Roadmap and recommendations for the development of integrated Coastal Energy systems in Italy and Croatia

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Abbreviations

BE	Blue Energy
CMU	Community of Mediterranean Universities
CCIACHPE	Chamber of Commerce of Chieti-Pescara
DURA	Dubrovnik development agency
EMFF	European Maritime and Fisheries Fund
ERDF	European Regional Development Fund
HP	Heat Pump
IRENA	Istria Regional Energy Agency
LCOE	Levelized Cost of Energy
NGO	Non-governmental Organization
NPV	Net Present Value
O&M	Operation and Maintenance
R&D	Research and Development
SDEWES	International Centre for Sustainable Development of Energy, Water and Environment Systems
SECAP	Sustainable Energy and Climate Adaptation Plan
SME	Small and Medium Enterprises
SWHP	Seawater Heat Pump
TRL	Technology Readiness Level
UNICAM	University of Camerino
UN00I0UD	University of Udine
WEC	Wave Energy Convert

1. Introduction

1.1 About the project

The project aims to foster the creation of a favourable environment for more significant deployment of devices designed to harness the Blue Energy (BE) potential. The project is focused on wave and thermal energy converters, which can be integrated into coastal and ports infrastructure. Therefore, the project will seek to produce a joint strategy and build a common knowledge framework that could initiate the dialogue among various stakeholders to boost investments in Blue Energy projects. Since installing such devices impacts local marine and ecosystems and the landscape, the inclusion of citizens, maritime-related activities, and public authorities are inevitable. This is done by establishing local coastal HUBs on BE, which aims to initiate discussion on benefits and opportunities that may arise from the utilisation of BE potential. Besides, cross-border cooperation between Italy and Croatian partners from both sides of the Adriatic Sea aims to promote the exchange of good practices and enable knowledge transfer and know-how. Therefore, international cooperation and action on the national level through coastal HUBs aim to define and share a common strategy to foster sustainable exploitation of marine renewable energy. A multi-level approach that connects different stakeholders should help in overcoming existing regulatory, environmental and social barriers by fostering mutual discussion to find a common interest and strategy.

2 National legislation for RES and seawater in Adriatic area

2.1 EU policies

The European reference regulation for the promotion of the use of energy from renewable sources is the EU 2009/28/CE Directive, which sets a common framework for the Member States. It sets targets for all EU countries with the overall aim of making renewable energy sources account for 20 % of EU energy and 10 % of energy specifically in the transport sector by 2020, obliges the Member States to design national action plans for 2020, setting a share for renewable energy sources in transport, heating and the production of electricity; it sets a renewable-energy exchange scheme to help EU countries to achieve targets cost-effectively and obliges the Member States to guarantee the origin of electricity, heating and cooling produced from renewable energy sources, and to build the necessary infrastructure for using renewable energy sources in the transport sector. For the specific Blue Energy sector, Directive 2014/89/EU is also relevant, which establishes a framework for the implementation of maritime spatial planning and integrated coastal management by the Member States aimed at promoting the sustainable growth of maritime economies, the sustainable development of marine areas and the sustainable use of marine resources.

2.2 National policies (including support to technological innovation, MSP and CZM)

2.2.1 Italy

Italy prioritised and incentivised the deployment of renewable energies by adopting a set of rules and regulations, which transposed the EU 2009/28/CE Directive into the Italian national legislation. The principles and the objectives of such regulatory framework are summarised in the National Action Plan for Renewable Energies of 2010 [1], followed in 2013 by the National Energy Strategy [2]. The former also reports the relevant Italian legislation already in force at the time and classifies legislative acts as to their compliance to specific indications of the transposed Directive, according to the following categories:

- Measures in compliance with Articles 13, 14, 16 and 17 to 21 of the cited Directive (Administrative procedures, regulations and codes)
- Measures favouring the production of electrical power from renewable sources
- Measures favouring the utilisation of renewable energies in heating/cooling systems
- Measures favouring the utilisation of renewable energies in the transport sector
- Specific measures aimed at promoting energy use of biomass
- Statistical transfers between the Member States and joint projects between member states and the Member States and third countries

The latest indications and regulatory measures for the operative implementation of the National Strategy and Plan have been issued in D.M. 23/06/2016. Relevant national legislation that transposes the EU 2009/28/CE Directive (up to 2013) is available at http://eur-lex.europa.eu/.

Measures currently in force that are relevant to the Blue Energy sector are summarised below.

- Administrative procedures, regulations and codes
  General framework
  The general framework of the Italian legislation governing the energy sector is delineated in D.Lgs. 112/1998, which transferred to Regions the related administrative functions, with the exception of those explicitly attributed to the National Government or delegated to local authorities, while the legislative power on the subject was kept under the exclusive competence of the National Government. With specific reference to renewable energy sources, Constitutional Law 3/2001 modified the repartition of competences between the National Government and Regions and attributed the subjects of the national production, transport and distribution of energy to the concurrent legislative powers of the National Government and of the Regions. It is, therefore, the prerogative of the National Government to establish the fundamental principles of each subject through the national legislative acts and that of the Regions to exert their legislative power in the

constraining framework of such principles, as explicitly determined by the National Government. Additional constraints are represented by EU Directives and by the National Government has sole competence on transversal subjects, such as the protection of the environment and competition. Regions are responsible for the regulative and administrative functions that are not explicitly attributed to local authorities or the National Government. For offshore energy production from renewable sources, D.Lgs. 387/2003 constitutes the main reference, in particular Art. 12 and its subsequent amendments. In accordance with the current repartition of functions, each region legislated and regulated energy through specific acts listed, together with the relevant national legislation, in Appendix 4.2.1.A to the National Action Plan.

Authorisation procedure

The simplified authorisation procedure for energy production from renewable sources currently in force was introduced via D.Lgs. 387/2003, which transposed EC Directive 2001/77/EC. In particular, Art. 12 of D.Lgs. 387/2003 and its subsequent amendments prescribe that the construction and operation of such plants, as well as their modification, upgrade, total or partial restoration, reactivation, and necessary works and/or infrastructures and interconnection facilities, are subject to a single authorisation (*autorizzazione unica*), which is issued by a single responsible authority. Nevertheless, such authorisation must comply with the legislation in force as to the protection of the environment, of the landscape, and of cultural heritage, and it must undergo a complex administrative procedure designed to ensure the involvement and coordination of all the authorities and administrative bodies that represent and protect the different and diverse public interests involved. Therefore, the authority responsible for the authorisation is to convene the *Conferenza dei Servizi* (Conference of Services), an assembly introduced via L. 241/1990, where the potentially concerned institutions, administrations and representative bodies are summoned in order to examine and evaluate the proposed project jointly. According to the prevailing position, a final argument resolution is then taken within 180 days from the application. The juridical expression *prevailing position* can be a matter of interpretation, as the single position of each participant in the Conference needs to be weighed by the authority each possesses to condition or bind the authorisation procedure, according to the legislation in force. Once issued, the single authorisation replaces the several permits and licenses required under the old regulatory regime.

In the case of offshore installations, the single authorisation is issued by the Ministry of Transport and Infrastructures (*Ministero delle Infrastrutture e dei Trasporti*), upon approval by the Ministry

of Economic Development (*Ministero dello Sviluppo Economico*) and by the Ministry of *Environment* (*Ministero dell'Ambiente e della Tutela del Territorio e del Mare*), having been granted rights to the use of state owned maritime properties and sea waters (according to the provisions of Art. 36 of the *Codice della Navigazione* – Marine Traffic Regulations), and having been examined and passed by the *Conferenza dei Servizi*. As the deployment of public maritime property and sea waters with the scope of energy provision also falls under the Italian national administrative jurisdiction and is not the object of concurrent legislation (according to the provisions of Art. 28, 29, 30, 31 and 105 of D.Lgs. 112/1998, and of Art. 1 of L. 239/2004), single Regions cannot oppose the installation of plants off their coast once the authorisation is issued, as confirmed by the *Consiglio di Stato* (i.e. Council of State, a constitutional body that ensures the legality of public administration, having both jurisdictional and consultative functions), with sentence n. 3252, July 1st 2015. Therefore, the authorisation permits sponsors to proceed with the works and operate the plants according to the project approved, in compliance with the prescribed requirements and reporting obligations that guarantee the safety and consistency of the national power system and the protection of the environment. The single authorisation also determines the decommissioning and site restoration requirements and the deadlines for the initiation and completion of the works, whose expiration will cause the same authorisation to lapse.

However, despite the described simplification effort, the process the application undergoes, from its submission to its final approval or rejection, can turn out to be less straightforward than expected, and its time frame is difficult to anticipate. Despite the identification of unique responsible authority, the applicant is required to submit their application to all three competent Ministries, while a parallel application to be granted rights to the use of state-owned maritime properties and sea waters is to be submitted to the *Ministero delle Infrastrutture e dei Trasporti.* In all cases, applications must be accompanied by the preliminary project, which must include a budget analysis for the necessary electrical connections issued by the national electric network operator, according to Resolution ARG/elt 99/08, Art. 6 and 21, of the Authority for Electricity and Gas. With reference to the necessary linear infrastructures, the preliminary project must also explicitly indicate the potentially concerned areas subject to pre-established confiscation constraints, buffer zones, and the necessary protection measures.

As a matter of fact, the application submission to the *Ministero dell'Ambiente e della Tutela del Territorio e del Mare* is delayed by the eventual completion of a positive preliminary evaluation process for the granting of rights over maritime properties, as it must be accompanied by the final project**,** accounting for the revisions and indications emerged during the evaluation process for

the granting of such rights, by the related environmental impact study (Studio di Impatto Ambientale – S.I.A.), and by a list of the granted authorisations, together with a non-technical, easily reproducible, description of the proposed project and of its expected impact on the environment, that can be easily comprehended by the general public. The applicant is allowed 60 days to prepare and submit such documentation. The *Ministero dell'Ambiente, del Territorio e della Tutela del Mare* then issues the *Valutazione di Impatto Ambientale* (V.I.A. - Environmental Impact Assessment). The time required for issuing the V.I.A. goes from a minimum of 150 days to a maximum of 330, should additional studies be required. These intervals are to be added to the time already elapsed in assessing the feasibility of the electric connections and the technical time necessary for granting rights to the use of state-owned maritime properties and sea waters (approximately limited to 75-90 days altogether).

On receiving approval by the Ministero dell'Ambiente through a positive V.I.A., within 30 days, the Ministero delle Infrastrutture e dei Trasporti summons the Conference of Services in order to evaluate the application, and, in the case of a favorable prevailing position, issues the authorisation within 90 days (reduced from the former 180 days via D.Lgs. 28/2011). Although the starting date for the computation of such term is virtually that of the application submission, time limits are suspended until the V.I.A. is issued and the formal Act granting rights over maritime properties is obtained. The total duration of the process can be well over a year.

Due to the nature and the complexity of the matter, a variety of public bodies, administrations, and stakeholders are liable to be concerned and therefore to participate in the authorisation process, ranging from Regions to municipalities, to the *Uffico del genio Civile per le Opere Marittime* (Marine Civil Engineering Department), to the *Circoscrizione doganale* (District Customs Bureau), to any other concerned administrative body or authority, that in force of legislation and/or regulation is entitled to represent specific public interests. The reason for such broad engagement is that the interests and values at stake are multifaceted, possibly intertwined, although often competing, so that the decision process must be fully participatory, achieving the best balance between all the goals and constraints. Among these, the protection of fisheries, the preservation of landscape values, the safeguard of public security and health, the respect of hydrogeological constraints, the conservation of submerged archaeological sites and protected areas.

Regulation of information, policy guidance and training (art. 14, par. 1, 2 and 4)

D. Lgs. 28/2011 ordered the creation of a web portal to serve as a national reference for information as to renewable energy and energy efficiency. Information as to authorisation

procedures is also released through the portal. The Gestore dei Servizi (GSE - Authority for Energy Services), is responsible for the management of the portal [3], and for the publication of the annual report on national, regional and local authorisation procedures, whose effectiveness is to be constantly monitored (according to the provisions of D.M. 10/9/2010), in order to identify best practices and improve current regulations.

Technical measures

In compliance with the EU 2009/28/CE Directive, a number of technical measures and regulations were also defined and are constantly monitored and upgraded, including technical specifications for the plants, the related infrastructures, storage facilities, the electrical connections and the distribution grid functioning. Measures for the development of infrastructures for district heating and cooling are also envisioned.

Promoting the production of electrical power from renewable sources

A variety of financial measures were introduced, monitored and updated in order to promote and sustain the production and utilisation of renewable energy. Among these, green certificates, feed-in tariffs, and measures introduced via D.M. July 6th 2012 [4].

2.2.2 Croatia

In Croatia, there are no specific policies and authorisation procedures for building offshore infrastructures for the exploitation of Blue energy. Actual laws regulate the use of renewable energy sources (RES) with only a few references to Blue energy. Several legislation documents exist which are responsible for RES and RES integration into the energy system. The most important national legislation documents related to RES projects, and in that way also to Blue energy projects, are following:

- **Energy Act (Official Gazette 120/12, 14/14, 95/15, 102/15)**

  The Act regulates measures for the safe and reliable supply of energy and its efficient production and use, acts establishing and pursuant to which energy policy and energy development planning are implemented, execution of energy activities, on the market or as public services, and fundamental issues in the execution of energy activities.

  Under Article 3, Point 17, the renewable energy sources are named, and these include renewable non-fossil energy sources (aerothermal, biomass, **sea energy, wind energy,** hydropower, geothermal and hydrothermal energy, gas from landfills, gas plant for wastewater treatment and biogas, solar energy).

Under Article 4, Point 1 states that the locations for construction of energy facilities that are explored and registered in the state spatial plans are of interest for the Republic of Croatia. Under the same Article, Point 2 it states that the construction of energy facilities, maintenance and use of these energy activities are of interest to the Republic of Croatia.

- **Regulation of Energy Activities Act (Official Gazette 120/12)**

  The Act regulates the establishment and implementation of the regulation system for energy activities, the process of establishment of the body for energy regulation, and other issues of importance for energy regulation.

- **Electricity Market Act (Official Gazette 22/13, 95/15, 102/15)**

  The Act regulates the manner of performing energy activities in the areas of electricity and the production of electricity, the transmission of electricity, distribution of electricity, supply of electricity and organisation of the electricity market.

  The Act governs the Energy approval for a new production facility. The production facilities can be built by a legal or private entity if the intended production facility meets the criteria laid down in the procedure for issuing energy approval. The criteria for the procedure for issuing energy approval for the construction of production facilities are public and are based on the principles of objectivity, transparency and impartiality.

- **Rules of the Electricity Market Act (Official Gazette 135/06, 146/10, 90/12)**

  The Act regulates the rules of the Croatian Electricity Market.

- **The renewable energy sources and high-efficiency cogeneration Act (Official Gazette 100/15)**

  The Act regulates the planning and encourages the production and consumption of electricity produced using renewable energy sources and high-efficiency cogeneration. The Act establishes measures to encourage the production of electricity using renewable energy sources and high-efficiency cogeneration, governs the implementation system to encourage the production of electricity from renewable sources energy and high-efficiency cogeneration, regulates the issues of construction of plants for the production of electricity from renewable energy sources and high-efficiency cogeneration on state land. The Act further regulates the keeping of the register of renewable energy sources and high-efficiency cogeneration projects, project developers and privileged producers of electricity from renewable energy sources and high-efficiency cogeneration, regulates the issue of international cooperation in the field of renewable energy and other issues of importance for the use of renewable energy sources and high-efficiency cogeneration.

The Act governs the planning, design, construction, use, maintenance and removal of production facilities and production units that produce electricity from renewable energy sources and high-efficiency cogeneration. The Act stipulates that in an appropriate manner, the provisions of the regulations governing the protection of the environment and nature protection and preservation of cultural goods, state aid, spatial planning, construction, electricity market, concession, maritime domain, water management, the pursuit of economic activities, the right ownership and other related rights and the provisions of other regulations.

Under Article 4, Point 11, the renewable energy sources are named, and these include: aerothermal, biomass, energy from bio-liquids, **sea energy**, hydropower, **wind energy**, geothermal and hydrothermal energy, gas from landfills, gas from wastewater treatment and biogas, solar energy and a biodegradable fraction of certified waste for energy production in an economically viable manner in accordance with the regulations of the administrative area of environmental protection.

- **Ordinance on the status of privileged electricity producer (Official Gazette 88/12)**

  The Ordinance establishes conditions for acquiring the status of privileged electricity producers which may be acquired by a project holder or producer simultaneously producing electricity and heat, uses waste or renewable energy sources for electricity production in an economically viable manner in compliance with environmental protection.

- **The tariff system for electricity produced from renewable energy sources and Cogeneration (Official Gazette 63/12, 121/12, 144/12)**

  The Tariff System for the production of electricity from renewable energy sources and cogeneration regulates the right of privileged producers of electricity to an incentive price of electricity paid by the market operator for the electricity produced and delivered from plants using renewable energy sources and cogeneration plants, excluding its own consumption.

  Power plants using blue energy for power generation are included in the tariff system under the designation of **other power stations on renewable energy**.

- **Thermal Energy Market Act (Official Gazette 80/13, 14/14, 102/14, 95/15)**

  The Act regulates measures for a safe and reliable supply of thermal energy to the thermal systems to be used for heating and cooling. It regulates the conditions for obtaining concessions for the distribution of thermal energy, or the concession for the construction of the distribution network, policies and measures for the safe and reliable thermal energy production, distribution and supply

to the heating and cooling system, and measures to achieve energy efficiency in heating and cooling systems.

Under Article 4, Point 3, it is stated that the use of renewable energy as a source of thermal energy is in the interest of the Republic of Croatia.

Related to the production of thermal energy, Article 15, Point 2 states that the energy entity using cogeneration units and using waste, biodegradable waste or **renewable energy sources for the production of thermal energy** in an economically viable manner, in accordance with the regulations governing environmental protection and waste management, may gain the **status of privileged producer** of electrical and thermal energy.

- **Physical Planning Act (Official Gazette 153/13)**

  The Act regulates the physical planning system: aims, principles and subjects of physical planning, spatial monitoring and monitoring in the field of physical planning, spatial planning requirements, adoption of the Spatial Development Strategy of the Republic of Croatia, spatial plans including their development and adoption procedure, implementation of spatial plans, building land development, property postulates of building land, development and supervision.

  As can be noted from the Croatian legislation, in order for a natural or legal person to be granted with a concession on the maritime demesne, e.g. the right for exploitation of maritime demesne, and to carry out the activities with respect to blue energy, rules set up by spatial plans need to followed and respected. However, the current spatial plans (county or national) do not predict any blue energy installations on the Croatian maritime demesne, and therefore cannot be implemented.

  In the following, Figure 1 depicts the plan for future energy-related infrastructure locations, preserved natural locations and international waterways inside Croatian territorial waters. As can be noted, there are no predicted maritime demesne areas for blue energy installations.

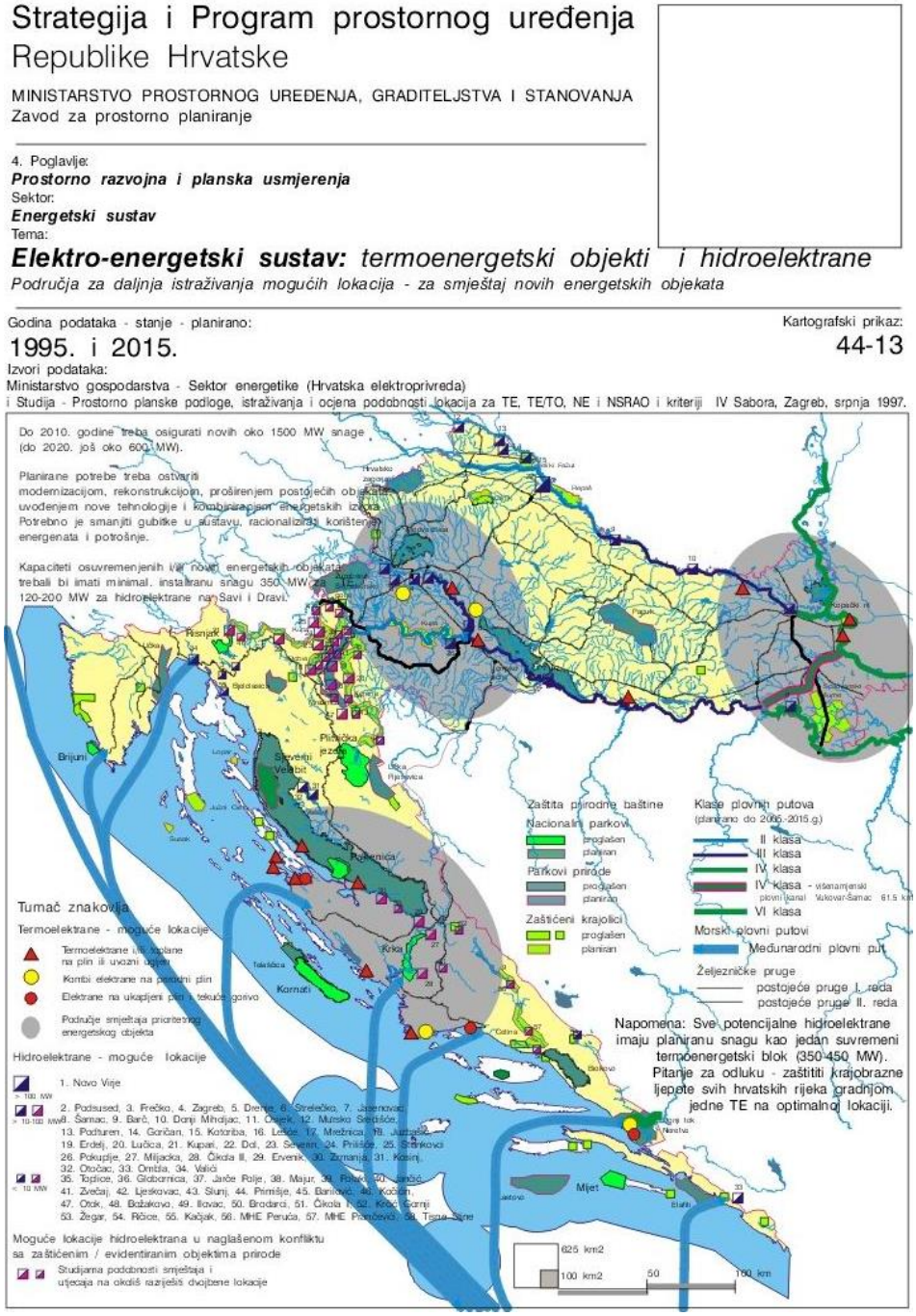

Figure 1. Spatial planning Strategy of the Republic of Croatia, Croatian energy system – Plan for future energy-related infrastructure locations [5].

3 Action plans to integrate Blue Energy on policy priorities

Actions plans at local levels (national) and one at the Mediterranean level were designed to prioritise Blue energy in Policy at the Regional, National and MED levels, integrating Blue energy to Regional Innovation Strategies (RIS3), Operational Programmes and National Strategies and Maritime Spatial Plans.

This activity included the examination of existing regulations and policies. It will provide an Action Plan to be delivered to Regional and other policy makers to consider Blue energy as a key element towards Blue Growth and development.

It consisted of policy recommendations targeting policymakers at regional, national and European levels to

- Increase awareness about the potential of MRE for the economic development of EU countries for the Mediterranean as well as solutions to comply with the EU 2020 energy objectives;
- Demonstrate the importance of MRE development in the MED;
- Influence Strategies and policies implemented at regional, national and EU levels.

The main recommendations and related action identified at the Mediterranean level are related to six key areas where progress is needed to achieve the MRE sector potential:

- *Marine Spatial Planning*

Offshore renewable energy is an emerging sector, and it still demands for risky investments; therefore its clear and explicit inclusion in MSPs should be pursued in order to reduce on the long term the planning and licensing uncertainty, which is necessary to secure investments.

The integration of MRE in Maritime Spatial Plans is a common priority for all the technologies considered and has to be considered as a major recommendation for future policies. Consequently, potential spatial conflicts with other maritime activities will be minimised. The adoption of technological tools to support the planning activities is also strongly recommended, as well as the identification, through MS plans of potential/prioritised areas for the development of MRE.

- *Research and Innovation*

The overall objective of the Research & Innovation community in the BE sector is to meet the target of driving down the Levelized Cost of Energy (LCoE), while reinforcing the European industry position on a global stage.

The offshore wind sector is much more mature than the ocean energy one, so specific targets are different for the two classes of technologies. The former has a quantitative target for LCoE of 5-7ct€/kWh by 2030. The technological challenges mainly concern the development of floating devices, advanced anchoring and mooring systems, and lowering Operation and Maintenance costs. The latter has the quantitative target of 10/15 ct€/kWh in 2030 for tidal/wave technologies respectively, and the great challenge of reaching technological convergence. Both objectives can be achieved by greatly improving the yield, which ultimately depends on the volume of energy produced, performance, survivability and reliability of the prototypes at the demonstration and pre-commercial stage. The characteristics mentioned above for a particular device may be verified only when it is placed in operation in the sea. The operation of full-scale devices in the relevant environment is a prerequisite to commercialisation. In this view, cost-effective deployment of MREs should be encouraged, as well as the strengthening of natural laboratories for testing marine energy devices. The upgrade of low TRL technologies to more advanced levels should be supported in order to favour technological convergence

- *Awareness raising activities*

A successful MRE development strategy in the Mediterranean Sea should look after the settlement of qualitative targets clearly expressed in the Europe 2020 strategy structured to create new job offers and deliver a sense of direction to society. The relevant policies should deal with the problem of social acceptance of MRE projects. Therefore, with the contribution of governance support, the supply of highly educated citizens should be ensured. Informational campaigns and training platforms must be designed in an attempt to increase awareness about the benefits provided from MRE exploitation through education, campaigns and actual public engagement in MRE processes. Certain feedback through socio-economic surveys during the design phase of MRE projects and public consultation procedures should also be adopted. Finally, introducing the Blue Growth strategy or its inclusion in other national strategies like RIS3 or similar is necessary. The bodies in charge of introducing the forthcoming RIS3 strategies should establish communication with all relevant stakeholders related to the Blue economy to produce integrative and comprehensive documents.

- *Access to funding*

To develop Marine Renewable Energies in the Mediterranean, substantial and stable public investment is required to commercialise the industry with the objective to reach a production cost in between €50 to €60 per MWh to be competitive with the other current sources of energies (nuclear, terrestrial renewables (solar/ wind)). The public commitment will stimulate private investment and foster long-term investors' confidence for the future of the marine energy industry in MED. The countries in which investments were first and most important (Germany, Netherland, Denmark, the UK, and France) have

changed their legislation to facilitate investment in offshore wind farms. This change is mainly about the risk reduction of investors (energy specialists) who respond to the call for tenders. This risk reduction is based on the fact that the Public authorities give the tender specifications full knowledge of the initial states (soil, wind, environment, etc.). Thus, investors do not take a margin for risks. As MRE are at different stages of development, those investments are expected to finance from the early-stage devices to pilots, large scale demonstrators and commercial farms installation (To give benchmarks: in France, the cost of each pilot of 24 MW is more than M€ 220. The state subsidy is nearly M€ 75). They are also required to de-risk the technologies that will be deployed at a commercial stage. In most of the European countries where MRE are currently developed/ under development, national public calls for projects were launched (England, France, Germany and Portugal). Time will be finally necessary to decrease the production price as the experience curve (*Boston Consulting Group)* demonstrates: "*company's unit production costs would fall by a predictable amount—typically 20 to 30 percent in real terms—for each doubling of "experience," or accumulated production volume*".

- *Simplification of procedures*

There is an overall lack of knowledge about regulatory processes to be followed to get authorisation to develop an MRE project. In addition, the procedures are in most of the MED countries complex. It prevents various development initiatives, which would contribute to the emergence of a strong economic sector in the MED area. The procedures to implement MRE pilots (connected or not to the grid) and get the authorisations such as permit, license, or other forms of permission should be simplified, explained and promoted to MRE projects developers.

- *Grid connection*

MRE production requires a transmission infrastructure to connect the offshore generated electricity to the on-shore electricity network, including on-shore and offshore substations and cabling between offshore platforms and on-shore substations. Selection of sites with existent components of the required electricity network (e.g., an on-shore substation) can mitigate costs and facilitate the integration of an MRE project. Nevertheless, the available electricity grid connection in the Mediterranean basin is very limited. A map of the existing electricity grid connection in the Mediterranean can be found in https://www.entsoe.eu/data/map/. The grid connection issue is of most importance, especially for non-interconnected islands, e.g., the majority of the Greek islands. Therefore, there is a need to accelerate the grid construction to support clean islands sustainable solutions, reduce their dependency on fuel imports, and mitigate climate change. As a step forward, and due to MRE intermittency, there is also a need for efficient power grids, including smart grids that can preserve the balance between the power supply and demand. Relevant progress can be greatly facilitated, at least at the regional level, by applying joint

actions and procedures when developing infrastructures relevant to MRE projects. In addition, there is a necessity to adapt the existing networks to the specificities of MREs. Existing energy networks are traditionally organised in "star form" from power plants to consumers. MRE networks should be meshed from distributed energies. The energy network operator should fund those heavy investments; therefore, they determine an impact on the price of MRE.

4 Social, economic and environmental factors and issues

4.1 Socioeconomic impacts

Attempting to assign monetary values to nonconsumptive public goods and to their functions presents several challenges. They might even be impossible to accurately calculate, as certain intangible values lose their significance in the process. However, a multidisciplinary effort must by necessity be implemented, in order to account for the parallel economy of the commons when evaluating the trade-offs and alternatives that are to be proposed to the public, in the context of a mature participatory decision-making process capable of accounting for the social and economic consequences of development and conservation. Such an approach is indeed mandatory in view of the social resistance to offshore installations that have been growing in some local communities (e.g. along the Italian Adriatic shores), and of the active role local representative bodies have in the authorisation process, which can lead to project rejection or any way to costly delays.

4.2 Environmental Impacts

Accounting for the environmental impacts of Blue Energy installations is not deferrable since it is obvious that any artificial ocean structure causes changes to the marine environment, both adverse and beneficial. For example, the measures and precautions taken during the operation of an offshore plant, such as the interdiction of trawling within the concerned area, are proved to be beneficial for the marine flora and fauna, or the development of hard bottom habitats due to the presence of the platform foundations. However, there has been a long debate about the potential impacts of offshore installations on marine wildlife (biotic components). The conclusion is sometimes very controversial and not always based on scientific evidence.

It is anticipated that by 2030, 12-16% of the EU electricity demand will be supplied by offshore wind farms (OWFs). Compared to other forms of ocean energy (e.g. wave and tidal power), offshore wind energy seems to be comparatively more developed from both the technological and environmental points of view. Since OWFs have been fully operative for a relatively short period, research on the potential associated environmental impacts is also limited. Moreover, current assessments of the effects of existing

OWFs in Northern European Seas may not be applicable to the Mediterranean, and site-specific analyses are needed before large-scale offshore wind energy exploitation is initiated. However, since on-shore wind farms have been in use for a longer time, it is possible to very carefully extend the available information on their relevant environmental impacts to the case of OWFs, for example, as regards the effects on bird migrations.

The assessment of the environmental impacts should be considered along with the entire operational life of a plant and during the construction and decommissioning phases. The available information for the rational impact assessment currently relies on three strategies:

1) gathering existing experience from relevant/similar activities;
2) implementing simulation models, and;
3) conducting ocean and environmental monitoring/surveys during the offshore plant's planning, construction, and operational phase, which is the most important (though expensive) action for an effective environmental impact assessment study. Water quality and pollution indicators should be derived and analysed, together with the associated impacts on benthic, sea mammal, pelagic, and bird communities. Ornithological surveys may be conducted on the sea, resting and migrating birds, as well as sea mammal surveys on cetaceans and seals. The surveys could be extended on-shore in order to assess the potential impact of on-shore stations and power transfer cables on the surrounding environment.

Key issues and sources of potential impacts are expected to vary from site to site significantly, and with the progress of our knowledge and understanding, and require their magnitude and acceptability to be identified and constantly updated.

4.3 Social acceptance

Despite the documented widespread support of renewable energy exploitation (European Commission, 2006), on several occasions, local communities oppose the installation of plants, thus delaying its implementation. An explanation for this apparent contradiction between public acceptance at the local and national levels is the Not-In-My-Backyard (NIMBY) syndrome. Individuals favour proposed interventions and/or installations provided they are implemented away from their own community. However, the NIMBY syndrome has been criticised because it cannot capture the multifaceted social attitudes and preferences towards complex and strategic matters such as energy production, as it strongly depends on age, education, and social rank. Therefore, a public effort to inform and involve citizens in participatory decision-making processes, illustrating necessary trade-offs and possible alternatives, is mandatory.

5 Pilot area selection and potential assessment for Blue energy

5.1 Italy - Pilot plant location

- **The on-shore wave energy converter**

The Port of Ancona

The Port of Ancona is located in the middle of the Italian Adriatic coast. The port areas cover 1.4 million sqm, articulated in passenger and ferry terminals, container and general cargo facilities. The port has a key function in the Adriatic-Ionian Macro-Region as the terminal of the international ferry routes to Greece, Croatia and Albania.

In recent years, further improvement works have been carried out at the port of Ancona, such as the expansion of the NW breakwater in 2010 and the lengthening of the NE breakwater pier.

Today, the port of Ancona is one of the most vital and active harbours in the Mediterranean area and plays a primary role in trade. It is classified as an international port by the European Union, and it is part of the Scandinavian Mediterranean route TEN-T.

Through the port of Ancona, over one million passengers transit on ferries and cruise ships, heading to the eastern shores of the Adriatic (Croatia, Albania, Greece) and of the Aegean. Container traffic has grown in recent years, exceeding the 150,000 TEUs per year and attracting all the major global carriers in the container transport sector [6].

San Benedetto del Tronto

San Benedetto del Tronto is the southernmost coastal town of the Marche region, on the border with the Abruzzo region. Its population is about 50,000 inhabitants, and it is an important tourist centre on the Adriatic coast with about 10 km of coastline.

In addition, San Benedetto del Tronto hosts the second largest port in the region, home to several shipyards and especially fishing boats, making it one of the most important fishing centres in the Adriatic. The Sentina Natural Regional Reserve, the smallest Park in the Marche region established in 2004 by regional Law, is located south of the town. From the environmental point of view, Sentina is considered a homogeneous system of land, river, and lake areas, a landscape of waters and sand covering an area of 177.55 ha. The Reserve represents for San Benedetto del Tronto, an invaluable treasure for its natural environments, life quality, and a differentiated tourist offer completing the already existing proposals offered by seaside tourism. The Sentina Regional Natural Reserve is characterised by about 1700 meters

of coastline along which there is a small dune system with natural vegetation. This environment is severely at risk due to coastal erosion, which prevents its natural evolution.

- **Seawater Heat pump**

Piazza Unità d'Italia, Trieste

The historic centre of Trieste is characterised by its proximity to the sea basin. It is characterised here by a depth of about ten meters and by a temperature with limited variations throughout the year 14-16 °C in summer and 9 11 °C in winter. The square has a rectangular plan with a total area of 12 280 m². The square opens on one side onto the Gulf of Trieste and is surrounded by numerous palaces and public buildings.

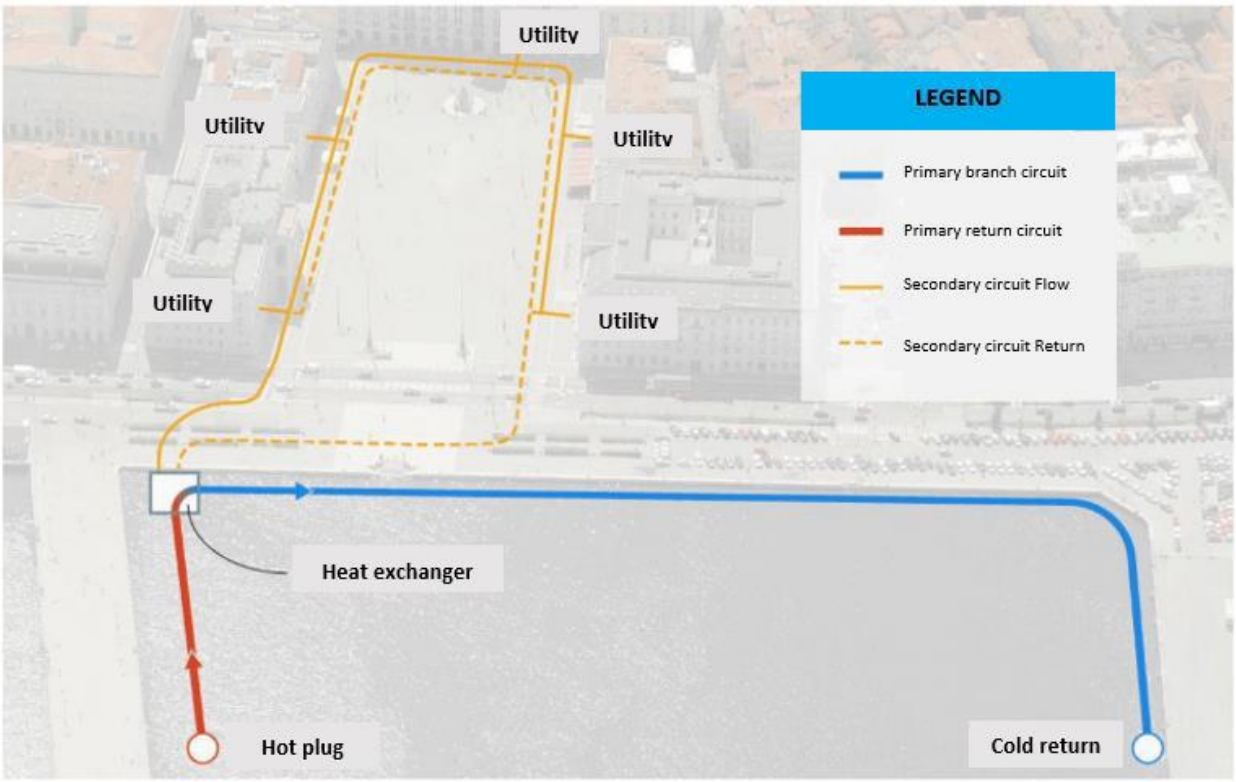

Figure 2. Piazza Unità d'Italia, Trieste

5.2 Croatia - Pilot plant location

- **Seawater Heat pump**

The Cres-Lošinj archipelago

The Cres-Lošinj archipelago is located north of the Adriatic Sea. It consists of three major islands: Cres, Mali Lošinj and Veli Lošinj, mutually connected by the roads and bridges and connected to the mainland by several ferry lines (Figure 7). Spatially, it is the largest archipelago in the Adriatic, with a total of 34 islands, islets and reefs located around the islands of Cres and the island of Lošinj. The total area of the archipelago is 509.39 km². Besides, six more inhabited islands are located alongside the west and south coast of the island of Lošinj: Unije, Ilovik, Susak, Srakane Male, Srakane Vele and Sv. Peter. Due to the extremely high biological diversity and its valuable biological heritage, the entire area of the Cres-Lošinj archipelago is included in the ecological network Natura 2000. The tourism sector, which is the most important economic branch, areas as "eco" destinations by introducing a number of environmental standards in their business. In this context, the energy transition is becoming an increasing priority in the political agenda of cities and counties.

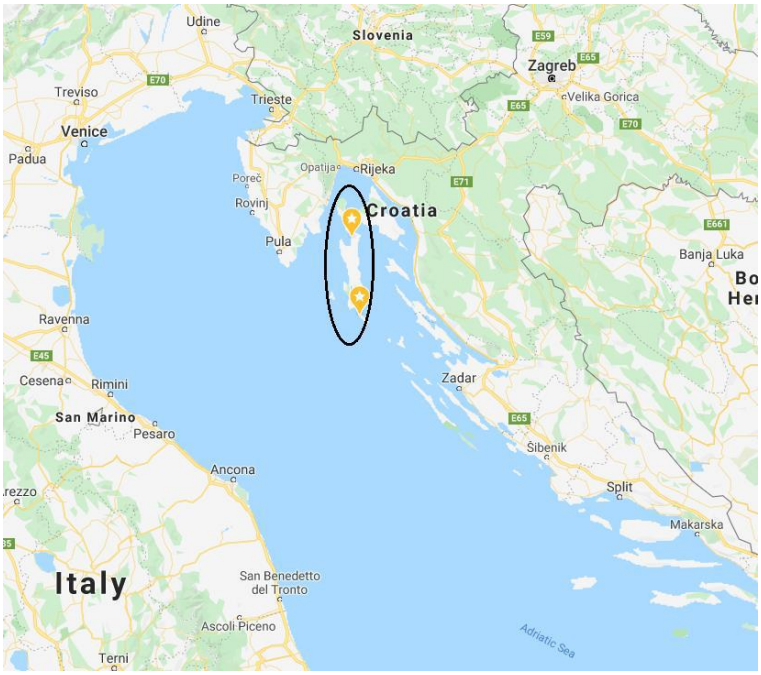

Figure 3. Location of the archipelago

Climate can be considered the Mediterranean with a continental influence. The mean annual temperature is around 16.3 °C for the Mali Lošinj and around 14.5 °C for Cres. The sea cools the islands in the summertime and warms it in winter, ensuring the aforementioned pleasant temperatures. During the average summer, the average temperature is slightly above 25 °C, while the lowest average temperature remains above 0 °C during the winter periods. As it can be seen from Figure 8, the maximum monthly average temperatures are the same for both biggest settlements on the island, while the slightly lower minimum temperatures are noticed for Cres [8].

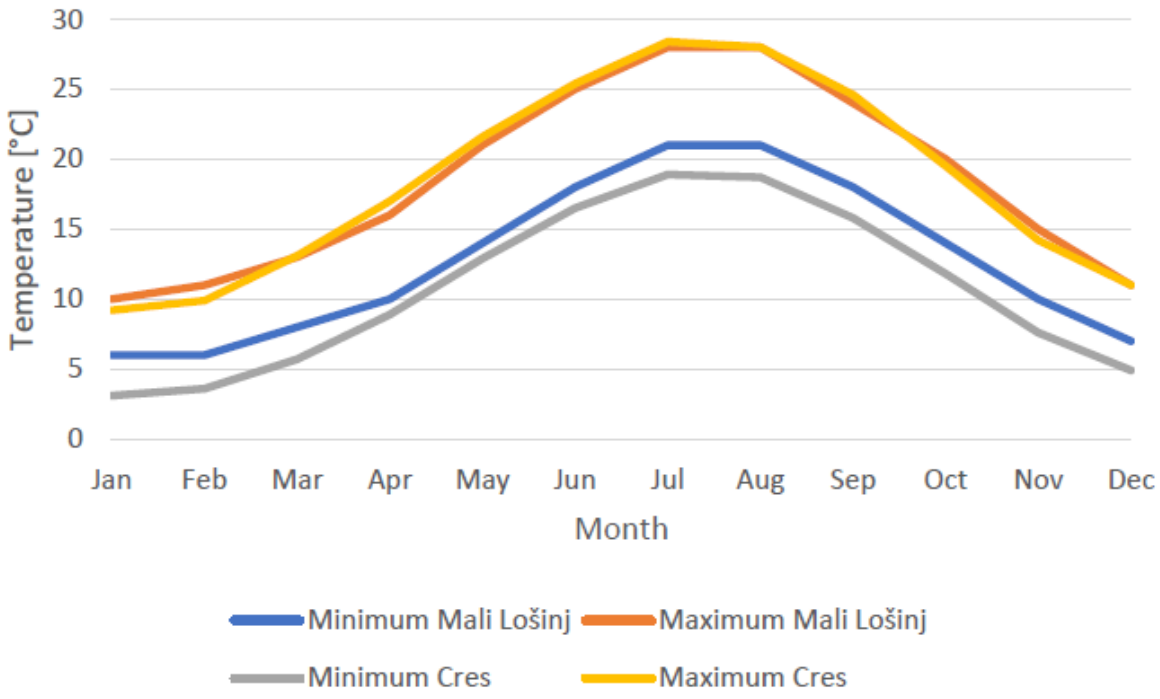

Figure 4. Average monthly temperatures for Cres and Mali Lošinj [9]

Average seawater temperature for the Adriatic Sea is between 11 and 24 °C during the year. Figure 9 and Figure 10, present the average sea temperature for the Cres and Mali Lošinj, which varies between 11 and 26 °C during the year. At the depths where often seawater is fetched (>5m), the average temperature is up to 14 °C during the year.

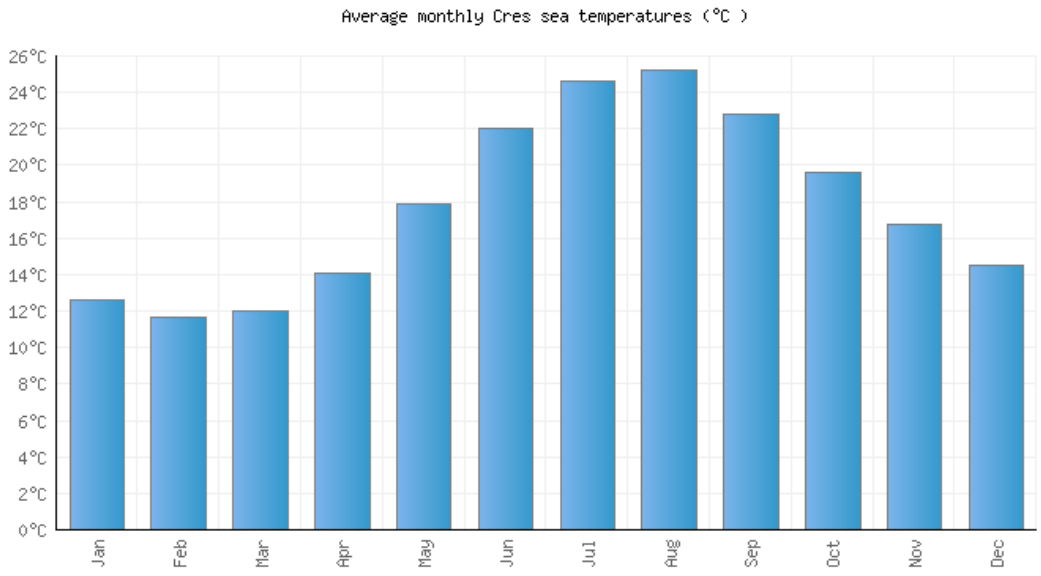

Figure 5. Average monthly sea temperatures for Cres [10]

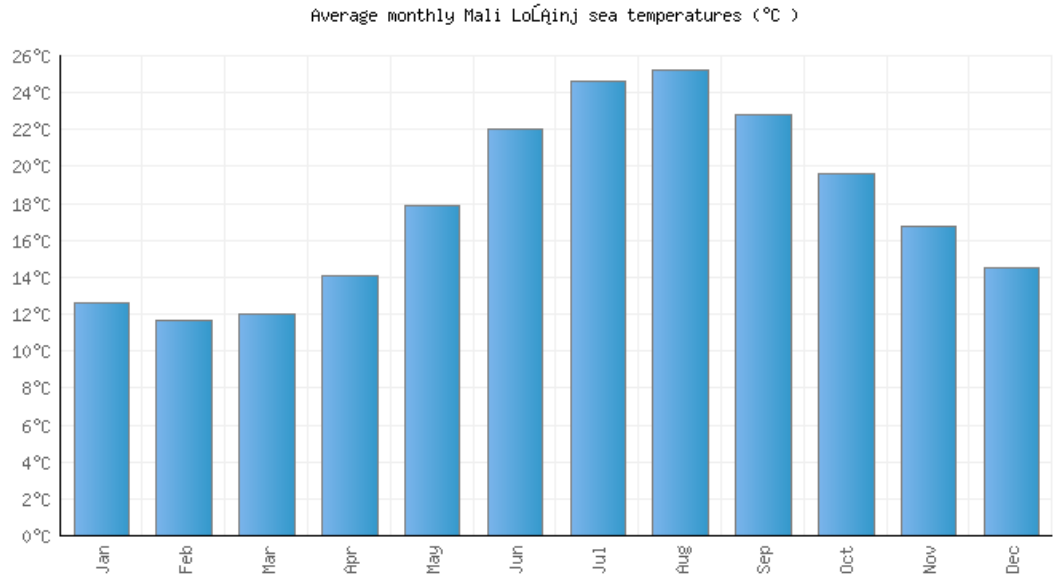

Figure 6. Average monthly sea temperatures for Mali Lošinj [11]

5.3 Italy - Blue energy potential

As mentioned above, the two selected sites fall into two different sectors of the Marche coast. For this reason and for the morphological differences between them, in order to calculate the energy potentials of the two sites, the data collected by the wave buoys of Ancona, for the Port of Ancona, and of the Port of Ortona for San Benedetto were analysed. The analysis has shown that despite the distance between the two buoys and the difference in depth at which they are anchored to the seabed, the recorded wave motions are very similar to each other. In fact, in the periods in which both buoys worked, the significant characteristics of the waves are almost the same. The only difference to take into consideration is the orientation of the coast with respect to the direction of the waves. For the Port of Ancona, we considered the breakwater pier in the NE sector of the harbour. The hourly sea states useful for calculating the energy potential have been processed, discarding the waves with a non-exploitable direction.

Analysing the data reported in the tables, it is noted that the characteristics of the main waves are comparable, and the only difference is the number of waves recorded, which in the case of Ancona are about 10% more.

Also, from the thermal point of view, the Adriatic Sea section of the Marche region can be divided into two sectors, the northern and the southern ones. As already written in D3.4.1, the data obtained by the RMN (Rete Mareografica Nazionale) show a difference of 1°C between the mean temperatures recorded in the survey station located in the Port of Ancona in the northern sector and the one located in the Port ofSan Benedetto del Tronto in the southern sector. The chart in figure 7. shows the data relating to the Ancona station. The minimum temperatures are in January with an average of 10 °C, with the minimum recorded at 8.6 °C, on the contrary, the maximum temperature is recorded in August with an average of 26.27 °C and a peak of 29 °C. This means that at the surface level, the annual temperature range is over 15 °C.

As for the data recorded in San Benedetto del Tronto (Fig 8), the minimum average temperature is in January (9.69 °C) with a recorded minimum of 7.95 °C, while the month with the highest average temperature is August, with 27.59 °C and a peak of 29.60 °C.

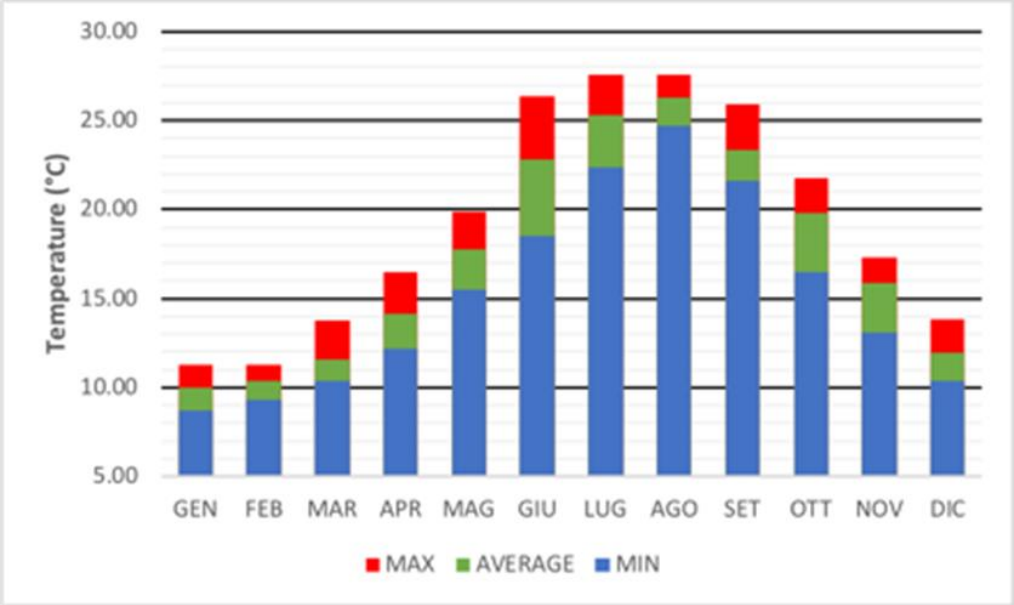

Figure 7. Annual sea temperature variation in Ancona

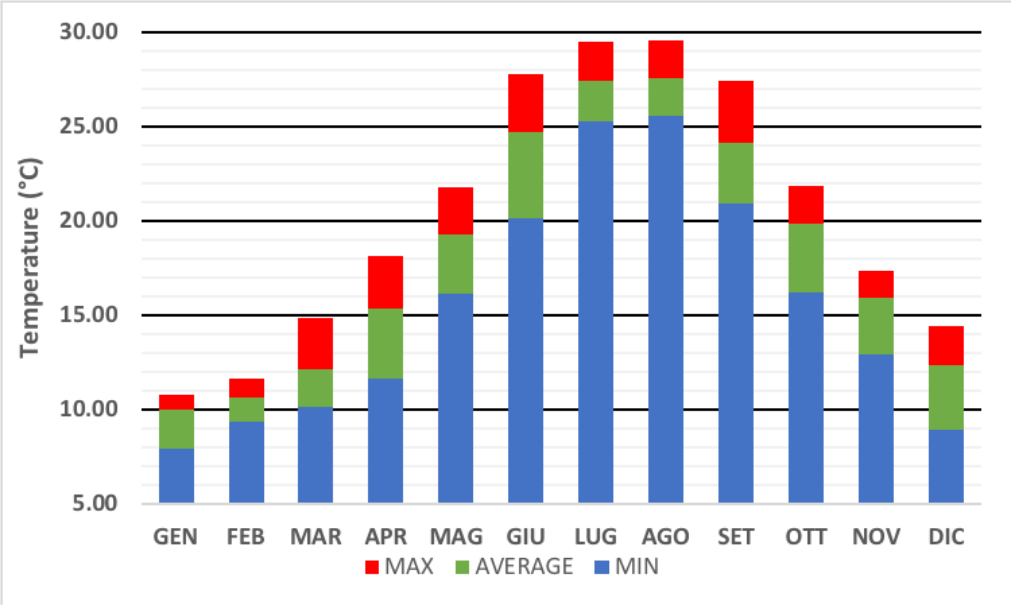

Figure 8. Annual sea temperature variation in San Benedetto del Tronto

- **Blue Energy in Italy**

Considering both the resource availability in the Mediterranean Sea and the current maturity of technologies for ocean energy harvesting, the most interesting devices, on a national basis, are offshore wind energy platforms and wave and tidal energy converters.

Offshore wind farms with a fixed foundation have all the advantages already gained by on-shore wind technology and are commercially viable. The construction of the first ever authorised offshore wind farm will begin during the current year near Taranto (Parco Eolico di Taranto).

However, the use of such a technology in the Mediterranean is often impaired by the steep bathymetry, whereas floating platforms would be more suitable. The major national industries and SMEs in the shipbuilding and oil & gas industries are currently investing in floating wind technology as a possible sector in which to pour their skills and get out of the crisis of the oil sector. Specifically, different actors are working to strengthen and develop structures for the exploitation of the wind resource at sea, technologies that can be developed in synergy and complementarity with other technologies to exploit the sea's resources. The Italian industry's efforts are currently engaged in the development of new floating platforms, turbine manufacturing, mooring systems, connectivity to the grid, and maintenance.

Thanks to the activity of Universities, Research Institutes, Spin-Offs, Small and Medium Enterprises (SMEs) and Large Enterprises (LEs), Italy is indeed at the forefront of research in developing and testing prototypal and pre-commercial devices for ocean energy conversion, particularly wave and tidal energy converters. Currently, 2 National Research Institutes, 10 Universities, 3 Spin-Offs, 4 Large enterprises, and several SMEs are actively developing OE devices.

Moreover, several important experimental infrastructures are available for testing prototypes and devices (four naval/wave tanks hosted by CNR and Universities and five natural laboratories).

In Italy, sixteen devices are designed to harness OE at Technology Readiness Level (TRLs), ranging from 4 to 8 (elaboration from Sannino and Pisacane, 2017). Their distribution in terms of TRLs is shown in Fig 9. Most of them are WECs (including on-shore, near-shore and offshore devices), and two are tidal current devices; five projects out of the total are at a quite high level of development, i.e. demonstration level. An important number of projects are at TRL 4 and will hopefully increase their TRL in the next years, thus signifying the sector's vitality.

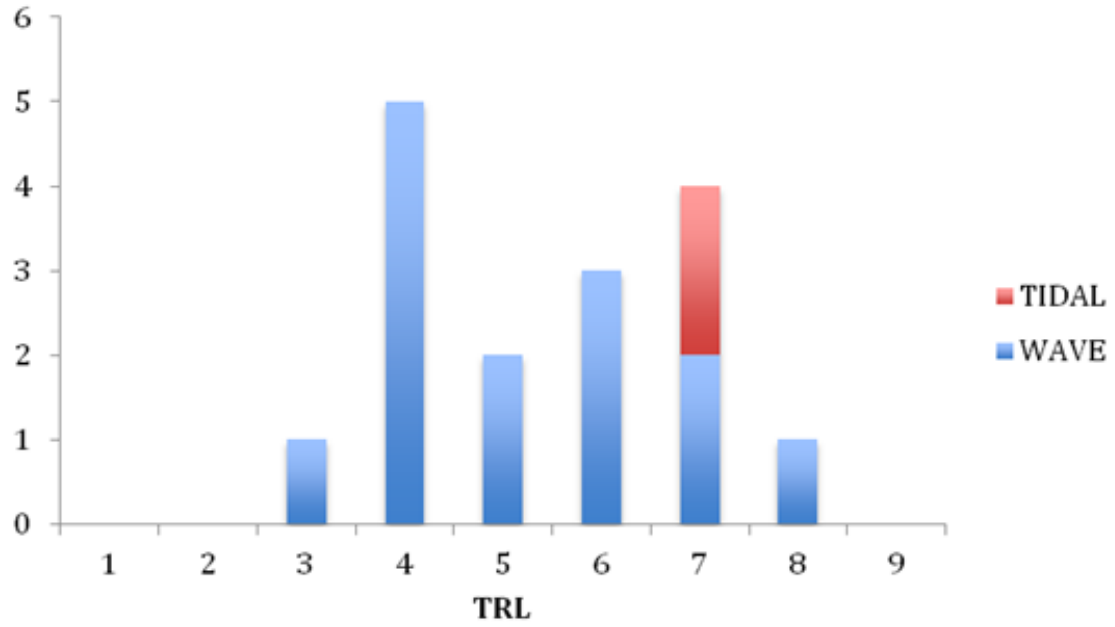

Figure 9. Histogram represents the total number of devices at different TRLs in Italy. Red: 2 devices at TRL7, blue: 14 devices at TRL 3-8

5.4 Building selection methodology for SWHP

The selection of buildings has been set according to the multicriteria method.

The building where an SWHP plant can be potentially installed is analysed and evaluated according to multiple criteria considered mandatory. The different selection criteria shown in this document are general; the designer must assign a score to each criterion to make the selection accurately.

- **Selection criteria**

Ranks of Power: for the purpose of the methodology of building selection, buildings are divided into two large categories: < 200 kW and > 200 kW.

The designer can further subdivide the studied buildings into the following classes on the basis of thermal and/or cooling energy power required by the users:

- < 50 kW
- Between 50 kW and 200 kW
- Between 200 kW and 500 kW
- > 500 kW

The ranks mentioned above represent large categories of users.

- **Physical criterion: Distance from the sea**

The distance of the building from the sea is crucial, as the costs for supplying seawater can be very high. Also, in this case, it is more favourable that the energy user is at a distance from the sea not exceeding 100 meters. It is still (though less) advantageous between 100 and 300 meters, while at distances of more than 300 meters, obstacles are often really difficult to overcome (for example, the physical obstacles to place the pipes, the unevenness in the ground to be overcome, the authorisations and licenses or procedures requested by the owners of the funds on which to putthe pipes, for withdrawing and discharging the seawater, etc.).

Therefore, the categorisation on the basis of the distance from the sea is the following:

< 100 m	most favorable
> 100 < 300 m	advantageous
> 300 < 600 m	less advantageous
> 600 < 1000 m	very less advantageous

A further category is represented by the adoption of the water withdrawal system by drilling if thesoil characteristics and conditions allow it (i.e. no stones, presence of groundwater, etc.).

- **Geological criterion**

Geological criterion refers to geological characteristics of the coastline in the territory, which constitutes the distance between the seawater adduction point and the building where the conditioning system is to be installed.

Coasts can be sandy (with shallow waters) or rocky (with deep seas). Difficulties may arise for both the supply and the discharge of seawater with different aspects of civil engineering in the water withdrawal system. For example, shallow sandy waters may require very expensive anchoring works of

seawater piping, as the presence of strong currents or stormy sea conditions can move or break the pipe anchors.

- **Urban criterion**

The selected building must be located in a position that allows a system for supplying water from the sea that does not require interventions such as changing the road structure, excavation in the ground for the insertion of pipes, or other civil obstacles/works difficult to overcome.

- **Energy criterion**

1. Possibility of using *both thermal and cooling energy*, and yield of energy utilisation produced during the year.

Seawater heat pump systems are ambivalent: they provide both thermal energy in winter forthe heating and cooling energy in summer.

Therefore, an essential criterion for the selection of our building is represented by the existenceof both energy needs.

In other words, the plant's high operating time will result in high economic benefits and satisfactory cost-benefit analysis.

2. Possibility of adopting *integrated technological solutions* to reduce or eliminate the intrinsic power consumption of the heat pump compressors.

Specific reference is made to the possibility of installing *ad hoc* photovoltaic systems – or using the energy produced by existing photovoltaic systems – provided with battery storage systems to ensure electric energy to the system even in the absence of sunlight. This way, the environmental benefit becomes considerable because the energy produced by renewable sources would largely cover the building's consumption.

Therefore, it is suggested to consider the possibility of adopting the solutions mentioned above carefully.

- **Building characteristics:**

The energy analysis of the building must highlight an effective energy distribution system. For example, the building should be in favour of low maintenance interventions, thus reducing costs andtime to ensure proper functionality. The building must also possess high-efficiency energy performances.

- **Economic criterion:**

To be considered representative, the business model must demonstrate a realistic investment return period, which should be as short as possible for the viewed country. There are different situations to evaluate: the manufacturing and purchasing costs of the components and the plant as a whole are different in the countries of the Adriatic-Ionian area; in addition, the economy of scale plays a very important role, as well as the subsidies to the use of renewable energy sources granted by the Governments of the countries.

To summarise, the best economic results will be achieved if the following conditions are met:

- the above-specified energy yields;
- the economy of scale in the case of more powerful plants;
- the possibility to rely (also) upon public contributions to the advantage of the use of renewable energy sources.

These factors need to be added to all the above-mentioned operating conditions, which only a careful cost-benefit analysis can make clear.

- **Environmental criterion**

1. absence or presence of *environmental impacts*: seawater heat pumps can create impacts, especially with regards to the discharge of hot water in summer. For example, current Italian legislation places limitations on hot water discharge in general and in protected areas with high environmental value in particular.

2. evaluation of *environmental benefits*: the energy analysis of the building and the adopted technological system can significantly reduce fossil fuel consumption, both direct and indirect. Electricity, in fact, can also be produced by thermoelectric power plants.

5.5 Procedure for installation of SWHP

5.5.1 Italy

The study of the technical and economic feasibility of a new plant to produce services requires the consideration of several factors:

- **Study of the market and the service**

The analysis of market trends in recent years by conducting market research, helpful for obtaining some useful information to define the marketing strategy

- **Research on the location of the new plant**

The factors taken into account are the physical factors (availability of energy, communications etc.), social (availability of labour, zoning etc.) and economic (tax breaks, labour cost etc.)

- **Potential of a plant (production refers to a specific unit of time)**

It is the number of services that must be produced in a given period of time, and that comes from studies of sales forecasts, resulting from specific market researches and production costs

- **Definition of the manufacturing process**
- **Plant layout**
- **Choice of the type or types of buildings**

They are characterised as civil, offices, services etc.

- **Definition of the cost of construction**

It identifies the cost of purchase, the payment terms and the period of time that will be available

- **Retrieval of capital**

It can be done by increasing the equity capital, loan capital, government grants and so on

- **Design of plants and general services**

Design of the production of services includes the arrangement of divisions, the selection and arrangement of machinery, the configuration of the stores, the general sizing of plants, services, general and auxiliary services, etc.

- **Study of a general development plan of the establishment**

The master plan defines the area and the shape of land for the construction of the plant

- **Program of construction of the plant and the scheduling of investments**
- **Production costs**

The construction of the plant can be started only after obtaining permission of the competent authority provided for by Law, which are:

i) **procedures for the Strategic Environmental Assessment (VAS)**

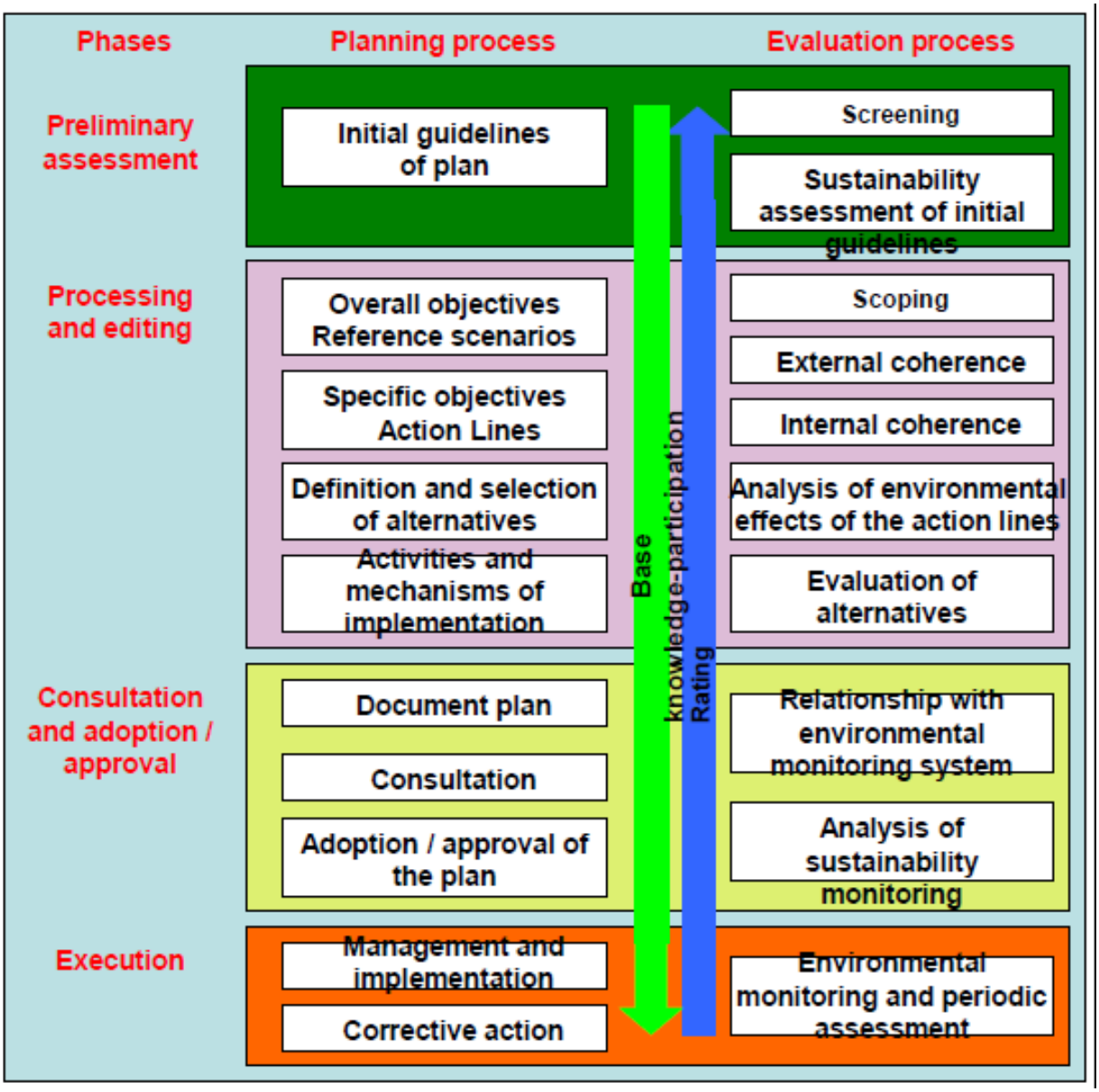

Figure 10. Flowchart of procedures for the Strategic Environmental Assessment (VAS)

ii) **procedures for Environmental Impact Assessment (VIA)**

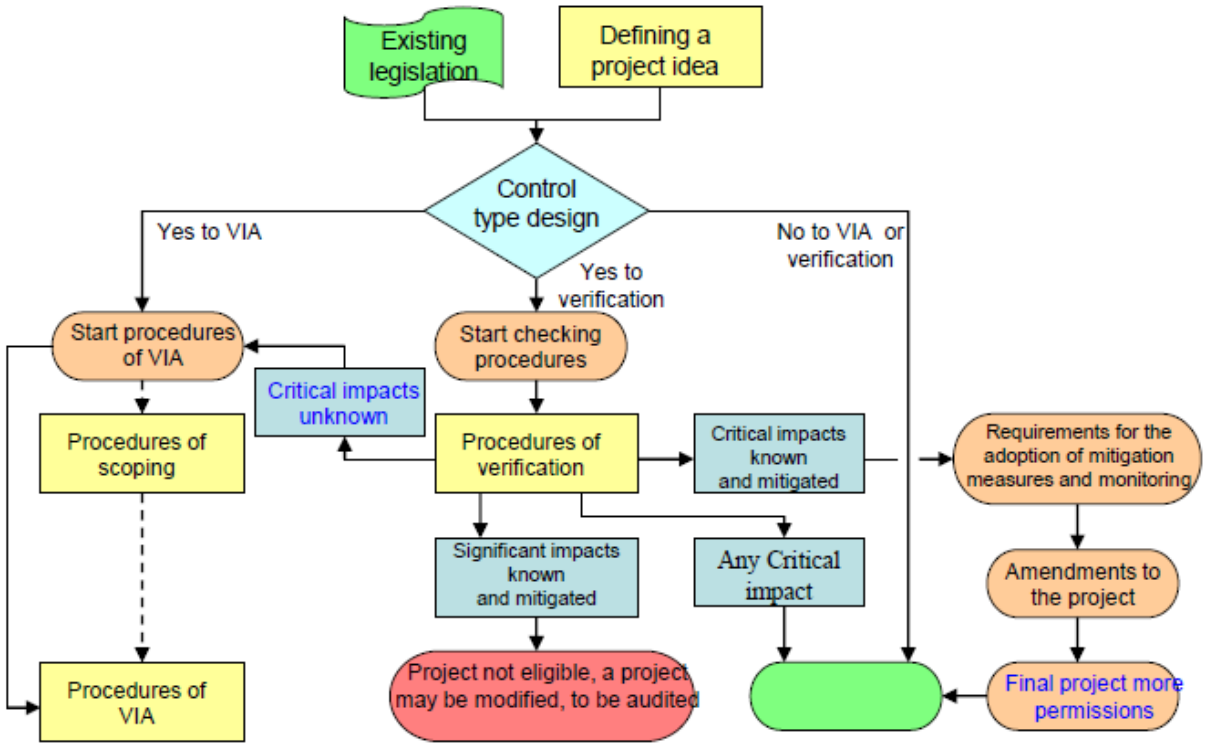

Figure 11. Flowchart of procedures for Environmental Impact Assessment (VIA)

iii) **soil conservation** (Law 31.07.2002, n. 179, Law 11.12.2000, n. 365 ecc.),

iv) **prevention of water pollution and water management** (Legislative Decree 3.4.2006, n. 152 - Code of the Environment)

v) **waste management** (Legislative Decree 3 aprile 2006**,** n. 152)

vi) **air protection** (Legislative Decree 7.3.2008, n. 51, Legislative Decree 3 aprile 2006, n. 152 ecc.)

vii) **reduction of atmospheric emissions** (Legislative Decree 3.4.2006, n. 152 ecc.)

viii) **compensation claims against environmental damage** (Legislative Decree 3.4.2006, n. 152 ecc.).

Prior to the construction of the plant, it is also necessary to obtain approval from the competent Authorities:

i) **Ministry of the Environment, Land and Sea**: assessment of environmental compatibility for the projects planned by Decree of President of the Council of Ministers 10.8.1988, n. 377)
ii) **Mayor of the municipality in the area in question which will arise the plant and civil engineering works for the concrete-reinforced**: building permit (Law 28.2.1985, n. 47)
iii) **One-stop shop for Productive Activities (SUAP) of the municipality in the area concerned that the Conference will launch the services (ex art. 14 Law 241/1990):** authorisation to run the heating systems and technological systems that give rise to emissions into the atmosphere (Legislative Decree 3.4.2006, n. 152)
iv) **Local Health Department responsible for the area and, as a matter, the National Body of Firefighters:** authorisation to protect the health and safety in the workplace (Legislative Decree 9/4/2008 n. 81) and use of lifting appliances and transport, equipment and tanks for pressurised fluids (Presidential Decree 24.7.1996 n. 459)
v) **Ministry of the Environment, Land and Sea: authorisation for the Law on major industrial hazards** (Legislative Decree 21.9.2005, n. 238)

5.5.2 Croatia

The most challenging task for the installation of seawater heat pumps is to obtain all necessary permissions. Besides inevitable project documentation, additional environmental impact studies, various additional permission related to the usage of maritime goods are required as well. This includes concession for the intake and usage of seawater, a concession for the usage of maritime and on-shore areas and similar.

In the case of Croatia, direct usage of seawater as a working media for heat pumps is often prohibited or complicated. Therefore, it requires alternative solutions. One is the drilling of dwellings close to the utilisation point and fetches for brackish water. This causes additional investment costs, which will be elaborated in the following subsections. Besides the national level, regional and local regulation must also be considered during the planning phase. Up to now, projects related to the exploitation of BE sources are seldom, implying that the procedure for obtaining all necessary permission is quite unclear. This is especially evident for spatial planning when there is not clear who is in charge of issuing permits. This misunderstanding often arises between local/regional and national authorities, and it complicates the overall procedure and causes significant delays in project implementation.

Following permissions are required for deployment of seawater heat pumps:

- Project and installation inclusion in spatial and maritime domain planning
- Concession for the usage of on-shore land
- Concession for the usage of maritime domain for the deployment of intake/outtake pipes and the usage of seawater
- Concession and agreement with the relevant national body (Hrvatske vode) for the usage of inland water goods in case wells are used for water intake

The basic "roadmap" which needs to be followed to obtain all necessary permissions is widely missing. In the first step, project documentation is prepared, and based on this, relevant public bodies are issuing an operational license, proving the project's feasibility. Moreover, the investor needs to obtain the concession for the usage of the maritime domain and seawater and request the inclusion of project installation in spatial and maritime plans. Simultaneously, the investor needs to contact the Harbour Master's office to prove that the installation does not interfere with the shipping.

Since the issuing concession might cause notable problems in project activities, and in the end, it might not be issued; alternative routes are used for the deployment of technology. This often means drilling the wells for brackish water with a high share of seawater (up to 95%) is used as an energy source. Drilling requires additional investment costs for two reasons. Firstly, the potential of the selected location needs to be assessed, followed up by expensive drilling works. Also, Hrvatske vode d.o.o., as a relevant public body in the case of inland waters, needs to be contacted to negotiate the price for water usage.

The procedure for obtaining the concession for the usage of maritime goods is partially defined by the *Law of maritime good and seaports* (N.N. 158/03, 141/06, 38/09, 123/11 - OiRUSRH, 56/16 i 98/19) (the Law in following lines) and by supplementary *Decree on the procedure for granting a concession approval on a maritime domain* (N.N. 36/04, 63/08, 133/13, 63/14) (the Decree in the following lines) available in Official Gazette. Even though the main obligations and steps are described well in the existing regulatory framework, problems arise when the implementation occurs. More precisely, as it was already mentioned, the issuing permits regarding the concession and usage of maritime gods is the most complex part due to the unclarity of who is in charge. To initiate the procedure for obtaining the concession for the usage of maritime goods, the following documents are needed:

- Project documentation with the technical data and requirements
- Location permit and inclusion of the concessionaire area in the land books; prior to this, the borders of the area which is about to be given in concession must be precisely determined

Once these two conditions are fulfilled, the investor can initiate the procedure for granting concession according to the Law and Decree. In the following lines, the workflow **Error! Reference source not found.** for obtaining permission is described, and in the end, we present potential solutions to ease the procedure.

1) According to the Law, Articles 6 and 7, two types of activity can be performed on maritime goods:
    - Commercial usage
    - Special-dedicated usage

In the case of seawater heat pumps deployment, a concession for special-dedicated usage should be asked. Article 17 defines that in such a case, a written request needs to be addressed to the Ministry of the sea, transport and infrastructure, which is a responsible public authority.

2) According to the same Law, Article 19, there are two types of objects which can be built for special-dedicated usage:
    - Construction of buildings for religious purposes on the maritime domain, carrying out activities in the field of culture, social welfare, education and science, informing, sport, health, humanitarian and other activities not performed to gain profit
    - Building (on the maritime domain) buildings and other infrastructure facilities (roads, railways, water supply, sewage, power grid, a telephone network, etc.) for the needs of defence, internal affairs, regulation of rivers and other similar infrastructure facilities

Once again, in the case of seawater heat pumps, the second option is the appropriate one since it includes energy infrastructure.

3) According to Article 20 of the same Law, the responsible public authority for granting concession is:
    - The Republic of Croatia (through Ministry), or
    - County administration (through County Council), or
    - Municipality (local) administration (through Municipality Council)

This third step is the most complicated one and often results in project delay since it is not clear which public body of this three presented should be in charge. This is also important since each public authority can give concession with different periods of duration (between 5 and 99 years). Since the Ministry is often not very well informed about the local needs and specifics, it would be reasonable to give local and regional authorities rights to grant the concession for such small-scale project which involves households or even bigger complex like hotels, sports hall or similar. The system size in these cases varies between a few kilowatts to several megawatts. In addition, Article 21 says that the county council, on the proposal

of the county prefect, can give the rights to local municipality councils to issue the concessions when projects are of great relevance for the local municipality. This would significantly enhance and encourage the development of such projects and the total number of installed devices.

4) Signing the Concession contract

Once all requirements are fulfilled, the two sides are signing the contract with the defined borders of maritime good, duration of the concession, annual fee, and other general rules that must be respected.

Additional demands described in Law:

- Article 10, Republic of Croatia is a governing body for maritime spatial planning (directly or indirectly through regional/local public authorities)
- Article 13, the concession fee is equally divided between the national, regional and local public authority
- Article 27, for all disputes, Ministry is a relevant public authority
- Article 28, the concession fee is symbolic or in case of commercial project mutually arranged
- Article 50, Harbour Master's Office is in charge of the supervision of the usage of maritime goods

Additional requirements described in Decree:

- Article 24, defines the relevance of public authorities for considered projects, and a maximum period of concession duration
- Article 25, defines that written request is required when seeking concession:
    - Name, surname, residence place; or full data for legal entity
    - Conceptual design and declaration of the intended use of the maritime goods
    - A statement of the competent authority for spatial planning on the significance of the considered object for which specific use is sought; and opinion on the compatibility of the conceptual solution with the spatial documentation;
    - Proof of registration, if the applicant is not a natural person
- Article 26, defines in which form the request should be addressed
- Article 27, when the request for a concession is received, compliance check with the spatial plan must be done in 30 days, and based on this proposition for a concession is made
- Article 28, Harbour Master's Office must give permission and agreement regarding the shipping safeness and compliance with maritime spatial plans
- Article 39, the concession fee is divided into two parts (fixed one - based on occupied m^2, variable – depending on the purpose of usage)

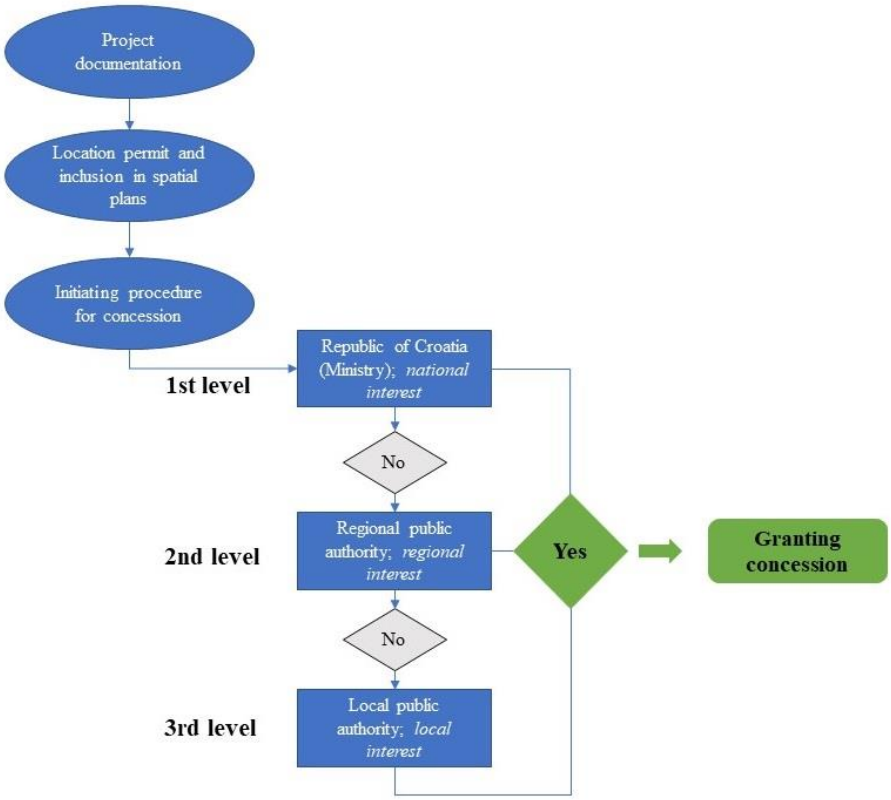

Figure 12. Flowchart of required actions when asking for concession

6 Conclusion

Selection of the pilot area and pilot technologies is the most important first step in developing case studies. Analysis conducted in this document indicates that investors must know local legislation and regulation to have successful pilot implementation. The document contains information about the regulation and policy-making aspects, which are pre-conditions for environmentally and socially sustainable blue energy development in coastal areas. Information collected during report preparation indicates that investors have several the most important steps to install the technology. In the case of Italy, the most important step is Strategic Environmental Assessment (VAS) and Environmental Impact Assessment (VIA), which must be implemented in the case of a great local influence of technology. In the case of Croatia, the most important step is obtaining of concession licence, which can sometimes take several months because concession must be requested from the responsible Ministry or Regional public authority or Local public authority. To find which level of government is responsible for issuing concessions detailed analysis of a project is needed.

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