LIFE CYCLE ASSESSMENT OF RENEWABLE ENERGY SOURCES TOWARDS CLIMATE NEUTRALITY

18TH MARCH 2022

80TH INTERNATIONAL SCIENTIFIC CONFERENCE OF THE UNIVERSITY OF LATVIA 2022:
TOWARDS CLIMATE NEUTRALITY: ECONOMIC IMPACTS, OPPORTUNITIES AND RISKS

FUTURE ENERGY LEADERS PORTUGAL

Agenda

01 INTEGRATED NATIONAL ENERGY AND CLIMATE PLAN (PNEC) 2030

02 Overall IMPACT assessment

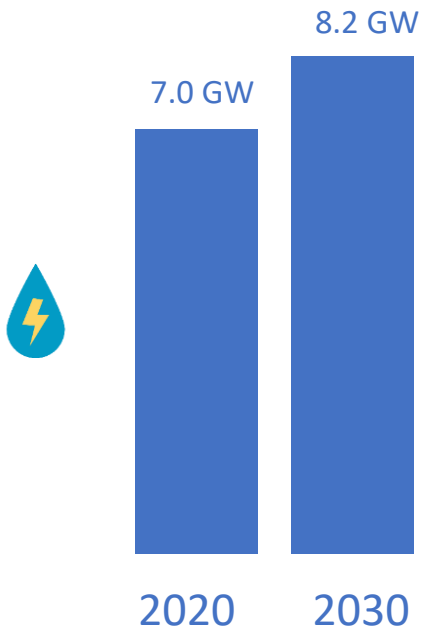
03 Results

04 Possible Solutions

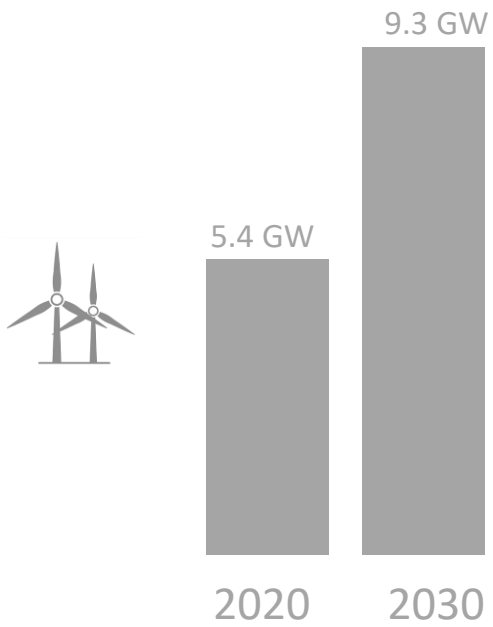
INTEGRATED NATIONAL ENERGY AND CLIMATE PLAN (PNEC) 2030

Prospects for the evolution of installed renewable capacity for electricity production

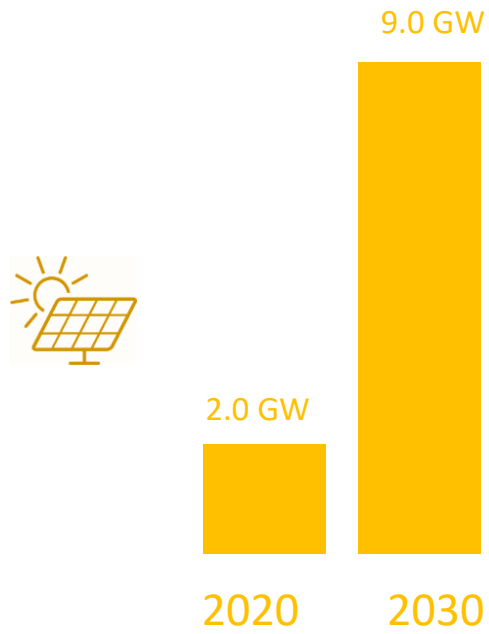
PNEC envisions a solid electrification boost of consumption, related with the decarbonization of energy production, by reinforcing the exploitation of the renewable sources potential, focusing on solar and wind technologies.
The perspective of electricity production evolution by technology, in particular, hydro, wind and solar, is the following:



HYDROPOWER

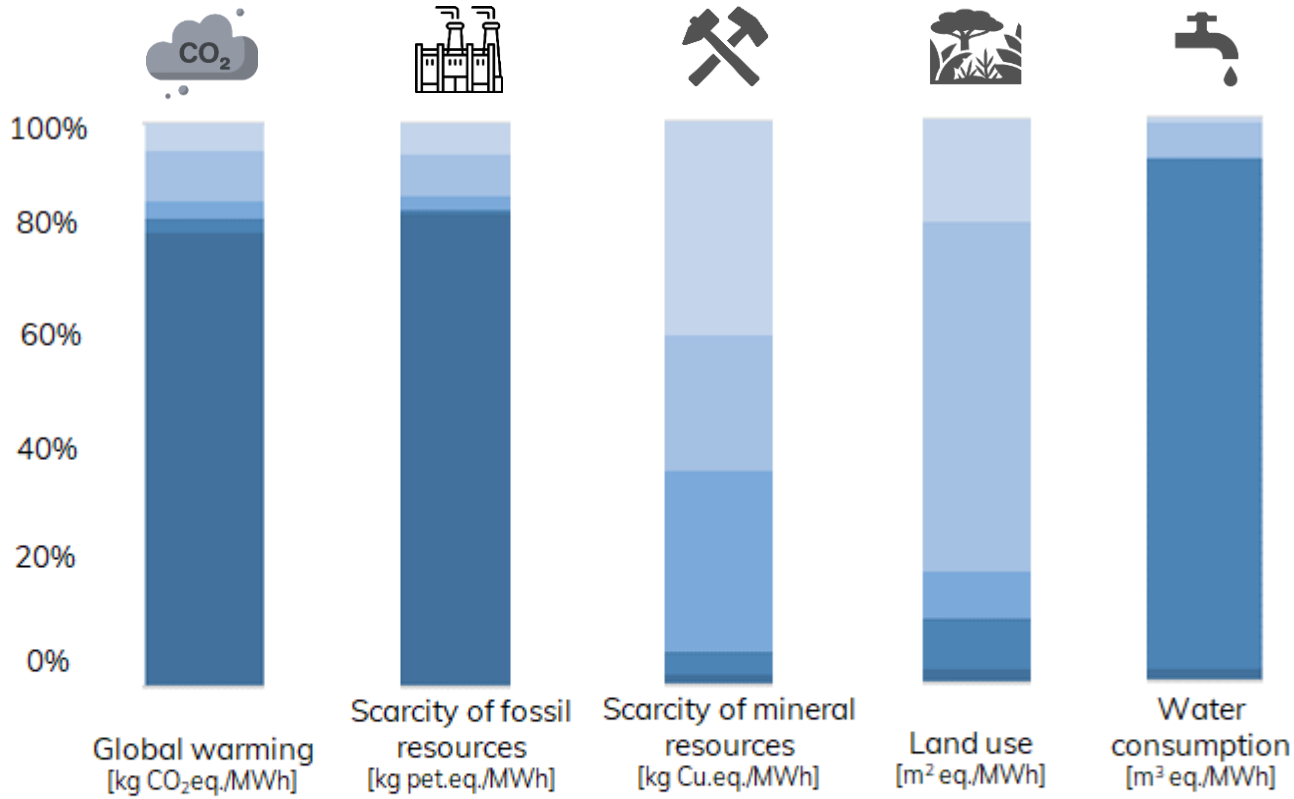


WIND



SOLAR

OVERALL IMPACT ASSESSMENT



	Global warming [kg CO_2eq./MWh]	Scarcity of fossil resources [kg pet.eq./MWh]	Scarcity of mineral resources [kg Cu.eq./MWh]	Land use [m^2 eq./MWh]	Water consumption [m^3 eq./MWh]
Concentrated Solar Power	26	10.3	1.4	12	0.3
Solar PV	50.3	13.4	0.9	41.2	2
Onshore Wind	16.2	4.4	1.1	5.4	0.1
Hydro	13.5	1.3	0.1	6	29.3
Natural Gas	443.7	154.8	0.1	1.6	0.7

Figure 1 | Environmental impact per MWh of electricity produced

NATURAL GAS

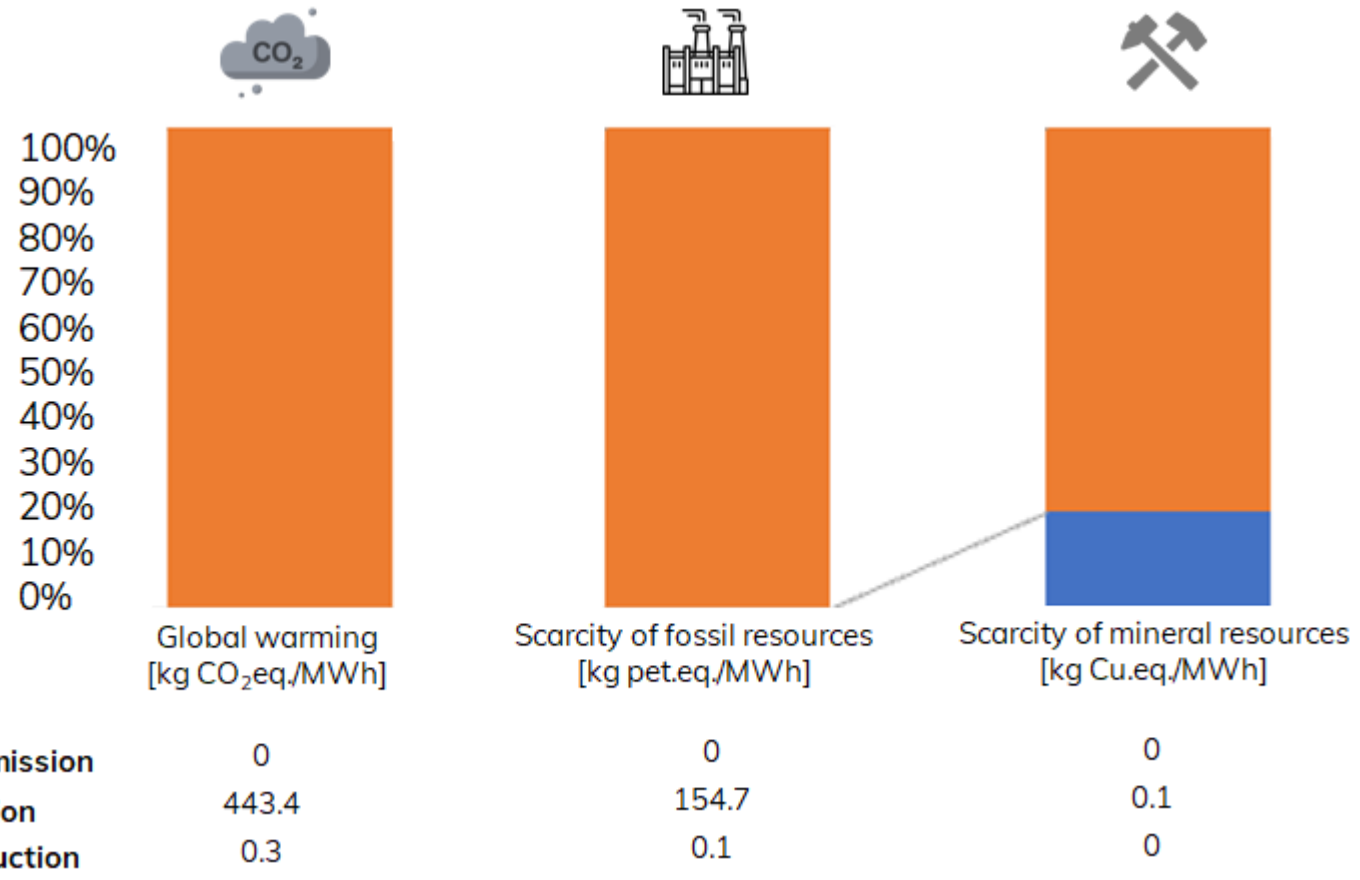


Figure 2 | Impact of **natural gas** technology for electricity production, in the 3 phases of the life cycle (construction, operation and decommissioning), per MWh produced

HYDROPOWER

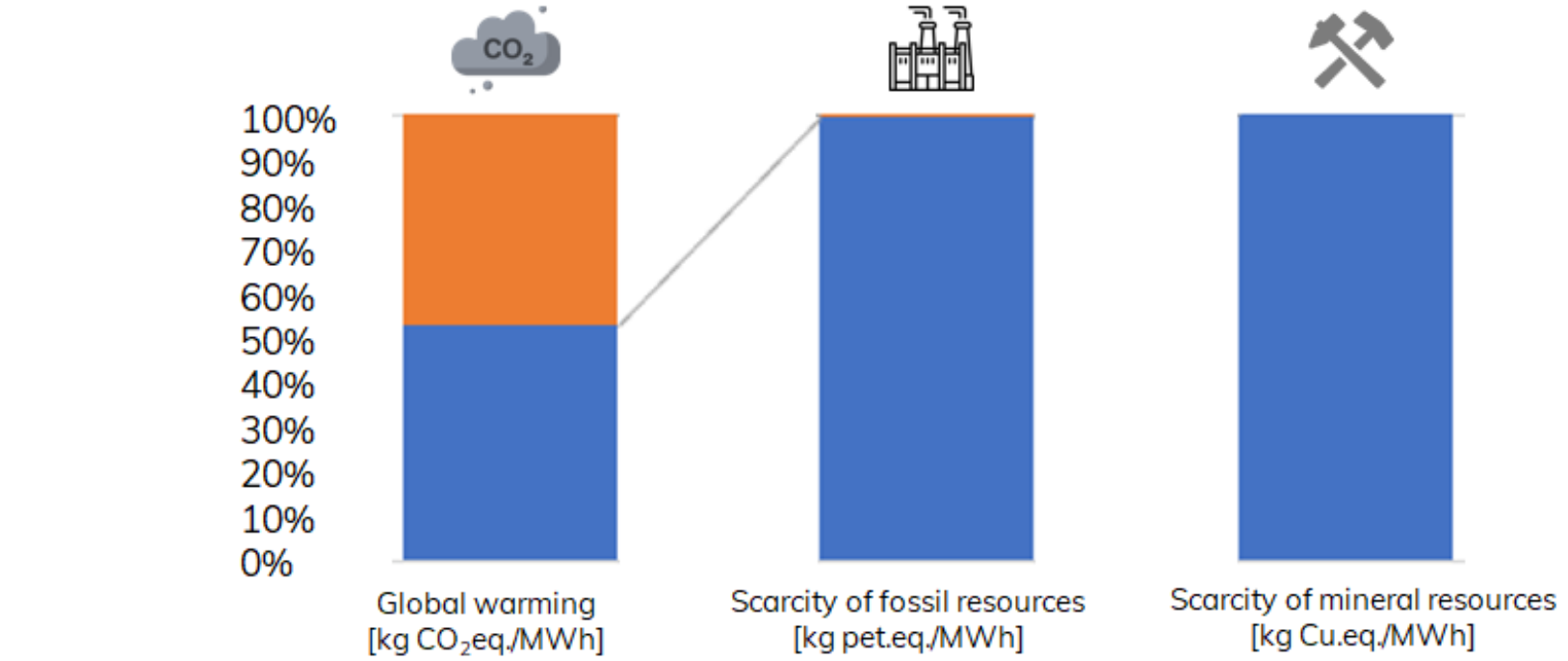


Figure 3 | Impact of **hydropower** technology for electricity production, in the 3 phases of the life cycle (construction, operation and decommissioning), per MWh produced

ONSHORE WIND

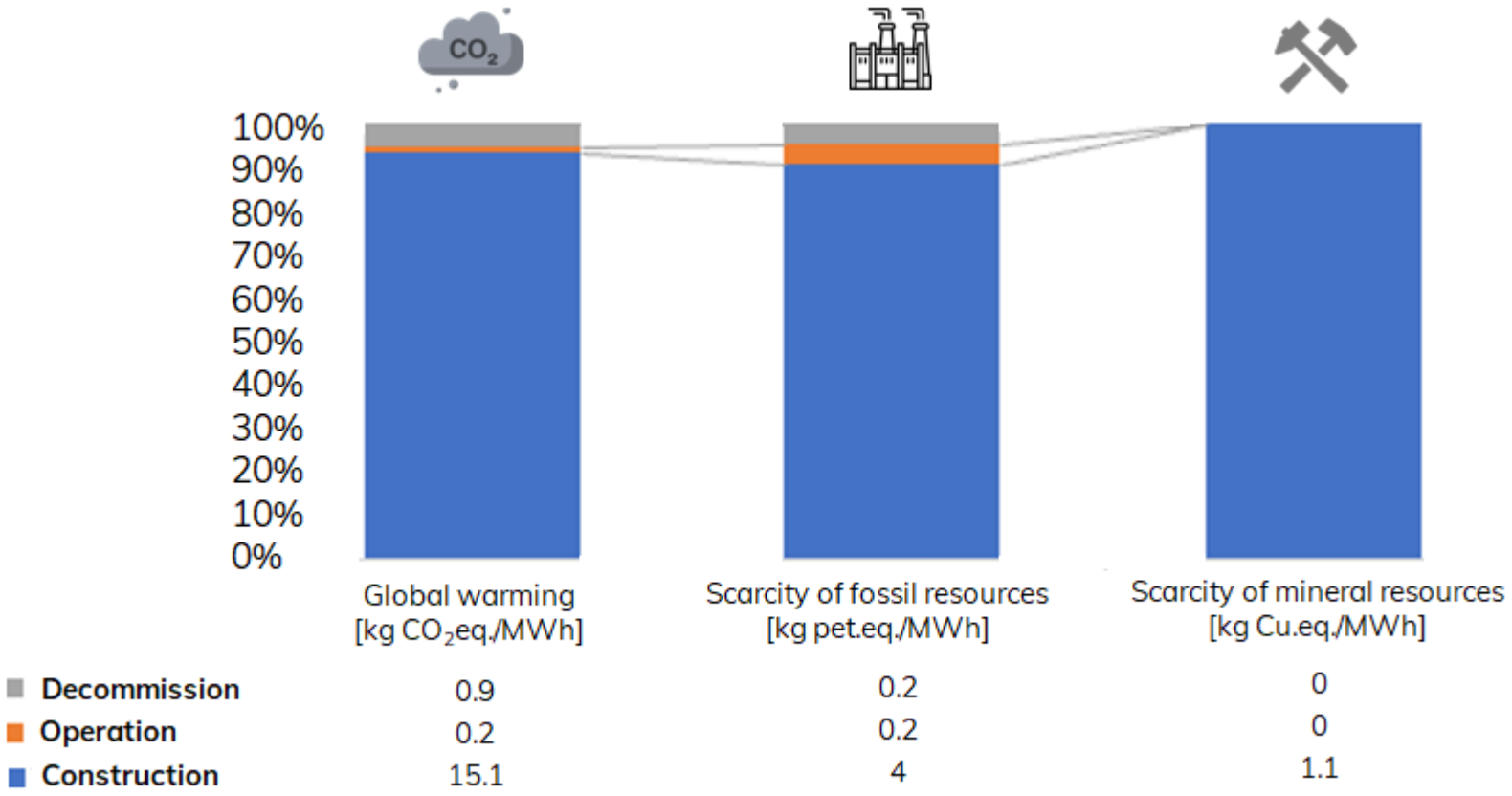


Figure 4 | Impact of **onshore wind** technology for electricity production, in the 3 phases of the life cycle (construction, operation and decommissioning), per MWh produced

PHOTOVOLTAIC PANELS

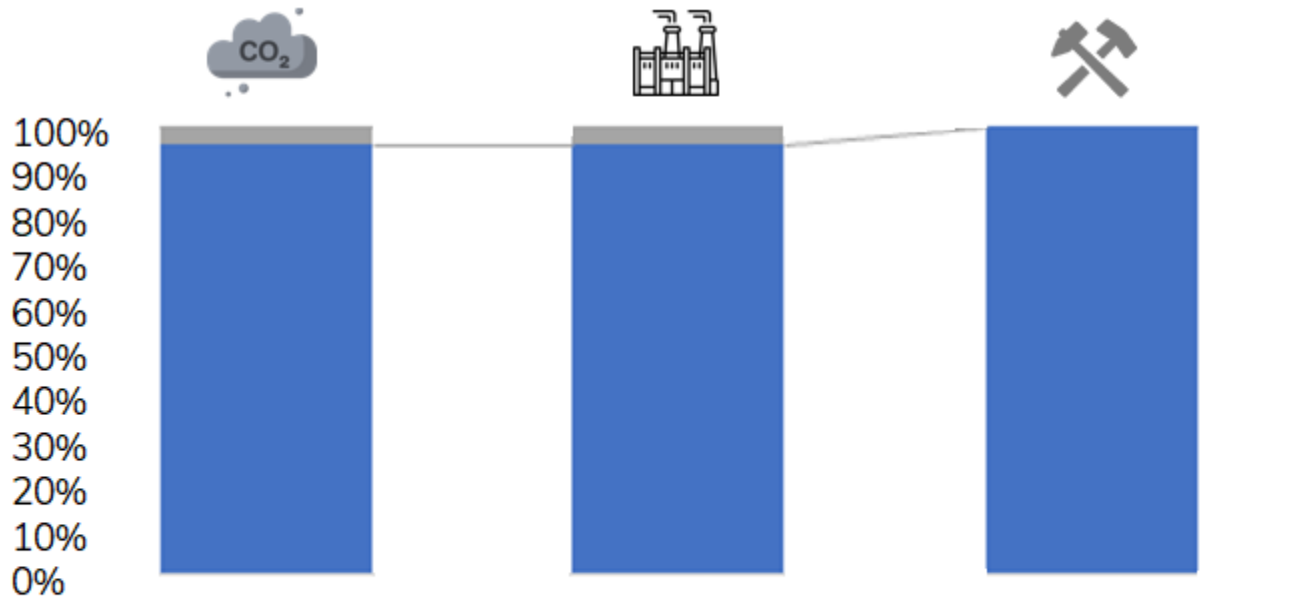


Figure 5 | Impact of **photovoltaic panels** technology for electricity production, in the 3 phases of the life cycle (construction, operation and decommissioning), per MWh produced

CONCENTRATED SOLAR POWER

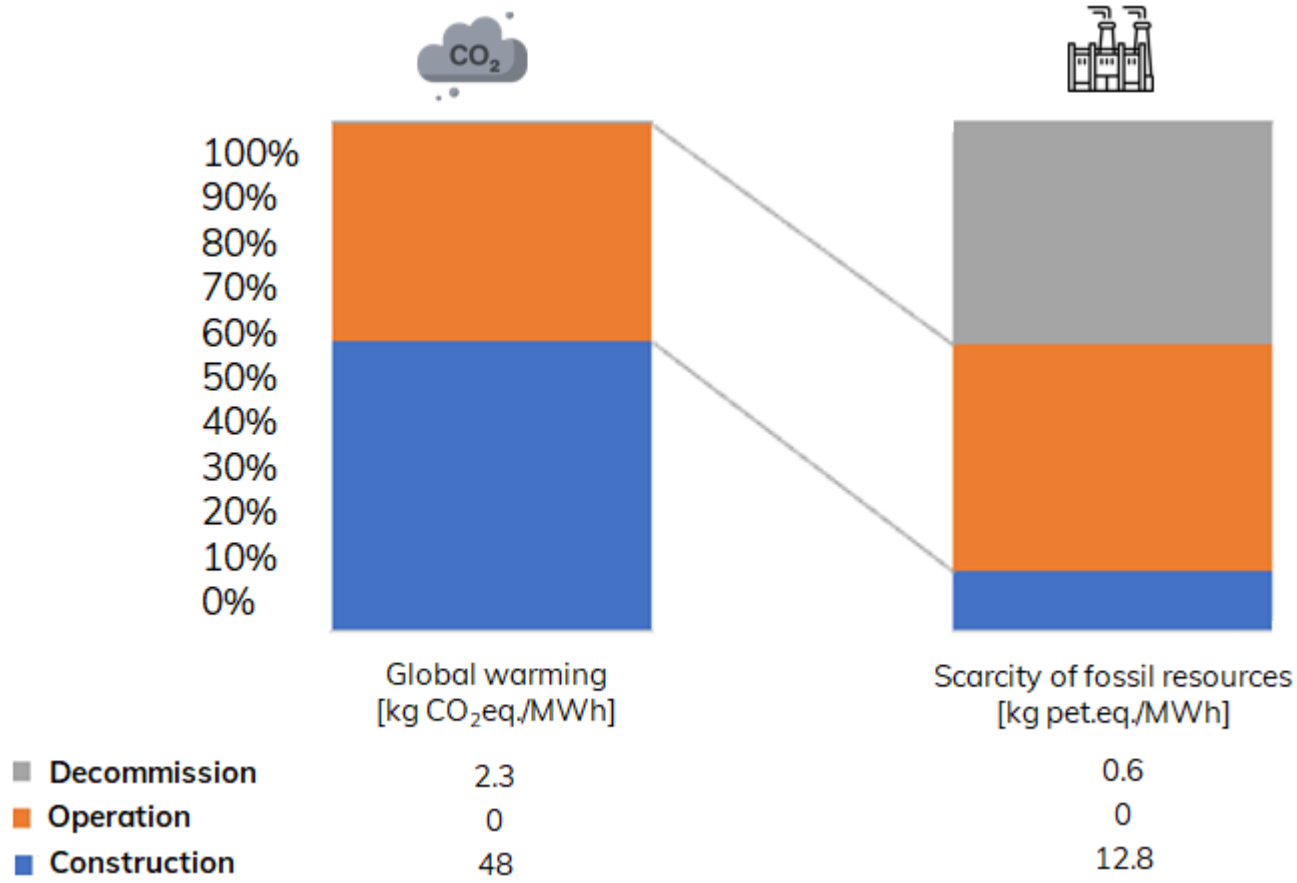


Figura 6| Impact of **Concentrated Solar Power** for electricity production, in the 3 phases of the life cycle (construction, operation and decommissioning), per MWh produced

RESULTS

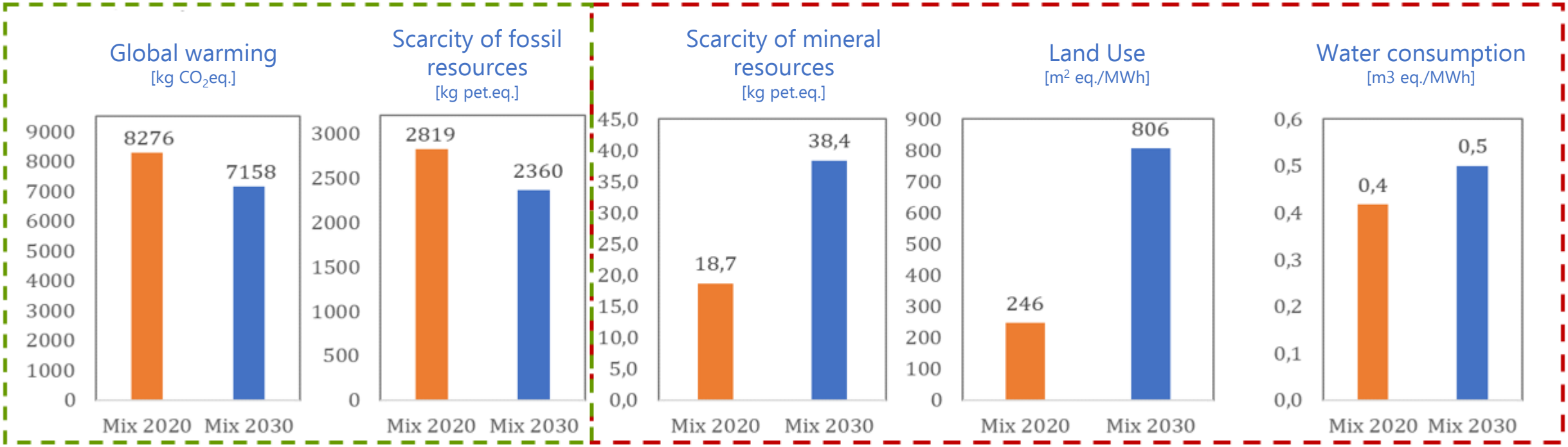


Figura 7| Total impacts for the 2020 and 2030 energy mix

RESULTS

Impact Category

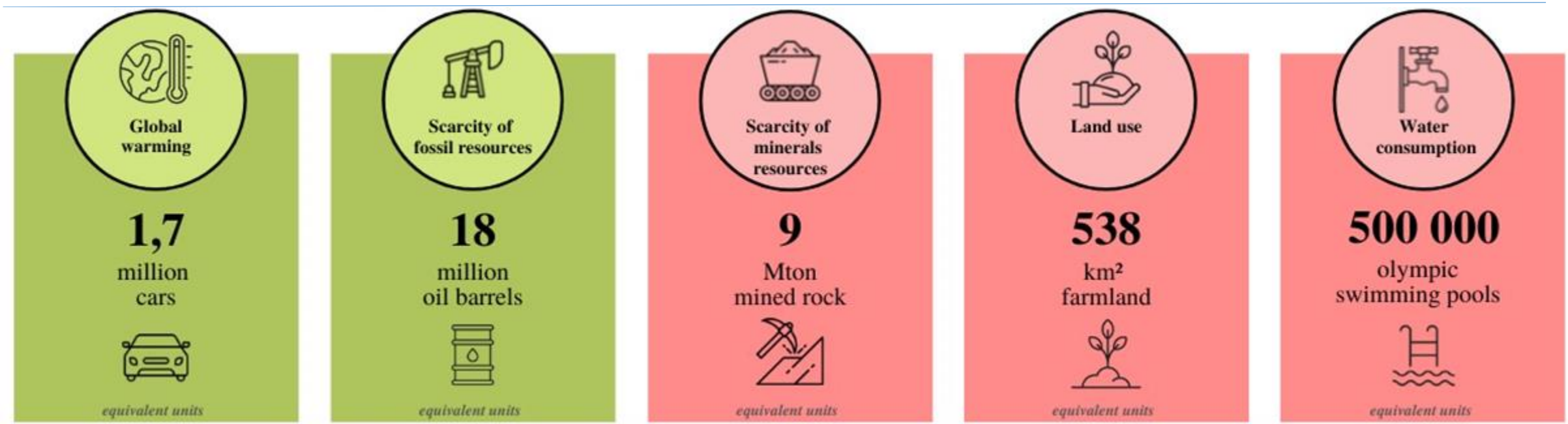


Figura 8| Potential environmental consequences, based on the targets set in PNEC 2030 vs 2020

POSSIBLE SOLUTIONS

Solution 1 – Integration of photovoltaic production in buildings; prioritization of non-productive lands; implementation in agricultural lands with specific crops compatible with shading and allowing some periods of sun when necessary.

Solution 2 – Hybridization of energy production systems, in particular hydropower and floating photovoltaic, in a symbiosis which reduces evaporation and avoids the use of soil for the allocation of photovoltaic panels.

Solution 3 – Development of material recovery programs during the decommissioning stage, thus increasing the external independence of raw materials and supporting inspection measures and social responsibility in the mineral extraction.

Solution 4 – Implementation of energy efficiency strategies in the several stages of technology's life cycle.

ANA SOUSA

BRUNO HENRIQUE SANTOS

FRANCISCO BOTELHO CARLOS

HENRIQUE POMBEIRO

JOÃO GRAÇA GOMES

MARGARIDA GONÇALVES

MURIEL ITEN

NUNO CARVALHO

PEDRO FERREIRA

PEDRO FRADE

felpt@apenergia.pt

FUTURE ENERGY LEADERS PORTUGAL