Discussion points of
July 2025

The Cebu + Bohol Blue Ocean SeaKITShub Opportunity

Comparative advantage from a deep pool of cost-effective scientific, technical and artistic talent

ONE DOZEN ESSENTIAL ACTIONS

1. Establish SeaKITShub as a scientific & technical basis for Blue Ocean systems
2. Build SeaKITShub comparative advantage from an exceptional talent pool
3. Focus on Cebu and the adjacent Bohol Island Geopark Region (BIGR)
4. Apply Enterprise ecology KITS to harmonize and valorize ecosystem services
5. Undertake restorative aquaculture in a context of enterprise ecology in Blue Ocean Economies
6. Quantify Blue Carbon for diverse valorization streams from all ecosystem services
7. Undertake tropical seaweed value chain innovation for product and market diversity
8. Ensure that appropriate KITS are internalized in ecoscape enterprise systems
9. Utilize multi-stream, zero effluent (MUZE) biorefining to add value in ecoscape enterprises
10. Evolve affordable climate sensing KITS based as much as possible on open sources
11. Produce cost-effective essential goods and services from solar/hybrid Blue Utility Systems
12. Build strategic alliance networks while evolving a "Blue Investor" base

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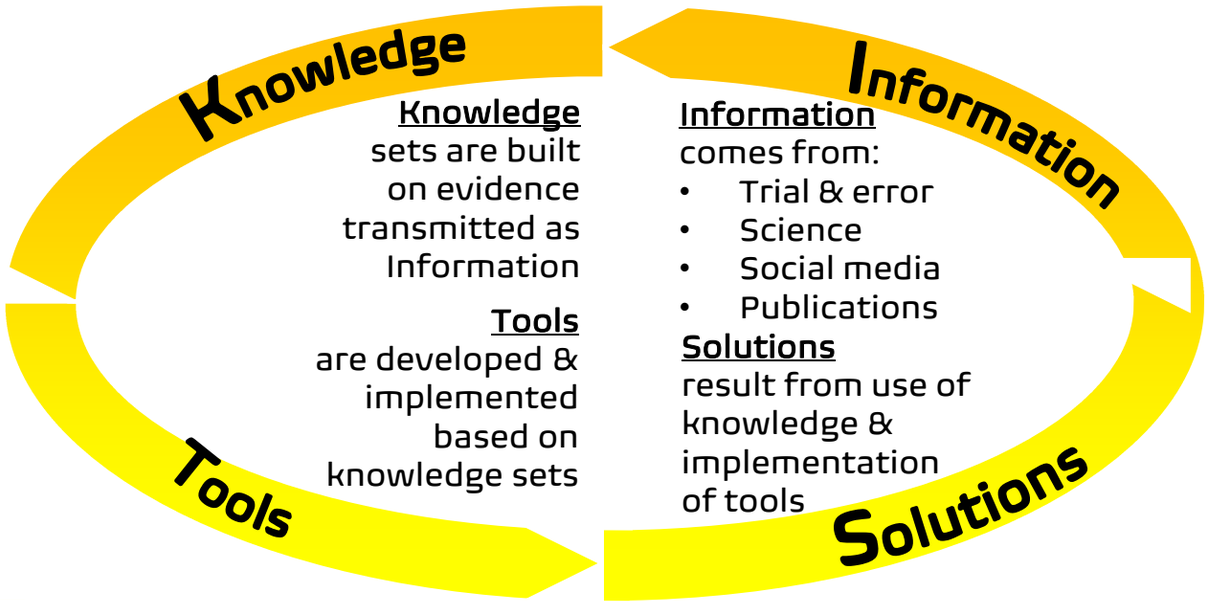
Establish SeaKITShub as a scientific & technical basis for Blue Ocean Systems

Knowledge systems — **SeaKITShub** — Information systems

Knowledge, Information, Tools and Solutions

- Enterprise Ecology
- Blue utility systems
- MUZE Biorefining
- Efficacy & quality
- Blue Ocean Engineering
- Climate Sensing



Knowledge sets are built on evidence transmitted as Information

Tools are developed & implemented based on knowledge sets

Information comes from:
- Trial & error
- Science
- Social media
- Publications

Solutions result from use of knowledge & implementation of tools

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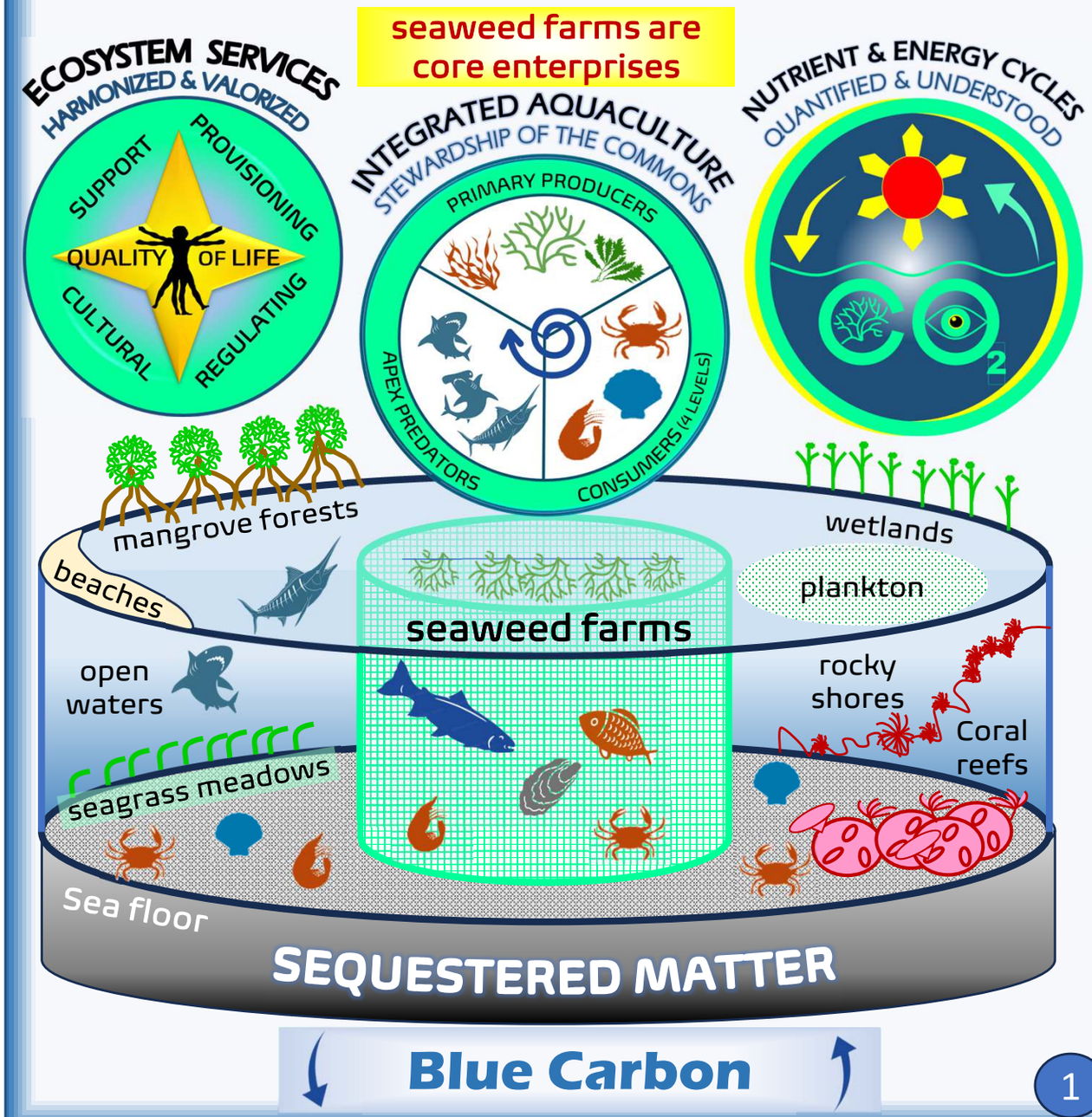
Holistic quantification of Blue Ocean energy and materials flow is essential for sustainability

seaweed farms are core enterprises



Blue Carbon

Build Sea KITSHubcomparative advantage from an exceptional talent pool

1. Metro Cebu is port city of about three million people with an international airport and world-class communications + infrastructure.
2. Contiguous with the Bohol Island UNESCO Global Geopark with dozens of Marine Protected Areas (MPA).
3. Home to an international export processing zone and Information Technology (IT) park that supports a pool of thousands of knowledge workers.
4. Linked to other Philippines knowledge hubs including Manila, Davao, Bacolod and many others.
5. Thousands of underutilized, trained people proficient in English and other world languages.
6. Levels of technical education among the best in the ASEAN Region.
7. Filipino workers tend to have a good "work ethic".
8. Compensation costs at or below other major knowledge-worker sources including India and China. Some examples:
    1. Field technician with diving certification and undergraduate degree and boat handling skills 400-800 USD/month.
    2. Experienced boat crew 200-300 USD/month.
    3. Recent graduate engineering and scientific staff 1,000 – 1,500 USD/month.
    4. Advanced degree and experienced engineering and scientific staff 1,800 – 1,500-3,000 USD/month.

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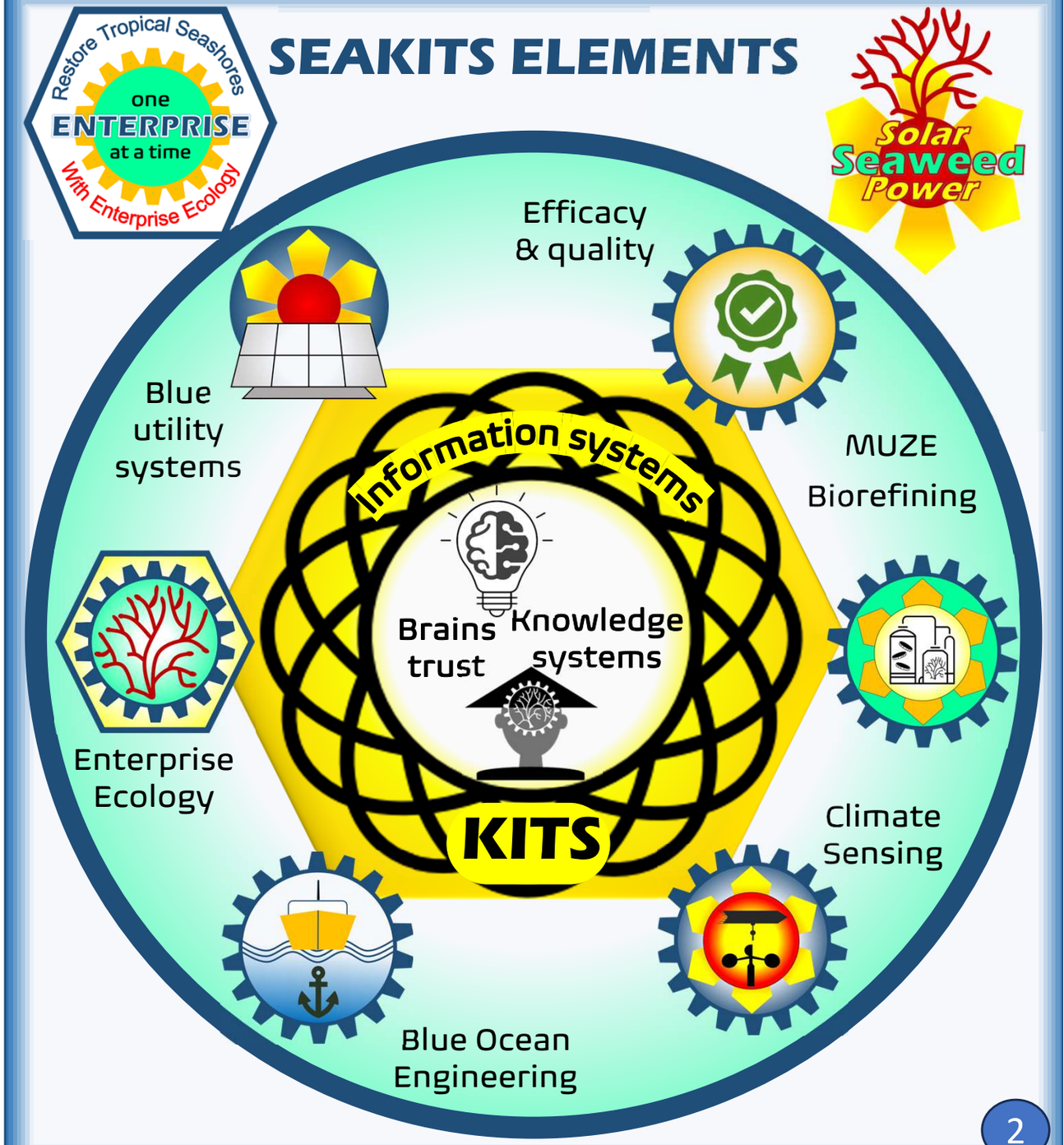
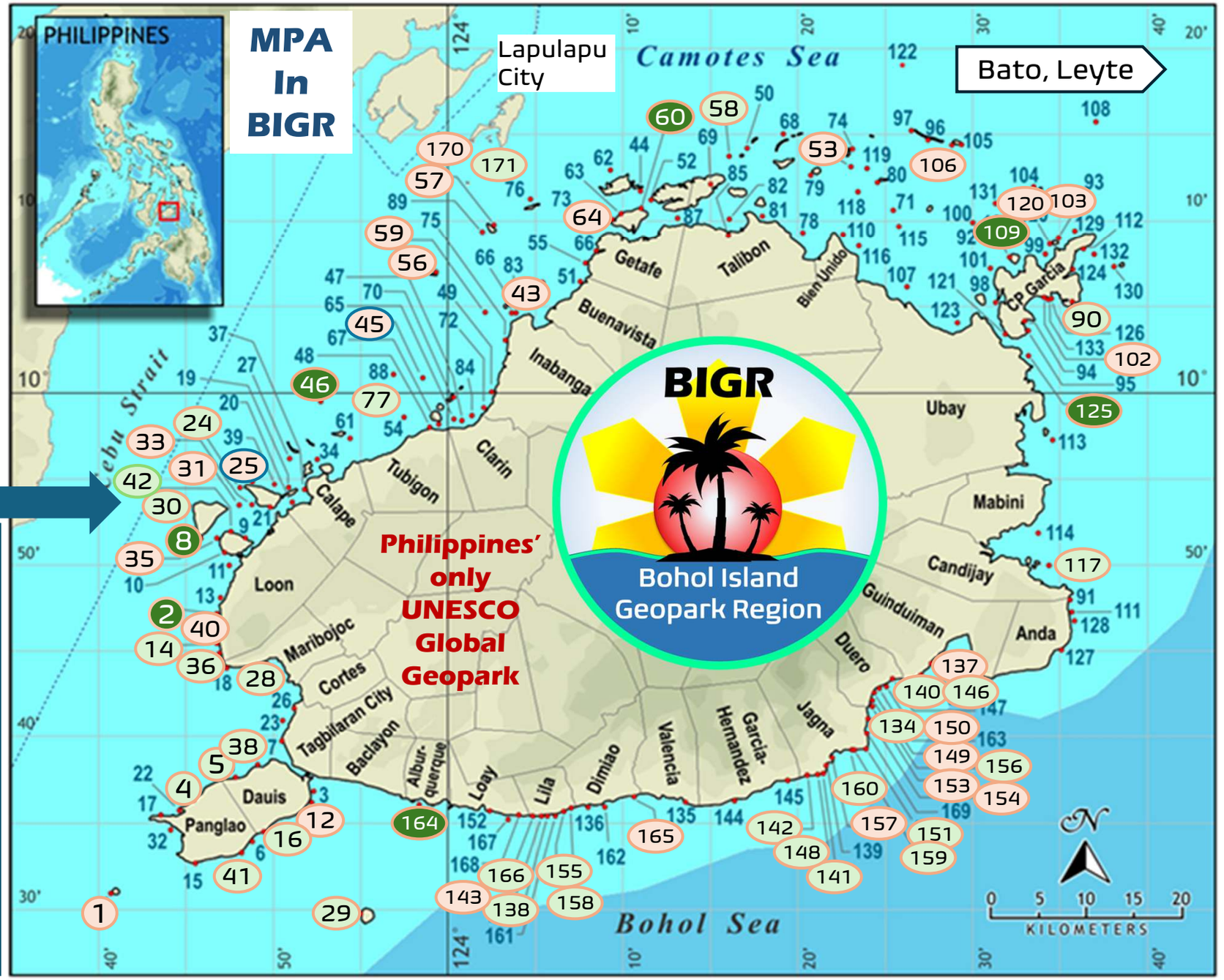


Focus on Cebu and the adjacent Bohol Island Geopark Region (BIGR)

BIGR seashores are home to as many as one million seafolk, distributed among about fifty local government unit (LGU) jurisdictions, who live in poverty despite attractive opportunities in the region.

Dozens of MPA in BIGR need Blue Ocean ecoscape mosaics as foundations for management



LEGEND

- # Coral only
- # Coral with mangrove
- # Coral + seagrass or seaweed
- # Coral + mangrove + seagrass or seaweed
- # Mangrove only
- # Mangrove + seagrass or seaweed
- # Seagrass only
- # Seagrass + Seaweed

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Apply Enterprise ecology KITS to harmonize and valorize ecosystem services

1. Profitable micro, small & medium enterprises (MSME) that are mostly family owned and operated are the foundation for enterprise ecology.
2. KITS internalized in MSME enable them to manage, control and influence ecosystem services through enterprise ecology.
3. Community MSME are embedded in socio-ecological production ecoscapes (SEPE).
4. KITS comprise the core art, science and technology that enable successful enterprise ecology.
5. Enterprise ecology harmonizes and valorizes diverse ecosystem services to balance sustainability with profitability.
6. Enterprise ecology is based on Blue Ocean ecoeconomic principles.

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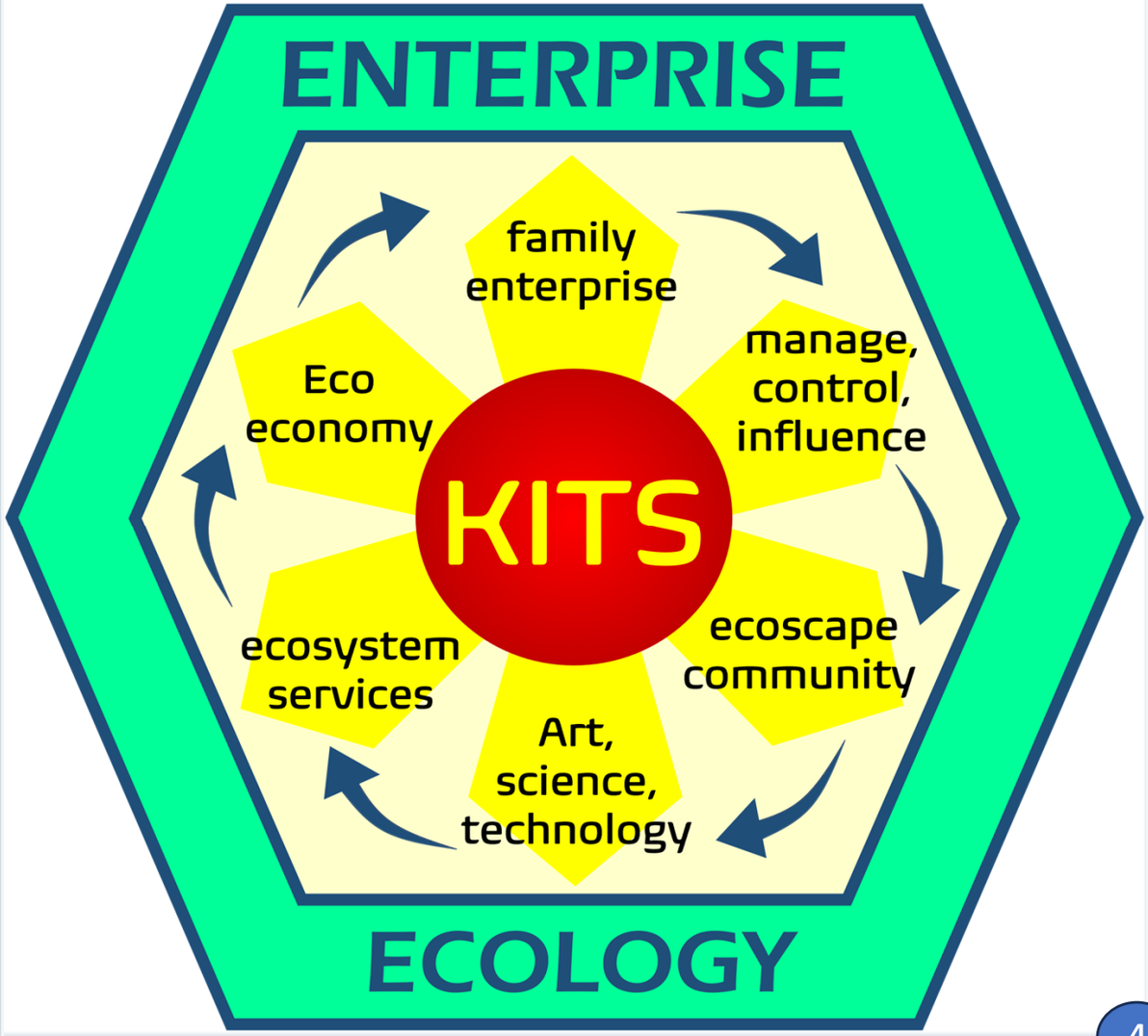
Seaweed farming is sustainable only with holistic ecosystem services harmonization and valorization



Undertake restorative aquaculture in a context of enterprise ecology in Blue Ocean Economies

Profitable enterprises
In value chains in market systems
are key to sustainable success

UN SDG GOALS	BLUE OCEANS
REGENERATION	RESTORATION
BIOSECURITY	BIODIVERSITY
CLIMATE CURES	ECOECONOMICS
INTEGRATION	SUSTAINABILITY
D.E.I.	STEWARDSHIP

Restore Tropical Seashores
one ENTERPRISE at a time
With Enterprise Ecology

Solar Seaweed Power

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Regeneration can happen when enterprises harmonize and valorize diverse ecosystem services through ecoeconomic tradeoffs that facilitate enterprise profitability

Seaweed farming is a foundation and a keystone activity central to marine enterprise ecology

AVOIDING & MINIMIZING Negative impacts	MITIGATING Environment monitoring & actions	IMPLEMENTING Environment solutions	PROVIDING Environment benefits	ACCRUING Environment benefits

REDUCED IMPACTS — RESTORATION

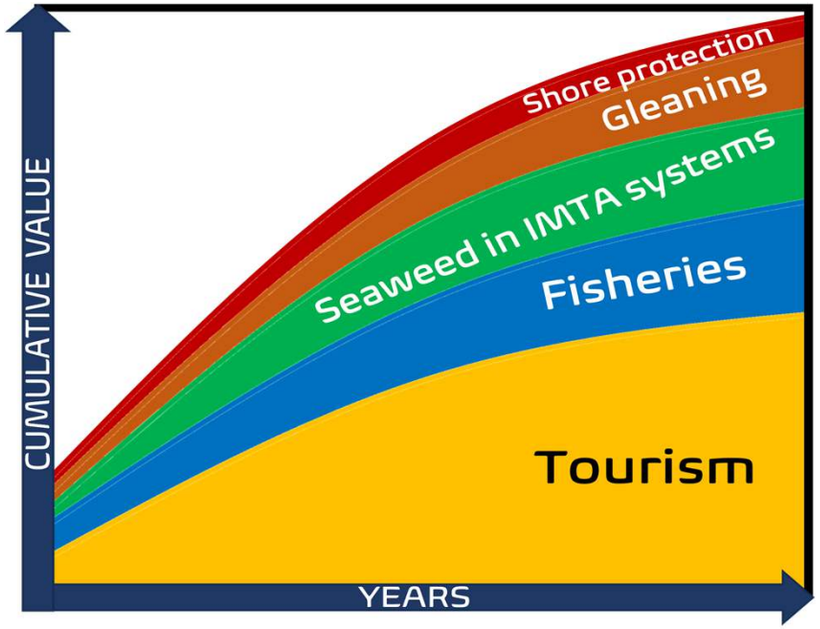
SUSTAINABLE DEVELOPMENT

Pathway diagram after The Nature Conservancy. 2021. Global Principles of Restorative Aquaculture. Arlington, VA

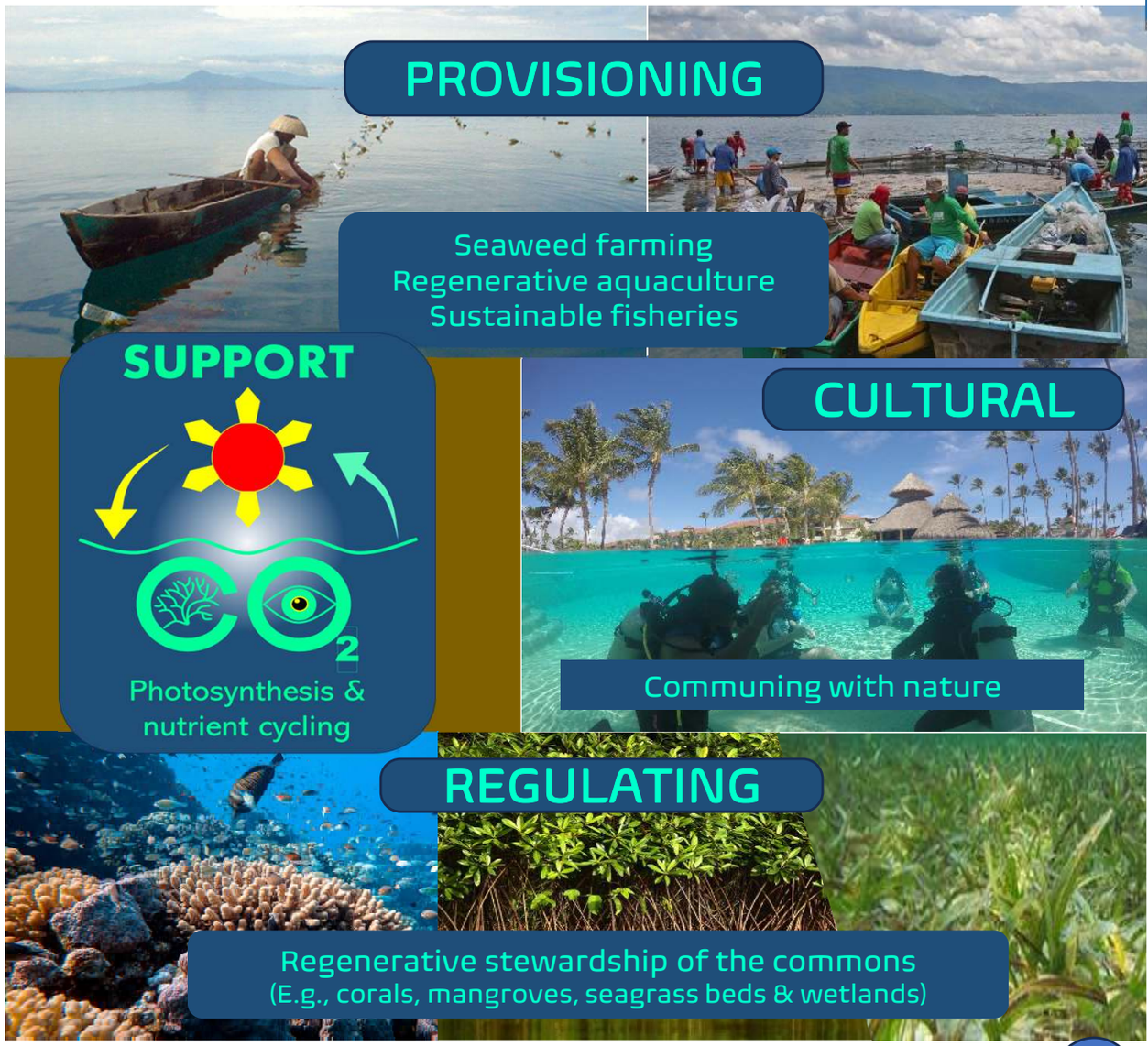
Undertake restorative aquaculture in a context of enterprise ecology in Blue Ocean Economies

1. Through this project SeaKITShub is conducting site surveys and working toward blends of ecosystem services that best suit specific ecoscape MPA mosaics.
2. Analysis of MPA data (SeaKITShub Monograph #E25) indicated that MPA were most functional and solvent when supported by revenues from tourism and aquaculture enterprises.
3. **Tourism opportunities include diving, glamping, action ecotourism and island hopping.**

Data and graphic concept from:
Samonte GPB, Eisma-Osorio RL, Amolo R, White A (2016). Economic value of a large marine ecosystem: Danajon double barrier reef, Philippines. Ocean & Coastal Management



Enterprise ecology drives sustainable harmonization and valorization of ecosystem services
Harmony results when optimized trade-offs build net enterprise profitability per ecoeconomic principles



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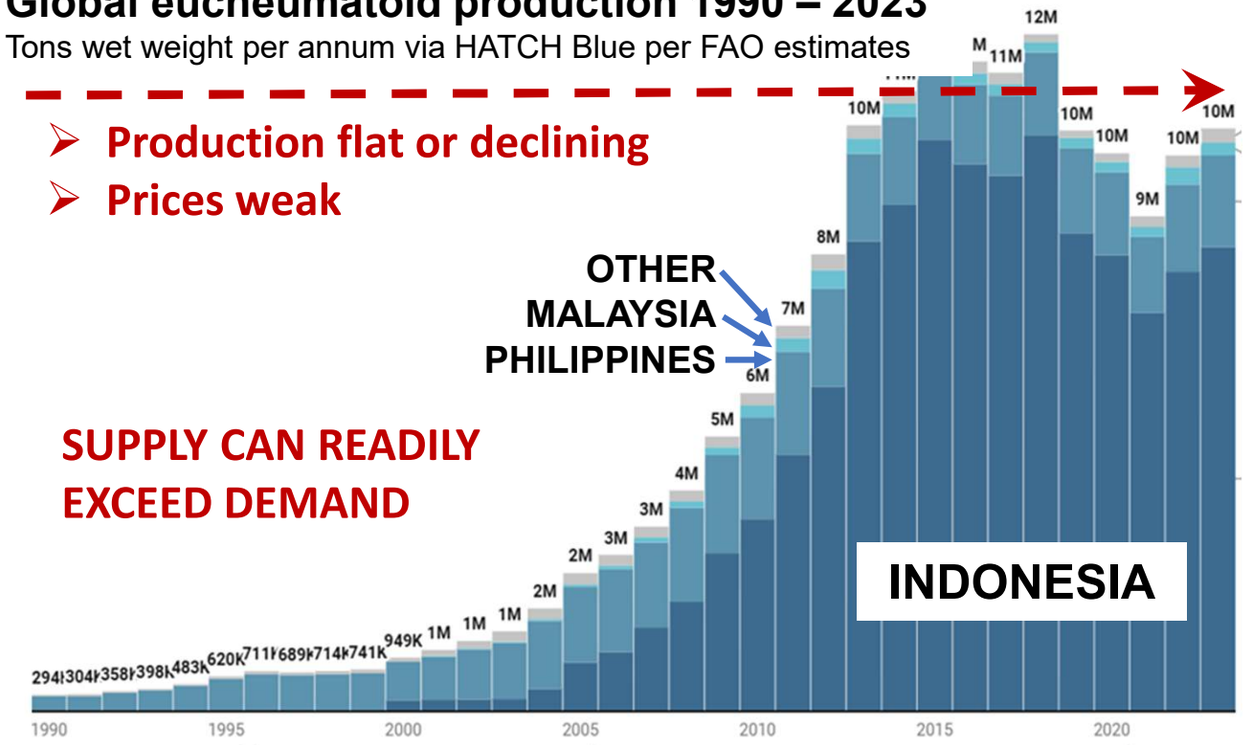
Undertake tropical seaweed value chain innovation for product and market diversity

- For decades latent supply has exceeded realized demand for tropical seaweeds (e.g., eucheumatoids as shown below).
- This has limited market volume and value margins.
- It is essential to evolve beyond dependence on markets for seaweed raw material for hydrocolloid manufacture.

Global eucheumatoid production 1990 – 2023

Tons wet weight per annum via HATCH Blue per FAO estimates

- Production flat or declining
- Prices weak



SUPPLY CAN READILY EXCEED DEMAND

Source: https://seaweedinsights.com/global-production-eucheumatoids/

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SWOT per tropical seaweeds

Strong entrepreneurial base	Difficult entrepreneurial environment	Diverse & numerous new products & markets	Stifling of entrepreneurial initiatives
STRENGTHS	WEAKNESSES	OPPORTUNITIES	THREATS
• Dedicated family enterprises • Established value chains • Ecosystem service synergies • Integration with MPA	• Poor market system support • Low genetic diversity • Phyconomy weakly developed	• Deep cost-effective talent pool available • Harmonization and valorization of ecosystem services • Elements of global science & technology ripe for utilization	• Multiple use conflicts • Climate change • Pollution (e.g. plastic) • Diseases & fouling

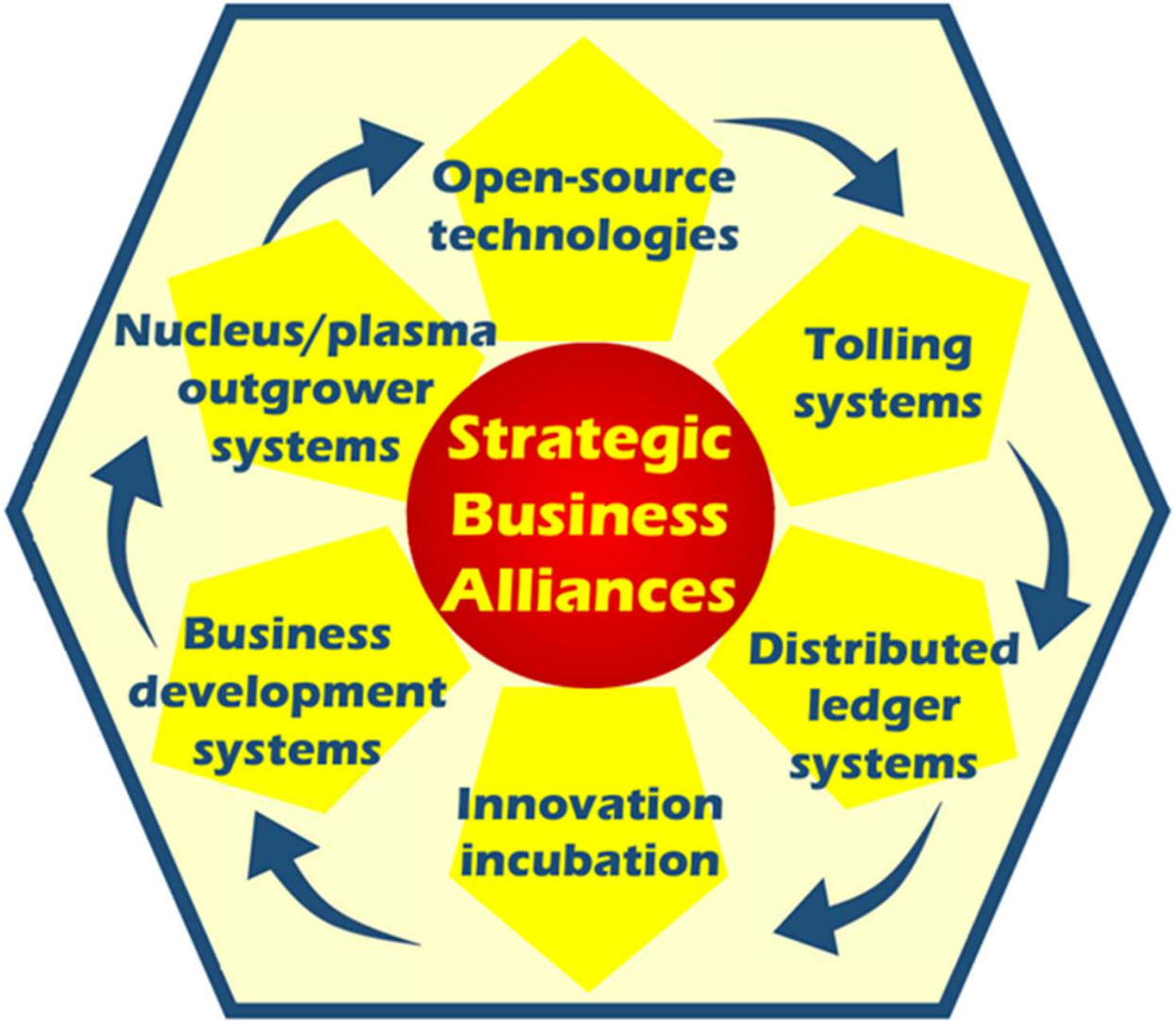
PRESENT — FUTURE

Selective interventions by organizations external to value chains have tended to specifically avoid supporting innovation … rather, they have fostered the spread of "copy-cat" technology

Innovation **Not copycat**

SWOT diagram after The Nature Conservancy. 2023. Tanzania seaweed guide: Opportunities for increased productivity, traceability, and sustainability. Arlington, VA.

Ensure that appropriate KITS are internalized in ecoscape enterprise systems



SUPPORT FUNCTIONS	VALUE CHAIN FUNCTIONS	GOVERNANCE FUNCTIONS
Inform, provide, facilitate	*Create wealth and add value*	*Set/enforce standards, rules, regulations*
Strategic alliances	KITS HUB	Government laws & regulations
Science , education & technology		National & international standards
Essential goods, services & infrastructure		Industry & buyer standards
Data, communication & logistics		Traditional systems
Fair finance for fair trade		

<u>MARKET PLAYERS</u>:
Government & Private sector
Business allies & Not-for-profit sector
Worker & business membership organizations

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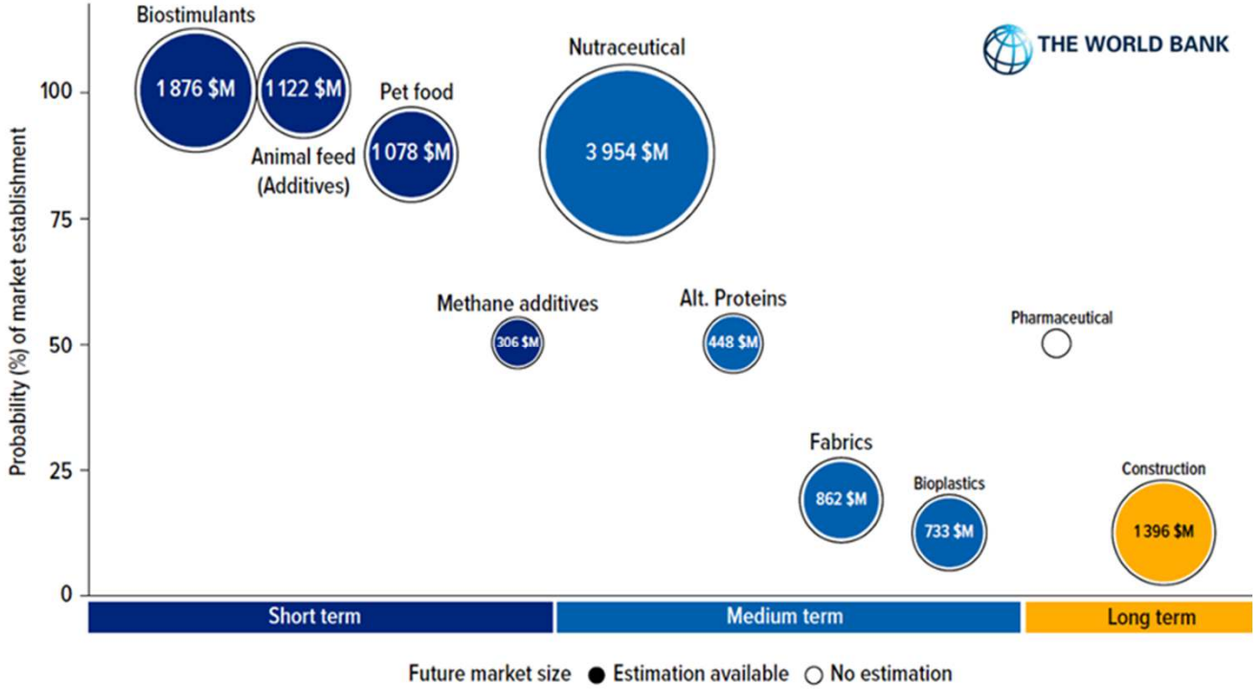
Utilize multi-stream, zero effluent (MUZE) biorefining to add value in ecoscape enterprises

Predominant single stream technology WASTES half the value of seaweed biomass as it extracts hydrocolloids from dried biomass, while destroying and/or discarding other biomass components.

Multi-stream, zero effluent (MUZE) processing develops diverse markets; innovative technologies; broad product range; minimal biomass value waste; and value-addition near farm areas. **WORLD BANK SEES ABOUT 12 B USD OF MARKET EXPANSION POTENTIAL BY 2030 (SEE BELOW)**



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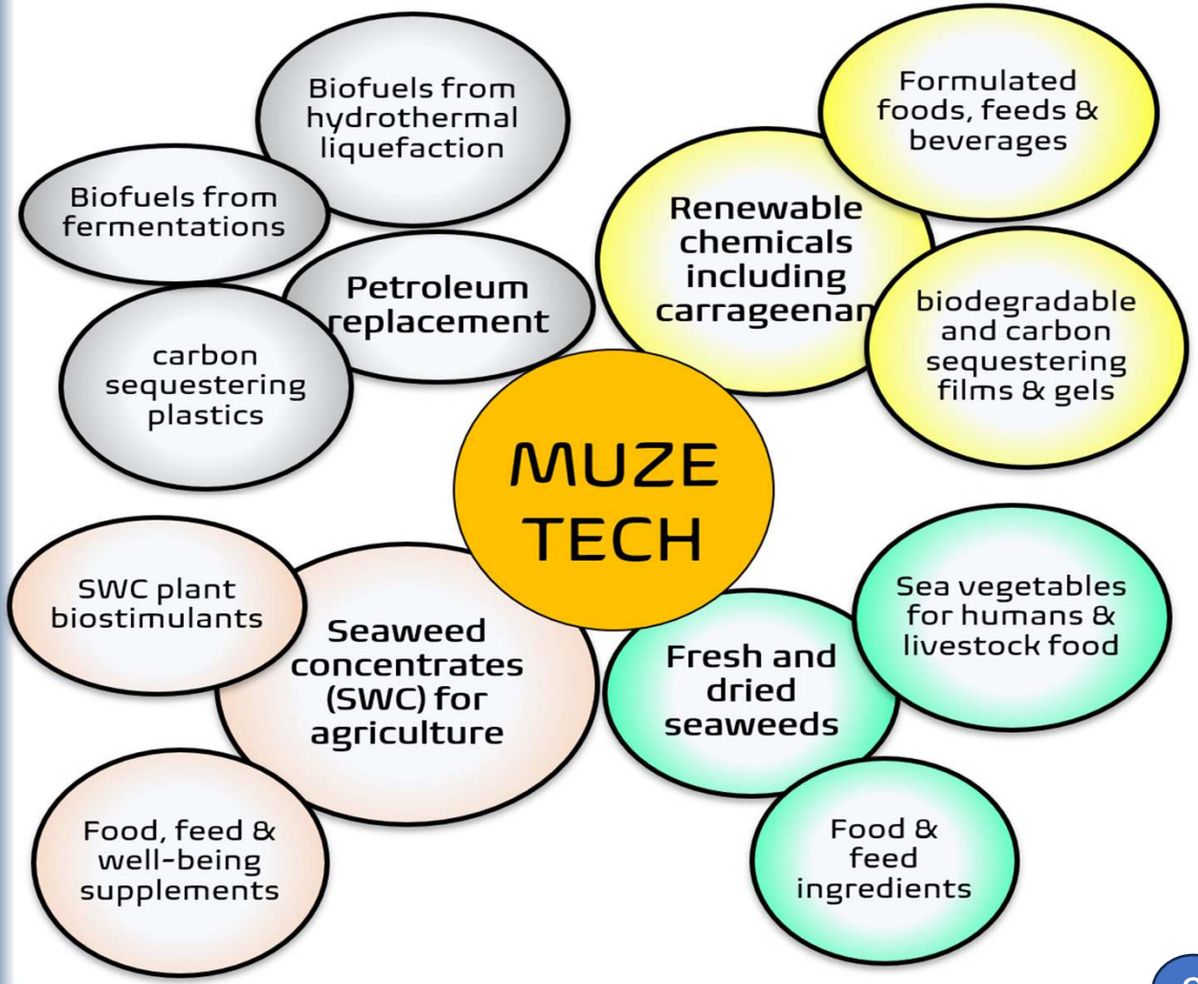
Present single stream processing:

Carrageenan and agar seaweeds → Single-stream processing → Agar & carrageenan; Non-hydrocolloid biomass wasted

MUZE opportunities:



Evolve affordable climate sensing KITS based as much as possible on open sources

The need for affordable gear:

Blue Ocean systems require marine intelligence data products based on Internet of Things (IoT), Information Technologies (IT) and human intelligence gatherers at sea level. During the 21st century, diverse conceptual frameworks are proliferating as climate change and coastal development issues attract attention in relation to UN SDG. Unfortunately, hype abounds, and hypotheses go untested, largely due to a lack of timely, affordable marine data. Furthermore, fast-paced developments of climate, and biomass management technologies fail to engage effectively with enterprises in coastal communities.

Open-source solutions as a gateway:

Open-source technologies such as Arduino and many others can be a gateway into production of affordable marine data hardware systems. This approach can be very effectively applied by the of technical talent that is abundant in the Philippines.

ARDUINO

ARDUPILOT

OpenDroneMap

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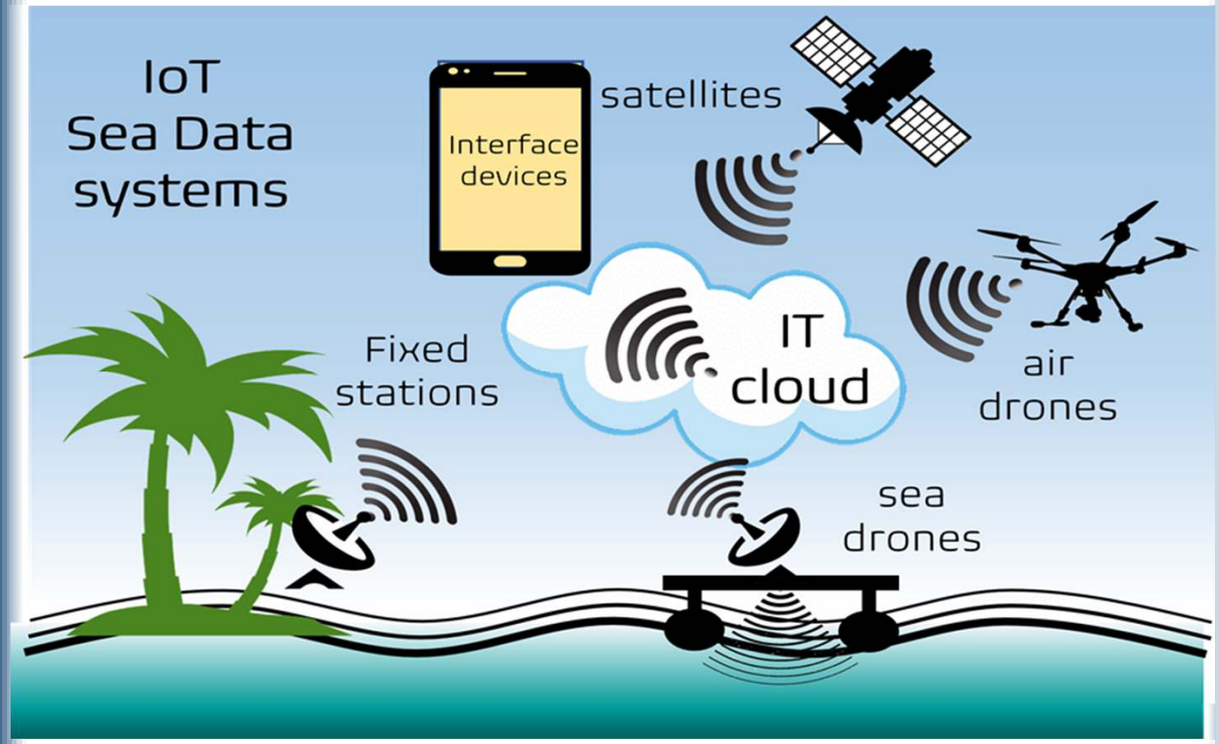
Some systems have commenced but need further funding before they can be deployed and developed further



SEA DATA SYSTEMS

PYLONS BUOYS DRONES

Produce cost-effective essential goods and services from solar/hybrid Blue Utility Systems

Urgently needed by seaweed enterprise clusters

Coastal communities along tropical seashores are famously mired in poverty, yet forced to pay high prices for necessities such as fuel, electricity and water. Packaged blue utility systems can ease such burdens not only for seaweed enterprises but also for communities at large.

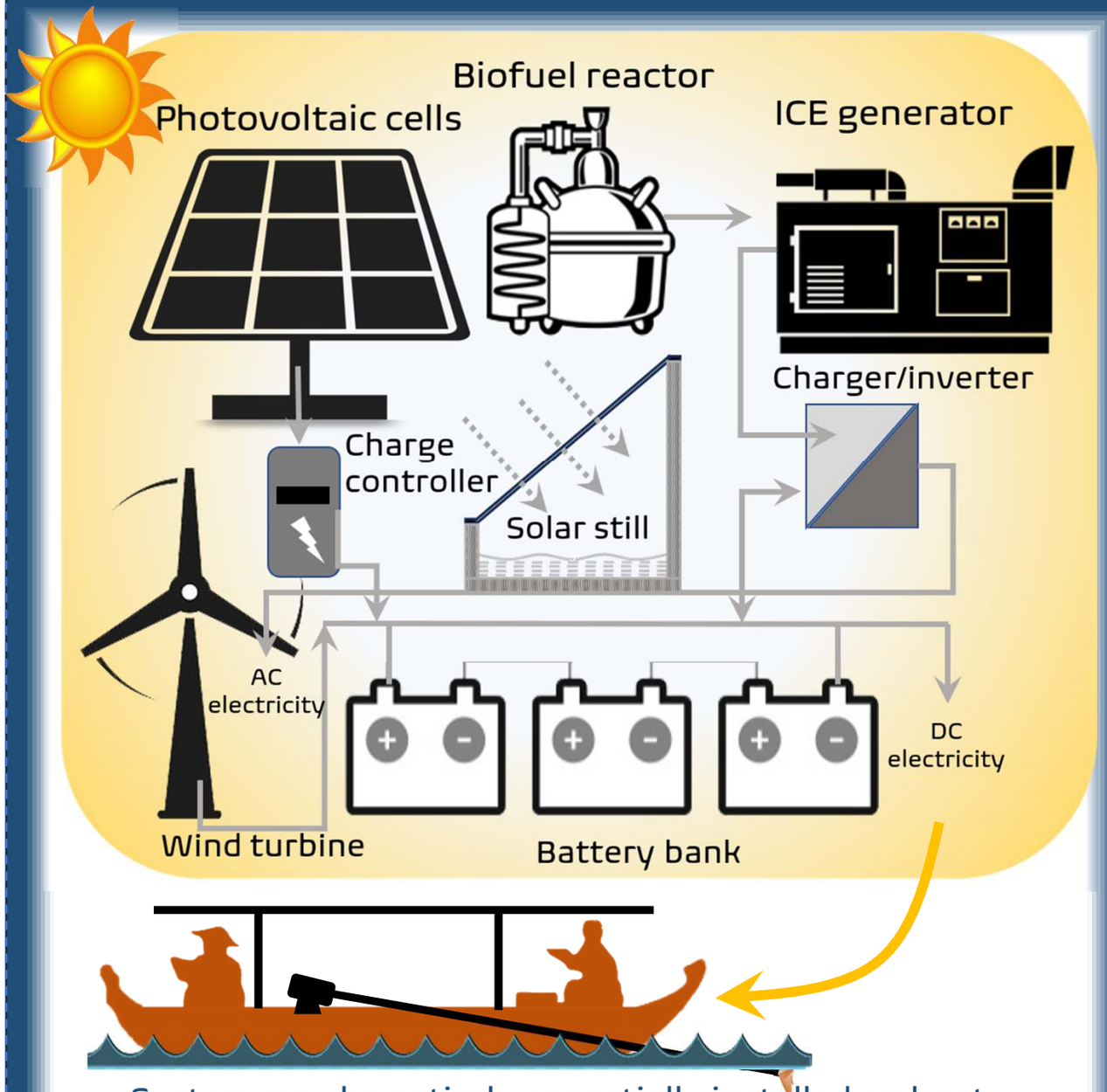
Impact on farming costs

Vessel operations can be a major contributor to farm operating costs and petroleum-based fuels are notoriously expensive and sparsely available in coastal farm areas. Blue utility systems can reduce costs and enhance availability.

Closely linked to value addition

Biorefinery systems require utility systems and wastes such as condensed water vapor can be cycled back to communities as fresh water.

Blue utility systems provide cost-effective low-carbon essential goods and services using state-of-the-art appropriate technologies



System may be entirely or partially installed on boats. Minimum boat installation is motor + portable battery pack that can be charged at stationary installations

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Build strategic alliance networks while evolving a "Blue Investor" base

1. **We are linking with existing BIGR seafolk groups, knowledge leaders and organizations** who embrace the cause of Blue Ocean enterprise ecology in the region.
2. **International support is essential but domestic engagement must be developed** as a path toward sustainability.
3. **Collaboration with established individuals and organizations is prioritized** because we wish to build on that foundation and not to "reinvent the wheel".

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Alliance network management is key to success

Strategic allies

Investing enterprises and individuals committed to Blue Ocean principles

SEPE
community enterprises

Customers we strive to satisfy

Urban professionals seeking participation in seashore restoration

Buyers of sustainable fisheries and aquaculture products

Buyers of multimedia KITS products

Market systems

- Essential goods, services & infrastructure
- Communication & logistics
- Science , education & technology
- Strategic Alliance support
- Donor organizations & Hospitality partners

Governance

- Governance enforcement organizations
- Fair finance
- Fair trade

Restore Tropical Seashores one ENTERPRISE at a time With Enterprise Ecology

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July 2025

The Cebu + Bohol Blue Ocean SeaKITShub Opportunity

Comparative advantage from a deep pool of cost-effective scientific, technical and artistic talent

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Knowledge, Information, Tools and Solutions = KITS

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