

9th AIEE Energy Symposium



HYDROGEN-OXYGEN CO- PRODUCTION PLANT IN HOSPITALS: BUSINESS MODEL AND ECONOMIC ANALYSIS

Mauro Giorgianni, Agatino Nicita and Gaetano Maggio

9th AIEE Energy Symposium Current and Future Challenges to Energy Security
sustainable energy security, ready for the future

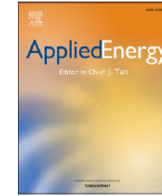
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Hydrogen and medical oxygen by renewable energy based electrolysis: A green and economically viable route

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ARTICLE

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Economic and business model analysis for hydrogen-oxygen co-production in hospitals

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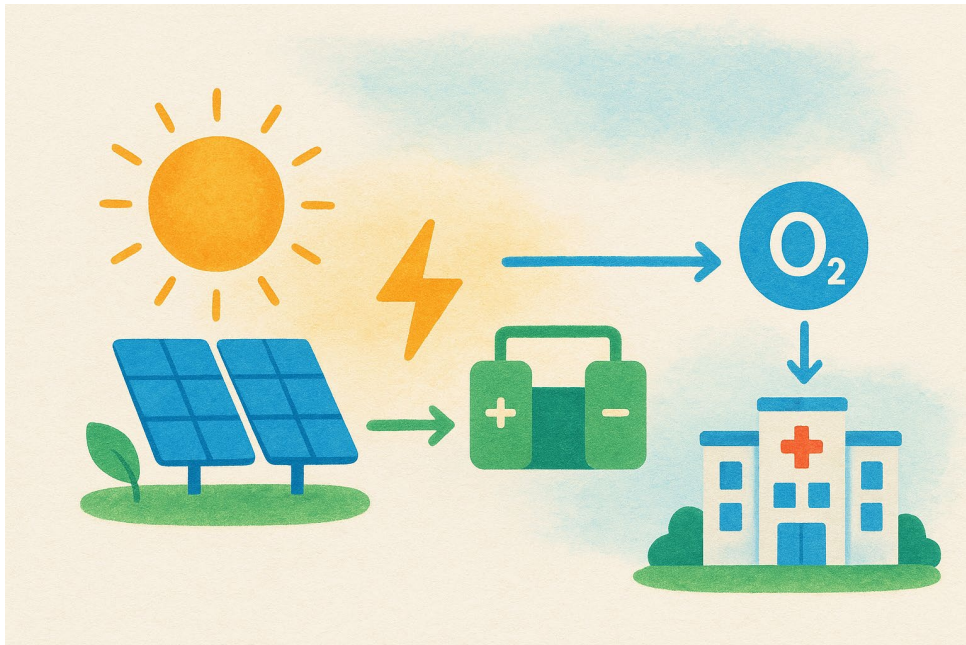
NOVELTY:

- *SELLING OF THE OXYGEN SURPLUS*
- *BUSINESS MODEL CANVAS*

GOAL AND SCOPE



❖ Economic feasibility and organisational structure of a company with business model.

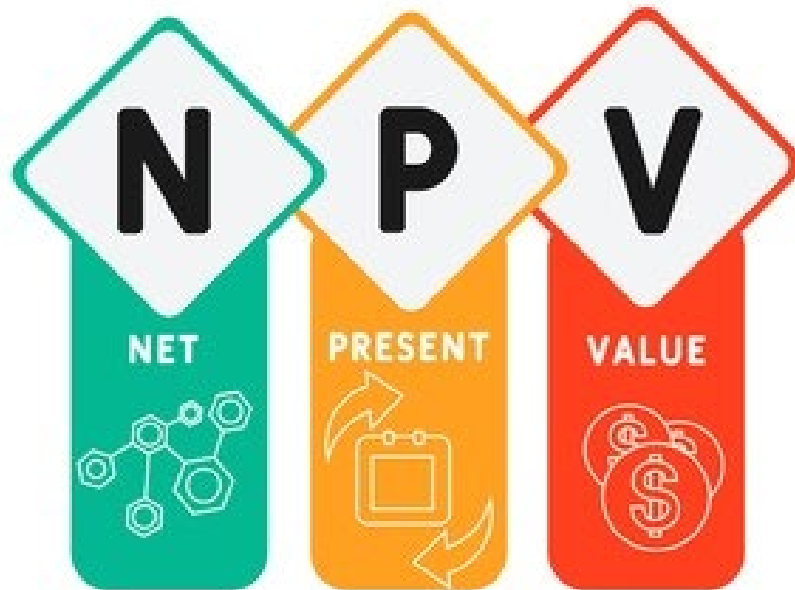


❖ Renewable Energy Sources-based water electrolysis plant for oxygen production in hospitals

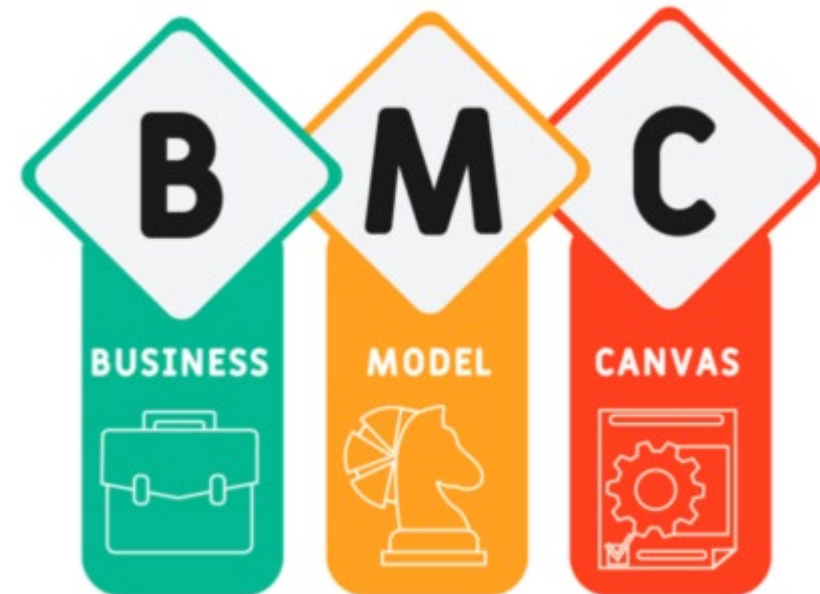
- PV PLANT = 5 MW
- ELECTROLYSER = 4 MW

ANALYSIS TOOLS

Discounted value, at a discount rate, of all cash flows generated over the life of the project.



Define information that was previously difficult to interpret in a clear, elementary and usable way.



CALCULATION OF OVERALL COST AND AFFORDABILITY

$$NPV = -CAPEX + (1 - TR) \sum_{n=1}^N \frac{REV_n - OPEX_n}{(1 + r)^n}$$

		PROPRIETARY PV	NO PROPRIETARY PV
CAPEX	Investment cost	11,773.5 k€	15,448.5 k€
OPEX_n	Operating costs	923.1 k€	923.1 k€
TR	Tax rate on profits	30 %	30 %
r	Discount rate	4.85 %	4.85 %

CALCULATION OF OVERALL COST AND AFFORDABILITY

Investment:	
Electrolyzer	4,365.3 k€
PV plant	0 k€ (proprietary)
	3,675 k€
Compression plant	6,267.9 k€
Storage system	1,140.3 k€
Total CAPEX:	11,773.5 k€ (proprietary PV)
	15,448.5 k€
Fix O&M costs:	
Material	332.8 k€
Labour	578.1 k€
Variable O&M costs:	12.2 k€
Total OPEX:	923.1 k€

Details on CAPEX and OPEX values

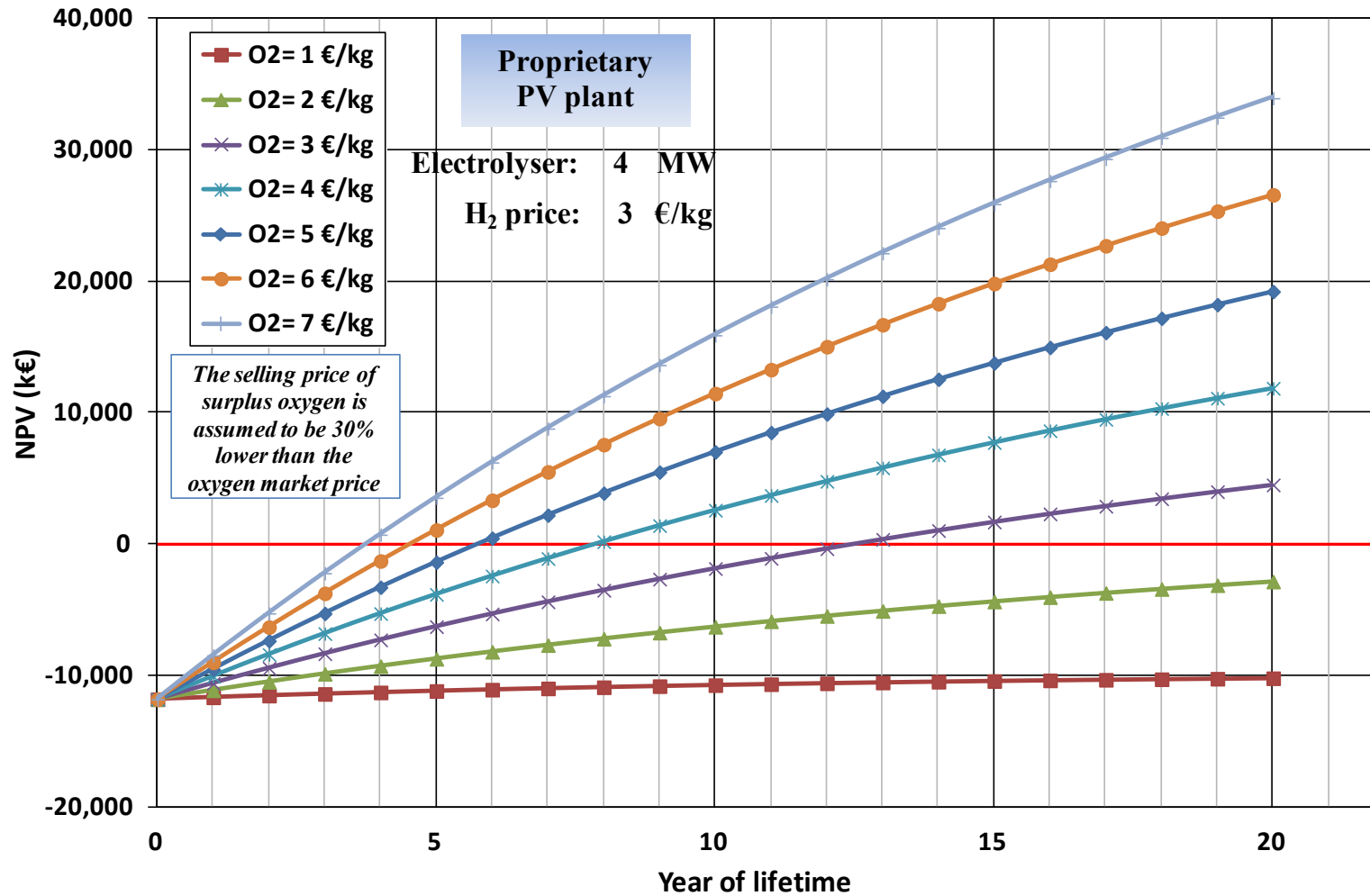
$r = WACC$ (weighted average cost of capital)

$$WACC = \frac{1 + e_r}{1 + infl} - 1$$

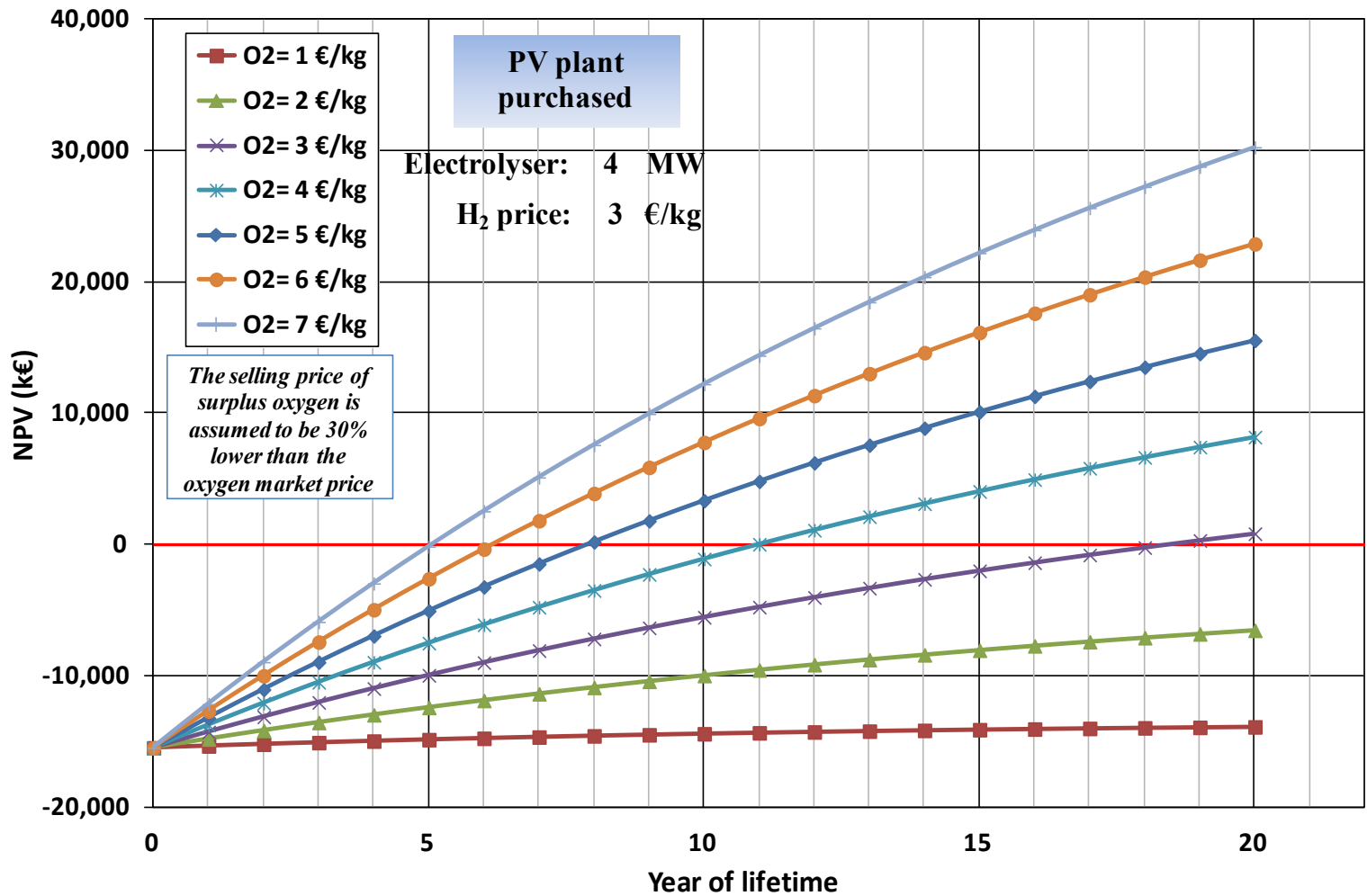
Parameter	Value
(e_r) Equity rate of return	7.0%
$(infl)$ Inflation rate	1.2%
Tax rate on earnings	30%

Financial and tax parameters

OXYGEN MARKET PRICE SENSITIVITY ANALYSIS: WITH PROPRIETARY PV PLANT

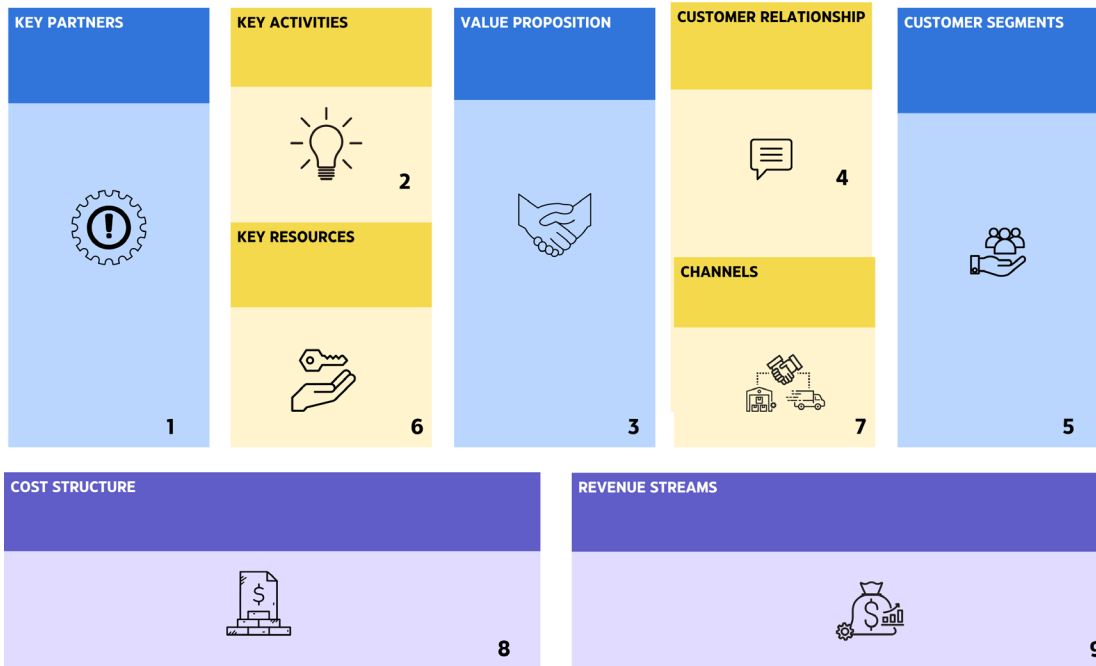


OXYGEN MARKET PRICE SENSITIVITY ANALYSIS: WITH PURCHASED PV PLANT

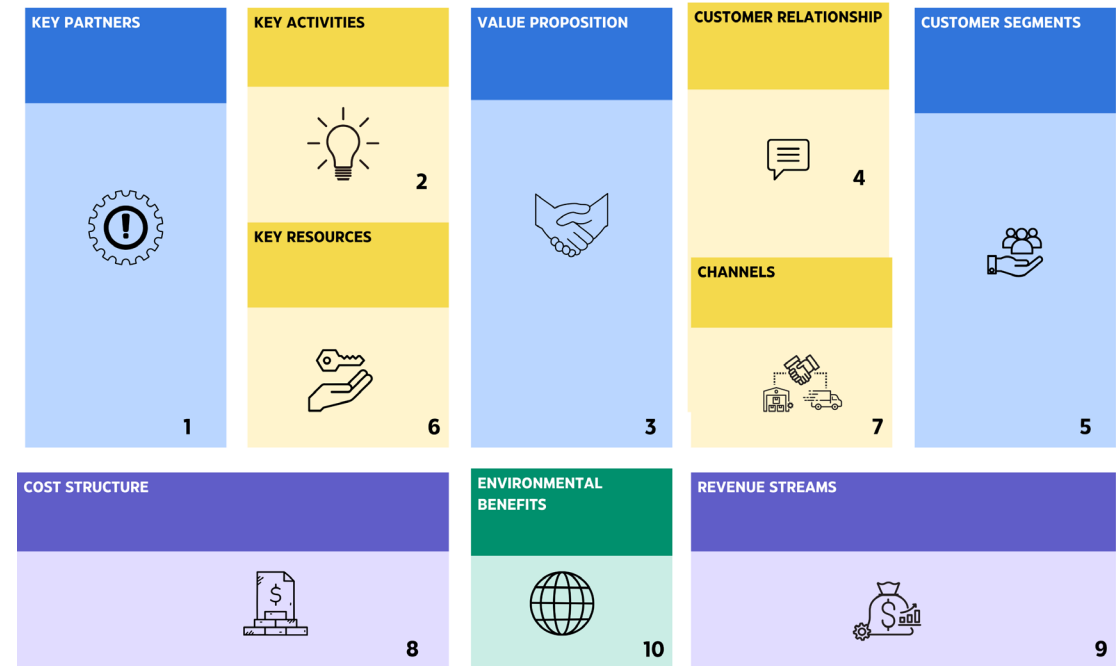


BUSINESS MODEL CANVAS (BMC): NINE → TEN BLOCKS

BUSINESS MODEL CANVAS

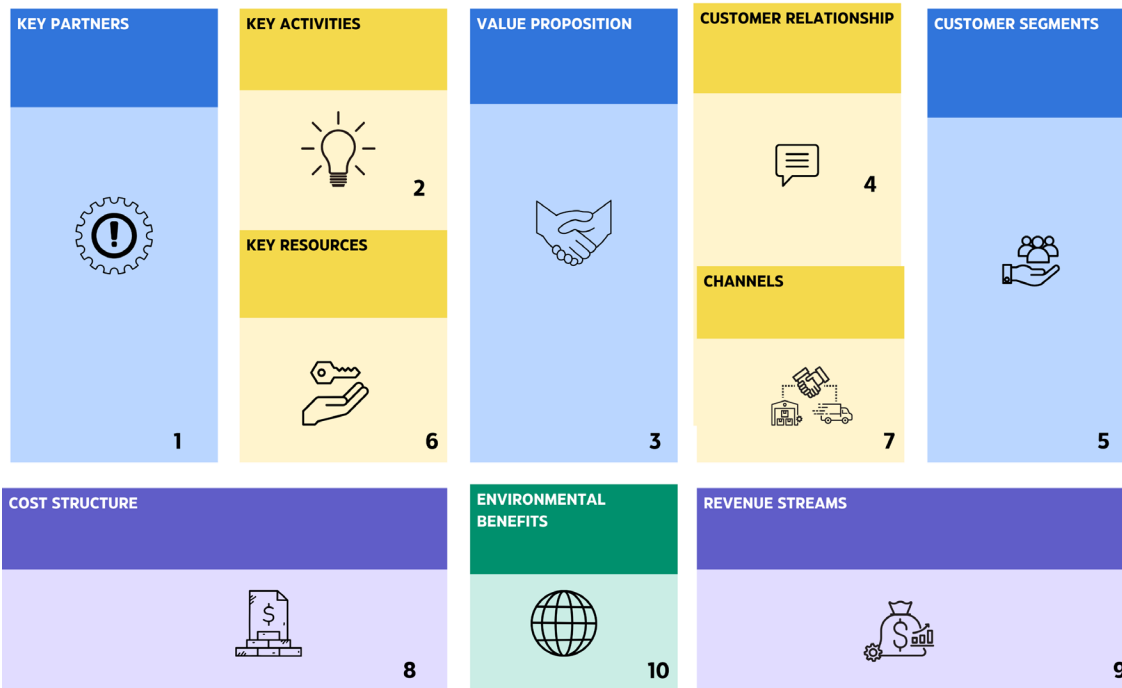


BUSINESS MODEL CANVAS



BUSINESS MODEL CANVAS (BMC)

BUSINESS MODEL CANVAS



BENEFITS:

- ❖ Include and represents all strategic business components;
- ❖ Use a visual language;
- ❖ Facilitate strategic analysis;
- ❖ Involves different types of actors, both internal and external to the organization.

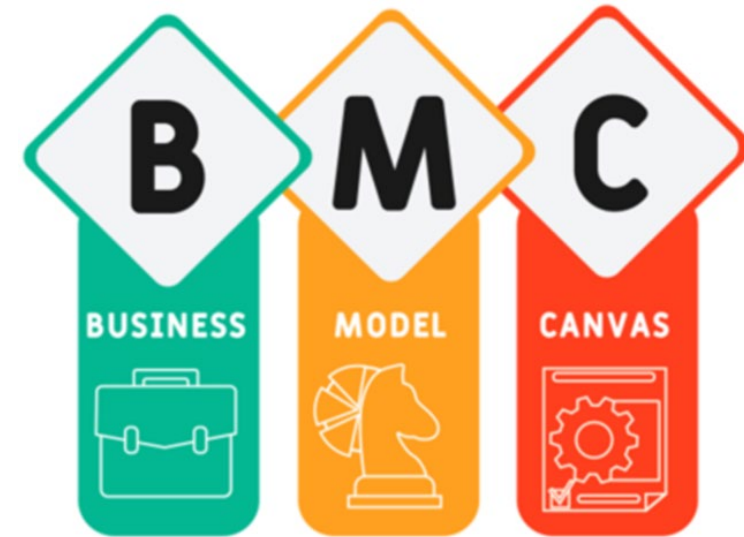
Business Model Canvas



CONCLUSIONS



- **GREEN HYDROGEN ECONOMICALLY VIABLE ROUTE**
- **ECONOMIC RETURN IN MEDIUM TERM**



- **CLEAR PICTURE OF THE COMPANY ORGANIZATION AND INFORMATION**
- **TEN BLOCK INCLUDES ENVIRONMENTAL BENEFITS**

THANKS FOR YOUR ATTENTION

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