MAREA[1]

From MARine Ecosystem Accounting to integrated governance for sustainable planning of marine and coastal areas

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Deliverable D.T3.2.1

Spatial cross-sectoral representation of Sustainability Compass analysis in the transnational pilot areas

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1 Introduction

This deliverable illustrates the Sustainability Compass and constitutes the instruction for its actual use.

In section 2 the Sustainability Compass is described. Section 3 contains the aims and benefits produced. Section 4 describes the key criteria on which the Sustainability Compass is based, i.e. the sustainability Means & Goals. Section 5 describes the general-purpose Sustainability Compass guide and its implementation in selected case studies as embedded in the PlanWise4Blue geoportal, realised in cooperation with UTARTU. In Section 6 the plans for the future use of the Sustainability Compass are outlined.

2 Definition of the Sustainability Compass

The Sustainability Compass is a bottom-up framework and method for social learning to improve the prosperity and human wellbeing within the bounds of ecosystem sustainability. It outlines the sustainability with appropriate themes and metrics, generated and updated through participatory learning in which all entrepreneurs, environmental managers, and whoever has an interest, can freely participate.

The tool enables different actors to reach a common understanding of sustainability, develop a shared vision for getting there, and to assess the level of sustainability e.g., in national or regional plans. The Sustainability Compass has been built and planned according to the scheme of Figure 1.

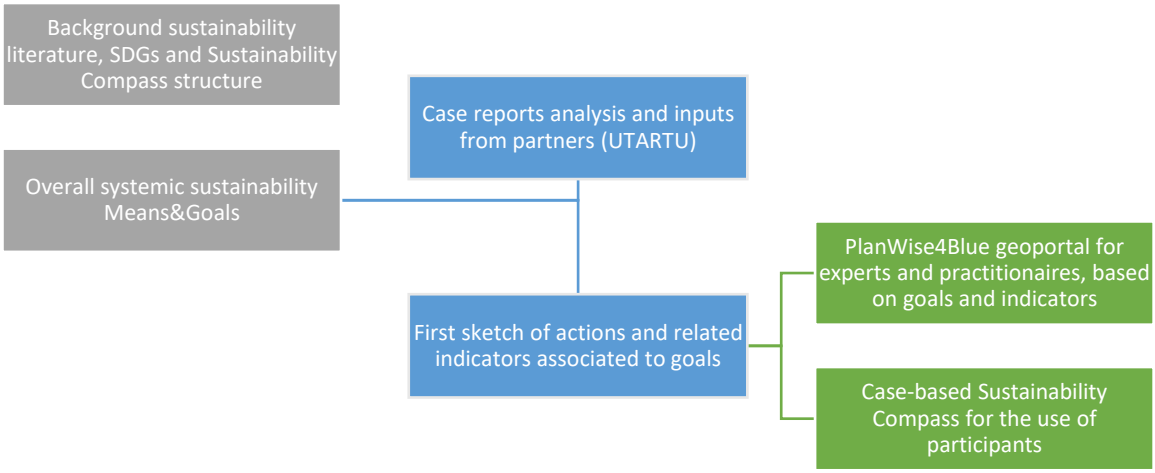

Figure 1. Process for Sustainability Compass application

More specifically, the research has been conducted according to the following steps:

1. Initial literature review identifying the criteria, defined as Means&Goals (look at explanation in section 4)
2. Structuring of the tool, with the internal working group and with partners of the MAREA consortium, and through external consultations with communication experts at the national and international level
3. Brainstorming with experts representing private companies of specific sectors (i.e., aquaculture and wind power)
4. Application to the PlanWise4Blue geoportal

3 Aims and Benefits of the Sustainability Compass

The main purpose of the Sustainability Compass is to realise a practical and effective method to identify concrete means, actions and solutions that can be implemented to achieve clear sustainability goals.

For this reason, the actions are associated with indicators, and the goals are referred to human well-being and continuous ecosystem functioning and equilibrium.

In this way all other objectives of organisations are referred to as means (or intermediate goals) to reach the final goals. This approach helps to keep in mind which the real goals of sustainable development are, and not to confuse with the means to reach them (Sen, 1997).

The specific aims and benefits of the Sustainability Compass are described in Figure 1 and described more in detail in the following points.

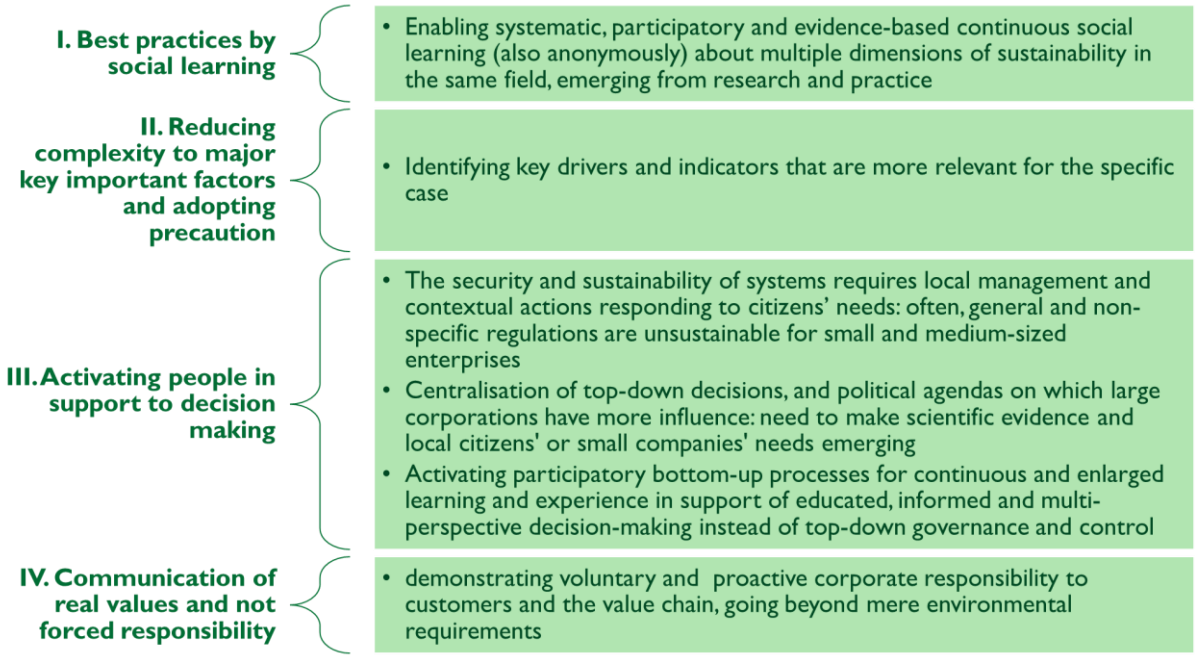

Figure 2. The aims and the benefits of the Sustainability Compass

3.1 Best practices by social learning

The Sustainability Compass enables systematic, participatory, and continuous social learning about sustainability through sharing and comparing multiple dimensions of sustainability between companies and other actors within the same field. Thus, the Sustainability Compass helps in improving their knowledge and understanding of overall sustainability, beyond environmental requirements.

The Sustainability Compass can be generated and used for specific cases and fields, which allow the participants from a certain field to improve their overall knowledge and best practices by learning (anonymously if they wish) from one another. The tool allows for a scientific and evidence-based continuous debate and co-learning in practice and will change over time based on research findings.

3.2 Dealing with uncertainty of complex systems

Human and natural systems and the interactions between them are characterised by high complexity. There is a need to reduce this complexity by understanding and defining most important interactions. This means identifying identify key factors, drivers and indicators that are more relevant and decisive for the specific field. In order to do this, the precautionary principle would suggest not to get involved in too complex and very uncertain matters, and to stop a step before. This means that in case of high

uncertainty the choice could be even doing nothing, avoid solutions, whose impacts might be unknown, or choosing approaches that imitate the natural functioning of ecosystems.

3.3 Activating bottom-up public participation for decision making

At the level of the European Commission, research on governance of critical networked infrastructures (Sajeva and Masera, 2006) pointed out the need for governance as *'joint integrated management of common affairs'*. This concept was meant to deal with the security assurance of interconnected systems and infrastructures (i.e. the interconnected European electric power grid), and involved instances of enlarged participation and the need to detach and isolate local systems in case of failure, in order not to jeopardise the whole system. This means that non interconnected systems that are different for location, culture, ecosystems and citizens' needs to be managed locally and that the well-being and sustainability of local contexts require the contextualization of the needed actions, as well as the participation and empowerment of citizens at local level.

The recent trends of centralisation of regulation involve that top-down decisions are often based on political agendas at regional and international level, and that large international corporations have more power to influence them, compared to small and local ones, researchers, citizens and consumers. Often general and non-specific regulation is very far from the local contexts to which they are applied and therefore are less able to appreciate citizens' needs. In fact, as reported also by participants in the construction of the Sustainability Compass, some regulations reveal to be unsustainable for small and medium-sized enterprises.

To face this challenge, the Sustainability Compass enables and activates participatory bottom-up processes for educated, informed and multi-perspective decision-making, through continuous participatory and enlarged learning and experience, to make best practices and solutions for specific contexts naturally emerge, and eventually achieve overall sustainability goals more effectively than top-down governance and control.

3.4 Communicating the ethical culture of organisations

The communication of real values rather than forced or induced trends of responsibility can demonstrate the voluntary and proactive corporate responsibility to customers and the value chain, for the realisation of benefits for the whole society, going beyond mere environmental requirements.

This can realise a truthful responsibility principle, based on new findings or growing experience, which is not just related to the compliance with the law but can even start a debate by which legislation can be improved. In this way, the process can activate participation of civil society in decision-making and give more robustness to the solution adopted.

4 Key sustainability principles for the Sustainability Compass and the final structure

In order to form the final generic structure for the Sustainability Compass, some main sources (Forum for the Future, 2021; The Natural Step, 2021) have been considered as represented in Table 1 and triangulated with other sources in relevant literature, as well as the UN SDGs.

These sources have been classified according to the structure of the Five Capitals Model of Sustainability (Forum for the Future, 2021). On the basis of this analysis, a general scheme of the

criteria of the Sustainability Compass has been realised. In Figure 2 the scheme is organised from left to right as means (or intermediate goals) towards final goals.

Figure 3 and tables 2 and 3 resume the outcomes of the analysis, as Means & Goals of the Sustainability Compass, which have been formulated, after consultation also with communication experts, in order to assure clarity, concreteness and usability for all possible contributors. Figure 3 describes the systemic interaction between them, going ideally from the left side, the use of the means, to the right side, which describes the goals, mainly human and environmental. Means&Goals are however flexible, as some means can well be intermediate goals, however they are the way through which the final goals can be reached, i.e., human well-being by the environmental resources available, allowing their correct and continuous functioning.

Depending on the role of the actor, they can start from any node of the system and think about what the input for their own activities is and what they need for their own operations. Then the actors can think about the key principles to consider their own activity with. Finally, they can consider which effects of their activity could support other actors pursuing the final goals.

Table 1. The main sustainability principles from the Forum for the Future (2021) and the Natural Step (2021)

	Forum for the Future		The Natural Step
Natural Capital	In their extraction and use, substances taken from the earth do not exceed the environment's capacity to disperse, absorb, recycle or otherwise neutralise their harmful effects (to humans and/or the environment)	In a sustainable society, nature is not subject to systematically increasing…	1… concentrations of substances from the earth's crust (such as heavy metals and minerals)
	In their manufacture and use, artificial substances do not exceed the environment's capacity to disperse, absorb, recycle or otherwise neutralise their harmful effects (to humans and/or the environment)		2… concentrations of substances produced by society (such as antibiotics and endocrine disruptors)
	The capacity of the environment to provide ecological system integrity, biological diversity and productivity is protected or enhanced		3… degradation by physical means (such as deforestation and draining of groundwater tables)
Human Capital	At all ages, individuals enjoy a high standard of health		4… concentrations of (exogen substances) substances in human bodies (as analogy to others)
	Individuals are adept at relationships and social participation, and throughout life set and achieve high personal standards of their development and learning		
	There is access to varied and satisfying opportunities for work, personal creativity, and recreation		
Social Capital	There are trusted and accessible systems of governance and justice		5. in the society there are no structural obstacles to people's health, influence, competence, impartiality and meaning.
	Communities and society at large share key positive values and a sense of purpose		
	The structures and institutions of society promote stewardship of natural resources and development of people		
	Homes, communities and society at large provide safe, supportive living and working environments		
Manufactured Capital	All infrastructure, technologies and processes make minimum use of natural resources and maximum use of human innovation and skills		
Financial Capital	Financial capital accurately represents the value of natural, human, social and manufactured capital		

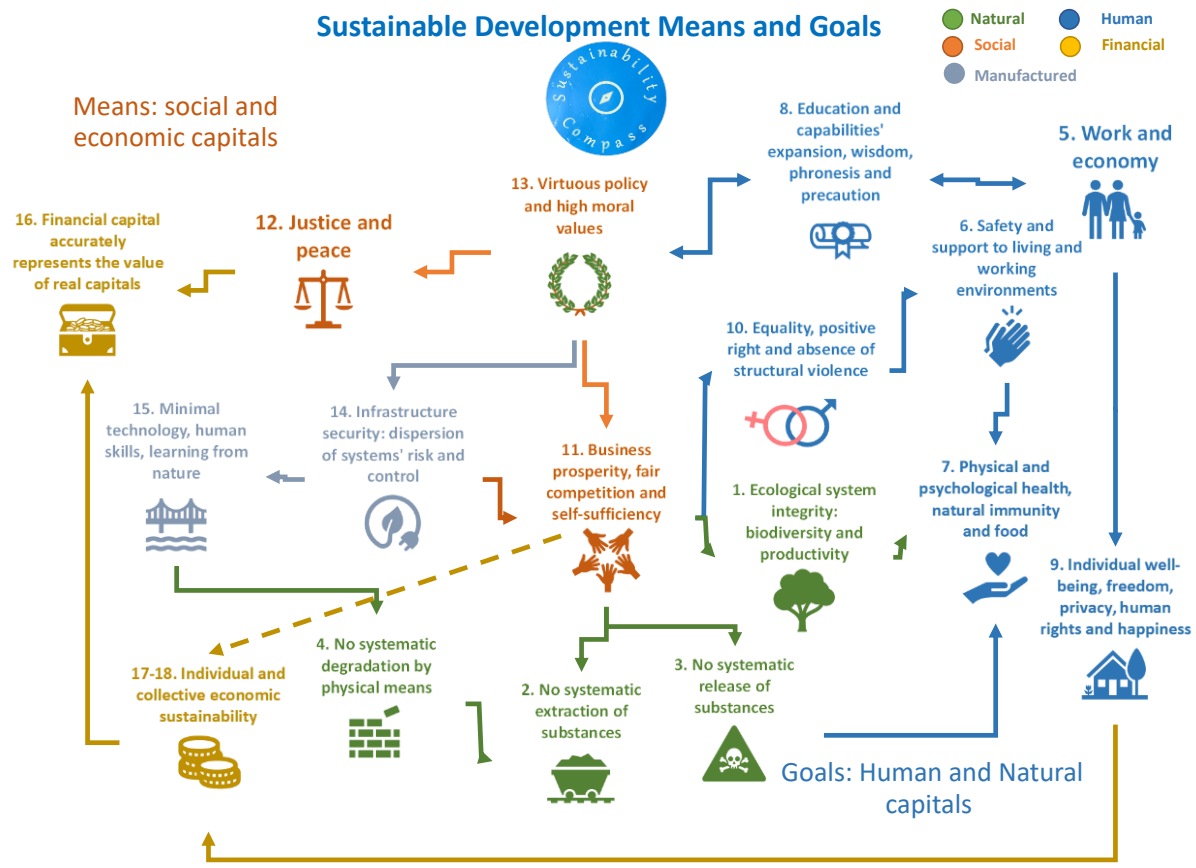

Figure 3. A systemic integrated representation of the Sustainability Compass Means&Goals (SM&G).

Table 2. The Sustainability Compass goals/criteria classified according to the Five Capitals Model of Sustainability

Natural systems	
1. Ecological system integrity: maintaining biological diversity and productivity	
2. No systematic extraction of substances, exceeding the capacity of the environment to neutralise their harmful effects	
3. No systematic release of substances, exceeding the capacity of the environment to neutralise their harmful effects	GOALS
4. **No systematic degradation by physical means**, exceeding the capacity of the environment to neutralise their harmful effects	
Human well-being	
5. Work and economy: access to varied and satisfying opportunities for work and business, especially rural depressed areas	
6. Safety and support to living and working environments	
7. Human health: high standard of physical and psychological health through precautionary principle, to avoid to systematically increase concentrations of substances in human body, e.g. good quality of water and of GMO free and organic food	
8. Education and capabilities' expansion: Independent and free education, open scientific debate, wisdom, phronesis and precaution	
9. Human well-being, freedom, privacy, individual human rights, peace, justice and happiness	
10. Equality between individuals and organisations, based on race, gender, age, health state or wealth, positive freedom and absence of structural violence and dominant position for assuring equal opportunities of development	

Table 3. The Sustainability Compass means or intermediate goals classified according to the Five Capitals Model of Sustainability

Social: collective institutions, regulations and social infrastructures and services		
11. Business prosperity, competitiveness and self-sufficiency especially for of small scale business and depressed areas, bottom-up approaches of cooperation and avoidance of monopoly or dominant positions		
12. Justice: assurance of trusted, effective fair, accessible and just institutional, legal and judicial services and protection of the citizens, peace, democracy and plurality, public participation and bottom-up approaches. Assurance of basic human rights of physical and psychological integrity.		
13. Virtuous policy and high moral values social structures and institutions support human rights and development and to the environmental sustainability, absence of corruption, transparency, accountability, ethics, wisdom and phronesis		
Physical infrastructure		
14. Security of critical infrastructure: avoiding systems' risk concentration, and of relying on a unique infrastructure or organisation or losing control from users. Non-adoption of innovation when usefulness or absence of harm for individuals is not proven. Efficient, secure an less invasive infrastructure systems and technology, learning from nature. Assurance of individual freedom and privacy.		
15. Minimal infrastructure, technologies and processes at support of human well-being minimum use of natural resources and manufactured capital and maximum use of human work and skills (help to humans)		
Economy		
16. Financial capital accurately represents the value of natural, human, social and manufactured capital	MEANS	
17. Economic sustainability for individuals **18. Economic sustainability for public/private organisations**		

5 Functioning of the Sustainability Compass within the PlanWise4Blue geoportal

The implementation of the Sustainability Compass into the PlanWise4Blue geoportal (http://www.sea.ee/marea/survey/compass) enables a bottom-up scheme for social learning about sustainability, which concretely applies to everyday life of business operations, consumer behaviour and policy making. The more each social group or individual learns in a systemic way how to operate in a sustainable manner in their specific and practical contexts, the easier the system can maintain a general equilibrium of continuous functioning of human-nature systems.

5.1 Technical guide for general-purpose application

The Sustainability Compass geospatial tool is built upon a database that is collected from different actors, integrating different problems, solutions (with the support of measurable indicators) and goals (solutions also having some measurable indicators). It represents various thematic areas (related to ecology, human well-being or social, physical and economic capitals) and their distance from the Sustainability Compass Goals. Each row in the database represents an environmental, social or economic challenge for which a sustainable solution is being sought. It also identifies potential obstacles as it moves towards a solution and provides indicators of the current situation and the speed of progress towards the objective. This enables examination of the existing information, addition of new information (e.g., by adding a single row or uploading a csv file that has a pre-defined structure) and updating existing information. Content can be filtered by various sets of activities, themes and goals enable to select more specific information.

As the Sustainability Compass is generated and updated through participatory learning (all entrepreneurs, environmental managers, researchers and interested people can participate), the tool enables different actors to reach a common understanding of sustainability, develop a shared vision for getting there and to assess the level of sustainability e.g., in national or regional plans.

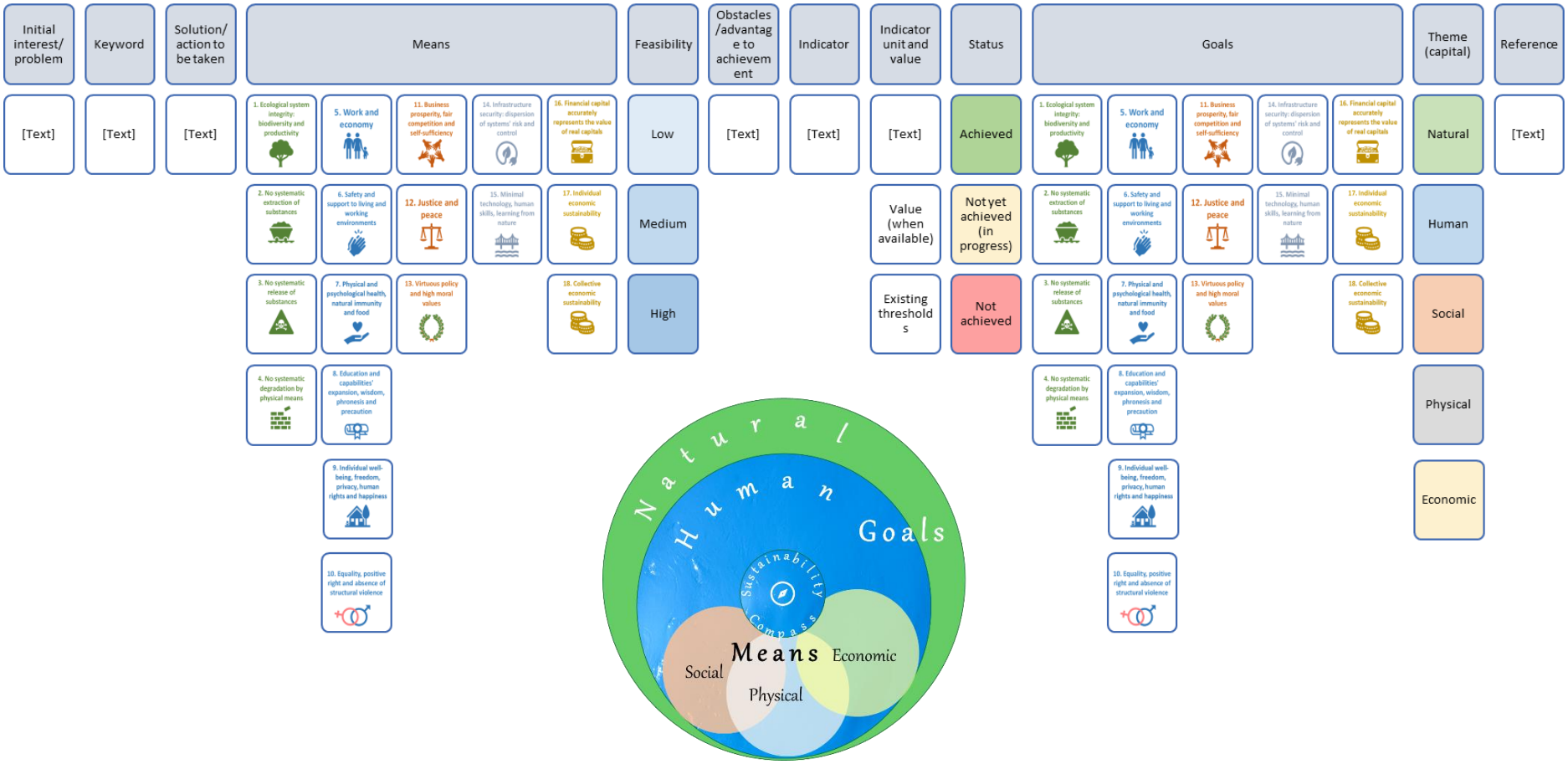

Figure 4. The structure of the Sustainability Compass within the PlanWise4Blue geoportal

Figure 4 shows the structure and process of the Sustainability Compass from left to right. Rows are added when at least one new element is inserted, replicating elements in unchanged columns:

- → Once an initial interest or problem is identified, a keyword can be assigned and a possible solution or action to be taken suggested by the user.
- → This solution is associated to a mean, among the drop-down list provided. Note that although means and goals were defined in Tables 3 and 4, these can be used both, as some means can be intermediate goals, or some goals can define measures to achieve other goals.
- → The feasibility of the action is assessed as low, medium or high through the drop-down list.
- → The obstacles to achievement or the advantage of the solution proposed for successfully pursue the goal is provided by the user.
- → The qualitative definition of possible indicators is provided.
- → The indicator unit of measurement, as well as its value and existing threshold (when available) are provided.
- → The achievement of the goals and the type of the goal are described. Here also an intermediate goal can be mentioned. However, in case goals are rarely reached and just means or 'intermediate goals' are mentioned, this does not reveal a positive outcome.
- → Finally, the theme treated is mentioned according to the means and goals mentioned, in terms of capital involved: natural, human, social, physical infrastructure o economic capital.
- → A final reference can be added to each row.

5.2 Practical examples of application

Two case studies concerning aquaculture in Finland and Estonia and offshore wind power planning in Finland have been carried out for the MAREA project. The application process is described hereafter with two practical examples for the case of offshore wind power. On the PlanWise4Blue geoportal the Sustainability Compass section can be selected. By selecting **Table view** and double clicking on **Add row**, a view like Figure 5 is shown, with various fields that the user can fill out. Figures 5 and 6 show the PlanWise4Blue interfaces and graphical outcomes of the analysis.

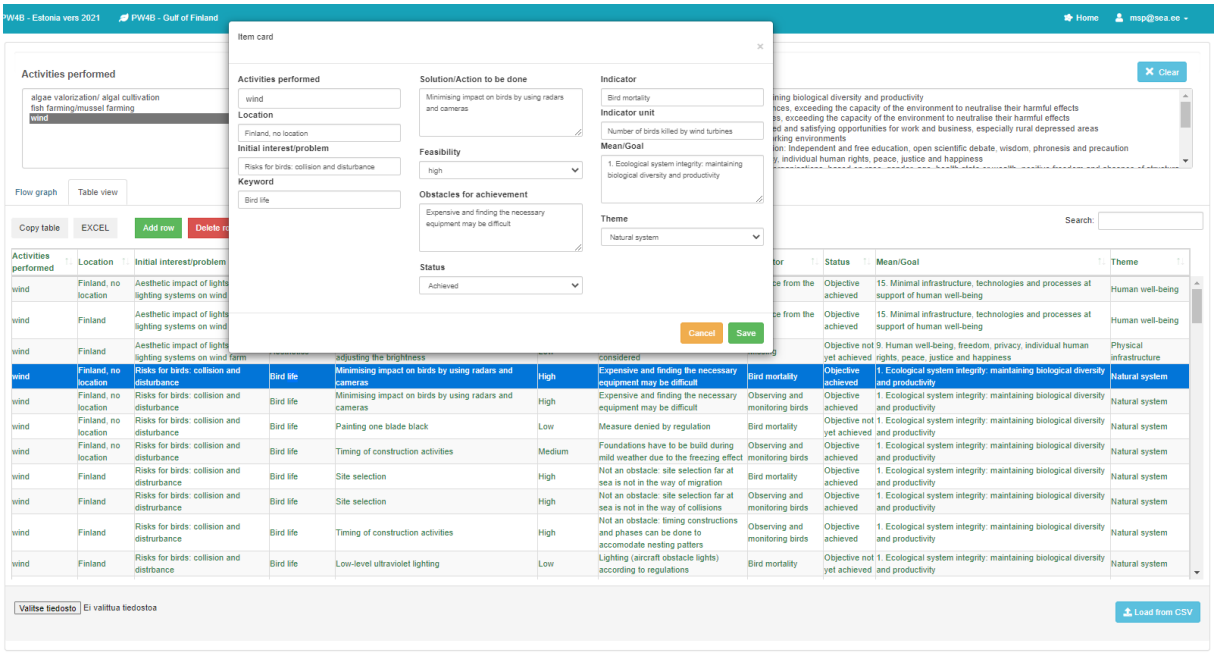

Figure 5. Sustainability Compass table view in the geoportal

Once the data has been entered, the portal will automatically generate the related graphics and tables. If the user is only interested in certain topics (e.g. aquaculture), filters can be used to limit the search. Here, when the filters are used, the related graphics and tables are automatically updated.

Figure 5 shows an example of the current mapping or visual path from problems through solutions to goals. The detailed description of all problems, solutions and goals can be checked in the graph by moving the mouse on top of keywords. Figure 5 shows how the links e.g., from solutions to goals, can be checked by just moving the cursor to a certain section of the graph. The Sustainability Compass can be used for visualising already collected data or for inserting new data. Using the tool to fill out information on issue starts out with the identification of an **initial interest** or a stated **problem**, such as for example *Risks for bids: collision and disturbance*. As the problems can be long and detailed, they are narrowed down to a theme by using a **keyword**, here in this example *Bird life*. The theme will help also with grouping the different issues under a common thematic.

The next step is the identification of **a solution, or an action to be done** to alleviate or counter the identified problem. The geoportal allows to describe the solution in detail. It is to be noted that one row of the tool can host just one *'Problem>Keyword>Solution>..>Indicator>…>Goal'* string. Each time even just one other element is inserted to that string, for instance an additional solution or an additional goal, this has to be put in a new row and all the other elements have to be duplicated for that new row. This means that if there are several solutions to the same problem, each solution would define an additional row and therefore the other elements have to be reinserted in each of the rows containing the other inserted solutions.

For example, if the initial interest *Risks for birds: collision and disturbance* the **solution** or **action to be done** is *Minimizing impact on birds by using radars and cameras.* Another **solution** could be *Painting one blade black.* These solutions should be inserted into the system in two different rows and all the rest should be duplicated. This is because each of the individual solutions will be assessed independently with regards to their **feasibility,** possible **obstacles or explanation of the possible advantage and their status** by the geoportal user. The **indicators** and **the unit of measurement** in use in the stated indicator are also filled in for each line item separately.

In our example, the feasibility of the action of *Minimizing impact birds by using radars and cameras* was rated as *High* based on the interviews conducted with Finnish companies with existing or planned offshore operations. The **obstacles** were seen as *Expensive and finding the necessary equipment may be difficult*. A qualitative description of the identified obstacle and the **status** of the solution was marked as *Object achieved*. The **indicator** identified for this issue by the researchers was *Bird mortality* with the **indicator unit** as *Number of birds killed by wind turbines*.

Each individual row is linked to the related **theme** and **Mean/Goal**. In this example the theme was *Natural system,* and the related Goal was *1. Ecological system integrity: maintaining biological diversity and productivity.*

A second example of the use of the geoportal was brought in relation to a well-documented and known impact of the construction activities on local fishers. *Reduced catch, loss of fishing grounds during the construction phase* was inserted as the **initial interest** or **problem**. The keyword is *Fishery impacts* (Figure 6). **The solution** was identified in the *Compensation to commercial fishers*. The feasibility of this was rated as *High* as it is a well-established and ordinary procedure. As of now, there are no identified obstacles, so **Obstacles** are filled in as *None*. in this case a justification of the advantages of the action could be added.

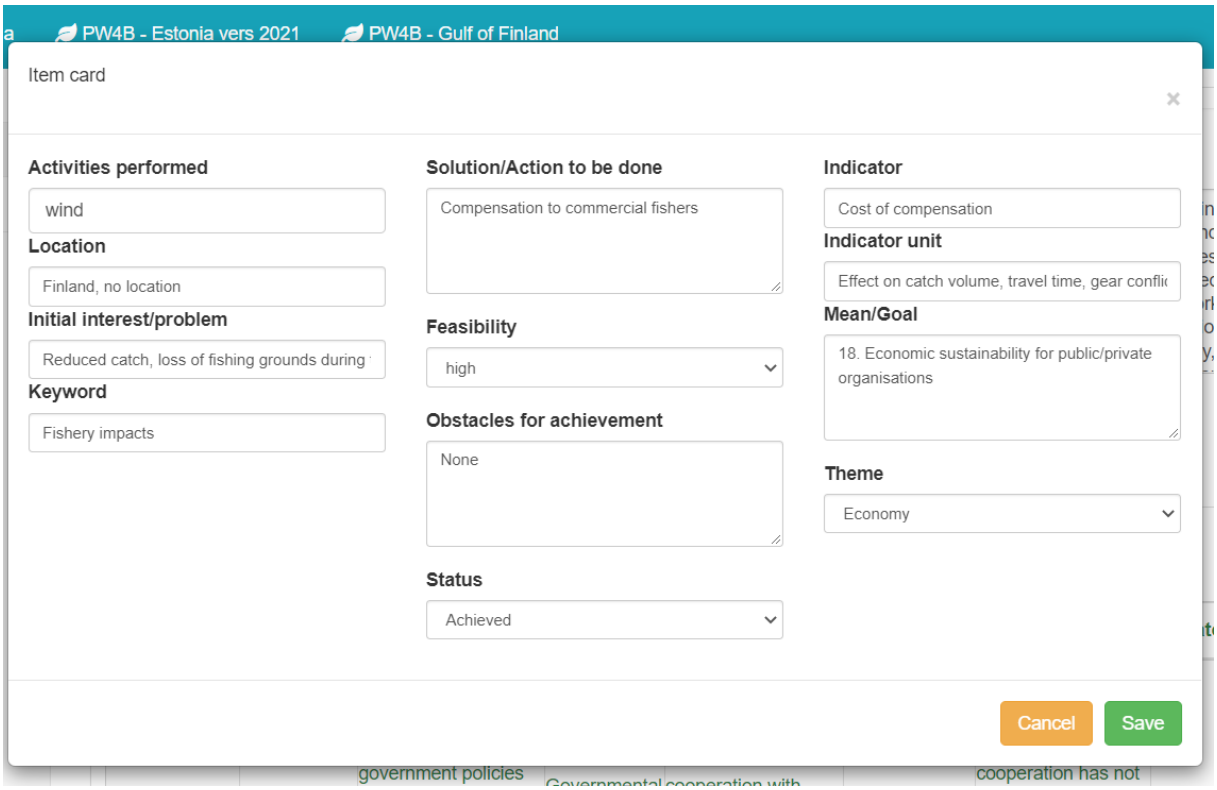

Figure 6. A closer view to the Sustainability Compass item card

The **indicator** was identifies as *Cost of compensation* and **the indicator Unit** *Effect on catch volume, travel time, gear conflict issues*. The **objective** was stated as *Objective achieved.* The identified **theme** was *Economy,* and the related **Mean/Goal** was *18. Economic sustainability for public/private organizations*.

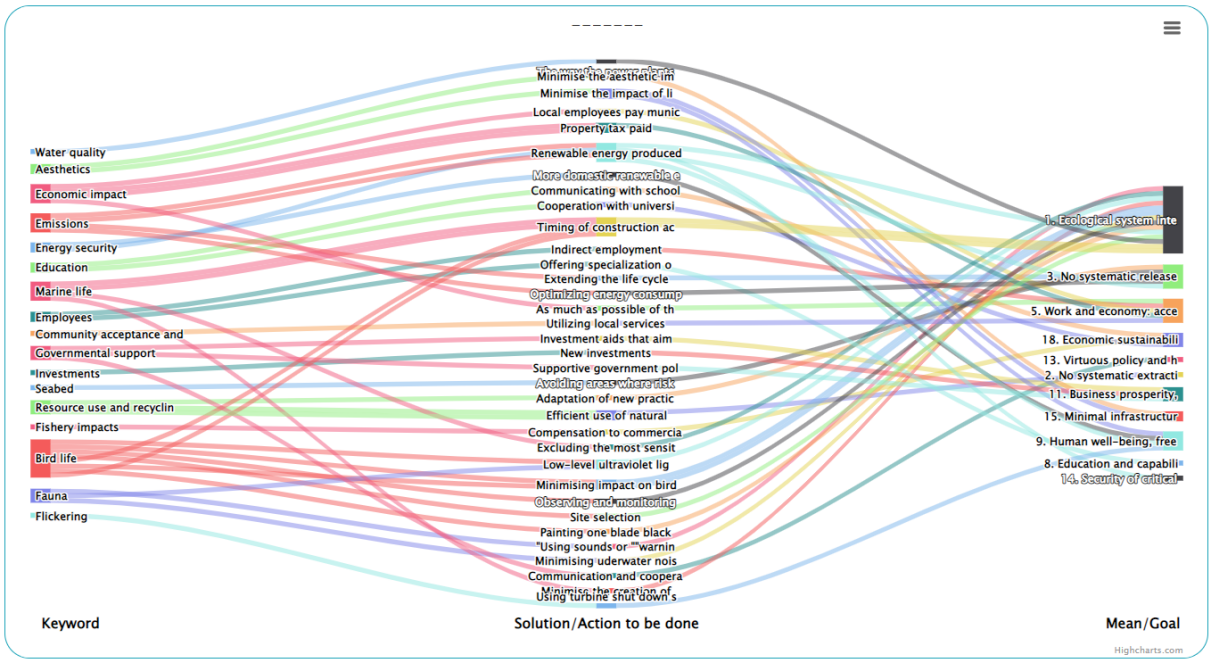

Figure 7. Sankey diagram for offshore wind

All of the collected data can be resumed in the Sustainability Compass tool of the PlanWise4Blue geoportal by a Sankey diagram (Figure 7). The collected data can be filtered according to the

parameters of '**activities performed'**, '**themes**', and '**Means&Goals'**. For each of the parameters the user can select multiple entries that will filter the underlying data. In the Sankey diagram the data is presented as 'keyword' and 'solutions or actions to be done' to achieve the selected 'mean' or 'goal'. The different elements are connected by color-coded lines. Hovering the mouse over the Sankey diagram highlights the paths between different elements. In addition to the Sankey diagram, the user can view all the filtered data by using the table view, which shows all data.

6 Plans for the future application of the Sustainability Compass

The Sustainability Compass has been implemented in selected cases (aquaculture and wind parks) and embedded into the PlanWise4Blue geoportal in cooperation with the University of Tartu for the MAREA project.

Certainly, at present the tool does not contain all the existing knowledge, rather just examples. The idea is that the Sustainability Compass would gather much more knowledge and data from existing research and bottom-up experience, to make best practice of sustainability naturally emerge. The aim is to activate participants and enable a virtuous competition, evidence-based, not only by complying with top-down rules, but by learning about to live and operate sustainably, and informing decision-makers about local and concrete examples. The approach can end up in even reducing the load of bureaucracy and compliance with top-down rules, sometimes redundant or treating all situation with the same criteria, and instead realise or strengthen bottom-up and place/culture-based voluntary operations.

Social bottom-up behaviour can become more effective than top-down regulation because it becomes internalised as part of an individuals' thinking. Therefore, the Sustainability Compass can constitute the tool and basic structure upon which this final aim can be reached. The aim for future research it to apply it to various contexts and establish in this way sustainability trends based on enlarged participation and continuous acknowledgement.

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