure (13) May end up being a bad investment. Needs careful historical time series and reliabilitiy analysis and proper operation so that it actually serves its purpose (store water to use it in periods of water stress) (16) Expands supply: not managing demand. Hydromorphological impacts (19) Instead of increasing the present capacity, more small scale reservoirs would be ..able. Oprimize operation of them is required (HUN) Security problems! (EE)

Name of measure: *Desalination*

General description	
Description:	Desalination is the process of removing salt from water to make it useable for a range of 'fit for use' purposes including drinking. Advancing technologies could render desalination more energy efficient and reduce operating cost. It could become a viable and weather independent alternative for urban drinking and non-drinking water supplies in the future.
Climate event addressed:	Water scarcity and droughts
Link to vulnerability indicators	Increase water availability (addressing *State*, reducing *Exposure*)
Character of measure:	preventing
Sector(s) affected:	Water management; Households/Tourism
Time to implement	short-term
Administrative level	National, regional, or municipality/company/farm
EU Policy area that could be used for implementation	WS&D Policy; Rural Development Regulation; Council Regulation (EC) N° 1083/2006 laying down general provisions of the European Regional Development Fund, the European Social Fund and the Cohesion Fund.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	Has no impact on drought (8) Time to implement: between the idea and the operation of the plant, there will be more than three years (17) Administrative level: municipality/company/farm do not have the decision of WORD the measure (17) Sector(s) affected: no mentioning of farms/agriculture (20) Time to implement: 'short term' was called into question (20) I think it is not too important now, maybe in 30 years (HUN) In some reason it is very urgent (EE) For Mediterranean area: for Romania not applicable (ROM)
Comments re measure assessment	**urgency and priority:** - not urgent because we have fresh water (12) - we are more in favor of water demand measure than water supply (3) - the measure reduces vulnerability but is not a priority (17) **side effects:** - very high carbon costs - measure may have beneficial effect on tourism, agriculture may become vulnerable (15) - energy requirements, tourism attractions since plants proximity to coast (16) - it damages the competitiveness of the agricultural sector (17) - increases global warming (18) - environmental issues arise and desalination simply leads to expansion (19) **performance under uncertainties:**

	efficiency: - potentially expensive (7) - 3, but depends on the stress level of the region (16) - expensive (infrastructure and energy, transport costs) (13) **effectiveness:** - effectiveness: depends on the region (7) **decision making:** **general comments:** - high investment, operational cost and energy demand - not feasible or cost effective to operate desalination at household level. Answers based on municipal level. - farmers could suffer high prices for water if more desalination is applied (13) - measure is applicable in coastal areas, due to the cost of transportation (14)
Other comments	Not feasible in BE due to energy need. Not feasible for all of Europe- very costly (1) Not a relevant measure for Germany but important measure in other (suitable) parts of Europe (2) Desalination is costly and not appropriate everywhere (3) Not relevant for Western Europe. This measure is rejected because problem is moved to another sector rather than solved (9) Not relevant to Germany (10) To use desalinated water for irrigation does not look applicable due to cost. Therefore, only desalination for drinking water seems feasible (14) Not relevant (15) By productions, energy issues- ref. To DG ENV relevant study on alternative water resources (16) Reduces WS&D, but cost, environmental impact, energy consumption. Dependant on energy price (18) Energy requirements and generation of saline water mean there are questions around sustainability. Perhaps offset by solar power. In principle, however, this measure expands supply rather than addressing demand. Limited geographically- coastal areas only (19) There is no problem with salination in my country (TURK) Not relevant for Hungary (HUN) and Poland (PL) The assessment is relevant for costal zone country, groundwater is “brackish” water, already mixed in the intruded seawater (EE) Some institutional arrangements should be done for Integrated Coastal Area Management Plan (ROM)

Name of measure: *Improving irrigation efficiency*

General description	
Description:	If saved water is not immediately relocated and used for new crop patterns and extended irrigation, net water savings can be achieved. This can be influenced to some extent setting conditions on funding schemes for new irrigation technology, such as prohibiting irrigation extension or requiring a minimum net water saving. The government encourages farmers to use these methods by offering incentives to participating farmers.
Climate event addressed:	Water scarcity and drought
Link to vulnerability indicators	all sensitivity and adaptive capacity indicators
Character of measure:	Preventing and recovery
Sector(s) affected:	Agriculture and other sectors indirectly
Time to implement	short-term
Administrative level	regional / farm
EU Policy area that could be used for implementation	WFD, WS&D-policy, Direct payments (cc), Rural Development Regulation, Solidarity Fund, Council Regulation (EC) N° 1083/2006 lays down general provisions of the European Regional Development Fund, the European Social Fund and the Cohesion Fund.

Remarks and comments from stakeholders	
Comments re. measure description (1 – 8)	Linkages with the CAP reform (3) The effect on drought is a Trojan Horse (4) Participants had strong problems with the content of the measure: even instances of the measure backfiring, worsening the situation, because of reduced return flows (20) It is very important to reduce losses (HUN)
Comments re measure assessment	**<u>urgency and priority:</u>** - 4 in Western Europe, 5 everywhere else (7) - Not urgent in Western Europe (12) **<u>side effects:</u>** - benefits for farm incomes - energy price, can affect farmers' income (13) - sometimes the demand increases with this measure (13) - the measure may also have a negative environmental effect: increases of salinity of soil and groundwater (14) - incentives to efficient irrigation can lead to increase in irrigated area (EE) **<u>performance under uncertainties:</u>** **<u>efficiency:</u>** - it depends on the already existing irrigation efficiency measures: therefore sometimes the ratio C/B will be very low but other times very high (when there are already measures) (17) **<u>effectiveness:</u>**

	decision making: - change the CAP - Conditions for decision making: the ownership of the land is not on the farmers (13) - Feasibility and institutional requirements are very linked (19) **general comments:** - this may be the most important measure! - efficiency in households is important, but the big volumes are used in agriculture. At the same time the european agriculture needs to be competetive on the global market - major benefits since even small % savings will have significant impact because of the high level of water used for irrigation
Other comments	Important measure but not for Germany (2) Reduction of return flows. Considering a nice basin with a large area with drip irrigation, it saves not too much water, although it's expensive (18) Need to make clear that this measure refers (I think) to getting water to a crop. Danger relates to an expansion of irrigation if efficiency gains are realised (19) Feasibility of measure: Question refers to various barriers, but numbering in evaluation (1 – 5) simply refers to length of time (19). Only 2% of whole Hungary is irrigated, if we can improve efficiency it can increase income (HUN)

Annex 1 –

The Climwatadapt consortium developed a list of criteria and sub-criteria being considered as a comprehensive set to be proposed for the assessment of the performances of adaptation options being considered at various levels in Europe (e.g. within the context of RBMPs).

Before having been used for the assessment of adaptation measures with stakeholders, the criteria were submitted to workshop participants for collecting documented feedback from workshop participants. An ad hoc form was circulated at the end of the first morning (see Annex 3), focused on the elicitation of weights to be allocated to the sub-criteria in case of practical use for an assessment exercise. The approach was derived from consolidated methods provided by the literature in the field of Multi-Criteria Analysis (Multi-Attribute methods in particular).

Participants were thus asked to distribute a total of 100 points to the various sub-criteria to express their preferences in terms of relative relevance. This approach was considered as an effective solution for the elicitation of the opinions of participants regarding the relevance of the sub-criteria in view of further consolidation of the proposed list. A final section of the form provided space for unstructured notes, comments and suggestions (see Annex 4 for the complete list of contributions from participants.

In total 63 compiled forms were collected, stored in a spreadsheet format and checked for consistency (in particular the total of the weights summing up at 100 was checked, and in case of errors, the weights were rescaled). Regarding the preferences expressed by the stakeholders involved in the weighting exercise, a clear focus is placed on the Efficiency and the Effectiveness criteria, which quite often were given one half or more of the 100 points to be allocated[1]. On the contrary, as reported in Annex 4, several doubted about the way we proposed a subdivision of the "Side effects" criterion. "No regrets", Spill-over", and "Negative" were considered by some participants as redundant, highly correlated, or simply not relevant. Such considerations can be clearly derived directly from the proposed weights which were overall in the order of half or less of the weights given to Efficiency and Effectiveness. Moreover, "No regrets" and "Negative" side effects are the sub-criteria that showed the higher spread in the values, thus demonstrating a relative discordance amongst the participants.

Less doubts were expressed about the last two sub-criteria related to the decision making conditions (Combinability and Institutional requirements), but similarly rather low weights were allocated to them, typically in the order of around 5 points.

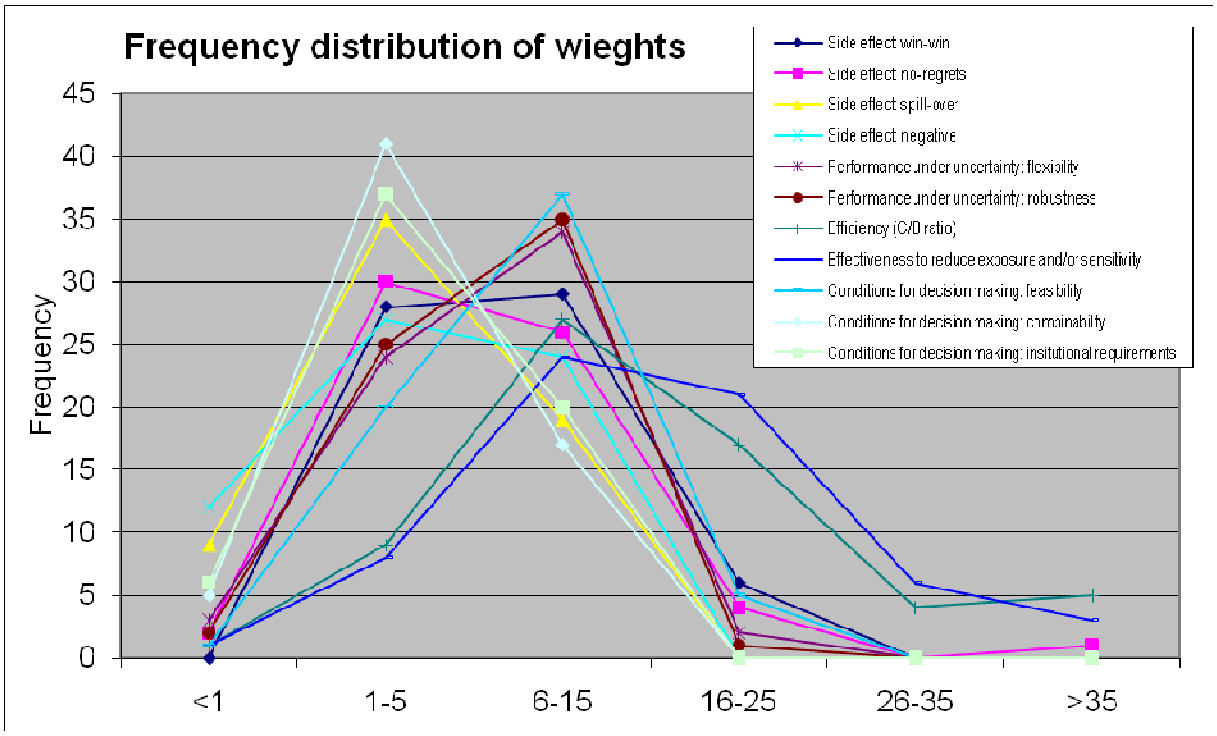
[1] In order to avoid any possible misinterpretation of the aims and the context of the exercise, which had a participative and exploratory nature, without any intention to provide sort of EU level averages, rankings or similar, the data and the descriptive statistics are not reported in this documents, but those interested in the details of all the information collected can find the documentation in the project section in the CIRCA web site.

Several participants demonstrated in the compilation a preference for assigning weights to the five criteria and later distributing them within the sub-criteria thus adopting a sort of hierarchical approach.

Open methodological issues were mentioned regarding the implementation of the assessment in the real world. For example those related to the assessment of cost and benefits, their multiple dimensions and meaning, the existence of other approaches, such as Cost-Effectiveness Analysis.

A comprehensive view on the results of the weighting exercise is reported in the frequency distribution graphs reported in Figure 1 below.

Figure 1: Distributions of sub-criteria weights provided by stakeholders. The higher the peak the higher the convergence on a specific interval of weights reported on the X axis. The more the curves are shifted towards the right and the higher the relevance of the sub-criterion.



Main messages from the outcomes of the weighting exercise

In total 63 comprehensive weighting forms were collected.

The Effectiveness and Efficiency criteria received much attention and higher weights thus expressing a general consensus about their relevance when adaptation measures are to be assessed. Several remarks raised relevant methodological issues related to the challenges related to the estimation of costs and benefits and the multiple dimensions to be considered.

No substantial criticism was raised about the five criteria proposed, but several doubts were raised instead about the way they were disaggregated into sub-criteria. “Side effects” sub-criteria were those more debated, thus requiring further attention for the finalization of the project.

In general, a reduction of the number of sub-criteria should be carefully considered.

….

Annex 2 – Results of the weighting of criteria

Results of the weighting exercise

	side effects				Performance under uncertainty		Efficiency	Effectiveness	Conditions for decision making			
Stakeholder	win-win	no-regrets	spill-over	negative	flexibility	robustness	ratio cost/benefit	to reduce exposure and/or sensitivity	feasibility	combinability	insitutional requirements	
HMDM	8.0	4.0	3.0	5.0	7.0	8.0	20.0	25.0	10.0	4.0	6.0	100.0
GH	12.0	10.0	9.0	10.0	11.0	8.0	8.0	9.0	10.0	8.0	5.0	100.0
JW	5.0	5.0	5.0	0.0	10.0	5.0	50.0	5.0	5.0	5.0	5.0	100.0
LF	10.0	5.0	5.0	5.0	5.0	10.0	20.0	25.0	5.0	5.0	5.0	100.0
CH	5.0	10.0	5.0	0.0	15.0	5.0	20.0	20.0	10.0	5.0	5.0	100.0
AJ	5.0	5.0	5.0	5.0	15.0	15.0	15.0	20.0	5.0	5.0	5.0	100.0
XDL	4.2	4.2	6.3	6.3	10.5	10.5	10.5	31.6	3.2	4.2	8.4	100.0
JG	5.0	5.0	0.0	0.0	10.0	10.0	20.0	20.0	20.0	0.0	10.0	100.0
	9.0	10.0	6.0	4.0	10.0	8.0	8.0	12.0	12.0	11.0	10.0	100.0
MS	10.0	10.0	10.0	0.0	5.0	5.0	20.0	20.0	10.0	5.0	5.0	100.0
G	10.0	10.0	5.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	5.0	100.0
JH	5.0	5.0	0.0	10.0	10.0	5.0	10.0	30.0	15.0	5.0	5.0	100.0
AS	5.0	5.0	0.0	5.0	15.0	15.0	15.0	25.0	10.0	5.0	0.0	100.0
GM	4.0	4.0	3.0	4.0	8.0	7.0	25.0	20.0	10.0	5.0	10.0	100.0
MV	9.9	9.9	7.9	8.9	9.9	11.9	7.9	11.9	9.9	11.9	0.0	100.0
PH	4.5	4.5	13.6	9.1	9.1	9.1	13.6	18.2	9.1	4.5	4.5	100.0
DP	5.0	5.0	5.0	5.0	5.0	5.0	25.0	25.0	10.0	5.0	5.0	100.0
	15.0	0.0	0.0	0.0	0.0	15.0	25.0	15.0	10.0	10.0	10.0	100.0
BP	11.1	11.1	11.1	11.1	11.1	7.8	3.3	11.1	8.9	11.1	2.2	100.0
JD	2.0	2.0	1.0	1.0	6.0	6.0	50.0	25.0	5.0	1.0	1.0	100.0

MPD	5.0	10.0	5.0	5.0	10.0	10.0	15.0	20.0	10.0	5.0	5.0	100.0
GD	20.0	5.0	5.0	5.0	5.0	5.0	20.0	20.0	10.0	5.0	0.0	100.0
FR	10.0	3.0	3.0	4.0	5.0	5.0	40.0	5.0	15.0	5.0	5.0	100.0
NE	4.5	4.5	4.5	4.5	18.2	9.1	18.2	18.2	9.1	4.5	4.5	100.0
FK	5.0	5.0	5.0	5.0	10.0	10.0	5.0	25.0	10.0	10.0	10.0	100.0
MM	5.0	5.0	5.0	5.0	10.0	10.0	30.0	20.0	5.0	0.0	5.0	100.0
MJA	20.0	20.0	0.0	0.0	10.0	10.0	10.0	10.0	10.0	5.0	5.0	100.0
WV	3.0	5.0	2.0	5.0	10.0	10.0	50.0	5.0	5.0	3.0	2.0	100.0
DD	7.9	2.0	6.9	3.0	5.0	5.0	19.8	29.7	9.9	5.0	5.9	100.0
MS	5.0	0.0	0.0	0.0	5.0	5.0	0.0	50.0	25.0	0.0	10.0	100.0
IS	5.0	2.0	2.0	5.0	2.0	2.0	5.0	50.0	15.0	2.0	10.0	100.0
AN	5.0	5.0	0.0	0.0	5.0	5.0	50.0	15.0	5.0	5.0	5.0	100.0
HR	10.0	20.0	5.0	10.0	0.0	5.0	30.0	5.0	5.0	5.0	5.0	100.0
VV	13.0	12.0	6.0	5.0	10.0	9.0	8.0	8.0	14.0	8.0	7.0	100.0
HF	10.0	12.0	8.0	10.0	8.0	12.0	15.0	10.0	5.0	5.0	5.0	100.0
GS	25.0	10.0	5.0	5.0	5.0	5.0	15.0	15.0	5.0	5.0	5.0	100.0
E	15.0	5.0	5.0	0.0	5.0	10.0	15.0	15.0	15.0	10.0	5.0	100.0
MH	10.0	10.0	5.0	5.0	5.0	15.0	20.0	10.0	15.0	5.0	0.0	100.0
YY	5.1	7.7	5.1	28.2	5.1	7.7	10.3	5.1	7.7	12.8	5.1	100.0
TG	5.0	10.0	5.0	5.0	13.0	12.0	10.0	10.0	15.0	10.0	5.0	100.0
MF	15.0	15.0	10.0	10.0	5.0	5.0	15.0	10.0	5.0	5.0	5.0	100.0
NR	20.0	20.0	0.0	0.0	0.0	5.0	20.0	20.0	5.0	5.0	5.0	100.0
DA	2.0	3.0	1.0	4.0	15.0	15.0	10.0	30.0	15.0	3.0	2.0	100.0
FJ	13.0	13.0	5.0	5.0	11.0	10.0	5.0	10.0	10.0	13.0	5.0	100.0
NM	5.0	5.0	5.0	10.0	5.0	10.0	15.0	30.0	5.0	5.0	5.0	100.0
MB	10.0	10.0	10.0	10.0	5.0	5.0	20.0	15.0	5.0	5.0	5.0	100.0
KA	6.0	7.0	6.0	10.0	7.0	8.0	13.0	15.0	12.0	7.0	9.0	100.0
	5.0	4.0	3.0	4.0	10.0	5.0	20.0	25.0	12.0	2.0	10.0	100.0
FN	10.0	10.0	10.0	10.0	5.0	5.0	20.0	5.0	15.0	5.0	5.0	100.0
RP	20.0	10.0	5.0	0.0	15.0	0.0	5.0	20.0	20.0	5.0	0.0	100.0
AM	2.0	3.0	3.0	7.0	2.0	3.0	15.0	40.0	10.0	5.0	10.0	100.0
HE	9.9	5.0	5.0	9.9	5.0	1.0	19.8	19.8	9.9	9.9	5.0	100.0
SQ	5.0	5.0	2.5	5.0	5.0	5.0	30.0	30.0	5.0	5.0	2.5	100.0
	0.0	50.0	0.0	0.0	20.0	0.0	30.0	0.0	0.0	0.0	0.0	100.0

SM	13.6	9.1	9.1	9.1	13.6	13.6	4.5	9.1	9.1	0.0	9.1	100.0
HT	10.0	5.0	5.0	5.0	5.0	20.0	15.0	15.0	5.0	5.0	10.0	100.0
NY	6.1	9.1	12.1	9.1	6.1	12.1	9.1	9.1	12.1	9.1	6.1	100.0
BM	9.0	10.0	8.0	10.0	9.0	9.0	9.0	9.0	10.0	8.0	9.0	100.0
MK	7.0	7.0	6.0	6.0	5.0	5.0	14.0	16.0	19.0	8.0	7.0	100.0
SN	10.0	10.0	5.0	5.0	14.0	9.0	12.0	14.0	7.0	4.0	10.0	100.0
	12.0	10.0	4.0	8.0	10.0	10.0	5.0	13.0	20.0	4.0	4.0	100.0
GH	9.0	12.0	10.0	7.0	6.0	12.0	6.0	10.0	11.0	11.0	6.0	100.0
ASB	20.0	20.0	10.0	10.0	5.0	5.0	10.0	5.0	5.0	5.0	5.0	100.0
AVG	8.8	8.4	5.1	5.8	8.1	8.1	17.2	17.4	9.9	5.7	5.5	
MEDIAN	8.0	7.0	5.0	5.0	8.0	8.0	15.0	15.0	10.0	5.0	5.0	
MAX	25.0	50.0	13.6	28.2	20.0	20.0	50.0	50.0	25.0	13.0	10.0	
MIN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
CV%	59.5	83.1	65.2	78.0	52.4	48.7	66.5	58.3	47.9	55.2	52.8	
COUNT	63	63	63	63	63	63	63	63	63	63	63	

Stakeholder	Notes, comments and suggestions
HMDM	perhaps sub-criteria for efficiency and effectiveness assessemtn should be produced
GH	
JW	cost-benefit should cover most of the oher sub-criteria if done properly (hence weights gave to it. E.g. Real Options Analysis should cover flexibility (see UK HM Thresury Green Book). Likewise many of these very similar thinngs (e.g. spillover and negative side effects seem the same to me
LF	It would have been useful to see the presentation and the description of each definition before the meeting. C/B ratio: does this account for indirect benefits such as ecosystem services? Much work has being done on valuing ecosystems and I wonder what has been included in this calculation
CH	
AJ	Impossible to rank beacuse of much overlap. E.g. robustness = no regret; feasibility = good B/C ratio. Therefore pls reduce these criteria to much less. Perhaps only 5 or something like that! Pls. We the Uk main "principles for good adaptation" which in my view is an excellent list. See UK DEFRA Climate Adaptation strategy web site.
XDL	
JG	
MS	
G	
JH	definitions of benefit is missing: social benefit (human health) number of fatalities reduction ; econ. Benefit damage expectations reductions; ecol. Benefit natural functions/resources improved. Only econ. B. considered here
AS	these criteria are very case dependent
GM	
MV	
PH	
DP	
BP	due to the continuoosly changing political situation institutional requirements can't be elaborated at all

JD	
MPD	
GD	May want cost effectiveness, rather than purely CBA, because of discounting of benefits. There is a strong link between some of these (e.g. robustness and no regret, e.g. spill over and negative. Also, it depends on the impact: there is no need to have no regret or robustness if the science is certain.
FR	Effectiveness already part of benefits under efficiency, so this sums up to importance of 45
NE	
FK	
MM	
MJA	It is hard to believe that a protection measure could induce negative effects or will decrease the capacity of other sectoers for adaptationm (spill over and negative = 0). On the contrary maybe flexibility should get an increased ?? But I ?? Without points!
WV	split-up criterium efficiency(e.g. human health, economy, ecology) some criteria overlap (will create biased answers)?
DD	
MS	
IS	
AN	
HR	It's crucial that welook at efficiency (ratio C/B) The measures should be done where they are as efficient as possible
VV	
HF	Too many subcriteria to have a meaningful distribution of points
GS	Missing: how do you assess the measure serving for various CC Adapt. Lines (WS&D, floods, SLR,..) at the same time? This was ?? At the beginning of the meeting and then got lost.
E	
MH	
YY	
TG	
MF	
NR	too little time to finish for not experienced people
DA	
FJ	
NM	
MB	
KA	
FN	

RP	
AM	
HE	
SQ	I think the time frame of the implementation can also be determinant. Long vs. short term measures
SM	In conditions for decision making, I am missing institutional capacity
HT	Climate change has different effects in different regions. This should be considered - no "one size fits all" approach
NY	
BM	
MK	
SN	
GH	Water pricing measures could cause problems for farmers and householders in such bad economical state
ASB	Some criteria could be merged together. They are something too detailed and similar

Annex 3

Form for the elicitation of weights distributed to the participants of the Budapest Stakeholders Workshop

"Climate Adaptation – Modelling Water Scenarios and Sectoral Impacts (ClimWatAdapt)"

Elicitation of relative weight from stakeholders

Expert identification

Name: _____
Geographical area: _____
Institution: _____
Role: _____

How to assign the relative importance:

1. Read carefully the list of criteria and sub-criteria.
2. You have a total of 100 points to allocate among the different criteria listed.
3. More important sub-criteria should be assigned higher points.
4. The total points assigned should equal 100. This will ensure that you trade-off along the different dimensions.

Criterion	sub-criteria	weight
Side effects	a) win-win:	___
	b) no regrets:	___
	c) spill-over:	___
	d) negative:	___
Performance under uncertainties	a) flexibility	___
	b) robustness	___
Efficiency	ratio cost to benefit	___
Effectiveness	to reduce sensitivity	___
Conditions for decision making	a) feasibility	___
	b) combinability	___
	c) institutional requirements	___
		100

Notes, comments and suggestions: _____
_____
_____
_____
_____

Annex 4

General remarks and comments about criteria and the weighting exercise from stakeholders

perhaps sub-criteria for efficiency and effectiveness assessment should be produced

cost-benefit should cover most of the oher sub-criteria if done properly (hence weights gave to it. E.g. Real Options Analysis should cover flexibility (see UK HM Treasury Green Book). Likewise many of these very similar things (e.g. spillover and negative side effects seem the same to me

It would have been useful to see the presentation and the description of each definition before the meeting. C/B ratio: does this account for indirect benefits such as ecosystem services? Much work has being done on valuing ecosystems and I wonder what has been included in this calculation

Impossible to rank because of much overlap. E.g. robustness = no regret; feasibility = good B/C ratio. Therefore pls reduce these criteria to much less. Perhaps only 5 or something like that! Pls. We the Uk main "principles for good adaptation" which in my view is an excellent list. See UK DEFRA Climate Adaptation strategy web site.

definitions of benefit is missing: social benefit (human health) number of fatalities reduction ; econ. Benefit damage expectations reductions; ecol. Benefit natural functions/resources improved. Only econ. B. considered here

these criteria are very case dependent

due to the continuously changing political situation institutional requirements can't be elaborated at all

May want cost effectiveness, rather than purely CBA, because of discounting of benefits. There is a strong link between some of these (e.g. robustness and no regret, e.g. spill over and negative. Also, it depends on the impact: there is no need to have no regret or robustness if the science is certain.

Effectiveness already part of benefits under efficiency, so this sums up to importance of 45

It is hard to believe that a protection measure could induce negative effects or will decrease the capacity of other sectors for adaptation (spill over and negative = 0). On the contrary maybe flexibility should get an increased ?? But I ?? Without points!

split-up criterium efficiency (e.g. human health, economy, ecology) some criteria overlap (will create biased answers)?

It's crucial that we look at efficiency (ratio C/B) The measures should be done where they are as efficient as possible

Too many sub-criteria to have a meaningful distribution of points

Missing: how do you assess the measure serving for various CC Adapt. Lines (WS&D, floods, SLR,..) at the same time? This was ?? at the beginning of the meeting and then got lost.

too little time to finish for not experienced people

I think the time frame of the implementation can also be determinant. Long vs. short term measures

In conditions for decision making, I am missing institutional capacity

Climate change has different effects in different regions. This should be considered - no "one size fits all"

approach

Water pricing measures could cause problems for farmers and householders in such bad economical state

Some criteria could be merged together. They are something too detailed and similar