INFORMATION as of 11:00 AM, Nov 9, 2013

SUPER TYPHOON YOLANDA

- NOV 6 — Super Typhoon "Yolanda" (Haiyan) entered PAR
- NOV 9 — "Yolanda" to leave PAR by afternoon
- Moving steady at 35 kph in a West Northwest direction
- Weaker max sustained winds of 175 kph with gusts of up to 210 kph
- Signal number 1 remains in Northern Palawan including Puerto Princesa
- Over 100 reported dead in Tacloban, Leyte alone.
- At least 792,018 persons or 161,973 families evacuated in 37 provinces

Infographics by: INQUIRER.net

GFX by: Matikas Santos, Mark Diamat

Source : NDRRMC, PAGASA


DANIEL Z. ROMUALDEZ AIRPORT


WELCOME
TO
TACLOBAN CITY


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Earth natural life support system has been compromised endangering "*the needs and aspirations of the future generations" is…*

Engineering's greatest challenge!

MECH-ENG
UP YOUR MIND

by

Dr. Alvin B. Culaba, Ph.D.
University Fellow and Full Professor 10
Mechanical Engineering Department

Former Executive Vice President
De La Salle University

Academician
The National Academy of Science and Technology


I'M A
MECHANICAL
ENGINEER
JUST LIKE A NORMAL
ENGINEER EXCEPT MUCH
COOLER
(AND HOTTER)


CLASSIC
54
72
LOTUS

What is Mechanical Engineering?

Applies the principles of physics and materials science in the manufacturing, design and maintenance of mechanical systems

Mechanical Engineering

- The Domain …

- Diminishing resources (energy, water, food)
- Global warming
- Environmental degradation

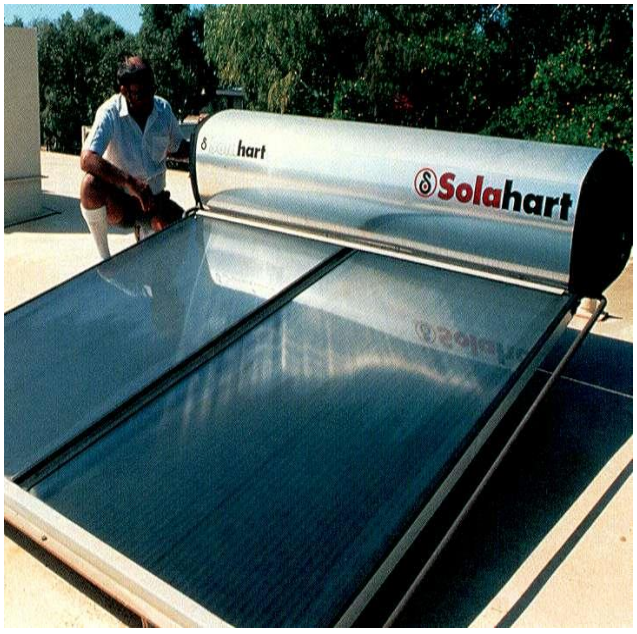
- ✓ Electrification technology started to light up the world
- ✓ Innovations include the improvement of the power systems, and continues to grow
- ✓ Development of convention, renewable and alternative energy power sources

Energy

- Thermal power plants
- Solar photovoltaics power plants
- Hydroelectric power plants
- Geothermal power plants
- Wind power system plants
- Off- and on-shore oil and gas plants
- Nuclear power plants
- Biomass and biogas plants

Large-scale power grids are supplemented by decentralized energy systems such as wind farms and photovoltaic power systems

Photovaltaics systems



Drilling rigs and gas piping

Transportation

- Air transport systems
- Water transport systems
- Land transport systems

- Changed the way we travel
- Remains an engineering work-in-progress
- Advancements such as electric-powered vehicles and fuel cell for cleaner cars
- Forefront of technology innovations

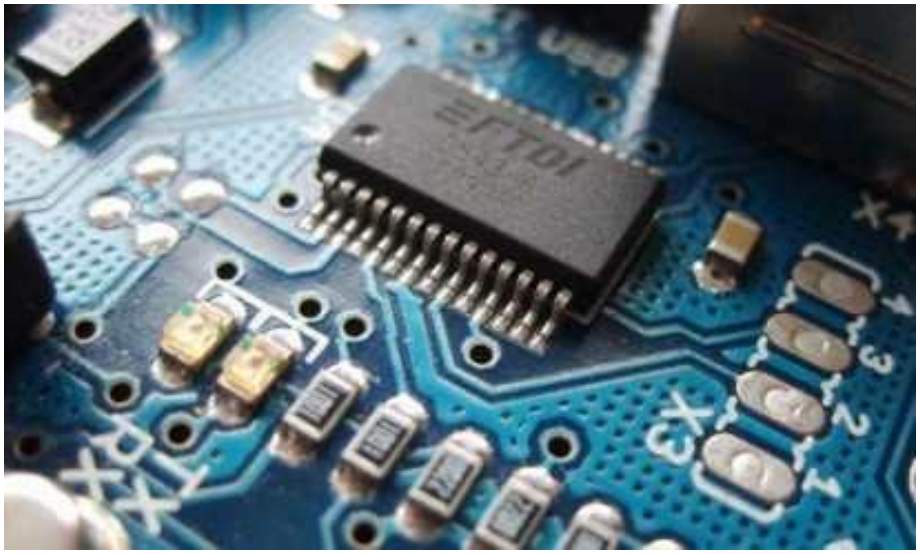
Manufacturing

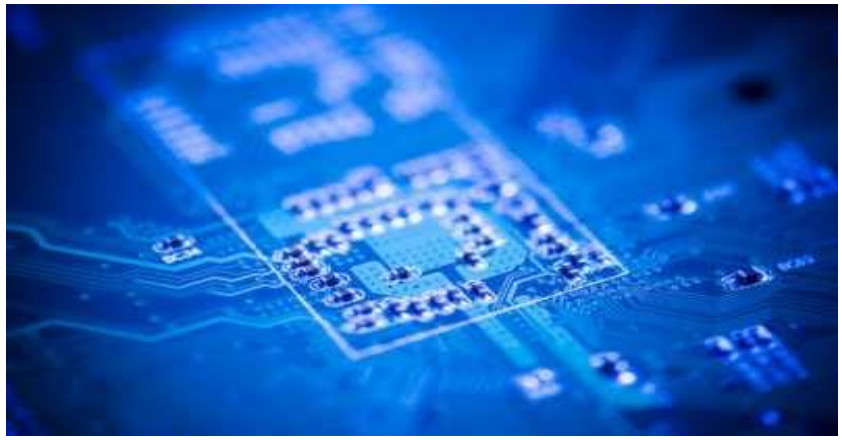
- Industrial plants
- Production and process systems
- Equipment and machineries
- Devices and gadgets
- Appliances
- Consumer goods

- Improved efficiency
- Higher productivity

- New age of communication
- Billions on mobile phones
- New forms of media and entertainment
- Received data and information through satellite

- From large computers capable of most basic tasks
- Today, technologically advanced, ie., PCs, Macs, laptops, smart phones
- Continue to be part in



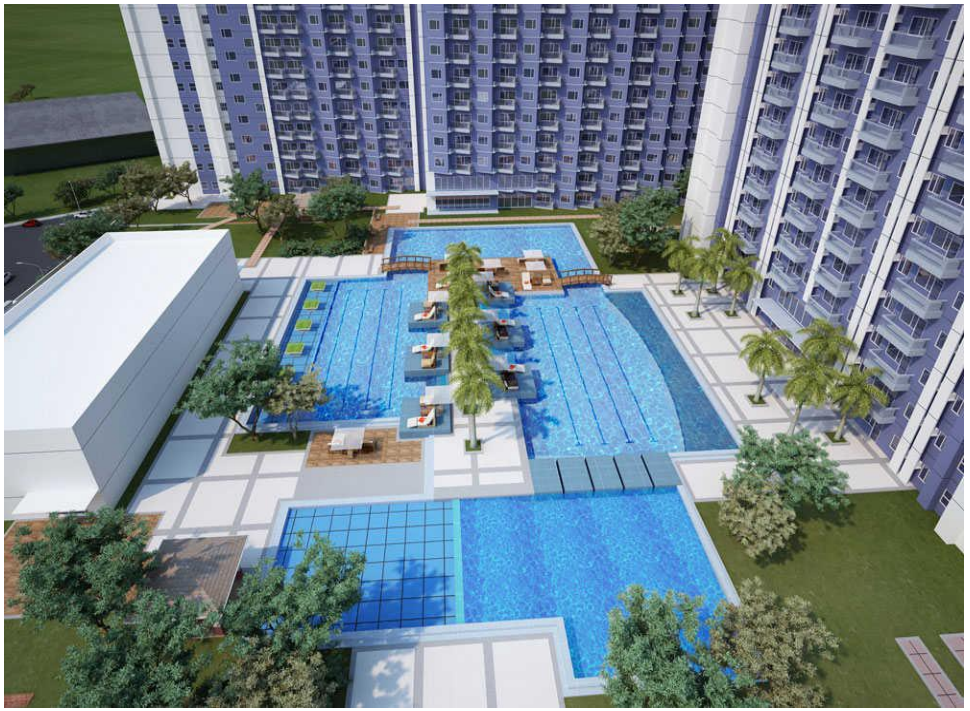


- Transistors to microscopic size
- Harness its magical power for digital computing, controls, communication, detection, display, etc.
- New circuit designs to improve quantum effects on computation and data processing

- Advanced medicines and medical care
- Prolong life span of people

Air-conditioning and ventilation

- High-rise buildings
- Commercial establishments
- Offices, theatres, museums
- Sports arenas
- Residential houses



- ✓ High-rise and multi-functional establishments
- ✓ Changed work- and life-styles
- ✓ Integrated facilities for work and wellness
- ✓ Improved comfort and efficient services

Advanced computing methods and techniques

- Modelling systems
- Simulation systems
- Computational softwares
- Mathematical algorithms
- Nonconventional algorithms (eg., neural networks, fuzzy systems, genetic algorithms)

- Began as a tool for academia and government
- Evolved into the World Wide Web open to anyone who is connected to a computer and a telephone line
- Changed the way we communicate, buy things, etc.
- Part of our lives; bring more opportunities to connect to the world around us

Mechanical Engineering and its future

❑ The Future …

- Developing Sustainability
- Engineering Large and Small Scale Systems
- Competitive edge of Knowledge
- Collaborative Advantage
- Nano- and Bio- future
- Regulating Global Innovation
- Diverse Face of Engineering
- Designing at Home
- Engineering for the other 90%

Mechanical Engineering and its future

- The Future …

- Competitive Edge
  - The ability of engineers and technologists to learn, innovate, adopt, and adapt faster will drive inclusive development
  - Mechanical engineering education must be structured to meet this challenge

Mechanical Engineering and its future

- The Future …

- … the other 90%
  - Mechanical engineering projects must also address the needs of the poorest 90% of humanity.

Mechanical Engineering and its future

- The Future …

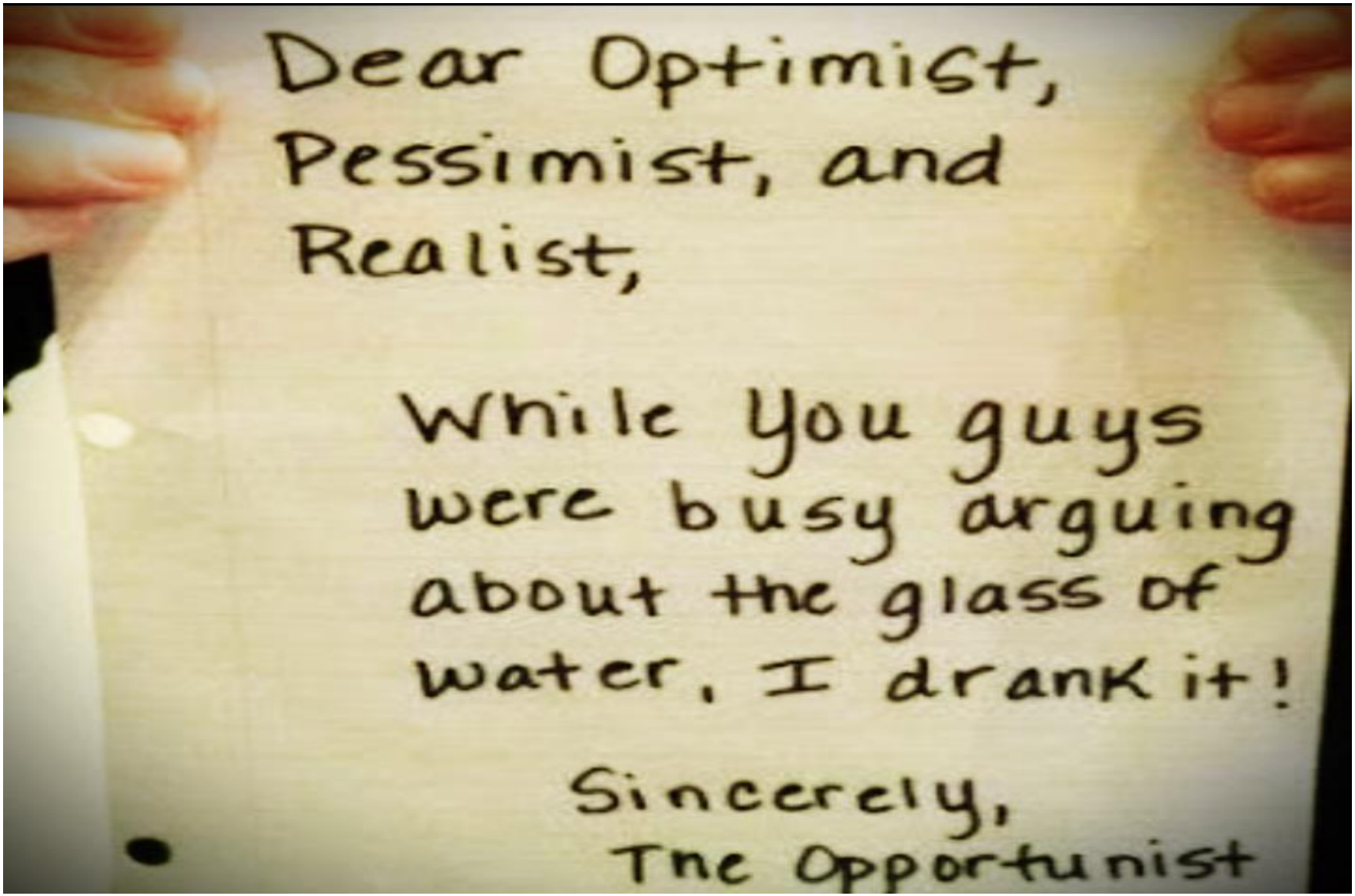
So what does the future hold for the Mechanical Engineer?

- Many problems indeed!
- Engineers see problems as challenges
- Challenges create opportunities
- Engineers live to solve problems

Pessimist's view

Technocrat's view

Opportunist's view



Who are we, engineers?

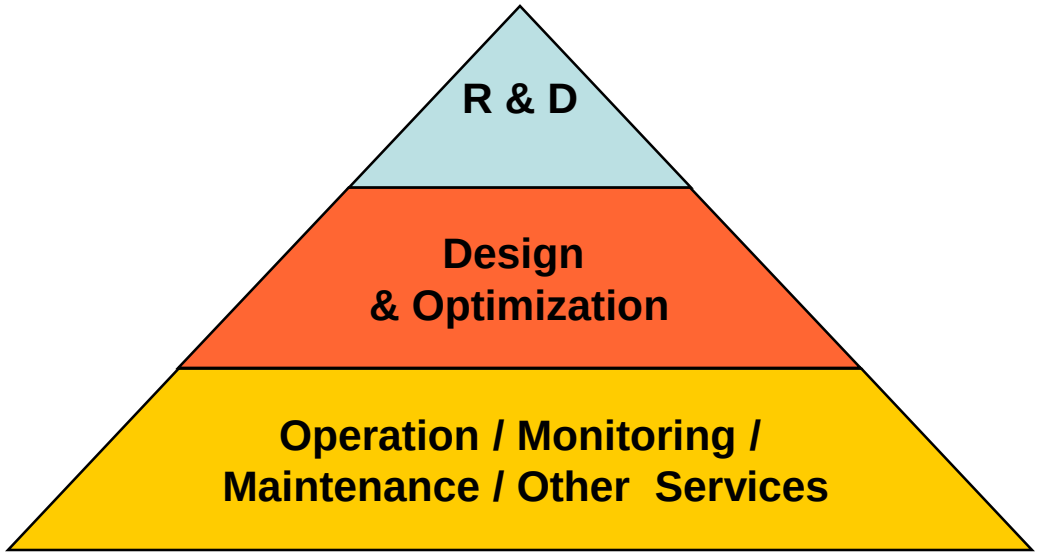
- Engineers turn ideas into reality
- Thrive on problems
- Develop new methods and approaches for production and manufacturing
- Develop powerful computational tools and dependable testing techniques
- Led the major engineering innovations that changed our world
- Innovations become central part of our lives, and
- Served as foundation for the greatest engineering achievement thus far

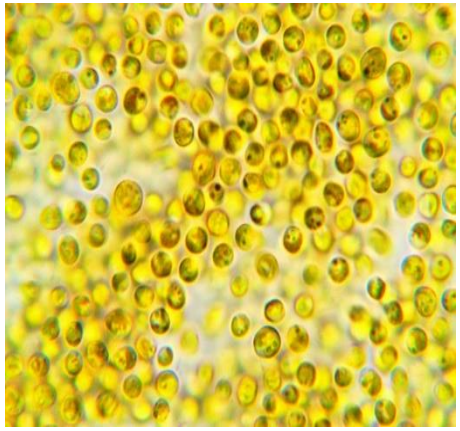
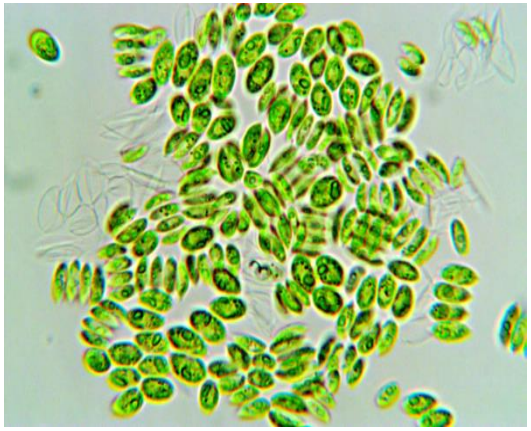
Solutions to Problems of the World?

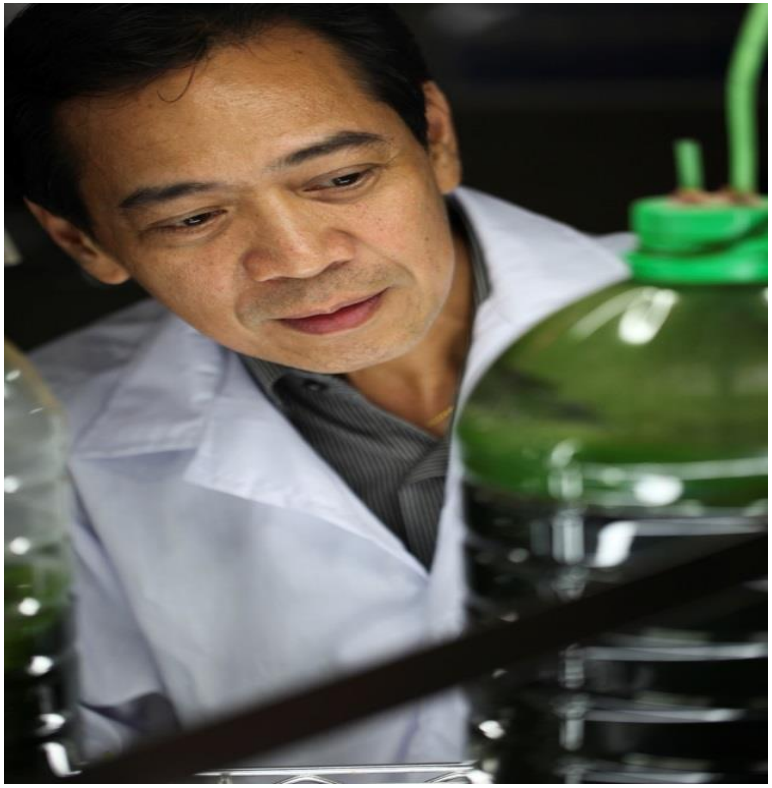
The (MECHANICAL) ENGINEERS may have the answers.

Mechanical Engineering and its future

- Degrees of Sophistication

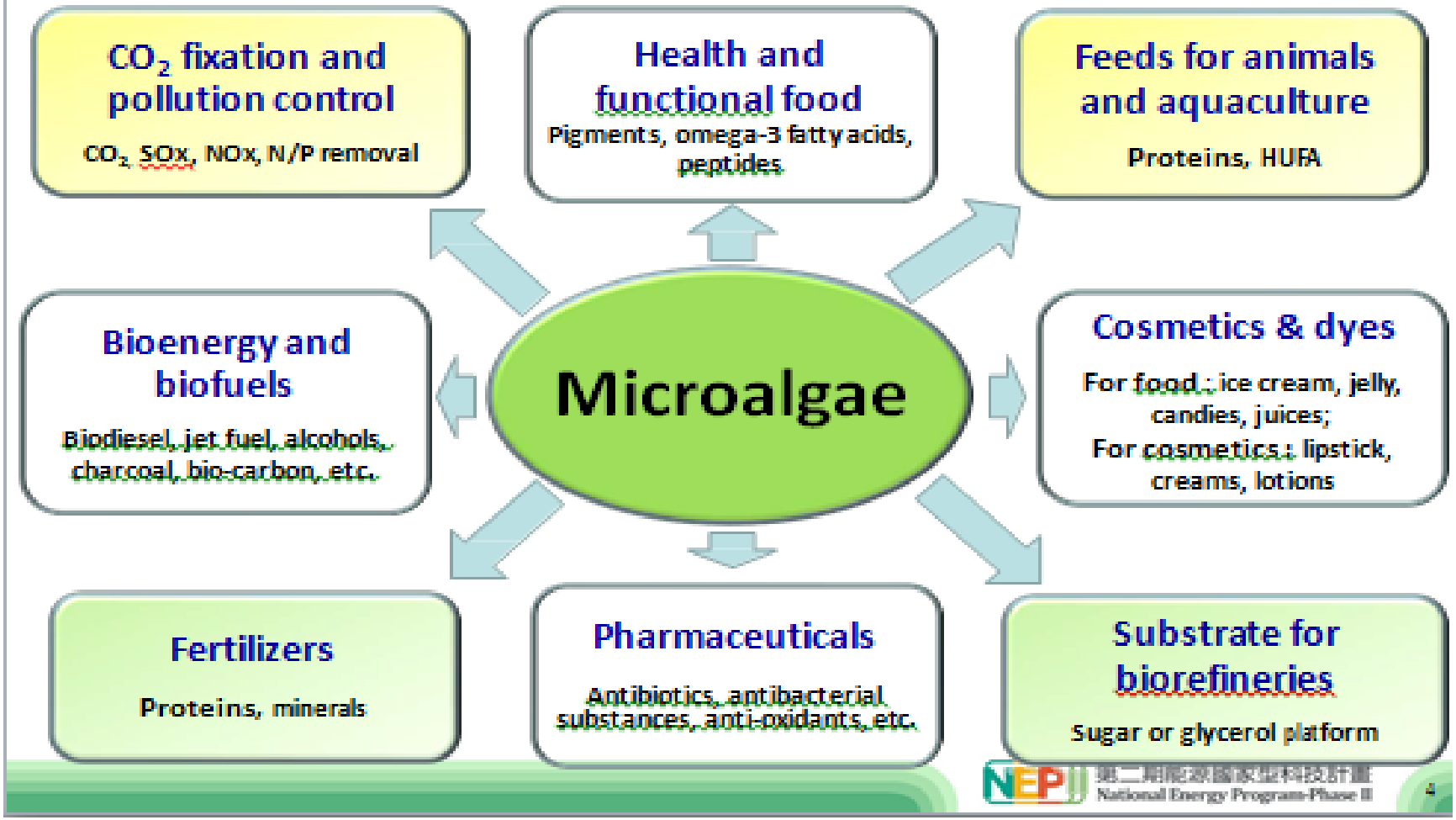


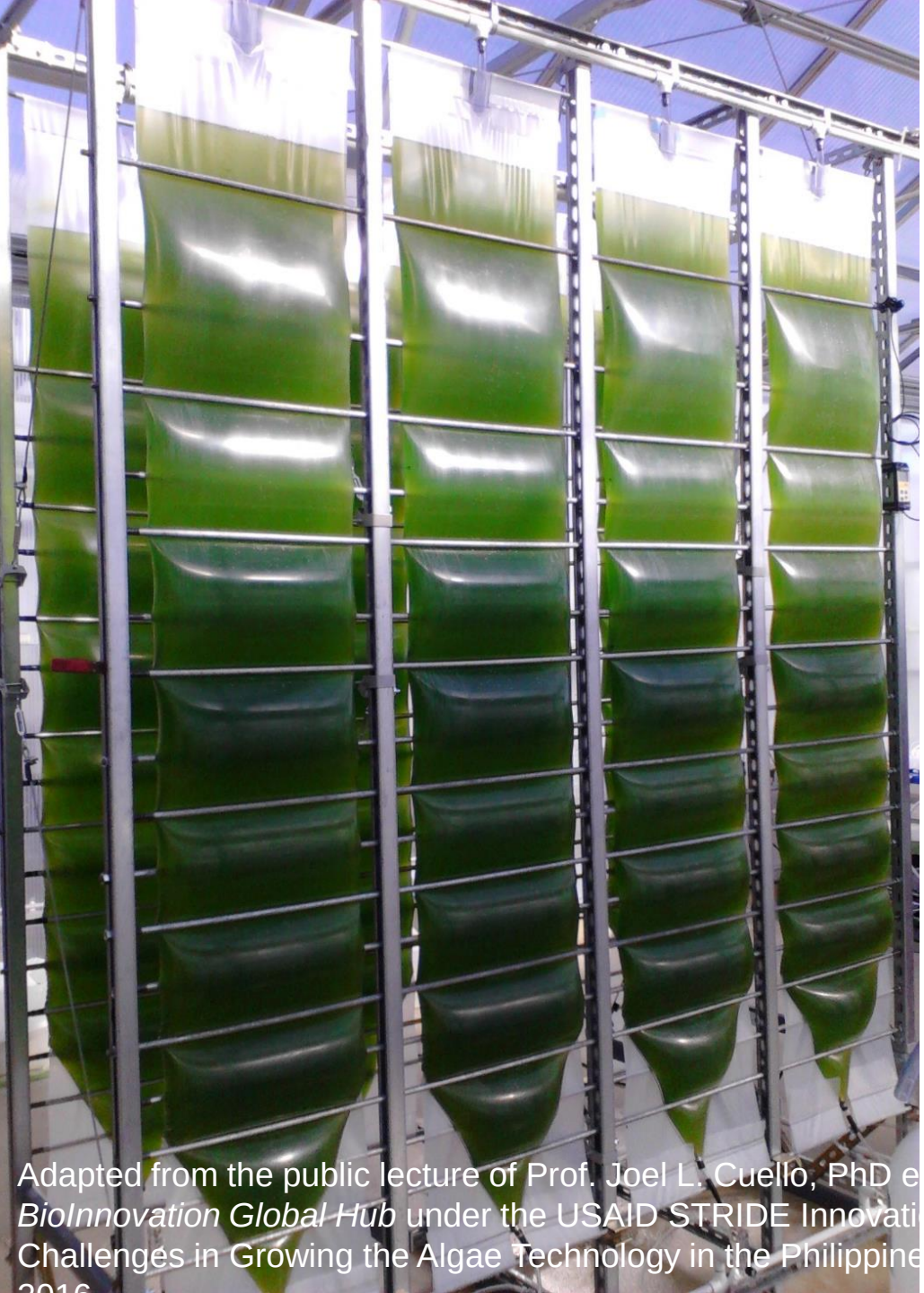






Microalgae Research

Opportunities for Microalgae Use





Adapted from the public lecture of Prof. Joel L. Cuello, PhD e
BioInnovation Global Hub under the USAID STRIDE Innovati
Challenges in Growing the Algae Technology in the Philippine
2016

Why Algae?

Omega 3 Oils Market Worth $4.3B by 2019

Astaxanthin Market Valued at over $1B by 2020

Global Bioproducts Market to Reach over $700B by 2018

Non-Energetics Bioproducts Market to Reach $236B by 2018

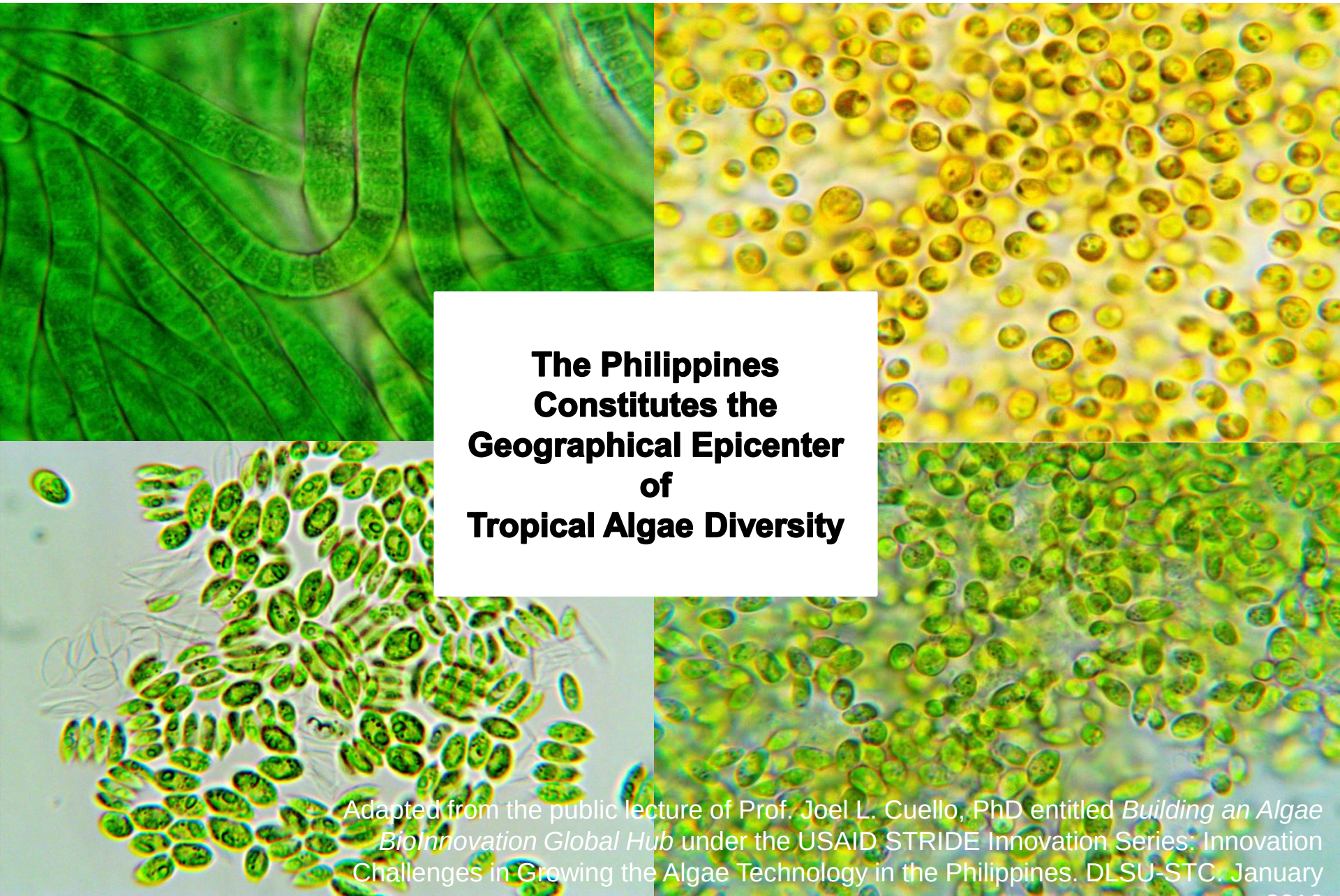
-- BCC Research

Why Microalgae?

Microalgae as Biomass Resource

- Exceptional growth characteristics
- Less nutrient input and land area requirement
- Minimum competition to productive land
- Wastewater treatment potential
- Carbon sequestration capability
- Size range: few to few hundred micrometers; length of 300-1,000 microns

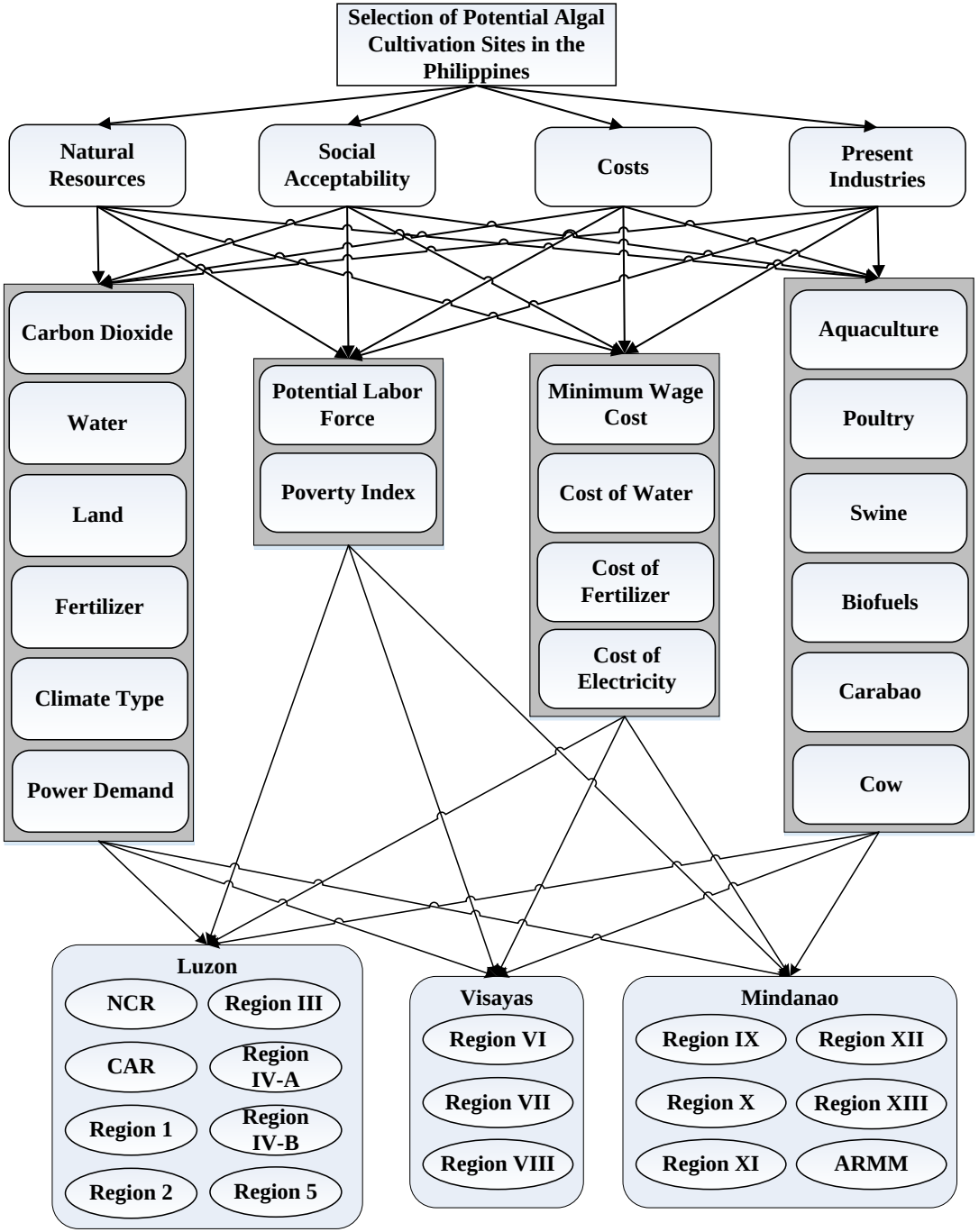
Prospects in the Philippines



The Philippines Constitutes the Geographical Epicenter of Tropical Algae Diversity

Adapted from the public lecture of Prof. Joel L. Cuello, PhD entitled *Building an Algae BioInnovation Global Hub* under the USAID STRIDE Innovation Series: Innovation Challenges in Growing the Algae Technology in the Philippines. DLSU-STC. January

Common Microalgae Strains



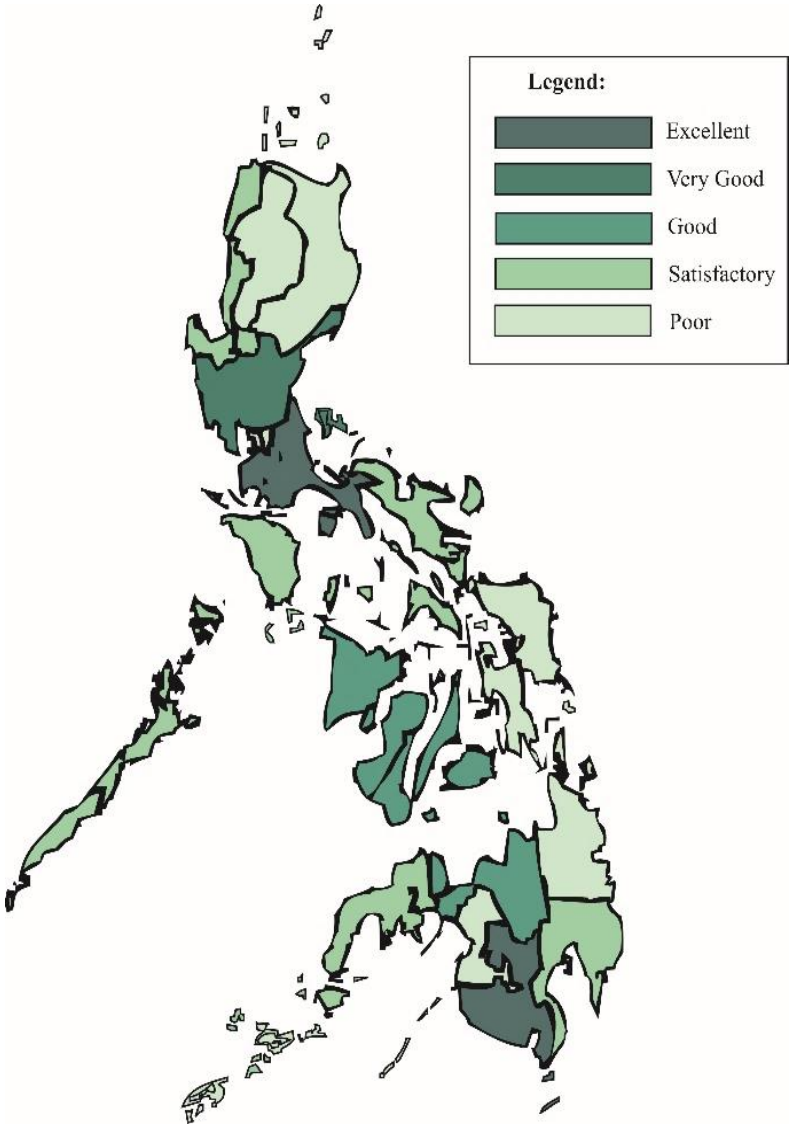
Deployment of a Microalgae Industry in the Philippines

Multi-Criteria Decision Analysis model in the evaluation of the most suitable cultivation sites in the Philippines

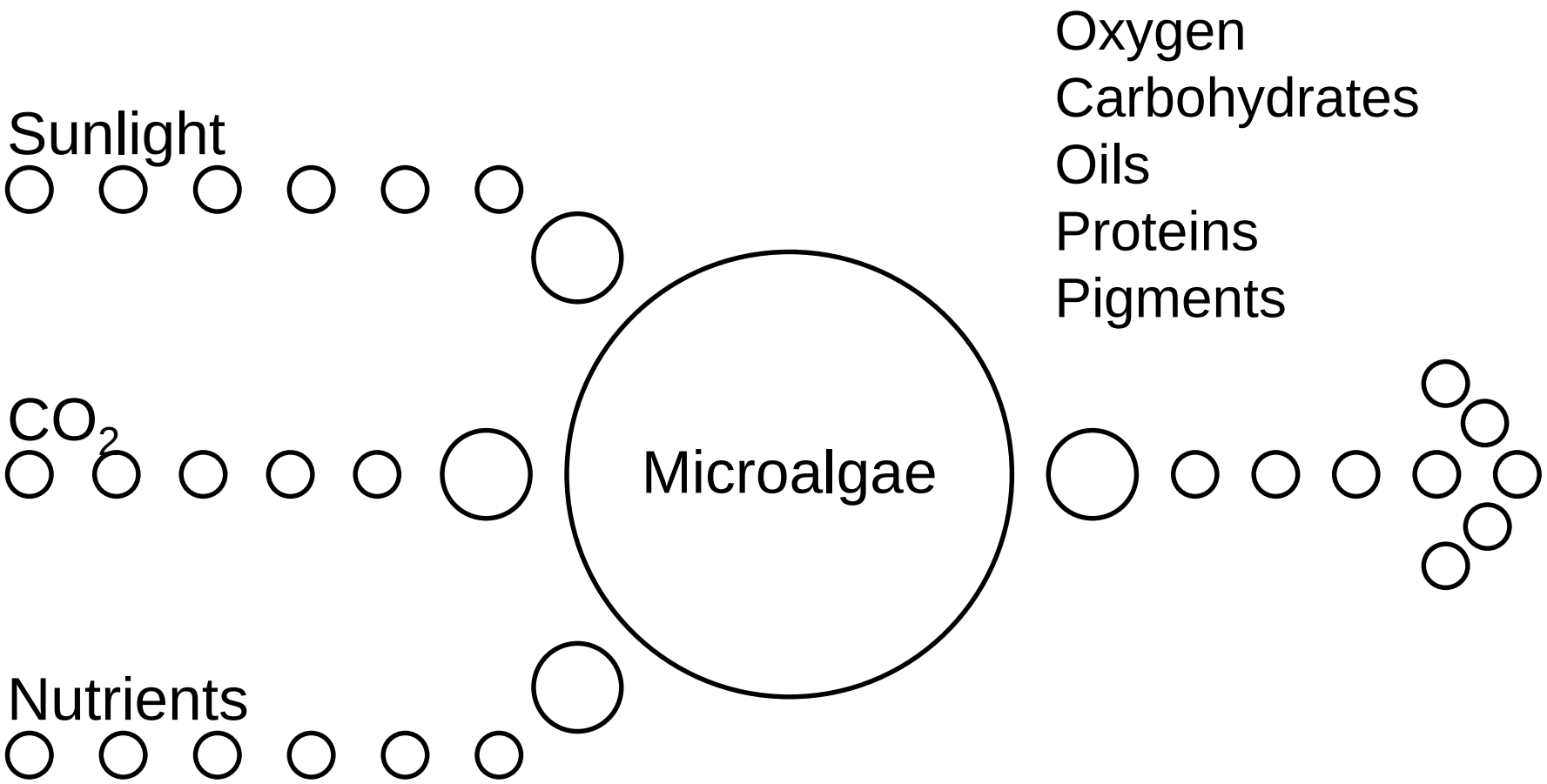
Ubando et al, 2015

Deployment of a Microalgae Industry in the Philippines

Ranking	Region	Weight, %
1	Region IV-A	11.47
2	Region III	9.22
3	Region X	8.73
4	Region VI	8.09
5	Region XII	6.39
6	Region VII	6.30
7	Region I	6.14
8	Region XI	6.04
9	Region IV-B	5.58
10	Region IX	5.37
11	Region V	5.31
12	Region II	5.17
13	ARMM	4.70
14	Region VIII	4.64
15	CAR	3.49
16	Region XIII	3.36



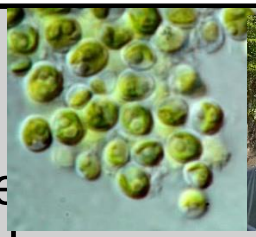
Microalgae Biomass



Microalgae for CO_2 Capture/Utilization

Cultivation

- Nutrient medium
- Sunlight or other light source
- CO_2 from flue gases and powe
- Photobioreactor or Open Ponds



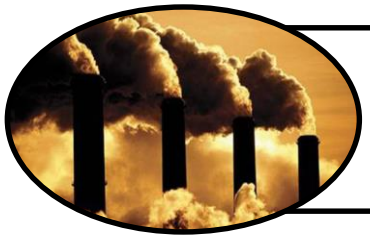
Strain Improvement

- Chemical or Physical treatment
- Genetic Engineering

Harvest and Separation

- Centrifugation
- Oil Extraction

Carbon from Flue Gases



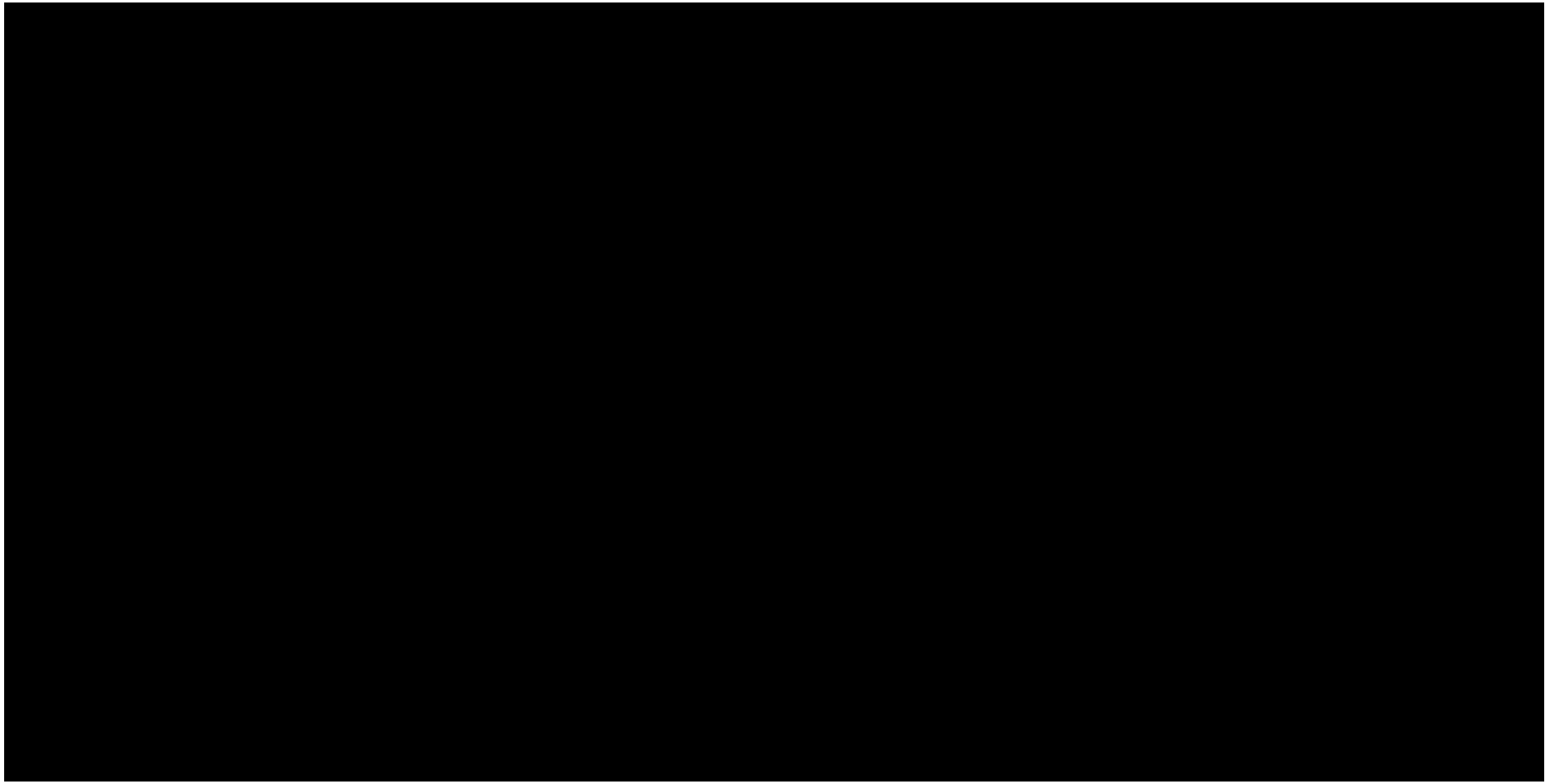
Fossil Fuel Power Stations

Cement Processing

Automotive Industry

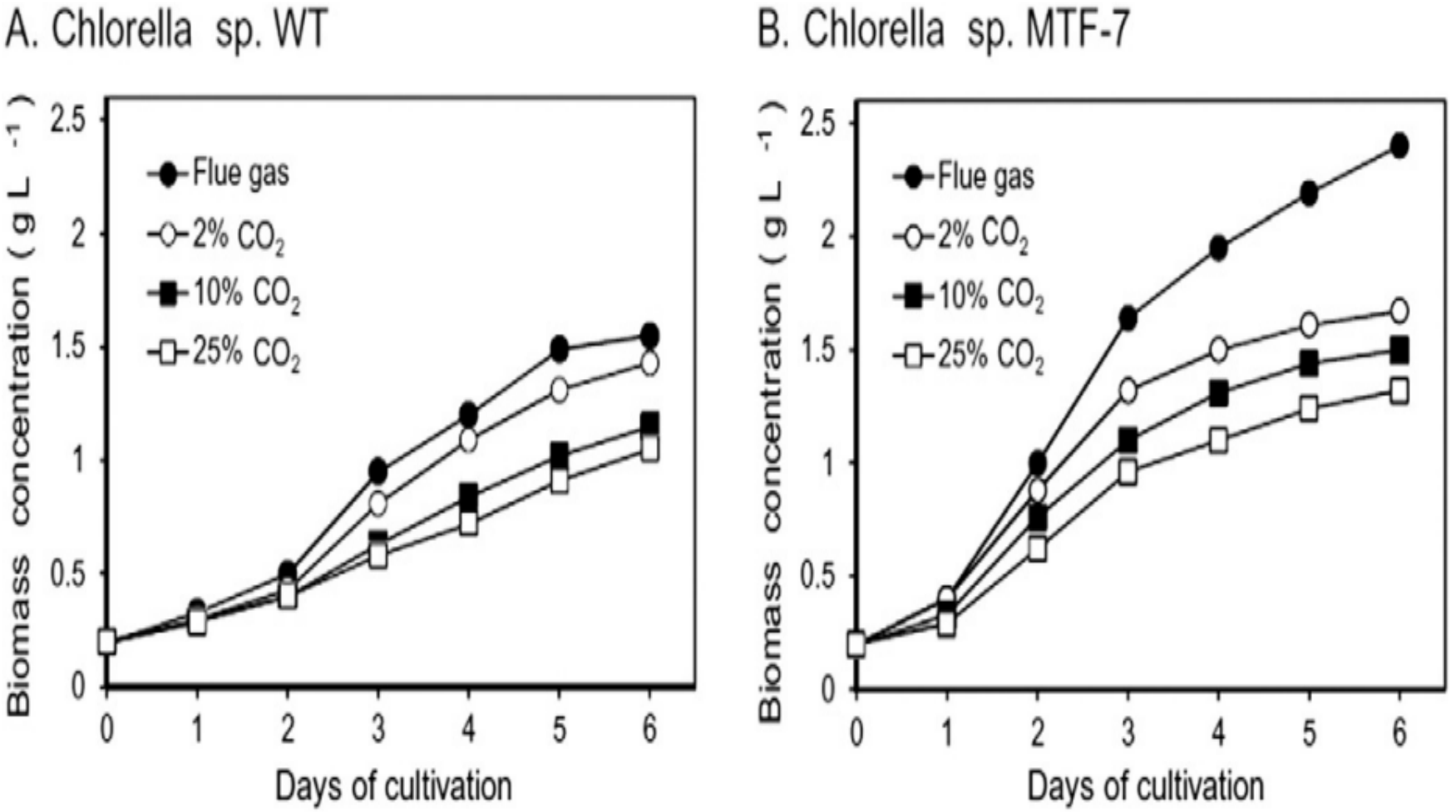
- Microalgae can grow on varieties of flue gas types.
- CO_2 reduction capacity is **300-500 ton CO_2/ha/yr** with a removal efficiency of **60-70%** (Taiwan NEP – II)
- Flue gas impurities such as NO_X and SO_X can be simultaneo removed as well

Carbon Sequestration: How it works



Source: http://reveal.uky.edu/algae_part1_howitworks

Microalgae Growth using Different Flue Gases



Source: Raeesossadati et al, 2014

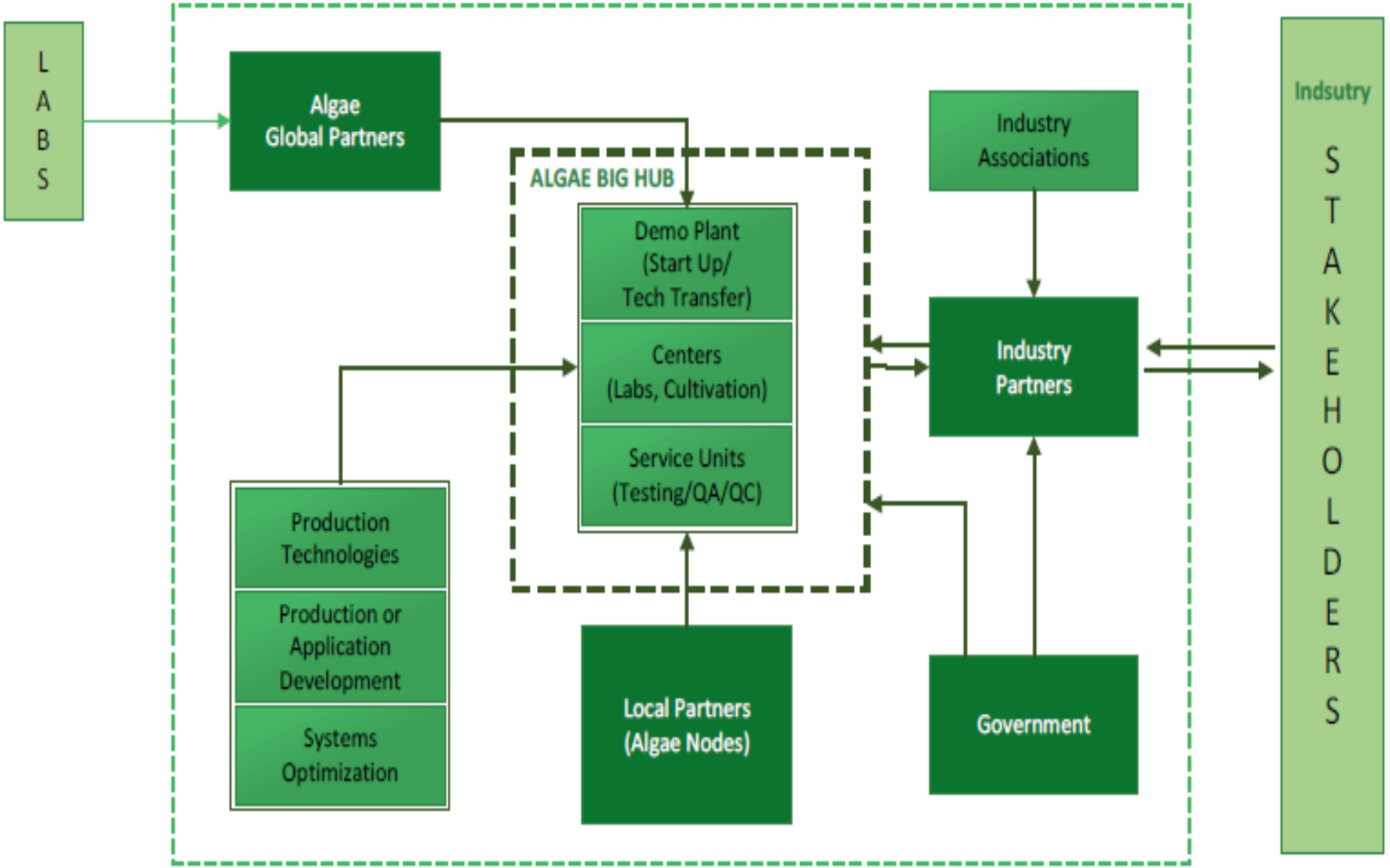
Open Pond / Closed Photobioreactor

Open Pond Cultivation System
at UP Visayas

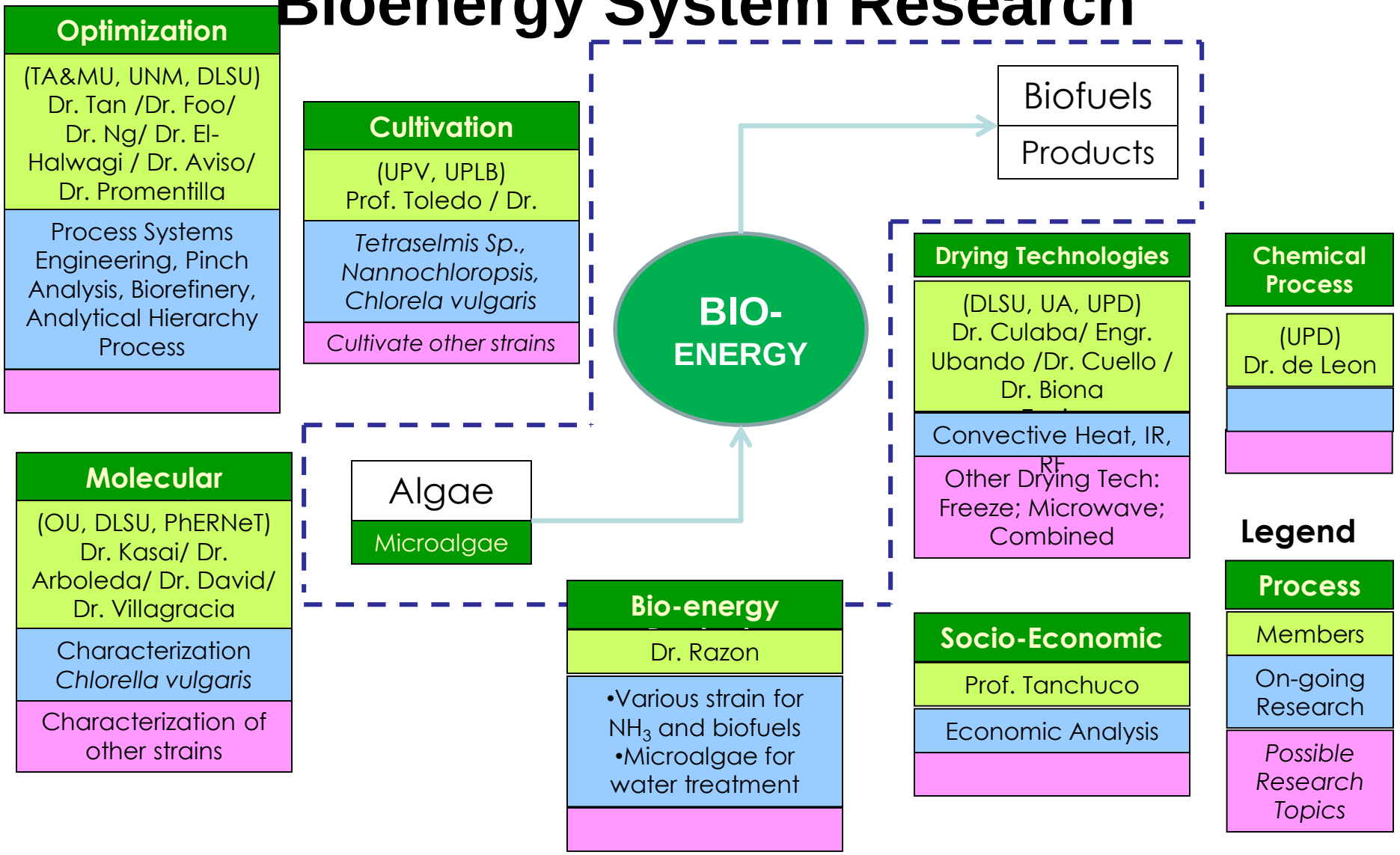
Open Pond Cultivation System of AZtec Spirulina in Cainta

Closed PBR system at DLSU Manila

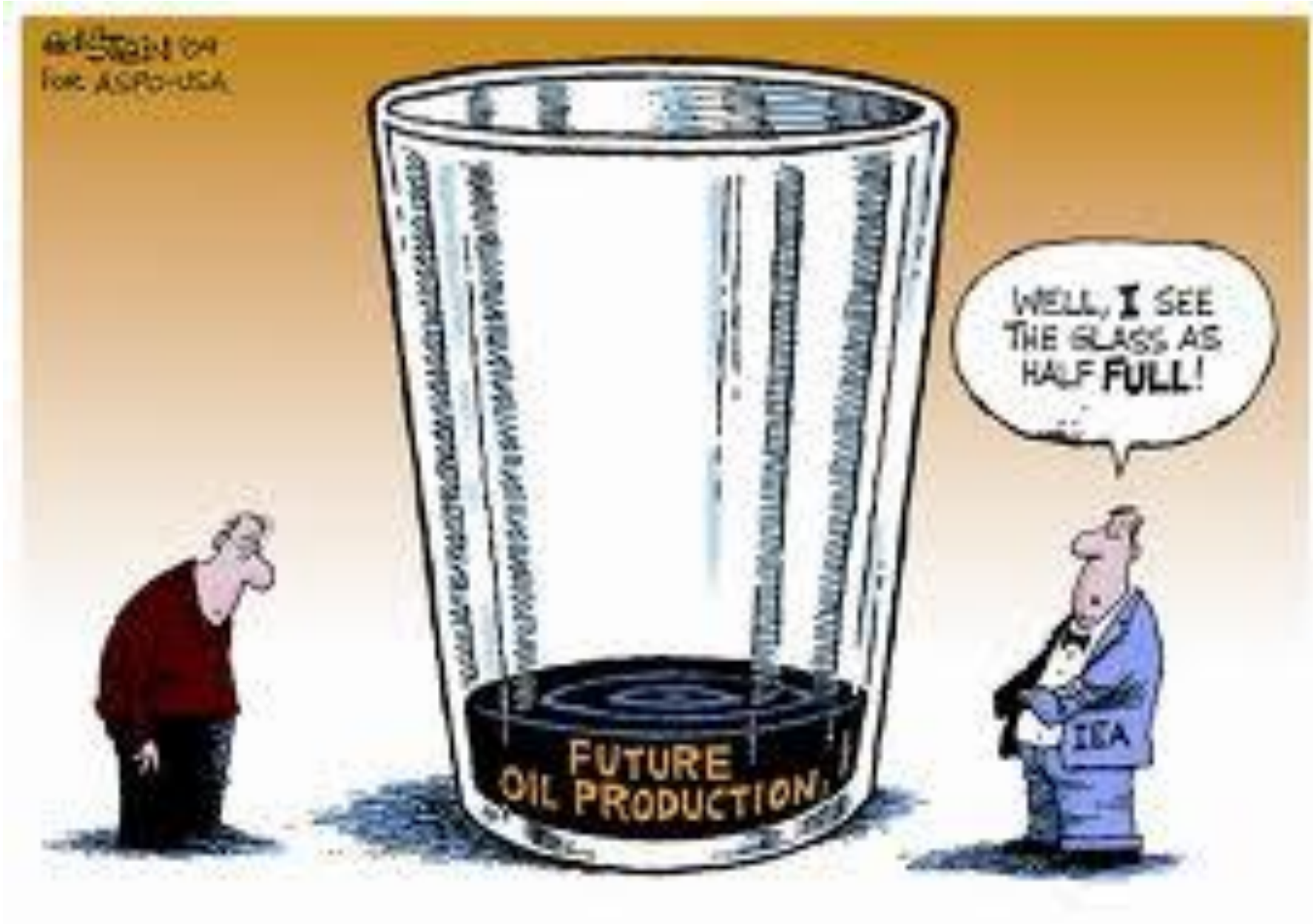
Algae BioInnovation Global Hub



Research@DLSU: Life Cycle-based Multifunctional Bioenergy System Research



Engineer's view (?)



THANK YOU.

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