Project co-financed by the European Regional Development Fund

ANNEX

SWOT ANALYSIS FOR BLUE ENERGY POTENTIAL IN GREECE[1]

[1] The SWOT analysis presented here is part of the BE potential report for Greece conducted by Aristotle University of Greece. partner of MAESTRALE project, funded by the Interreg MED 2014-2020 Programme and co-financed by the European Regional Development Fund

SWOT analysis for Wave Energy

Strengths

Aspect	Strengths
Socio/ Economic (incl. stakeholders &SMEs)	• growing interest in creating infrastructure for energy self-sufficiency in Greek not interconnected islands (NNI) • emerging interest on blue energy ventures (e.g. blue growth competitions)
Legislation/ Funding	• funding potentials through partnership Agreement for Greece 2014 - 2020 • competitions for funding blue economy startups
Environment	• extended coastline • large number of islands in which energy plants could be implemented for energy self-efficiency • not a lot marine protected areas
Technology	• the current energy demand is not met by domestic power production, therefore there is need for new initiatives
Energy Potential	• increased wave energy potential due to specific climate conditions in greek territory • large number of ports and marinas could host the necessary power conversion facilities/plants

Weaknesses

Aspect	Weaknesses
Socio/ Economic (incl. stakeholders &SMEs)	• “not in my back-yard” attitude on adoption of new technologies in local societies • unstable tax system • time-consuming administrative procedures for licensing, construction and operation
Legislation/ Funding	• lack of specific national regulation supporting the establishment of wave energy plants • 6 nautical mile territorial sea limits siting opportunities for offshore wave energy plants. • there are no maritime spatial plans for the time being
Environment	• bathymetry in many sites does not allow the construction of certain types of wave energy technologies due to foundation limitations • legislation restrictions for constructions on

	foreshore zones may limit possible sites for onshore power conversion units • Dense shipping lines associated with the large numbers of greek islands, might affect other coastal economic activities
Technology	• many islands are not connected to grid, therefore the energy generated cannot exceed local power demand • equipment for wave energy plants is not produced currently in Greece
Energy Potential	• High seasonal variability in energy potential

Opportunities

Aspect	Opportunities
Socio/ Economic (incl. stakeholders &SMEs)	• job creation opportunities • strengthening awareness about new types of RES • cost-effective energy production • less interference with already established activities (e.g. fisheries, shipping) compared to other technologies • RES as a means of power generation can support the creation of new businesses in this sector
Legislation/ Funding	• Form of energy that complies achieving the "European 20-20" and "Europe 2030" strategies goals on gas emission reduction. • can create momentum for the development of a clearer regulatory framework on BE • European Directive for RES exploitation
Environment	• clean form of energy, creating no waste in the energy production process • Reduction of fossil fuel usage • Reduction of CO2 emissions
Technology	• minimal visual impact on surrounding landscape compared to other technologies (e.g. offshore wind farms)
Energy Potential	• Wave energy potential is more predictable related to other forms of Blue RES • can increase energy self-sufficiency for the country based on RES instead of fossil fuels.

Threats

Aspect	Threats

Socio/ Economic (incl. stakeholders &SMEs)	• existing power companies may have conflicting economic interests • construction of energy plants near touristic sites may affect local economies • possible visual impact
Legislation/ Funding	• since the funding schemes that blue energy plants are very vaguely worded, they may not be eligible • lack of defined maritime navigation routes.
Environment	• impact on marine ecosystems
Technology	• many technologies are still in an infant stage and therefore not fully commercialized
Energy Potential	• Possible decrease of potential energy due to climate change

SWOT analysis for tidal current

Strengths

Aspect	Strengths
Socio/ Economic (incl. stakeholders &SMEs)	• interest in blue energy plants • type of energy better accepted in societies with NIMB attitude • since Greek government encourages ventures that reinforce competitive inland market, blue RES are an opportunity. •
Legislation/ Funding	• funding potentials through partnership Agreement for Greece 2014 – 2020 • Reduction of fossil fuel usage • Reduction of CO_2 emissions •
Environment	• not a lot marine protected areas
Technology	• Numerous tidal devices
Energy Potential	• high predictability of tidal and sea currents

Weaknesses

Aspect	Weaknesses

Socio/ Economic (incl. stakeholders &SMEs)	• Not well known technology may rise conflict among social groups • lengthy construction period is a major investment disincentive
Legislation/ Funding	• Lack of specific legislation for the development of tidal/ sea current energy plants. • Lack of maritime spatial plans
Environment	• Steep slope of Greek seas bathymetry may spatially restrict the installation of tidal farms.
Technology	• Although tidal barrages could provide substantial electrical power, they are expensive in terms of capital cost
Energy Potential	• can be applied to a few sites nationwide

Opportunities

Aspect	Opportunities
Socio/ Economic (incl. stakeholders &SMEs)	• Compared to other RES technologies it is more likely to cause less conflicts and even make possible the establishment of synergies with already existing activities, due to the fact that the turbines are submerged. • Does not have a negative impact on tourism, thanks to the lack of visual impact. • Employment opportunities
Legislation/ Funding	• As it is not a common technology for the Mediterranean area, funding of pilot projects and plants is possible. • Reduction of fossil fuel usage • Reduction of CO_2 emissions • European Directive for RES exploitation
Environment	• Submerged turbines have no visual impact
Technology	• New territories for refining existing technologies in seas with lower tidal currents
Energy Potential	• Stable

Threats

Aspect	Threats

Socio/ Economic (incl. stakeholders &SMEs)	• Disagreements from the nearby residents • Lack of funding • Economic climate in Greece
Legislation/ Funding	• no relative legislation • lack of defined maritime navigation routes.
Environment	• environmental impact of tidal technology on marine ecosystems has not been extensively studied.
Technology	• possible impact on shipping depending on safety margin clearance necessary for the operation of the tidal plant • many technologies are still in an infant stage and therefore not fully commercialized
Energy Potential	• Competition from other BE technologies • Rapid technology change

SWOT analysis for wind energy

Strengths

Aspect	Strengths
Socio/ Economic (incl. stakeholders &SMEs)	• Most exploitable technology • Numerous technologies that can be used • Already exploitation of onshore wind farms • Interest from investors
Legislation/ Funding	• funding potentials through partnership Agreement for Greece 2014 – 2020 • Reduction of fossil fuel usage • Reduction of CO_2 emissions •
Environment	• Technologies that are suitable for different environmental parameters • Extensive coastline
Technology	• Well tested technology • Numerous technologies that can be used according to specific parameters
Energy Potential	• High wind energy potential

Weaknesses

Aspect	Weaknesses
Socio/ Economic (incl. stakeholders &SMEs)	• Visual impact • Noise • Reactions from nearby residents regarding economic impact in the area, since all islands in Greece are based in tourism
Legislation/ Funding	• There are not existing or upcoming funding schemes in national and EU level related to the construction of commercial offshore energy production sites. • There is not any national legislation for Blue Energy, this may cause delays of the licensing of any possible project. • Lack of maritime spatial plans
Environment	• Impact on birds and particular on migration flow
Technology	• Steep bathymetry allows the exploitation of more costly technologies
Energy Potential	• Seasonal variability

Opportunities

Aspect	Opportunities
Socio/ Economic (incl. stakeholders &SMEs)	• Employment opportunities as well as in construction and maintenance • Tourist attractions
Legislation/ Funding	• European Directive for RES exploitation
Environment	• Exploitation of areas with steep bathymetry
Technology	• Technologies that can be installed in areas with steep bathymetry as well as in more shallow areas
Energy Potential	• Exploitation of floating wind turbines for areas with steep bathymetry

Threats

Aspect	Threats

Socio/ Economic (incl. stakeholders &SMEs)	• Installation cost • Maintenance cost • Impact in tourism • Impact in marine traffic • Possibility of sea accidents due to lack of lack of defined maritime navigation routes
Legislation/ Funding	• No specified existing legislation for offshore wind exploitation • lack of defined maritime navigation routes.
Environment	• Impact on mammals and birds
Technology	•
Energy Potential	• Lack of ad hoc studies

SWOT analysis for Algae

Strengths

Aspect	Strengths
Socio/ Economic (incl. stakeholders &SMEs)	• emerging interest on blue energy ventures (e.g. blue growth competitions) • the market for fuel can be described as "binary"- a vision in which there is unlimited demand for the product once available
Legislation/ Funding	• Existing funding schemes for fuels produced from biomass
Environment	• extended coastline • variety of kinds of water in which algae could be cultivated • impact on marine ecosystems • fast cultivation • need of smaller area for cultivation
Technology	• turn for biofuel production • Can be cultivated • Existing technologies for cultivation that can be used • Plethora of technologies that can be exploit for suitability
Energy Potential	• Concerning biogas production as a transport biofuel • Possess a fast growing potential as they can complete an entire growing cycle every few days

Weaknesses

Aspect	Weaknesses
Socio/ Economic (incl. stakeholders &SMEs)	• "not in my back-yard" attitude on adoption of new technologies in local societies • unstable tax system • Mineral nutrients are a substantial cost
Legislation/ Funding	• lack of specific national regulation supporting the exploitation of algae • there are no maritime spatial plans for the time being
Environment	• Protected areas near rivers (Delta areas) may restrain the exploitation
Technology	• The selection of species must balance the requirements for biofuel production and extraction of valuable by-products • Further investments in Technologies such as photobioreactors to use sea water that can have economic and environmental implications. • Still commercially immature technology–not many large scale companies in production.
Energy Potential	• There is a need to develop techniques for growing a single species, reducing evaporation losses and increasing the utilization of CO_2 • Extraction and processing still expensive compared to other biofuels.

Opportunities

Aspect	Opportunities
Socio/ Economic (incl. stakeholders &SMEs)	• job creation opportunities
Legislation/ Funding	• European Directive for RES exploitation
• Environment	• Reduction of fossil fuel usage • Reduction of CO_2 emissions • As algae consume carbon dioxide as they grow, they could be used to capture CO_2 from power stations and other industrial plants that would otherwise go into the atmosphere. • Pollution is minimized if industrial wastes are transferred to algae production medium
• Technology	• In addition to energy products, algae from open ponds can be for production of fertiliser, soil amendment, platform and fine

	chemicals. • Integrated algae-based biorefinary model could be adopted.
• Energy Potential	• Onsite renewable heat production may have be eligible for government financial support, for certain technologies

Threats

• Aspect	• Threats
• Socio/ Economic • (incl. stakeholders &SMEs)	• Alternative biofuel production technologies are more cost effective than energetic algae and as such more attractive for investors • If future demand for biofuels falls radically this industry could face bankruptcy. • Market and societal acceptance still unclear.
Legislation/ Funding	• since the funding schemes that blue energy plants are very vaguely worded, they may not be eligible • lack of defined maritime navigation routes.
Environment	•
Technology	• many technologies are still in an infant stage and therefore not fully commercialized • Diffusion difficulties: the large number of competing fuels could delay algal biofuels to achieve high growth on the basis of cost.
Energy Potential	• Possible decrease of potential energy due to climate change / environmental conditions