

# Guidelines for initial assessing renewable energy potential and its feasibility at seaports

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## 1 Introduction

Along with EU Green Deal and Finnish own energy targets, there is a strong focus on renewable energy solutions in the country. Being precise about the issue, Finland as a forerunner promised the EU that by 2030, there will be a 50% share of energy from renewable sources in the gross final consumption of energy. The current level in the year 2020 is 44.6% which means there are 5,4% left to achieve the energy target. How can it be realized? Perhaps, port infrastructure and the available (yet unutilized) renewable energy potential in its areas can have a positive impact on the issue.

Once the port authority becomes interested in renewable energy solutions, the next question is: “*Will it be possible in our port?*” This guidebook accompanied by a special survey in EVISA attachments will help you reply to this. The positive answer depends strongly on external natural conditions (wind or sun) and internal infrastructural structure which is located on port territory (available roof areas, open sea and land areas). Ports can take advantage of the location and prevailing climatic conditions and put up a wind turbine or install solar panels – after estimating the potential, and what is more important, the feasibility of such action. Note that the usual focus in Finland at the moment is on two technologies: wind and solar

photovoltaic energy. That is the reason we put focus on those two renewable energy sources. As a result of using this part of the EVISA tool, renewable energy potential will be assessed for wind and solar energy. Those numbers are normally rather high. For solar energy, the EVISA tool has also a feasibility study. It will help to design the right size of solar panel installation so that investment pays back to the port in under 5 years.

## 2 Potential for renewable energy generation

### 2.1 General discussion on renewable energy application in port

This short section with three general questions opens the presented survey. These questions will lead and narrow your focus to the topic in consideration. It asks about the port's motivation to apply renewable energy. If you thought about one or another technology, you can mention what preconditions are available for such in the port. Since **pre-survey** and **energy mapping** tools were already shown to you before you started to fill out this survey, you could tick those boxes too under Question 3, especially if you had done those to understand the *status quo* in the port and collect needed information. This general section aims to set you on the right train of thought before going into the details suggested in the next section.

### 2.2 Internal factors

After filling out the general part of the survey, you are offered to go into specifics about port conditions for solar and wind energy generation. The following questions will be answered after completing this part of the renewable energy potential assessment survey:

- Where would you install renewable energy solutions in the port?
- Do you have suitable roofs or onshore/offshore areas?
- What is available space on those?
- How many installations could you put up?

After these aspects are discussed in the survey and all necessary details are filled in, the next section will shed light on the issue if you have enough wind or solar energy potential in the area to make it all work. After looking at internal port capacity, we go to external climatic factors. By the way, we do not open in great detail questions in the survey because they are and the survey itself is built so that everything seems rather self-explanatory, and it is easy for the port authority to proceed by themselves about solar and wind energy.

## 2.3 External factors

This section utilizes already existing tools and rather simple equations which everybody can use to calculate required parameters. All comments are provided in the survey. The following two open access tools are going to be used:

- for solar energy: <https://ec.europa.eu/jrc/en/pvgis>
- for wind energy: <https://globalwindatlas.info/>

The survey helps you to get both the needed data and take into account some crucial considerations. From the feedback we collected from ports where this survey was verified, we can say that it is simple, easy to use and quick. There are a couple of short calculations involved but it is made accessible to all and does not require sufficient knowledge of higher mathematics. The whole survey is guided with tips and examples in an MS Word file which you can find in EVISA attachments.

## 2.4 Feasibility study for solar energy

At this stage, you have already found out that there is potential to install solar panels on your port roof spaces, walls or elsewhere suitable. Now it is time to think in numbers and euros, including such important components as required investments and payback time. In one of the EVISA attachments, we offer you a calculation tool to do that feasibility study. It is presented in MS Excel format with already pre-filled formulas to make it as straightforward as possible.

The column to fill, as seen in Fig. 1 below has obligatory **green** and optional blue cells. The data in green is needed here to have at least preliminary results. When you have blue numbers, more precision to the prediction will be given. Cells of the other colours are automatic or static: no need to enter numbers there.



SHORT INTRO				
<b>Comment 1:</b>		<b>Comment 2:</b>		
There are two types of cells you are going to fill in: green and blue		Mind that there are comments for you in some cells of the table		
	- green boxes is where you have to provide data			
	- blue boxes mean it is optional to fill in data here the blue data can help you get more accurate results	<b>Comment 3:</b> Blue, green and black cells have tips on the right hand side (grey text)		
Info about company current electricity costs:				
	Electricity purchase price, cnt/kWh			0.0
	Electricity transmission price, cnt/kWh			0.0
	Electricity tax and service security fee, cnt/kWh			2.253
	VAT on purchased electricity			0%
	Current / reference electricity price, cnt/kWh			2.25
	Estimated change in the reference price over years, % per year			3.0%
	Annual electricity consumption, kWh/year			0
	Approximate (or exact) share which can be covered by generated solar energy, %			0
	Generated energy can be used for this share of annual consumption, kWh/year			0
Info about the photovoltaic (PV) system:				
	Installed peak power, kWp			0.0
	Surface area, m <sup>2</sup>			0
	Yearly irradiation in the location, kWh/kWp			0
	PV production, kWh/year			0
<b>NOTE!</b> When you play with different values of <b>surface area</b> , you get different values of <b>payback time</b> and <b>PV production</b> . Please use the table below ("Your summary notes") to register those numbers.				
			Payback time, years	#DIV/0!
Your summary notes	Surface area, m <sup>2</sup> →			
	PV production, kWh/year →			
	Payback, years →			
	Decrease in electricity production of the solar power plant, % / year			-0.5%
	Solar electricity surplus of annual production, %			#DIV/0!
	Sales price of surplus solar electricity to the grid, cnt / kWh			2.0
Info on financing costs of the PV system:				
	Turnkey PV system investment cost, euro			€0
	Price of PV system without subsidies, euro/kWp			1,100 €
	Potential investment aid in initial investment, %			0%
	Port budget for green measures, €			€0
	Investment costs with subsidies, euro			0 €
	Own available financing for solar energy panel installation, €			0 €
	Amount of loan, €			€0
	Loan period, years			20
	Interest rate on the loan, %			1.5%
	Installments of a loan or external financing, euro / year			€0.0
	Return on investment requirement			0.0%
	Inverter replacement cost: once in 15 years			8%
	Annual maintenance costs, euro/year			€0

Figure 1 - Feasibility study for solar energy: the main table

Again, as there are helpful tips on the right from the table and also in the MS Word file of the survey, there is no need to overexplain it in this guidance. It is user-friendly and can give you results within 1-2 hours.

### 3 Conclusion

This survey will help you to focus on renewable energy potential in the port and choose a suitable solution to proceed with. Solar energy potential can be worked out in further detail: with a verified option of a feasibility study to see the payback time of the initial investment. Welcome to start and use this questionnaire and calculation tool! Hope you find all the necessary information and get promising results for your future use.