Ports Energy and Carbon Savings

DELIVERABLE 1.3.3: CALCULATION TOOL FOR ASSESSMENT OF THE RENEWABLE ENERGY POTENTIAL IN PORTS

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9.1 Calculation tool for initial assessment of the potential of renewables

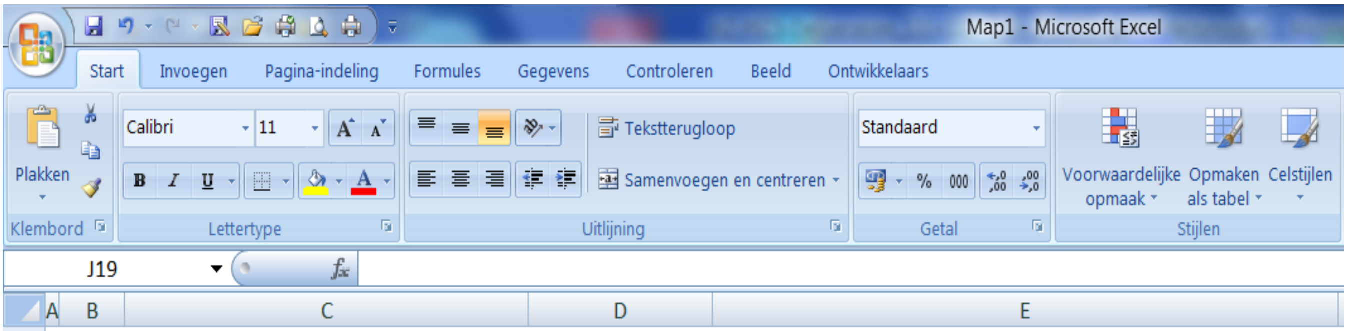
As renewable energy is ambient energy, its potential directly is related to (horizontal) surface area. Following the principles outlined in "1.3.2 Draft method to determine potentials of renewable energy sources in SMS ports", the potential of renewable energy in ports follows from a comparison of energy consumption and energy production.

The energy consumption follows either from an assessment (done within WP1) of from an estimate on the basis of the typology of the port (see table 2.2).

Energy production potential is determined on the basis of available surface area [m^2] and specific potential (e.g. solar irradiation, [kWh/(m^2.a)]).

The calculations can be done easily in a spreadsheet. Table 3.1 provides the example for Hellevoetsluis habour.

Table 3.1 Calculation tool: spreadsheet to assess the theoretical potential of renewable energy techniques. Example Hellevoetsluis



	B	C	D	E
1				
2			Quantity	remark
3		**Current port energy consumption**		
4	A	Port electricity consumption [kWh/a]	300000	From Energy audit (Workpackage 1), Hellius habour
5	B	Port gas consumption [kWh/a]	0	From Energy audit (Workpackage 1)
6	C	Port heat consumption [kWh/a]	0	From Energy audit (Workpackage 1)
7		**Total energy consumption [kWh/a]**	**300000**	Assuming that elektricity and heat are equivalent
8				
9		**Port characteristics**		
10	D	Usable water area of the port (tidal) [m2]	250000	Assuming 50 % for Hellius Harbour
11	E	Usable land area of the port (solar) [m2]	250000	Assuming 50 % for Hellius Harbour
12	F	Usable water front length (wave) [m]		N.A. due to unfafourable wave climate
13				
14		**Port Renewable potential**		
15	G	Solar Thermal [kWh/a]	131400000	E x power density of 60 W/m2
16	H	Solar PV [kWh/a]	37230000	E x power density of 17 W/m2
17	I	Wind [kWh/a]	4380000	E x power density of 2 W/m2
18	J	Wave [kWh/a]		F x 10 kW/m. N.A. due to unfafourable wave climate
19	K	Tidal [kWh/a]		D x 2 power density of 2 W/m2. N.A. due to unfafourable tidal rage
20		**Total renewable potential [kWh/a]**	**173010000**	
21				
22		**Reduction of energy consumption [%]**	**> 100 %**	

As can be seen from this example for Hellius habour, Hellevoetsluis:

1. The current energy consumption of the marina is modest: 300 MWh/a, which corresponds to 0,07 W/m^2.
2. Comparing row H and row I (renewable potential) with the demand (row A) it can be stated that, in principle (theoretically) more than sufficient renewable energy can be harnessed.

Note that this favourable outcome very likely is not representative for a port with industrial activity.
Main advantage of the calculation sheet is that itprovides a quick assessment of the potential. After positive indication, a more detailed analysis must determine the actual feasibility.

An example of this procedure is TNO's Energy Potential Scan. It involves a more detailed (and cumbersome) analysis of individual users (companies, buildings) with determination of consumption and renewable production potential.

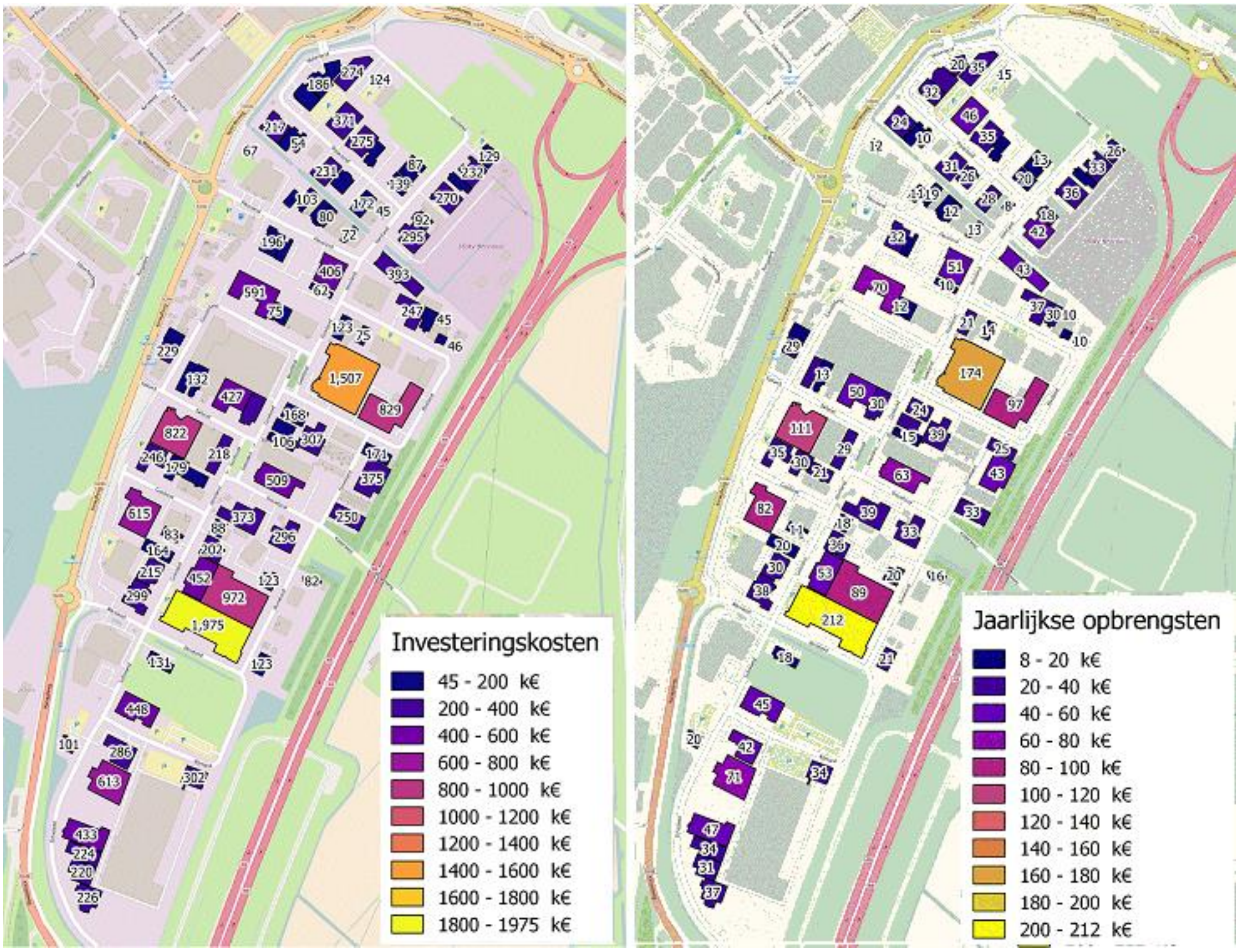


Figure 3.1 Example of TNO's Energy Postential Scan (EPS)-BE+ for the industrial area Kagerweg (IJmond) showing Investment costs (left) and annual benefits (right), reference OD-IJmond.