

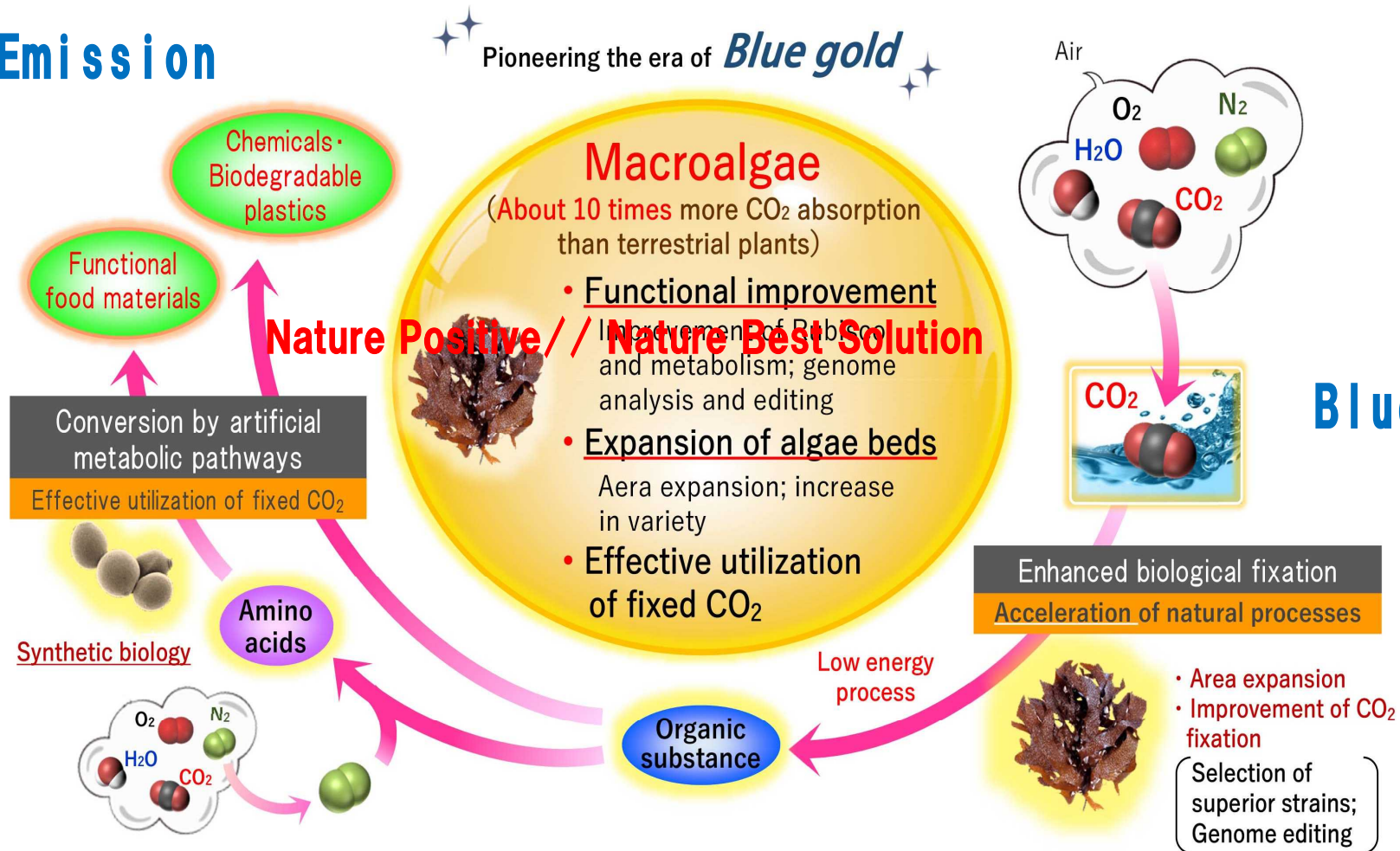
Redesign of macroalgae for highly efficient CO₂ fixation by functional modifications and their product generation



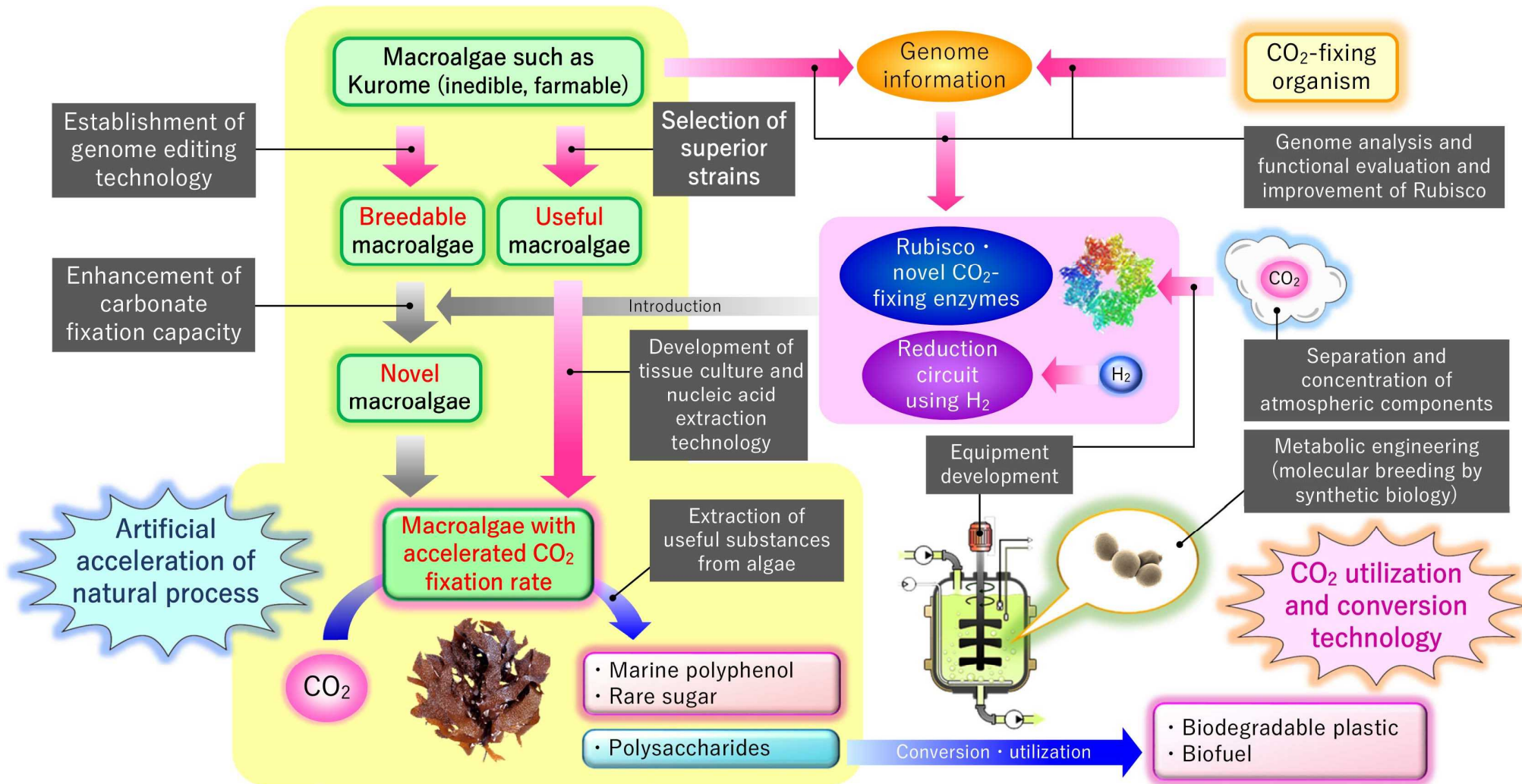
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PJ implementation organization : Kyoto Univ., iCeMS,
Grad. Eng., KIT., Mie Univ., Kansai Chemical
Engineering Co., Green Earth Institute Co.

Researches Nature Positive // Nature Best Solution

Negative Emission



Implementation structure & period (2022-2024)



2011–2017

CREST PJ: Development of biological technologies for complete utilization of macroalgae (Kyoto Univ. and Mie Univ.)

2021

NEDO–pioneer research PJ: Development of basic technologies for complete utilization of macroalgae (Mie Univ.)



***Establishment of breeding technologies
of all macroalgae (natural and artificial cultures)***

Coupling with Carbon Neutral Port Programs

四日市港・港湾区域面積：約6,600 ha



港湾内への「海藻養殖ユニット」の設置による人工的な藻場の造成 (2023.11.28-)

「四日市港CNP計画」対象範囲内の年間CO₂排出量

港湾ターミナル内：約0.57万トン
 出入船舶・車両：約8.1万トン

港湾ターミナル外：約1687万トン
 (コンビナート)



2,200 haの海域 (1/3に相当) で海藻養殖を行った場合の試算値

現行の優良選定株養殖技術の導入 (210 トン/ha/年)

50万8200 トン-CO₂/年

→ 港湾ターミナル内, 出入り船舶・車両の合計CO₂排出量に対して**目標達成は確実!**

MS研究開発事業による海藻養殖の技術革新 (420 トン/ha/年)

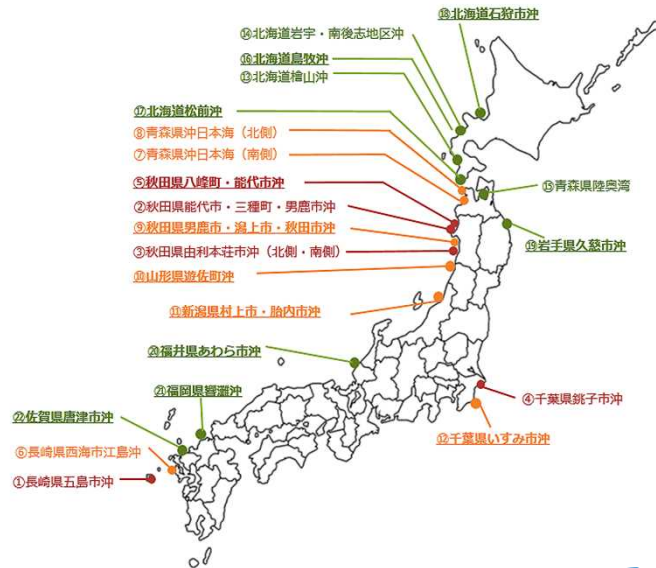
101万6400 トン-CO₂/年

Equipment development

- functional improvements & enlargement of algal farms

Collaborations with Offshore Wind Power Projects

Venti-Japan (Akita) & Mitsubishi



200 km²

(Shunan、Akita、Noshiro Ports)

Collaborations of Airports on Sea



54 ha

Kansai-Air Port

Biomass and Energy Production in Japan

Final targets (2029)

	Starch-Sugar(1G)	Lignocellulose (2G)	Algae (3G)		Algae(3G)
Raw materials	Agriculture products	Forest	Microalgae	Macroalgae	Macroalgae
Productivity (t/ha/y)	11	9	10~20	30	100
CO ₂ -fixation rate (kg-CO ₂ /m ² /y)	1.6	0.84	1.5~2.9	3.3	6.0
CO ₂ fixation ratio	2.3	1	7.6	13	130
Biomass energy production process	simple	complicated (Removal of lignin)	simple	simple (Key-alginate)	simple
Problems	Competing with food	Using lands	Using lands, Contamination risk, High cost	Enlargement of algae beds	No problem
Production conditions	Sunlight, CO ₂	Sunlight, CO ₂ , Freshwater, Land, Fertilizer, Pesticides	Sunlight, CO ₂ , Freshwater/ Brackish water, Land	Sunlight, CO ₂ , Seawater	Sunlight, CO ₂ , Seawater

2029

