Review on Waste- to-Hydrogen (WtH) Approach and the SDGs

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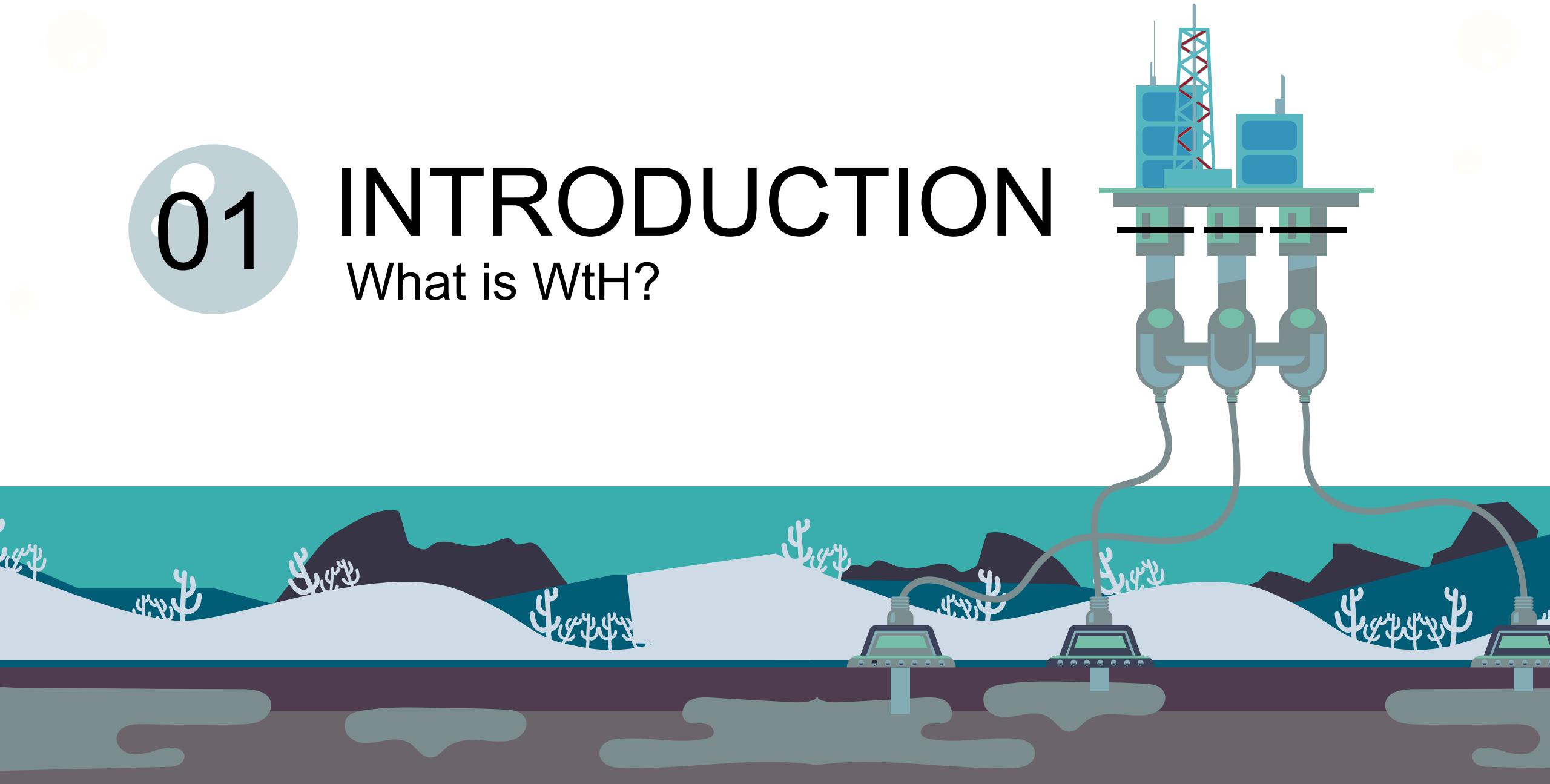
01 INTRODUCTION

What is WtH?



BACKGROUND

waste generation is over 2 billion tons annually worldwide with an average of

With the growing population rate of 1.18% annually, global waste generation is expected to reach 6 million

In 2050 these values are expected to reach 3.40 billion tons/year

Landfilling and incineration emit vast amounts of CH4 that has a global warming potential of 21 times CO2

NASA & Hydrogen

Hydrogen fuel cells were firstly used by NASA in order to produce the energy required for operating the electrical system on the spacecraft.

The hydrogen fuel cells generate electricity by combining the atoms of oxygen and hydrogen, where the oxygen reacts with hydrogen in an electrochemical cell.

https://www.nasa.gov/content/space-applications-of-hydrogen-

WASTE TO HYDROGEN

One of the zero-carbon energy methods that can be produced from biomass.

A particular form of energy from waste (EfW).

it contains the highest energy content/unit of weight among the other most used fuels.

Hydrogen is viewed as an energy carrier and alternative fuel with a high calorific value for electricity generation.

WASTE TO HYDROGEN

assist in the process of decarbonization of the energy sector by replacing fossil fuels with clean hydrogen produced from

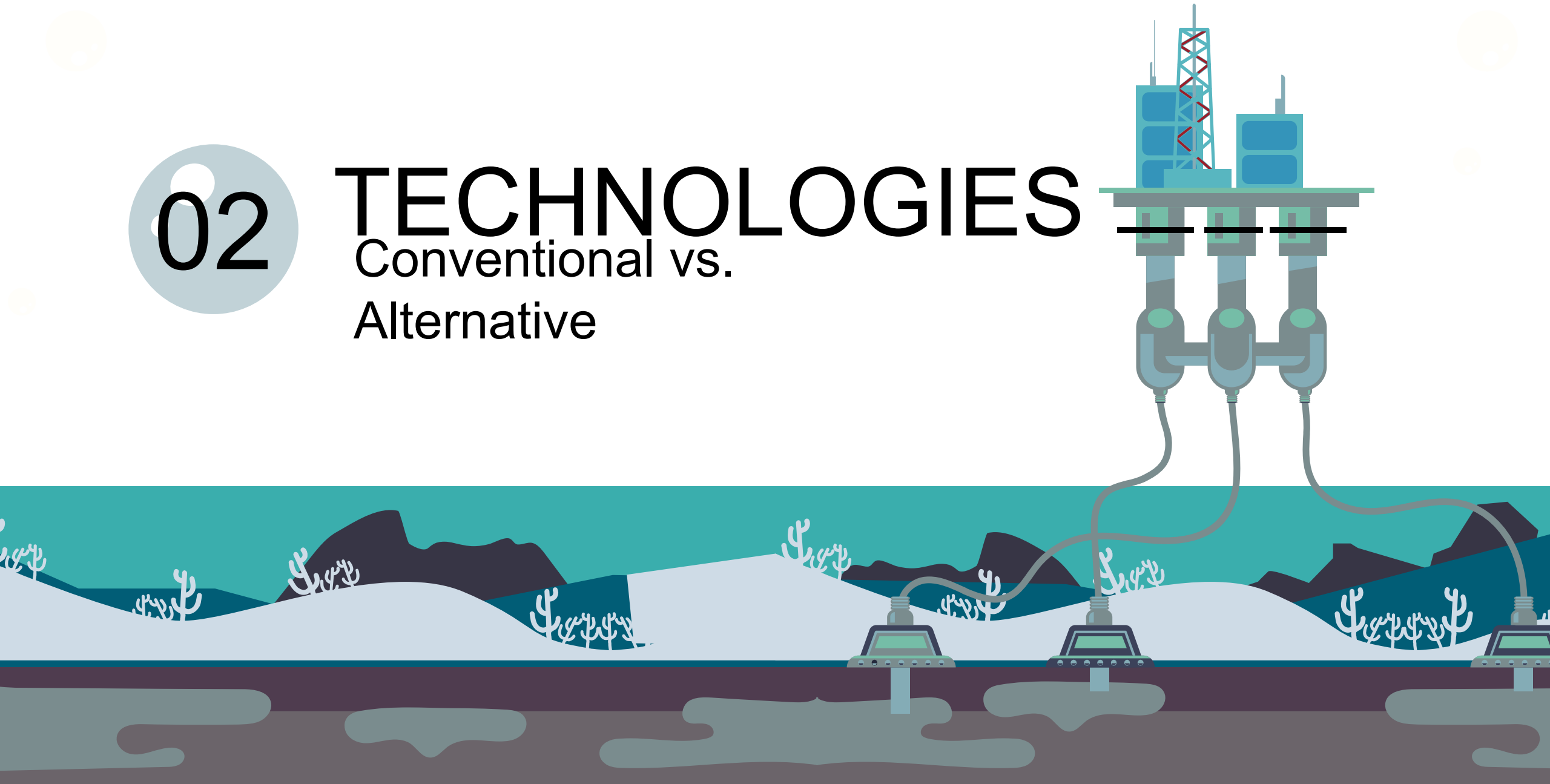
Producing hydrogen from waste contributes to reach energy security, reducing waste disposal, and decreasing the dependency on fossil fuels

It is expected that by 2050, 24% of the global energy demand will be achieved through clean hydrogen, with annual sales of 630 billion EUR

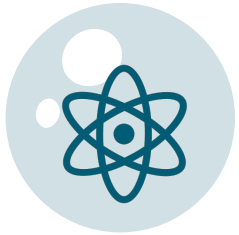
02

TECHNOLOGIES

Conventional vs. Alternative



CONVENTIONAL TECHNOLOGIES



CATALYTIC DECOMPOSITION

PARTIAL OXIDIZATION

STEAM REFORMING

The conventional hydrogen production technologies are considered highly energy-intensive, and they create high CO2 emissions.
So should be replaced by alternative processes.

ALTERNATIVE TECHNOLOGIES

THERMOCHEMICAL

- Gasification
- Pyrolysis

BIOLOGICAL

- Biofermentation: Dark-Fermentation, Photo-Fermentation
- Bio-photolysis: Direct,Indirect

BIOLOGICAL METHODS

They have more advantages over the thermochemical techniques as they don't need high energy requirements.

BIO-FERMENTATION

- Dark Fermentation
- Photo-Fermentation

BIO-PHOTOLYSIS

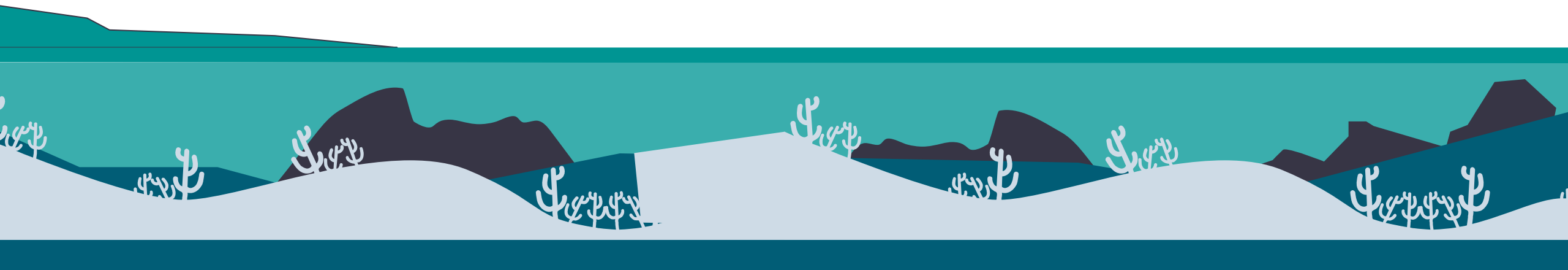
- Indirect
- Direct

03 LIMITATIONS

Feedstock charactrestics and challenges

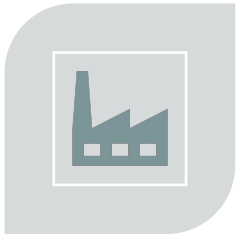
FEEDSTOCK

Shall include MSW, sewage sludge, plastics, SRF, and RDF. Thermochemical conversion is often used for recycling food, agriculture waste, and plastics because they are rich in carbon.

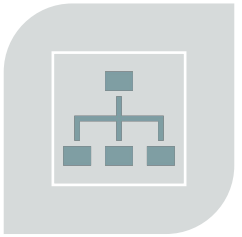


LIMITATIONS

SOME FACTORS THAT AFFECT THE IMPROVEMENTS OF HYDROGEN OUTPUT ARE RELATED TO THE ADVANCED ENERGY



THE HIGH COST OF THE OPERATION AND PRODUCTION PROCESS.



THE LACK OF SUPPORTING POLICIES AND MANAGEMENT STRATEGIES.

THE LOW EFFICIENT PROCEDURES

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HIGH MARKET UNCERTAINTY AND SUPPLY CHAIN RISKS WHICH MAKES IT DIFFICULT TO DEPEND ON HYDROGEN IN INDUSTRY.

04 WtH and SDGs

WtH & SDGs

A circular approach to waste management.

By focusing on the achievement of **SDG 7: Affordable and Clean Energy**, WtH provides an optimum solution to improve energy productivity by providing cheap and clean sources of energy to all.

Germany is one of the IISDFU countries to sign bilateral agreements for importing hydrogen produced from solar power in Australia, which contributes directly to **SDG 17: Partnerships for the Goals.**

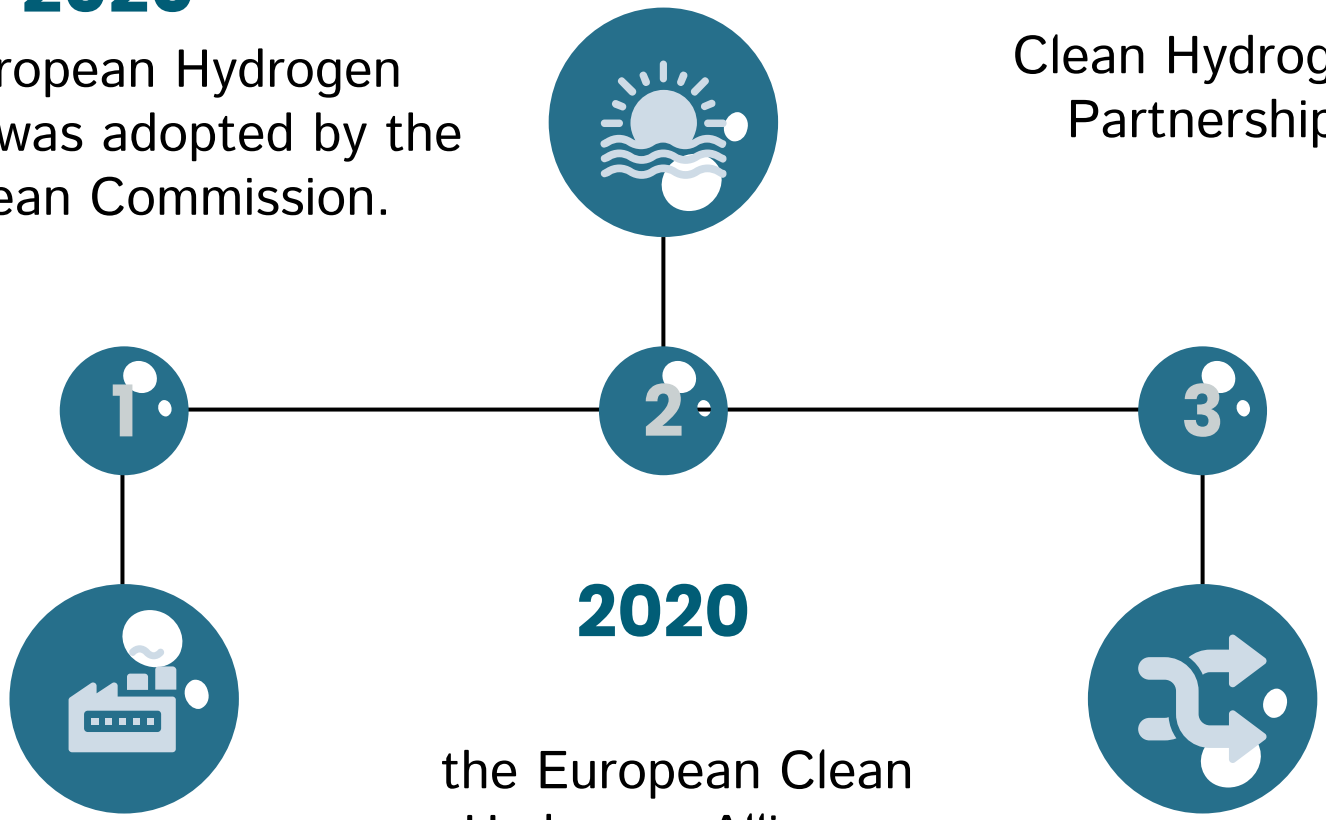
TIMELINE

2020

the European Hydrogen Strategy was adopted by the European Commission.

2021

Clean Hydrogen Partnership



2020

the European Clean Hydrogen Alliance was created

Hydrogen Strategy

The EU Hydrogen strategy identifies the vision of the methodology that the EU can follow in order to make clean hydrogen a feasible solution to achieve decarbonization in various sectors

It addresses the challenges and determines the actions that the EU can take as coming steps.

All Member States of the EU have already incorporated clean hydrogen schemes into their national energy strategies.

AIMS OF THE EU STRATEGY

GOAL 1

Decarbonize hydrogen production and use it for energy applications instead of burning fossil fuels.

GOAL 2

Establish 40 GW of renewable hydrogen electrolysis by 2023.

GOAL 3

more than 60GW in 2024.

GOAL 4

EU energy mix is expected to have 14% of it to be hydrogen, by 2050.

Current Initiatives

Germany

In 2021, WtH plant with an investment of 70 million EUR in Permnitz.

Implemented by the German Richter Group and a Swedish technology company called Plagazi.

By 2023, the project intends to transfer 44 thousand tons of composites and non-recyclable plastic waste into 7.5 thousand tons of clean hydrogen and 100 thousand tons of liquified CO_2

Using plasma gasification technology.

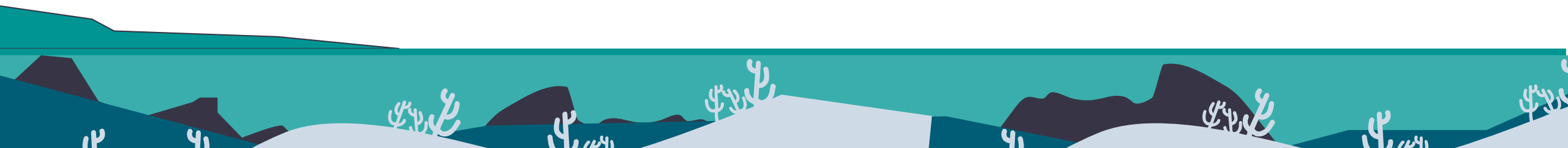
http://www.greenovate.eu/contents/projectsv2/plagaziplantweb_8298.jpg

KEY TAKAWAYS

is a sustainable and clean hydrogen production method that is gaining more

New policies and supporting actions should be taken.

extensively, countries will respond positively to the threats of



THANKS!

Do you have any questions?

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