

Sustainable Harbor Towards Energetic Sustainability

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Introduction

- A harbor consumes a high amount of energy
- In Barcelona, GHG emissions (NO_x, SO_x, CO₂) represent 7.6% of air pollution
- By using renewable energy sources harbors would reduce the dependency on fossil resources

Main Advantage

- Feasibility to combine different energy sources



Main Disadvantage

- Renewable sources generate intermittent energy due to its natural conditions



Objectives

- Achieve partial energetic independence from fossil fuels
- Reduce the emission of pollutant gases



Renewable sources



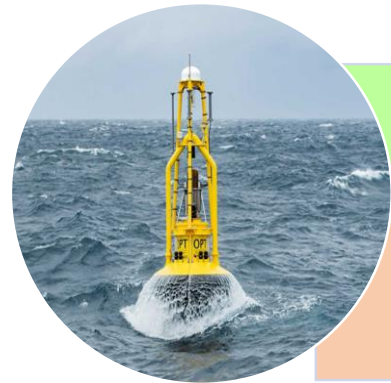
- Easy to implement

- Intermittent energy



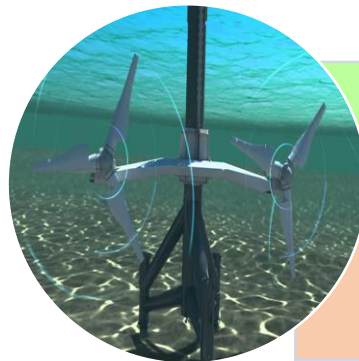
- Huge production of energy

- Intermittent energy



- Constant production

- Elevated cost



- Constant production

- Absence of marine currents



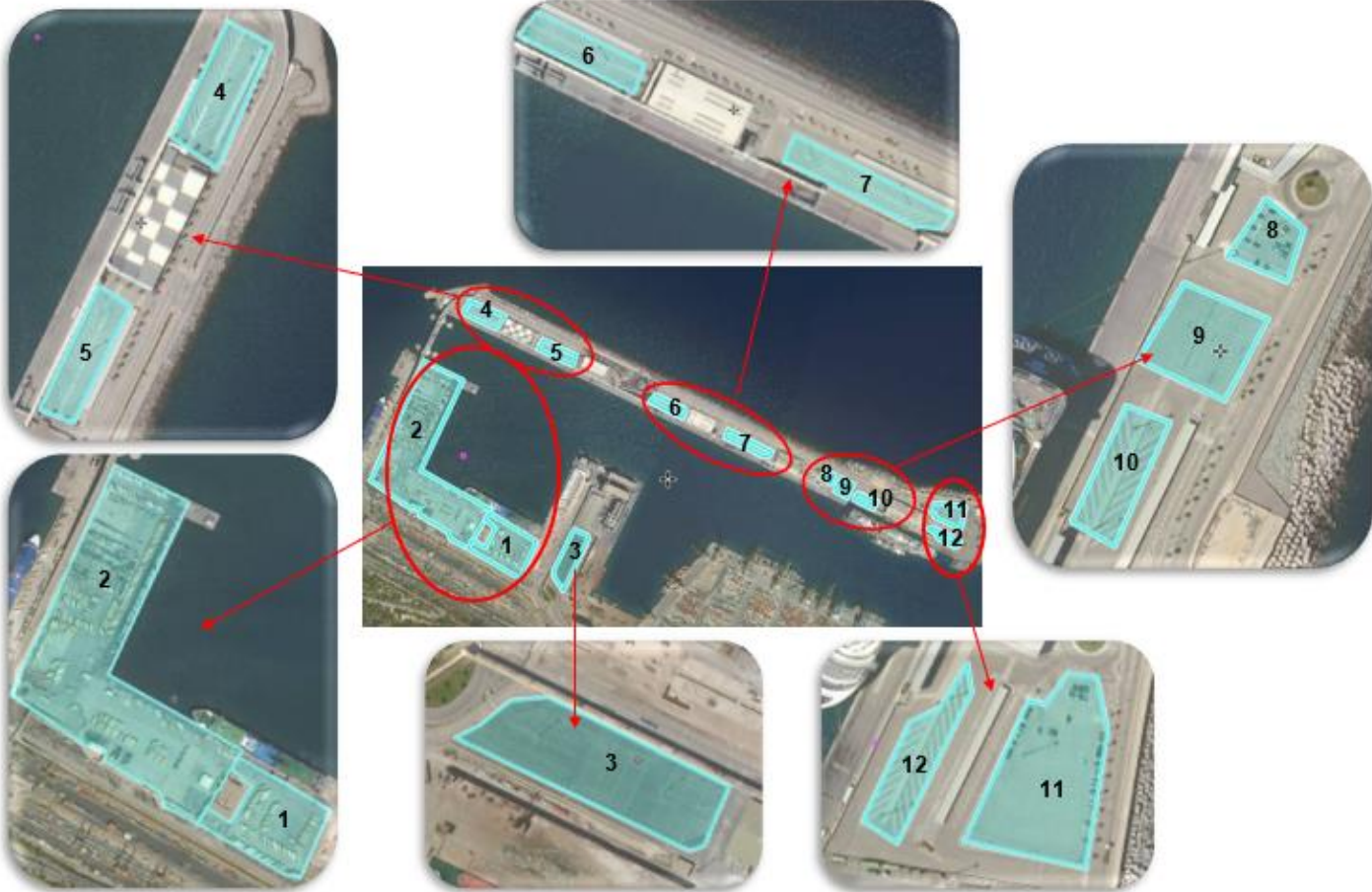
- Predictables

- No significant tides

Feasible energies in the port of Barcelona

- Solar power

	Surface (m ²)	Available installing surface (m ²)	Available Power (kWh/day)	GWh per year	Panels
13 buildings	78 090	62 472	71 076.1	25.9	31 236
12 parkings	171 504	137 203	156 099	57.0	68 601



Feasible energies in the port of Barcelona

- Wind power

Available distance (km)	Wind turbines	GWh per year
7	10	127.3



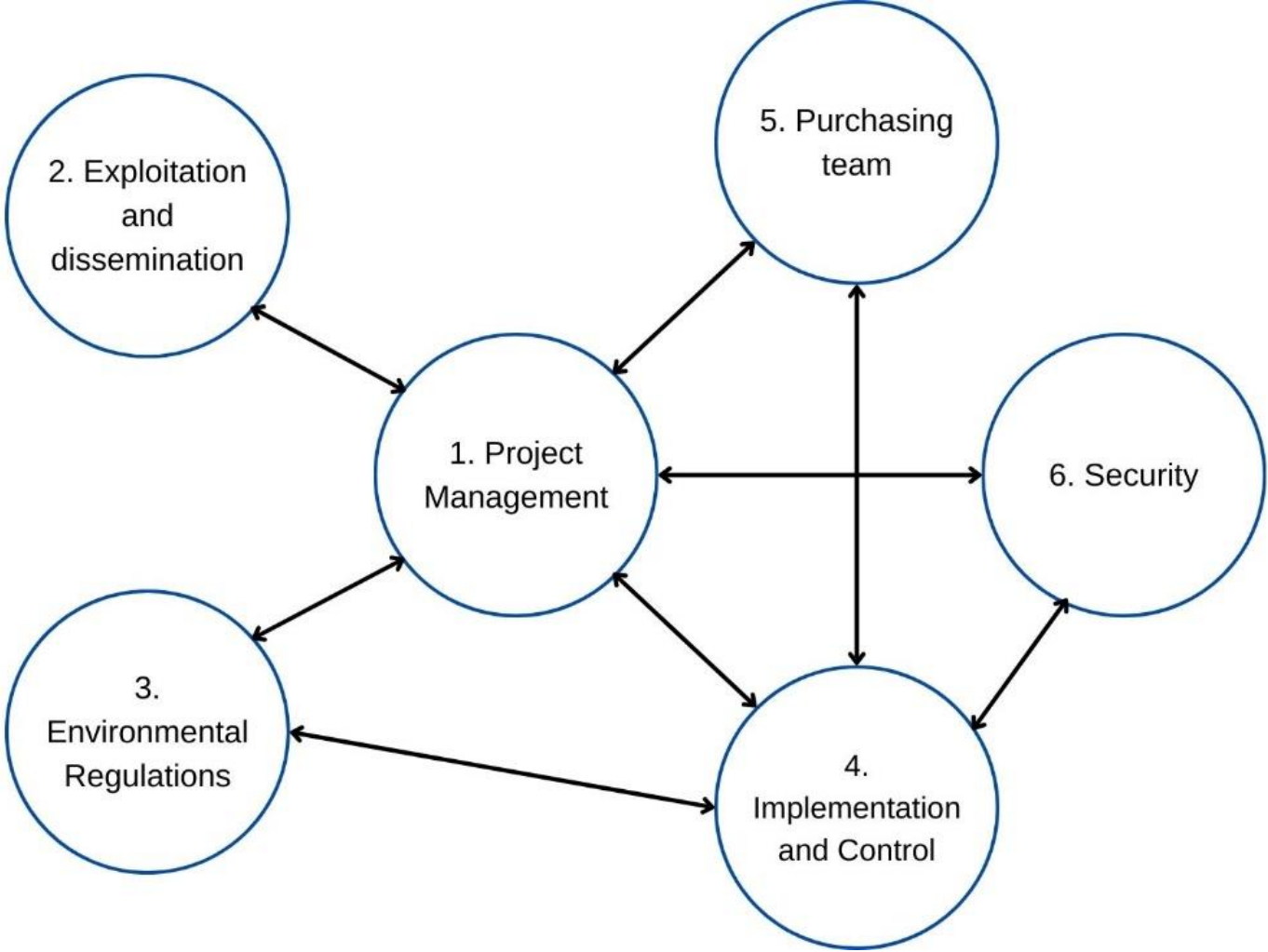
Economic summary

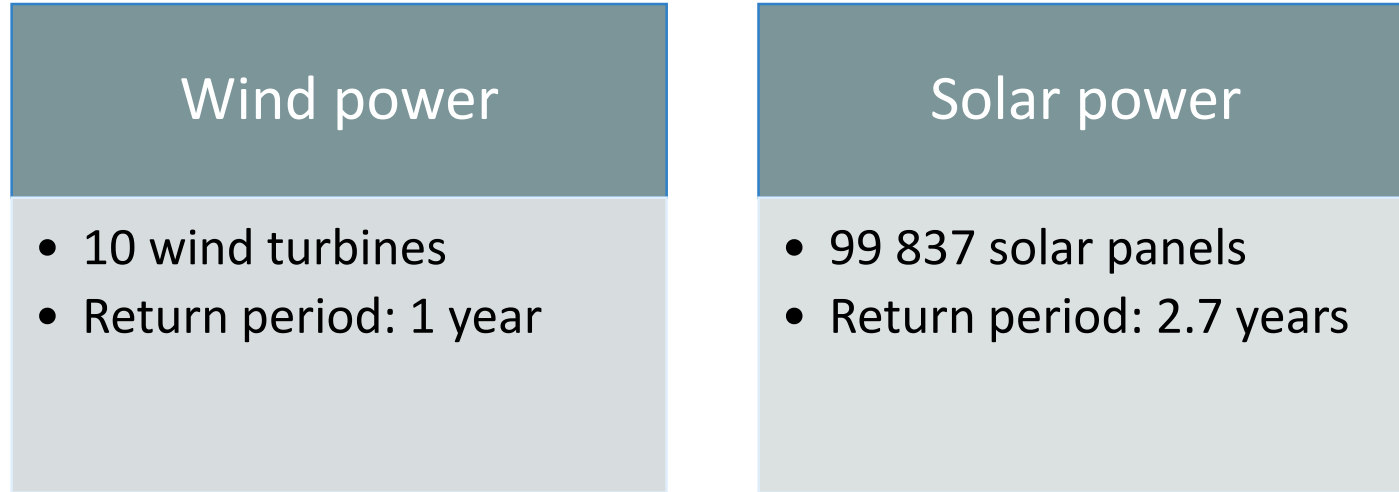
	Wind turbines	2m ² solar panels
Quantity	10	99 837
Total cost (€)	20 000 000	63 044 740
Annual energy generated (GWh/yr)	122.23	82.9
Savings/yr (€)	34 713 330	23 549 020
Return period (years)	1	2.7
CO ₂ tn equivalent	31 658	21 476
% CO ₂ emissions 2020	18.69	12.68

SWOT Analysis

STRENGTHS	WEAKNESSES
<ul style="list-style-type: none"> - Work team with good intellectual property. - Low return period for each renewable energy implemented in Barcelona. - Strong marketing team to promote the project to other ports. 	<ul style="list-style-type: none"> - In the port of Barcelona not all the renewable energies are feasible. - In other ports, one of these renewable energies can be already implemented or not feasible.
OPPORTUNITIES	THREATS
<ul style="list-style-type: none"> - Implementation of the project in some port where all, or at least two, renewable energy sources can be implemented. Therefore, a better result can be obtained. - Reduce the CO₂ emissions with self-producing energy - High social awareness about the importance and need to move to renewable energies. 	<ul style="list-style-type: none"> - Concerns by AENA management due to the impact on the airspace. - The biodiversity cannot be altered. - Citizens in Barcelona may not like the project as it requires a lot of equipment and has a visual impact of the port.

Workpackages





Specific conclusions:

- Solar and wind power are the only feasible options in Barcelona
- The implementation of the project would allow the Barcelona seaport to take a step towards self-sufficiency

General conclusions:

- The combination of different renewable energy sources could be successfully applied in different ports to meet its needs

 55 000 tones CO₂/year



t < 3 years



EDPR and renewables energies: a future side by side