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

The proposed adaptation pathways are framed by the geographic, economic and social context of the island and is a result of a consultation process with regional stakeholders

Click on the sector to see the specific recommendations

TOURISM

MARITIME TRANSPORT

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APT A - Pathway

Minimum Intervention
low investment, low commitment to policy change

This policy trajectory assumes a no-regrets strategy where the lowest cost adaptation policies are pursued to protect citizens from some climate impacts

Short-term (up to 2030)	Mid-century (up to 2050)	End-century (up to 2100)
Public awareness programmes	Activity and product diversification	Activity and product diversification
Drought and water conservation plans	Coastal protection structures	Coastal protection structures
Fire management plans	Health care delivery systems	Health care delivery systems
Post-Disaster recovery funds	Pre-disaster early recovery planning	Pre-disaster early recovery planning
Monitoring, modelling and forecasting systems	Monitoring, modelling and forecasting systems	Adaptation of groundwater management

APT B - Pathway

Economic Capacity Expansion
high investment, low commitment to policy change

This policy trajectory focuses primarily on encouraging climate-proof economic growth but does not seek to make significant changes to the current structure of the economy

Short-term (up to 2030)	Mid-century (up to 2050)	End-century (up to 2100)
Economic Policy Instruments (EPIs)	Economic Policy Instruments (EPIs)	Economic Policy Instruments (EPIs)
Activity and product diversification	Activity and product diversification	Activity and product diversification
Beach nourishment	Beach nourishment	Desalination
Coastal protection structures	Coastal protection structures	Coastal protection structures
Monitoring, modelling and forecasting systems	Monitoring, modelling and forecasting systems	Adaptation of groundwater management
Dune restoration and rehabilitation	River rehabilitation and restoration	River rehabilitation and restoration

APT C - Pathway

Efficiency Enhancement
medium investment, medium commitment to policy change

This policy direction is based on an ambitious strategy that promotes adaptation consistent with the most efficient management and exploitation of the current system

Short-term (up to 2030)	Mid-century (up to 2050)	End-century (up to 2100)
Public awareness programmes	Activity and product diversification	Activity and product diversification
Local circular economy	Local circular economy	Local circular economy
Water restrictions, consumption cuts and grey-water recycling	Water restrictions, consumption cuts and grey-water recycling	Water restrictions, consumption cuts and grey-water recycling
Drought and water conservation plans	Coastal protection structures	Coastal protection structures
Mainstreaming Disaster Risk Management	Mainstreaming Disaster Risk Management	Mainstreaming Disaster Risk Management
Adaptation of groundwater management	Monitoring, modelling and forecasting systems	Monitoring, modelling and forecasting systems
River rehabilitation and restoration	Dune restoration and rehabilitation	Dune restoration and rehabilitation
Adaptive management of natural habitats	Ocean pools	Adaptive management of natural habitats

APT D - Pathway

System Restructuring
high investment, high commitment to policy change

This policy direction embraces a pre-emptive fundamental change at every level in order to completely transform the current social-ecological and economic systems

Short-term (up to 2030)	Mid-century (up to 2050)	End-century (up to 2100)
Financial incentives to retreat from high-risk areas	Economic Policy Instruments (EPIs)	Economic Policy Instruments (EPIs)
Activity and product diversification	Activity and product diversification	Activity and product diversification
Water restrictions, consumption cuts and grey-water recycling	Water restrictions, consumption cuts and grey-water recycling	Water restrictions, consumption cuts and grey-water recycling
Drought and water conservation plans	Coastal protection structures	Coastal protection structures
Post-Disaster recovery funds	Pre-disaster early recovery planning	Pre-disaster early recovery planning
Monitoring, modelling and forecasting systems	Monitoring, modelling and forecasting systems	Adaptation of groundwater management

Vulnerability Reduction *Disaster Risk Reduction* *Socio-Ecological Resilience*

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- **Public awareness programmes:** establish targeted programmes that raise awareness about climate change (specific values and protection needs) among guides, site managers and local communities.
- **Activity and product diversification:** actions to diversify the tourism activities and products and aim to reduce seasonality and overload in infrastructures and ecosystems.
- **Economic Policy Instruments (EPIs):** incentives designed and implemented with the purpose of adapting individual decisions to collectively agreed goals. Different type of instruments: pricing, environmental taxes, subsidies; trading; and voluntary agreements.
- **Beach nourishment**: artificial placement of sand to compensate for erosion. Maintaining beach width (for tourism and recreation).
- **Desalination**: removing salt from sea or brackish water to make it useable for drinking, and can contribute to adaptation in circumstances of current or future water scarcity problems.
- **Local circular economy**: economic system aimed at eliminating waste and the continual use of resources for reduced carbon emissions from materials and increased resilience to climate change.
- **Water restrictions, consumption cuts and grey-water recycling**: Restrictions of certain uses of water to allow water administration services to cope with water crises. Grey-water recycling reuse to cover water use needs that don't demand such a high-quality.
- **Financial incentives to retreat from high-risk areas**: to retreat or relocate settlements, infrastructure and productive activities from the original location due to their high exposure to floods, sea-level rise and storm surges.

- **Drought and water conservation plans:** to reduce the economic, social, and environmental consequences of drought and water scarcity, reduce the loss of water and improve efficiency in the sector.
- **Coastal protection structures:** different types of artificial structures designed to protect the coast from sea level rise or storms.
- **Fire management plans:** actions with a wide range of application such as early warning detection, escape routes and advice to citizens and tourists, mobilization and suppression of damaging fires.
- **Health care delivery systems:** pre-emptive actions and adjustments, namely reinforcing less prepared aspects of its operation and/or logistics, in order to guarantee effectiveness and efficiency.
- **Post-Disaster recovery funds:** minimize the economic and social impacts (which may include future loss of the touristic destination attractiveness) that can occur in a post-disaster context.
- **Pre-disaster early recovery planning:** the development of knowledge, good practices that aim to improve the living conditions of the affected communities, while facilitating the adjustments necessary to reduce the risk of future disasters.
- **Mainstreaming Disaster Risk Management (DRM)**: plan and organize DRM along five stages including prevention, protection, preparedness, and response, recovery and review.

- **Monitoring, modelling and forecasting systems:** information system that provide timely and reliable climate information, up-to-date data on the occurrence and severity of extreme events, possible impacts and their duration.
- **Adaptation of groundwater management:** (1) conserve groundwater reservoirs, limiting water use and optimizing water reuse, and (2) restore or increase natural infiltration capacity.
- **Dune restoration and rehabilitation**: strengthening of the flood safety and sand reservoir functions of dunes. Erosion happens as a result of wind action, marine erosion, human activities and SLR.
- **River rehabilitation and restoration**: emphasise the natural functions of rivers and create vegetated buffer zones alongside watercourses. Improving micro-climatic conditions, reducing run-off and erosion, and increasing groundwater recharge.
- **Adaptive management of natural habitats**: preservation of ecosystem services which are essential for human well-being.
- **Ocean pools:** seawater pools located by the sea where waves can wash into the pool. These recreational structures are useful on SLR context, doubling as an additional protection of the coast and creating alternatives to beach leisure areas.

Vulnerability Reduction *Disaster Risk Reduction* *Socio-Ecological Resilience*

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APT A - Pathway

Minimum Intervention
low investment, low commitment to policy change

This policy trajectory assumes a no-regrets strategy where the lowest cost adaptation policies are pursued to protect citizens from some climate impacts

Short-term (up to 2030)	Mid-century (up to 2050)	End-century (up to 2100)
Social dialogue for training in the port sector	Social dialogue for training in the port sector	Awareness campaigns for behavioural change
Climate proof ports and port activities	Climate proof ports and port activities	Climate proof ports and port activities
Prepare for service delays or cancellations	Prepare for service delays or cancellations	Prepare for service delays or cancellations
Backup routes and infrastructures during extreme weather	Backup routes and infrastructures during extreme weather	Backup routes and infrastructures during extreme weather
Marine life friendly coastal protection structures	Marine life friendly coastal protection structures	Combined protection and wave energy infrastructures

APT B - Pathway

Economic Capacity Expansion
high investment, low commitment to policy change

This policy trajectory focuses primarily on encouraging climate-proof economic growth but does not seek to make significant changes to the current structure of the economy

Short-term (up to 2030)	Mid-century (up to 2050)	End-century (up to 2100)
Financial incentives to retreat from high-risk areas	Financial incentives to retreat from high-risk areas	Insurance mechanisms for ports
Social dialogue for training in the port sector	Social dialogue for training in the port sector	Social dialogue for training in the port sector
Sturdiness improvement of vessels	Sturdiness improvement of vessels	Increase operational speed and flexibility in ports
Climate proof ports and port activities	Climate proof ports and port activities	Consider expansion/retreat of ports in urban planning
Marine life friendly coastal protection structures	Combined protection and wave energy infrastructures	Combined protection and wave energy infrastructures
Coastal protection structures	Hybrid and full electric ship propulsion	Hybrid and full electric ship propulsion

APT C - Pathway

Efficiency Enhancement
medium investment, medium commitment to policy change

This policy direction is based on an ambitious strategy that promotes adaptation consistent with the most efficient management and exploitation of the current system

Short-term (up to 2030)	Mid-century (up to 2050)	End-century (up to 2100)
Social dialogue for training in the port sector	Social dialogue for training in the port sector	Awareness campaigns for behavioural change
Climate resilient economy and jobs	Diversification of trade using climate resilient commodities	Climate resilient economy and jobs
Refrigeration, cooling and ventilation systems	Refrigeration, cooling and ventilation systems	Restrict development and settlement in low-lying areas
Climate proof ports and port activities	Climate proof ports and port activities	Consider expansion/retreat of ports in urban planning
Reinforcement of inspection, repair and maintenance of infrastructures	Early Warning Systems (EWS) and climate change monitoring	Early Warning Systems (EWS) and climate change monitoring
Marine life friendly coastal protection structures	Marine life friendly coastal protection structures	Combined protection and wave energy infrastructures
Coastal protection structures	Coastal protection structures	Hybrid and full electric ship propulsion
Integrate ports in urban tissue	Integrate ports in urban tissue	Ocean pools

APT D - Pathway

System Restructuring
high investment, high commitment to policy change

This policy direction embraces a pre-emptive fundamental change at every level in order to completely transform the current social-ecological and economic systems

Short-term (up to 2030)	Mid-century (up to 2050)	End-century (up to 2100)
Financial incentives to retreat from high-risk areas	Financial incentives to retreat from high-risk areas	Financial incentives to retreat from high-risk areas
Social dialogue for training in the port sector	Social dialogue for training in the port sector	Social dialogue for training in the port sector
Refrigeration, cooling and ventilation systems	Restrict development and settlement in low-lying areas	Restrict development and settlement in low-lying areas
Climate proof ports and port activities	Consider expansion/retreat of ports in urban planning	Climate proof ports and port activities
Post-Disaster recovery funds	Backup routes and infrastructures during extreme weather	Backup routes and infrastructures during extreme weather
Marine life friendly coastal protection structures	Combined protection and wave energy infrastructures	Combined protection and wave energy infrastructures

Vulnerability Reduction *Disaster Risk Reduction* *Socio-Ecological Resilience*

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 776661.

- **Social dialogue for training in the port sector:** training into social and educational issues related with the gender equality and attracting the young to the sector, while tackling climate change. Facing and how the industry is adapting to change and preparing for the future.
- **Awareness campaigns for behavioural change:** increase individuals and organisations' knowledge about climate change and the risk faced by the maritime transport sector.
- **Financial incentives to retreat from high-risk areas:** relocate settlements, infrastructure and activities from the original location due to their high exposure to flood, sea-level rise and storm surges.
- **Insurance mechanisms for ports:** risk-sharing schemes that aim to assist port operators in responding to the climate risks they are enabled to reduce. Insurance outsources the risks to a third party in exchange for a regular financial compensation.
- **Sturdiness improvement of vessels:** improve the strength of vessels to sea storms while decreasing the noise and increasing efficiency. Wave-induced loads on the ship structures are a major concern in hull design process. Ship owners should prefer designs that allow for more demanding wave regimes (for instance including the survivability to rouge waves).
- **Increase operational speed and flexibility in ports:** increase the attractiveness of ship transport in order to capture more freight and passenger movement. Faster operations also reduce the effects of heat waves on goods and people as well as decarbonise the economy.
- **Climate resilient economy and jobs:** to shift the economy and jobs towards a more climate resilient society. Perishable goods and some critical services rely heavily on the marine transport which can be affected by unpredictable extreme weather events.
- **Diversification of trade using climate resilient commodities:** to reduce dependency on trade of perishable goods and critical services, create larger stocks of goods that are climate resilient and consider whether is economically feasible, strategically justifiable and equitable.
- **Refrigeration, cooling and ventilation systems:** improve efficiency in order to reduce costs in warmer weather and maintain operations during heat waves. Ensuring the safety of passengers and workers, and manage goods that need low temperatures
- **Restrict development and settlement in low-lying areas:** assure that ports are not further developed in low-laying areas exposed to sea level rise. Planning must consider the long-term potential risks.

- **Climate proof ports and port activities:** investments that consider specific climate change projections to manage future risks in port infrastructures and improve operational safety conditions.
- **Prepare for service delays or cancellations:** promote the creation of new procedures, alternative options and channels to sell goods and transport passengers, as well as better communication to deal with delays or cancellations.

- **Backup routes and infrastructures during extreme weather:** create a post disaster response that ensures available alternatives when the main ports are damaged or inaccessible due to extreme weather events. It considers alternative ports and access roads.
- **Consider expansion/retreat of ports in urban planning:** to consider the expansion or reallocation of areas for future maritime transport infrastructures due to climate change risks.
- **Reinforcement of inspection, repair and maintenance of infrastructure:** adapt monitoring to a new climate context. Changes in the frequency and/or intensity of storms, SLR or temperature, for example, may have impacts in infrastructure.
- **Early Warning Systems (EWS) and climate change monitoring:** to assesses climate risks and relay that information to decision makers, companies utilities and the general public in real time. Transport operators should integrate this tool in procedures in order to protect the safety of people and goods.
- **Post-Disaster recovery funds:** the creation of recovery funds for the maritime transport sector to recover after disasters, through initiatives that get the economy up and running quickly while building-back-better. The aim is to minimize the economic and social impacts that can occur in a post-disaster context.

- **Marine life friendly coastal protection structures**: constructed with materials that maximize the fixation of marine organisms. Reducing climate change impacts on local ecosystems, provides water waste depuration and water quality bio-indicators inside the ports.
- **Combined protection and wave energy infrastructures**: combines sea protection structures with wave energy production. This can create economies of scale, increase coastal protection and further decrease wave propagation inside the port during normal operations.
- **Coastal protection structures**: groynes, breakwaters, artificial reefs and seawalls built in the shoreline, designed to protect the coast from sea level rise or storms, can be used to, e.g. drift and trap sediments, protect from erosion, absorb wave energy, or allow navigation.
- **Hybrid and full electric ship propulsion**: environmentally friendly for marine life, decreases carbon emissions and can increase ship manoeuvrability which is useful in small ports and under difficult weather conditions.
- **Integrate ports in urban tissue**: opening port areas to other activities, namely cultural, while gaining room in the urban landscape. This allows some port activities to be pooled from low-laying areas while leisure and cultural activities can access more waterfront space.
- **Ocean pools:** Ocean pools are situated 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 a response to SLR, protect the coast and create alternatives to beach leisure areas.

Vulnerability Reduction *Disaster Risk Reduction* *Socio-Ecological Resilience*