SOCLIMPACT

This project has received funding from the European Union's Horizon 2020 research and innovation programme under Grant Agreement No776661

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Downscaling climate impacts and decarbonisation pathways in EU islands, and enhancing socioeconomic and non-market evaluation of Climate Change for Europe, for 2050 and beyond

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Work Package 7:

This is a result of Tasks 7.3. This deliverable will include the agendas, the list of participants, and the workshops outputs including the decisions taken.

Deliverable 7.3.

Workshop Report – French West Indies

Disclaimer

The overal frame of the present document was taken and adapted from the second version of the Azores report from Hugo P. Costa, Ricardo Coelho, Andreia Sousa, Tiago Capela Lourenço.

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1 Introduction

This document presents the results of the stakeholder's consultation process to design the SOCLIMPACT Adaptation Pathways Workshops in the French West Indies. This process is included in SOCLIMPACT Task 7.3 - Engage islands' stakeholders in the design of alternative pathways. According to the project Description of Action is expected that these online workshops use the background material prepared in Task 7.2/D7.2 and include the main results from previous WPs.

In the consultation process, the following objectives are expected to be covered:

1. **Identify and present the characterized packages of adaptation and risk management options** available for each archipelago/island.
2. **Develop detailed archipelago/island integrated adaptation pathways**, in three timeframes: Short term (up to 2030), Mid-century (up to 2050) and End-century (up to 2100).
3. **Evaluate** and rank pathways for Blue Economy sectors.

The original plan was to hold physical workshops in each archipelago. However, health and travel limitations due to Covid-19 forced changes to the original plan and partners decided to develop two shorter online sessions mixed with an online survey. The rationale was to make it as easy as possible for both **IFP** and **LWG** (stakeholders) to carry out the proposed work, without seriously compromising the **scientific quality** of the projects' outcomes.

In the French West Indies, the consultation process was conducted through bilateral exchanges over the telephone. Attempts to bring all stakeholders together by videoconference at the same time failed for several reasons related to the identification of a COVID 19 cluster in Martinique and a positive case among some experts. Moreover, some of the stakeholders solicited did not feel able to respond to the survey. Therefore, we sought new experts in order to reach the required number of respondents.

There were two exchange sessions. The first during the weeks of 12 and 19 October, during which the material was presented to the experts. Then between 9 and 24 November there was a second exchange on the results in order to confirm those and collect data for the evaluation criteria.

Due to the climatic and socio-economic data available as well as the minimum number of experts required (at least 6), we have prioritized the tourism sector.

The gap in the climate data was filled in by drawing on the public results of other local research work on climate change such as C3AF (Changement Climatique et Conséquences sur les Antilles Françaises). The C3AF research project has made available to the public some information on climate modelling on temperature and rainfall projections as well as cyclonic activity and sea states up to 2080 in the French West Indies.

The 24 options/measures available per sector were characterized by the IFP using the five criteria defined and exchange with LWG. In addition, up to six additional adaptation options per island and per sector could be added by the LWG (class of adaptation "Local Knowledge"). For the West Indies, three options were added from data of the current local programs.

The report follows what was defined in the proposal by presenting the online workshop materials, namely: (1) decisions taken; (2) agendas and (3) list of participants.

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2 Method

The **Adaptation Pathways methodology applied in SOCPLIMPACT was based in the framework developed by Suckall et al.2018 and considered the three main strategic vectors for climate resilience: (1) vulnerability reduction -** Five capitals of Sustainable Livelihoods Approach (SLA)**; (2) Disaster Risk Reduction –** developed throughout Hyogo and Sendai Frameworks**; (3) Social-Ecological Resilience** – that emerge from the Millennium Ecosystem Assessment (MEA) and Common International Classification of Ecosystem Services (CICES).

The **Adaptation Pathways** aim to capture the policy preferences in time and the relevancy of the context traduced in investment and commitment (Suckall et al., 2018). These Adaptation Pathways Trajectories (APT) were delineated as a set of adaptation classes each one with two options/measures to choose from. Each individual stakeholder choices contribute to create a policy pathway together with the other choices made by different stakeholders. If most of the stakeholders chose one option, then that measure was incorporated in the island adaptation pathway for that specific class in each APT for the sector of tourism. The result of the series of choices in the three timeframes defines the pathway. If there is a tie between two options, then they will both be included and become part of the adaptation pathway in each time frame. The options were included in the pathway when they were selected more than 50% in each time frame in each APT. Local Knowledge measures were included if they were chosen by at least 2 (33%) of all stakeholders.

Pathway options are grouped around three objectives: (1) actions to reduce socio-economic vulnerability; (2) actions that address disaster risk reduction; and (3) actions that affect social-ecological resilience. Adaptation policy under **vulnerability reduction**, **disaster risk reduction**, and **social-ecological resilience** were developed considering classes of adaptation (Figure 2) under which the participants decide which are the most relevant options for the region.

For **vulnerability reduction** five classes were considered: (1) Financial capital; (2) Human capital; (3) Social capital; (4) Natural capital; and (5) Physical capital. For **Disaster Risk Reduction** four classes were considered: (6) managing long term risk; (7) preparedness; (8) response; (9) post disaster recovery and rehabilitation. For **Social-Ecological Resilience** three classes were considered: (10) Post disaster recovery and rehabilitation; (11) Provisioning services; and (12) Regulating and Maintenance Services (Figure 1 - The 12 classes of adaptation in the figure are structured in three broader objectives (Vulnerability reduction, Disaster Risk reduction and Ecosystem and social resilience).Figure 1).

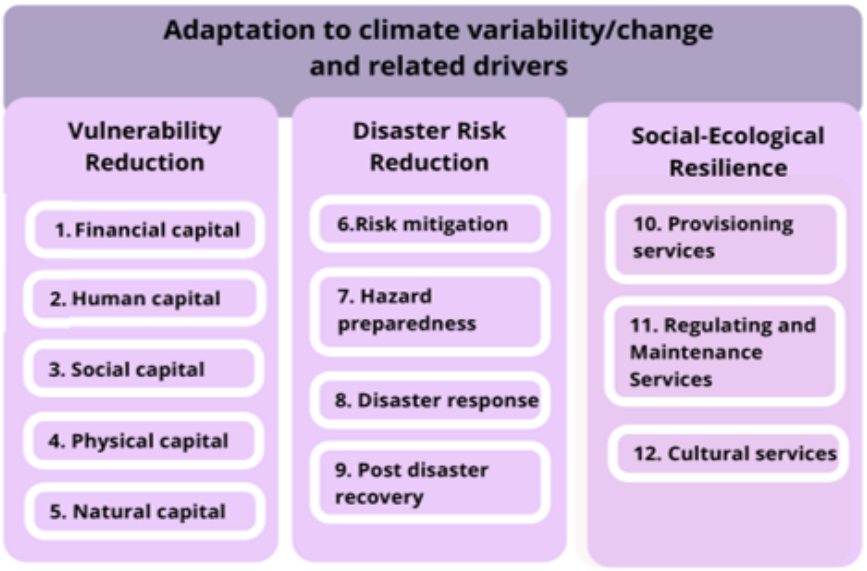

Figure 1- The 12 classes of adaptation in the figure are structured in three broader objectives (Vulnerability reduction, Disaster Risk reduction and Ecosystem and social resilience).

The results of the Adaptation Pathways are presented in this report in two different outputs: **(1) Selected Adaptation Pathways; and (2) Sustainability Performance.**

The **(1) Selected Adaptation Pathways** outputs aim to capture the acceptance of each adaptation option by calculating the options (number of times) selected within the maximum number of times they can be selected (Ratio – Selected/Maximum). This considers the number of times the option was selected by all stakeholders in all four APTs and three timeframes.

The **(2) Sustainability performance** outputs aim to characterize each pathway through the evaluation of the options chosen in each APT. The options selected in each APTs are evaluated considering a set of criteria: Cost Efficiency; Environmental protection; Mitigation (GHG emissions) win-wins and trade-offs; Technical applicability; Social acceptability (Table 1).

Tableau 1 – Description of the criteria used to evaluate the adaptation pathways performance.

Criteria	Description	
Cost Efficiency	Ability to efficiently address current or future climate hazards/risks in the most economical way	Higher score = higher cost efficiency
- *Environmental protection*	Ability to protect the environment, now and in the future	Higher score = higher environmental protection
- *Mitigation (GHG emissions) win-wins and trade-offs*	Current ability to meet (win-win) or not (trade-off) the island/archipelago's mitigation objectives	Higher score = higher mitigation win-wins and lower trade-offs
- *Technical applicability*	Current ability to technically implement the option/measure in the island/archipelago	Higher score = higher technical applicability
- *Social acceptability*	Current social acceptability of the option/measure in the island/archipelago	Higher score = higher social acceptability

The results are presented in a spider diagram and is the average of all options chosen for the participants in each APT pathway.

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3 Summary of Background Material

To support the decisions within the Online Survey Tool and to define the Adaptation Pathways, relevant information related to climate, socio-economy and adaptation were presented to stakeholders. The deliverable 7.2 (Background Materials) were the preferential source information but additional and tailored information was developed.

Tableau 2 - Summary of the information used support the decisions within the Online Survey Tool. All relevant information related with climate, socio-economy and adaptation is included.

Variable	Description
Evolution of the density of modeled cyclonic trajectories (historical climate & 2080)	According to the simulations of the Arpege-Climat model, a decrease in hurricane activity can be expected in the West Indies. Produced by C3AF : more info
1 Contribution of cyclones to the significant wave heights modelled during the hurricane season (historical climate)	The model estimates the contribution of cyclones to the average wave height has about 20 cm. Produced by C3AF : more info
2 Evolution of the significant wave height modeled in the French West Indies (historical climate & 2080)	According to MFWAM model simulations, a decrease in wave heights in the order of 5% can be expected. Produced by C3AF : more info
Evolution of modeled precipitation (historical & future climate)	According to the simulations of the Arpege-Climat model, a decrease in rainfall over the Lesser Antilles is to be expected. Produced by C3AF : more info
Precipitation during the dry season in the French West Indies (historical climate)	The altitude has a very important weight on the rainfall in Guadeloupe and Martinique, with cumulative rainfall 2 to 3 times more than in the rest of the island. Produced by C3AF : more info
Evolution of precipitation during the dry season by 2055 (French West Indies)	Modelling indicates a reduction in rainfall of 5% for Guadeloupe and 10 to 15% for Martinique by 2055. Produced by C3AF : more info
Evolution of precipitation during the dry season by 2080 (French West Indies)	Modelling indicates a reduction in rainfall of 10 to 15% for Guadeloupe and 15 to 20% for Martinique by 2080. Produced by C3AF : more info
Evolution of precipitation during the wet season by 2055 (French West Indies)	According to the Arpege-Climat model, there should be a decrease in rainfall of between 10 and 15% on both islands. Produced by C3AF : more info
Evolution of precipitation during the wet season by 2080 (French West Indies)	3 A drying up of between 10 and 15% for Guadeloupe and 5 to 10% for Martinique should be observed. 4 Produced by C3AF : more info
Evolution of modeled temperatures (historical & future climate)	We can expect a marked warming over the entire West Indies region, of the order of 1.5°C in the ocean and 2°C on land (variations according to the relief). Produced by C3AF : more info
Retreat of the coastal line in Guadeloupe	BRGM is currently carrying out a study on the evolution of the coastal line in Guadeloupe and Martinique. In Guadeloupe, it is mainly Grand-Terre where a retreat of the coastal line can be observed. Produced by BRGM : more info
Climate Change and its Economic Implications on Tourism Sector in the West Indies	In 2013, Dupont has estimated the economic losses in the tourism sector by 2100, according to a pessimistic scenario, at 45 million euros for Guadeloupe (or 0.7% of its 2004 GDP), and 60 million euros for Martinique (or 0.8% of its 2004 GDP). Dupont, 2013
Tourism – willingness to pay	Climate Change impacts on tourists' choice and expenditure decisions at the island. Produced by SOCLIMPACT: more info

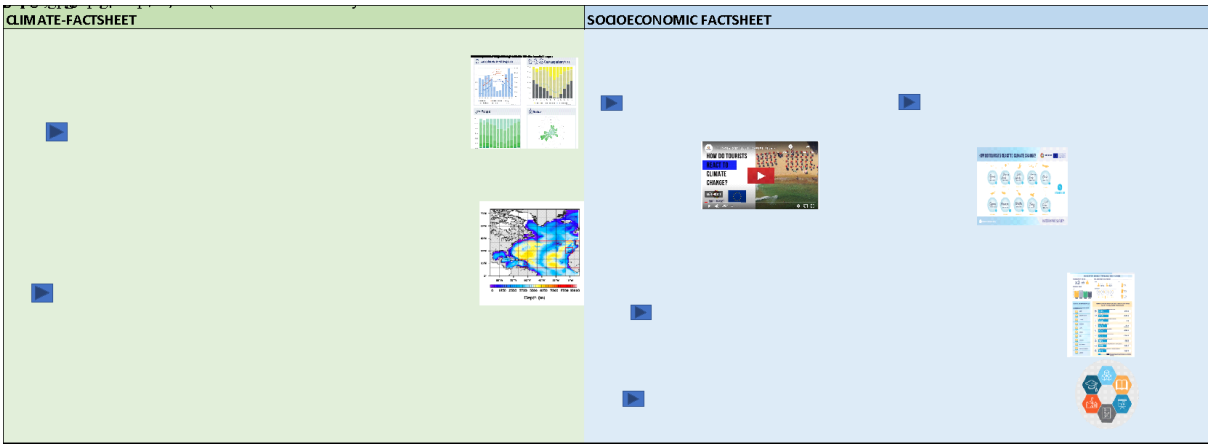

Figure 2- Visual representation of how the background material was presented and delivered in the Online Tool Survey for the West Indies

Tableau 3- List of participants who answers the online survey for the tourism sector.

First Name	Last Name	organization
Emmanuel	COLLIN	ODE
Philippe	EDOM	DEAL
Denis	ETIENNE	DEAL
Bruno	LAZZARINI	DEAL
Loïc	MANGEOT	ODE
Maéva	VINGADASSALOM	Région Guadeloupe

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4 Sector Adaptation Pathways

4.1 Adaptation Options Evaluation

4.1.1 Selected Adaptation Pathways

ID	Name	Class adaptation	APT A			APT B			APT C			APT D		
			S	M	L	S	M	L	S	M	L	S	M	L
T1	Economic Policy Instruments (EPIs)	Financial capital					B						D	
T2	Financial incentives to retreat from high-risk areas						B						D	
T9	Activity and product diversification	Human capital		A			B			C			D	
T10	Public awareness programmes			A			B			C			D	
T11	Local circular economy	Social capital								C				
T12	Tourist awareness campaigns									C				
T13	Local sustainable fishing	Natural capital								C			D	
T14	Water restrictions, consumption cuts and grey-water recycling									C			D	
T15	Beach nourishment	Physical capital					B							
T16	Desalination						B							
T17	Coastal protection structures	Managing long term risk		A			B			C			D	
T18	Drought and water conservation plans			A			B			C			D	
T19	Mainstreaming Disaster Risk Management (DRM)	Preparedness								C				
T20	Using water to cope with heat waves									C				
T21	Fire management plans	Response		A										
T22	Health care delivery systems			A										
T23	Post-Disaster recovery funds	Post disaster recovery and rehabilitation		A									D	
T24	Pre-disaster early recovery planning			A									D	
T3	Adaptation of groundwater management	Provisioning services		A			B			C			D	
T4	Monitoring, modelling and forecasting systems			A			B			C			D	
T5	Dune restoration and rehabilitation	Regulating and Maintenance Services					B			C				
T6	River rehabilitation and restoration						B			C				
T7	Adaptive management of natural habitats	Cultural services								C				
T8	Ocean pools									C				
T25	Coastal forest restoration and protection	Local knowledge		A			B			C			D	
T26	Improve the use and distribution of water			A			B			C			D	
T27	Reinforcement of priority infrastructures			A			B			C			D	

Figure 3 - Adaptation options for the tourism sector. Options are identified with an ID number, full name, and class of adaptation name. Adaptation objectives are identified in each option by colour: ***vulnerability reduction (red),*** *Disaster* ***Risk Reduction (blue);*** ***Social-Ecological Resilience (green);*** *Local Knowledge adaptation options (grey). Each ATP (APT A; APT B; APT C; APT D) is represented in three timeframes: S - Short term (up to 2030), M- Medium term (up to 2050), L - Long term (until 2100). Bold letters in each ATP indicate the option was available to be selected. Highlighted options indicate the measure was selected in each ATP and timeframe: ATP A (light green); ATP B (light blue); ATP C (Light orange) and ATP D (light purple).*

The general aspect of the selected pathway adaptation shows numerous situations of ties between the adaptation options.

Concerning **Vulnerability reduction**, for the "Financial capital" adaptation class, the choice fell on Financial incentives to retreat from high-risk areas (T1) at the beginning and middle of the century then on Economic Policy Instruments (T2) for the late century.

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Activity and product diversity (T9) is the preferred option on all four APTs and all time horizons (short term, medium term and long term). However, there is a tie situation with the Public awareness programmes (T10) for APT A in 2030 and 2050 and APT C in 2030.

Regarding social capital is concerned, there is a tie in 2030 between the Tourism awareness campaigns (T12) and the Local circular economy (T11). But the circular economy should be implemented on the medium term and long term.

Concerning the Natural Capital, the choice went to Local sustainable fishing (T13). It reflects a concern about the resource which is currently very limited in the French West Indies. The Water restriction option (T14) is tied in the APT C in 2050 in a tie with Local sustainable fishing.

Beach nourishment (T15) is the measure chosen throughout the century for APT B because of concern about beach erosion.

In the **Disaster Risk Reduction** section, for the APT A, B and C, priority is given to the Drought and water conservation plans (T18) over the short term for the APT A, B and C. Coastal protection structures (T17) appears from the medium term and long term on the three APTs. There is equality between the two measures for APT A in 2050 and also for APT C and D in 2100.

As far as Preparedness is concerned, Mainstreamin Disaster Risk Management (T19) is the option chosen throughout the century. The use of water to cope with the heat wave (T20) appears in 2100 and is equal to T19.

For the adaptation class "Response", the major concern is to improve the health system (T22). Forest fires (T21) is not a major concern. This option is selected at the end of the century and create a tie case with T22.

With regard to the post-disaster class, there is a strong tie between post disaster recovery (T23) and pre-disaster early recovery planning (T24) in the short and medium term on APT A and the short and long term on APT D.

On the subject of Provinioning services, the Adaptation of groundwater management (T3) appears early in the APT B, C and D. Monitoring systems (T4) is the only measure applied in APT A. For APT B and D, it is implemented from 2050 onwards. On APT C, it is implemented throughout the century with a tie with T3 in 2030.

In **Social-Ecological Resilience**, for the Adaptation class Regulating and Maintenance Services, priority is given to the rehabilitation and restoration of rivers (T6) throughout the century and for APT B and C.

Concerning cultural services, the option selected throughout the century is adaptive management of natural habitats (T7).

For **Local knowledge**, the conservation and restoration of coastal forests is the measure chosen for APT A and throughout the century. It also appears for APT B and C in 2030. This measure enables several ecosystem functions to be fulfilled, such as the natural protection of the coasts against climatic risk, but also a tourism asset.

Improve the use and distribution of water (T26) is the adaptation measure considered most relevant on APT B from 2050 and throughout the century for scenarios C and D.

Finally, the reinforcement of priority infrastructure concerns buildings and public facilities (restaurant, first aid post, road axis, etc.) in order to make them resilient, such as the construction of a modular restaurant along the beach. This measure only appears on the APT C in 2030. There is also equality between the three Local Knowledge measures for this year.

4.1.2 Sustainability Performance

Figure 4 - Pathways evaluation for tourism sector considering: Cost Efficiency; Environmental protection; Mitigation (GHG emissions) win-wins and trade-offs; Technical applicability; Social acceptability. The policy pathways scenarios: APT A - Minimum Intervention; APT B - Economic Capacity Expansion (ECE); APT C- Efficiency Enhancement (EE); APT D - System Restructuring (SR), for different timeframes: short, medium, and long term

The four graphs representing the pathway scores for the tourism sector in the French West Indies are almost similar.It shows a very small performance gap between each scenario.

APT A has the highest level of social acceptability and technical applicability over the short term.

APT C has the best performance from the point of view of environmental protection in all time frame. It also has the highest level of mitigation in the short term.

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However, the score for all pathway seems to decrease slightly over time, apart from the cost efficiency, which seems to remain stable.

5 Discussion and conclusion

The general aspect of the selected pathway adaptation shows an important uniformity across the scenario and numerous situations of ties between the adaptation options with sometimes small deviations in terms of time of application. This shows that even if some priorities remain the same, the pathway should include a certain level flexibility for better resilience regardless of the scenario.

The biggest difference appear when considering the local knowledge for the minimum intervention scenario (APT A). In this case, costal forest protection appears to be the main objective while in the other scenario, it is improving the use and distribution of water.

If we look for the choice of adaptation options without any tie situation, there is only River rehabilitation and restoration, Beach nourishment and adaptative management of natural habitats. This can be explained by the fact that dune (T5) doesn't exist in the French West Indies. As for Desalination (16), it does not represent a sustainable solution at the present moment due to the ecological impact of production waste. It is preferable to address the problem in the distribution of water. One of the main reasons for water scarcity is a 50% loss of water production in the distribution network due to numerous leaks in Martinique and Guadeloupe (Observatoire de l'eau en Martinique, Observatoire de l'eau Guadeloupe). As for the importance of the conservation of natural habitat, it is because both islands are part of the Caribbean biodiversity hotspot (WEDGE, 2010). Biodiversity is considered to be an asset for tourism that must be developed.

In terms of performance, the scenario with the minimum intervention (APT A) and the scenario with Efficiancy Enhancement (APT C) are the ones that stand out the most, notably from the point of view of Social Acceptability and Environmental protection, mainly in the short and medium terms. The lowest score is for mitigation.

In conclusion, there is a strong desire to preserve natural resources while at the same time putting in place approaches that allow a degree of flexibility between adaptation measures. In the context of climate change, there is a strong need to better protect water resources, which requires the improvement and redesign of the water treatment and transport system throughout the territory for more efficient management in the short, medium and long term.

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7 Annexes

7.1 Adaptation Options Evaluation

7.1.1 Tourism

Options Characterization				Criteria				
ID	Name	Description	Class of adaptation	Cost Efficiency	Environmental protection	Mitigation (GHG emissions) win-wins and trade-offs	Technical applicability	Social Acceptability
T1	**Economic Policy Instruments (EPIs)**	Economic Policy Instruments (EPIs) are incentives designed and implemented with the purpose of adapting individual decisions to collectively agreed goals. Diferent type of instruments can be aplied, like: pricing (e.g. water tariffs), environmental taxes and charges, subsidies; trading (e.g tradable permit for pollution or water abstraction, compensation mechanisms, payments for environmental services); and voluntary agreements and risk management schemes such as insurances.	1. Financial capital	**3**	**2**	**3**	**3**	**3**
T2	**Financial incentives to retreat from high-risk areas**	Financial incentives to retreat from high-risk areas refers to the creation of financial incentives to retreat or relocate settlements, infrastructure and productive activities from the original location due to their high exposure to risks such as flood, sea-level rise and storm surges.	1. Financial capital	**2**	**3**	**2**	**2**	**2**
T3	**Adaptation of groundwater management**	Adaptation of groundwater management can be used to (1) conserve groundwater reservoirs, limiting water use and optimizing water reuse, and (2) restore or increase natural infiltration capacity. Both contribute to adaptation in circumstances of reduced precipitation and sea saltwater intrusion aggravated with groundwater over-exploitation. Different packages of interventions usually inlcude: freshwater	10. Provisioning services	**2**	**3**	**2**	**2**	**3**

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		injection, modifying pumping practice, delayed inflow, artificial recharge or efficient use of freshwater.						
T4	**Monitoring, modelling and forecasting systems**	Monitoring, modelling and forecasting systems are information system that provide timely and reliable climate information, as well as up-to-date data on the occurrence and severity of extreme events, possible impacts and their duration. Different systems can be implemented to respond to different climate hazards, such as drought-related, water quality monitoring, water resources management and predicting and managing flood risks.	10. Provisioning services	**3**	**3**	**3**	**3**	**4**
T5	**Dune restoration and rehabilitation**	Dune restoration and rehabilitation refers to the strengthening of the flood safety and sand reservoir functions of dunes. Dune erosion happens as a result of wind action, marine erosion, human activities and Sea Level Rise (SLR). Possible technics examples include: grass planting, thatching and fencing.	11. Regulating and Maintenance Services	**1**	**1**	**1**	**2**	**2**
T6	**River rehabilitation and restoration**	River rehabilitation and restoration are measures that emphasise the natural functions of rivers and create vegetated buffer zones alongside watercourses. This contributes to the improvement of micro-climatic conditions, reduces run-off and erosion, and increases groundwater recharge. For Tourism, this option also increases available leisure areas, increases thermal comfort areas and the availability of water.	11. Regulating and Maintenance Services	**3**	**4**	**3**	**3**	**3**
T7	**Adaptive management of natural habitats**	Adaptive management of natural habitats refers to the preservation of ecosystem services which are essential for human well-being. Human activities induce pressure and impacts on biodiversity and ecosystems that tend to be aggravated by climate change. Adaptive management measures include: understanding species response; make space for the development of rivers and coasts; aid gene flow; species translocation; targets and conservation mechanisms/plans.	12. Cultural services	**3**	**4**	**3**	**3**	**3**
T8	**Ocean pools**	Ocean pools are seawater pools located by the sea where waves can wash into the pool. The width, length and depth of ocean pools varies and often depends on their location on the coastline. These recreational structures are useful on SLR context, doubling as an additional protection of the coast and creating alternatives to beach leisure areas.	12. Cultural services	**2**	**2**	**2**	**2**	**2**

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T9	**Activity and product diversification**	Activity and product diversification include actions to diversify the tourism activities and products and aim to reduce seasonality and overload in infrastructures and ecosystems. Shifting the dependency from 'sun, sea and sand' products to alternative leisure activities can reduce the impacts of heat waves, coastal erosion or ecosystem degradation, and thus help to maintain destination attractiveness.	2. Human capital	**4**	**3**	**2**	**3**	**4**
T10	**Public awareness programmes**	Public awareness programmes establish targeted programmes that raise awareness about climate change (specific values and protection needs) among guides, site managers and local communities.	2. Human capital	**3**	**3**	**3**	**3**	**4**
T11	**Local circular economy**	Local circular economy is an economic system aimed at eliminating waste and the continual use of resources that offers a valuable framework for reduced carbon emissions from materials (decarbonization) and increased resilience to climate change and its impacts.	3. Social capital	**3**	**4**	**3**	**2**	**2**
T12	**Tourist awareness campaigns**	Tourist awareness campaigns target behavioural change of visitors and aim to increase tourists (individuals and organisations) knowledge about climate change and the risk faced by tourism destinations. These campaigns can be targeted to regions affected by a particular climate threat, specific groups of visitors or the general tourism sector as a whole.	3. Social capital	**3**	**3**	**3**	**3**	**3**
T13	**Local sustainable fishing**	Local sustainable fishing refers to the promotion of fishing zones/rights for local small-scale fishers maintaining stocks and using sustainable methods. This option aims to add value to local resources and products, protect ecosystems services and decrease external dependency.	4. Natural capital	**3**	**3**	**3**	**2**	**3**
T14	**Water restrictions, consumption cuts and grey-water recycling**	Restrictions can be applied to allow water administration services to cope with water crises. Restriction (or rationing) of certain uses of water such as irrigation of lawns, car washing, filling swimming pools or hosing down pavement areas may be necessary during these times. Grey-water recycling (or reclamation) is the reuse of non-drinkable water (usually treated waste water) to cover water use needs that don't demand such a high-quality standard.	4. Natural capital	**3**	**3**	**2**	**3**	**2**

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T15	**Beach nourishment**	Beach nourishment (or replenishment) is the artificial placement of sand to compensate for erosion. Beach nourishment also often aims at maintaining beach width (for tourism and recreational purposes). Several beach nourishment techniques can be used including beach, backshore and shoreface nourishment, and large scale coastal nourishment (e.g. using sand motors).	5. Physical capital	**3**	**2**	**3**	**2**	**3**
T16	**Desalination**	Desalination is the process of removing salt from sea or brackish water to make it useable for a range of purposes including drinking, and can contribute to adaptation in circumstances of current or future water scarcity problems. Technological examples include electrically driven technologies, like reverse osmosis, and thermally driven technologies, based mainly on vapor distillation processes.	5. Physical capital	**2**	**1**	**2**	**3**	**3**
T17	**Coastal protection structures**	Coastal protection structures such as groynes, breakwaters, artificial reefs and seawalls are different types of artificial structures, built in the shoreline (or rivers), which are designed to protect the coast from SLR or storms. Those structures can be used to, for example, drift and trap sediments, protect from erosion, absorb wave energy, or allow navigation.	6. Managing long term risk	**2**	**2**	**2**	**2**	**3**
T18	**Drought and water conservation plans**	Drought and water conservation plans refer to tourism-lead adaptation and/or involvement in drought management plans with the aim to reduce the economic, social, and environmental consequences of drought and water scarcity, and to reduce the loss of water and improve efficiency in the sector.	6. Managing long term risk	**3**	**3**	**2**	**3**	**4**
T19	**Mainstreaming Disaster Risk Management (DRM)**	Mainstreaming Disaster Risk Management (DRM) aims to plan and organize DRM along five stages including prevention, protection, preparedness, and response, recovery and review. Examples include interventions to limit urban development in flood prone areas; identify natural hazard prone areas; develop strategies, arrangements, and procedures to address crises; and post-emergency recovery activities.	7. Preparedness	**3**	**3**	**3**	**2**	**4**
T20	**Using water to cope with heat waves**	Water use to cope with heat waves in cities are a set of investments in water supply services and infrastructures that aim to increase urban resilience regarding heat waves. Different packages of grey interventions are usually applied, as for example: creating and/or repairing fountains for drinking water and cooling; water spray fountains; and wetting streets.	7. Preparedness	**2**	**3**	**2**	**3**	**3**

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T2 1	**Fire management plans**	Fire management plans are management actions have wide range of application such as early warning detection, with escape routes and advice to local citizens and tourists, mobilization and suppression of unwanted and damaging fires, or use of fire to manage fuel. Additionally, these plans help to increase the understanding of the interactions of climate change with vegetation cover and fire regimes.	8. Response	**2**	**3**	**3**	**2**	**3**
T2 2	**Health care delivery systems**	Health care delivery systems are pre-emptive actions and adjustments that need to be made to health care systems, namely reinforcing less prepared aspects of its operation and/or logistics, in order to guarantee effectiveness and efficiency during, for example, high temperature and heat-wave situations.	8. Response	**3**	**2**	**3**	**3**	**4**
T2 3	**Post-Disaster recovery funds**	Post-Disaster recovery funds is the creation of recovery funds for the Tourism sector to recover after disasters, through initiatives that get the economy up and running quickly while building-back-better (e.g. rebuild damaged critical infrastructures such as ports and roads or recorver the landscape from fires). The aim is to minimize the economic and social impacts (which may include future loss of the touristic destination attractiveness) that can occur in a post-disaster context.	9. Post disaster recovery and rehabilitation	**3**	**2**	**2**	**3**	**3**
T2 4	**Pre-disaster early recovery planning**	Pre-disaster early recovery planning processes include the development of knowledge, good practices and objectives that aim to improve the living conditions of the affected communities, while facilitating the adjustments necessary to reduce the risk of future disasters. Examples of good practices are may include identifying critical ecosystems (goods and services) that require immediate restoration after a disaster or particularly vulnerable communities.	9. Post disaster recovery and rehabilitation	**3**	**4**	**3**	**3**	**3**
T2 5	**Coastal forest restoration and protection**	Coastal forests such as mangroves are particularly fragile and provides a natural barrier against the risks of submersion and erosion. It is also a structuring component and a tourist asset. This is why it benefits from legal protection measures which must however be strengthened.	Local knowledge	**3**	**4**	**3**	**3**	**4**
T2 6	**Improve the use and distribution of water**	About 50% of the drinking water production is lost in the distribution network. The efficiency of the network can be greatly improved. Local authorities are implementing actions to reduce the strain on the production plants.	Local knowledge	**3**	**3**	**3**	**3**	**4**

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T27	**Reinforcement of priority infrastructures**	Maintaining robust and resilient infrastructure systems regarding road and communication network in order to facilitate emergency response.	Local knowledge	**3**	**2**	**2**	**3**	**3**