

# **The Critical Role of Science Education and R&D in Social Innovation and Inclusive Economic Development**

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Professor

The Marine Science Institute

University of the Philippines Diliman

**NAST Social Innovation Forum**

November 11, 2019

Jen Hotel, Roxas Blvd.

# INNOVATION FOR SOCIAL IMPACT

- solving specific social or environmental challenges
- through **technology, social enterprise, policy, education and R&D**
- Integrated ecosystem of solutions to build a more inclusive and sustainable society
- Involves civil society

**SOCIAL INNOVATION**

**THROUGH TECHNOLOGY**

# TOP 3 SOCIAL INNOVATION CHALLENGES IN THE PHILIPPINES

**HITACHI**  
Inspire the Next

The Philippines is looking to adopt technological solutions to resolve its social innovation challenges in Metro Manila, one of the most densely populated regions in the country. We take a closer look at three key challenges and explain how Hitachi works hand-in-hand with the Philippine government, as we co-create a brighter future together.

The Philippines is home to  
**101**  
million people

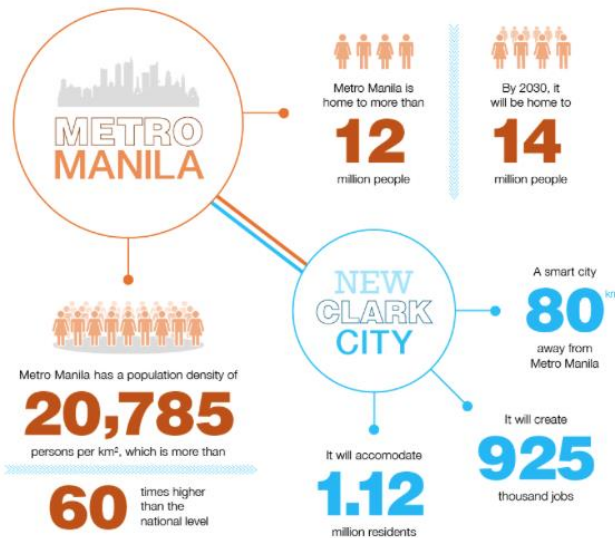
The Philippine economy is  
**29th**  
largest in the world

The Philippines's GDP per capita is  
US\$ **8,815**  
in terms of PPP



## EASING POPULATION GROWTH PRESSURES IN METRO MANILA

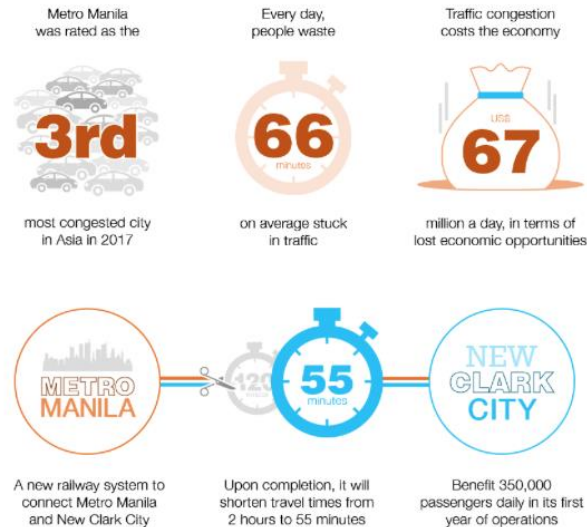
To absorb the population growth, the government is implementing a long-term solution of building a new city, New Clark City, from the ground up.



Hitachi has been helping policymakers to achieve their smart city visions in places such as Kashiwa-no-ha City

## DECONGESTING THE DAILY TRAFFIC IN METRO MANILA

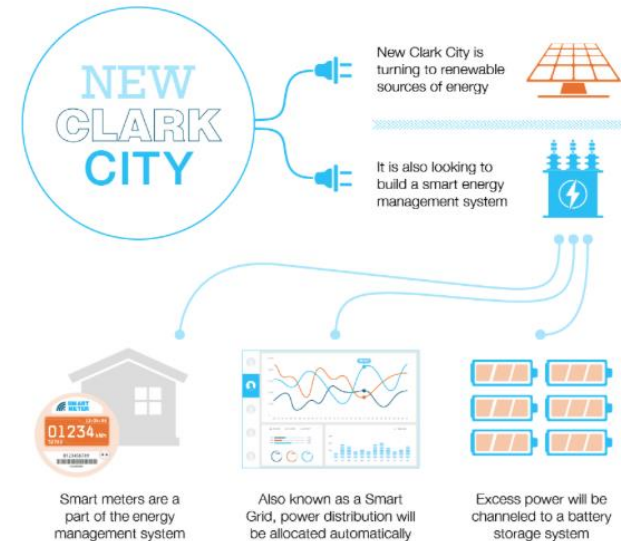
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With expertise in building railway systems in Japan and England, Hitachi hopes to play a key role in the new railway system to help ease congestion

## BUILDING AN ENERGY MANAGEMENT SYSTEM FOR NEW CLARK CITY

To power a smart city like New Clark City, the Philippine government is looking to avoid heavy reliance on non-renewable sources of energy.



Hitachi has implemented a similar energy management system in Kashiwa-no-ha City, which enables efficient use, monitoring and control of energy in the city



# **SOCIAL INNOVATION THROUGH SOCIAL ENTERPRISES**

ON A COMMUNITY SCALE

URBANIZING, URBAN, RURAL, AND  
POOREST OF THE POOR

INVOLVING ACADEME

# Museong Pambayan ng Morong

Morong, Rizal



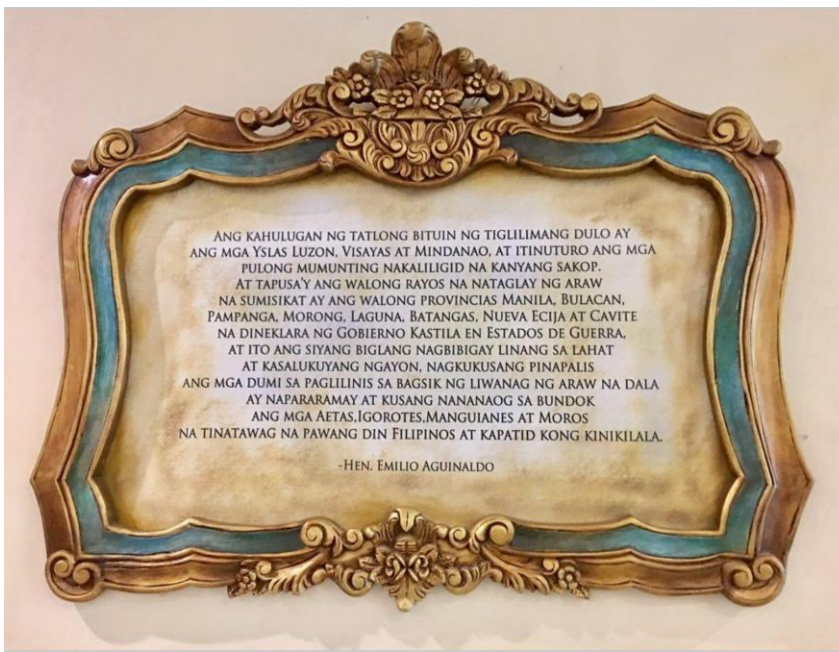
Mario Sto. Domingo  
Founding President  
Lipunang Pangkasaysayan ng Morong (LIKAS Morong)

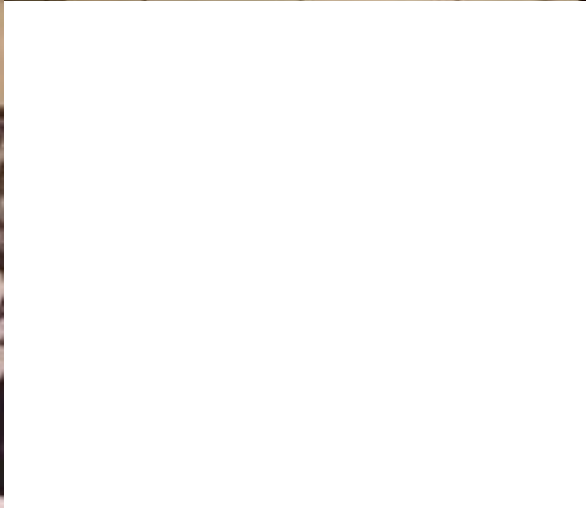




Gisela Concepcion  
Inaugural Lecturer  
The Annual Francisco & Enriqueta Angeles  
Memorial Science Lecture  
University of Rizal System  
Morong, Rizal





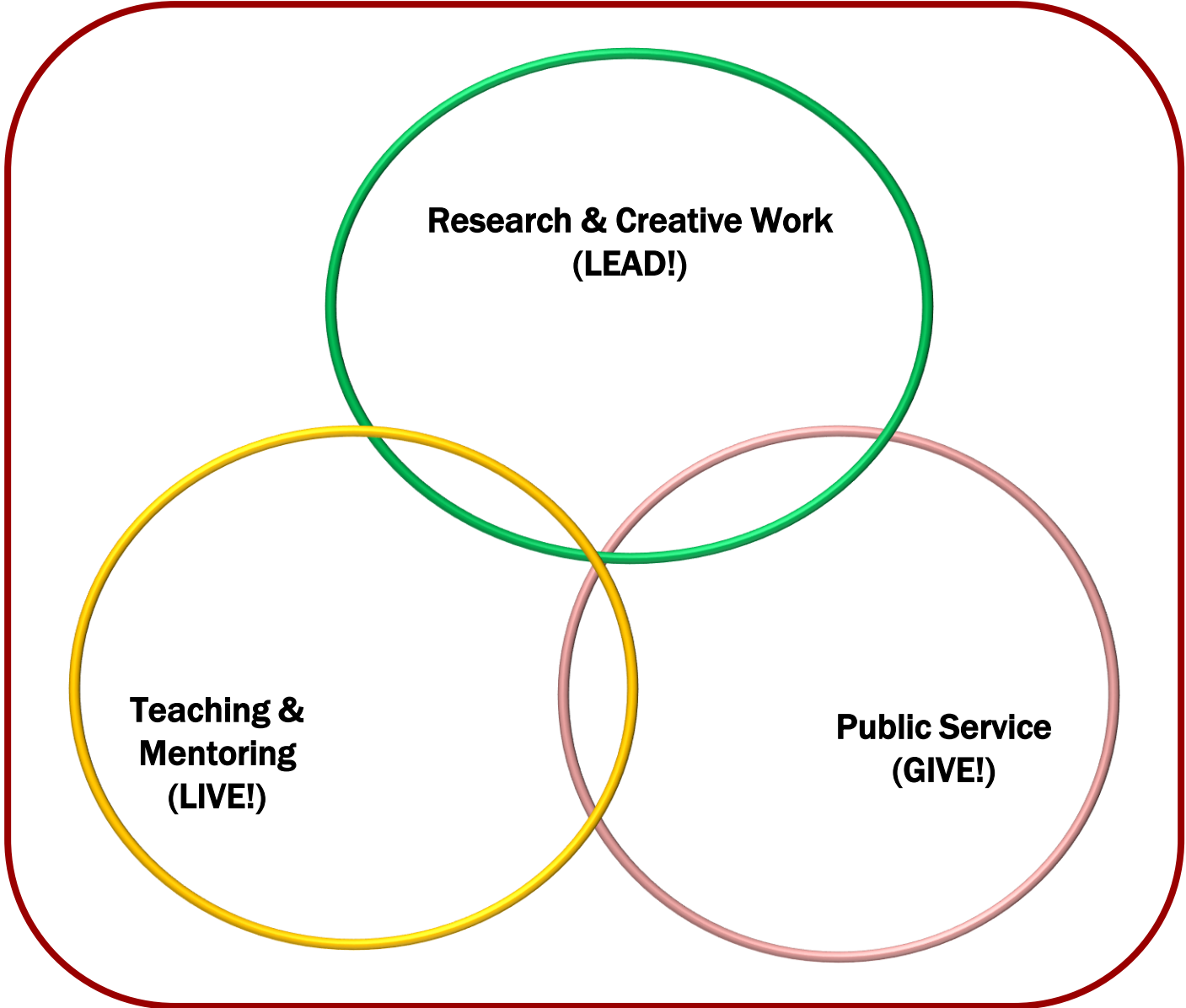












## Overview

We continue to set the pace and trend in the development of shopping centers in the country. Our malls are not merely places to shop. They have also become lifestyle and cultural centers that celebrate the best in Filipino architecture, artistry, and design. Through our malls around the country, we bring the good life to Filipinos, addressing not only their basic needs, but also creating vibrant community hubs. Developed using unique and memorable concepts, each Ayala mall is made to be distinct. Creativity, innovation and originality are crucial to the way we build and operate our malls.

[Visit the Ayala Malls Website](#)

*Choose a location*

Pasig



*Choose a mall*

**Ayala Malls The 30th**

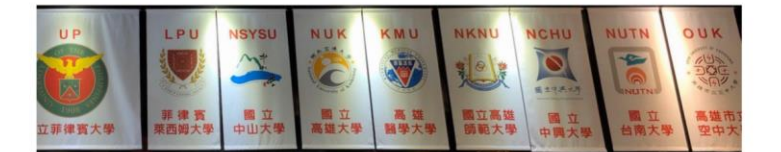
## About U.P. Town Center

The pioneer university town concept in the country and a playground for curious minds. UP Town Center plays host to two major universities and educational institutions, as well as residential villages along Katipunan Avenue, Quezon City. With its distinctive dining and retail options complemented by lush landscaping and greenery, UP Town Center will continue to expand to serve as a place for social interaction, relaxation and convergence, as well as a venue for creative expression and performing arts.



# UP System and Edu-Connect Initiative

## Academic Weekend Kapihan: UP Guest House@ Kindness Hotel





Sign IN >>

BUILDING COMMUNITIES TO END POVERTY

WHO WE ARE

HOW WE END POVERTY

VOLUNTEER

GIVE

EXPLORE

GK1WORLD



## Center for Social Innovation

[Date Created: July 3, 2013]

**CSI (Center for Social Innovation)** is a business ecosystem developer that aims to build a culture of social entrepreneurship. Business ecosystems are spaces that are **forgiving enough** for social entrepreneurs to make mistakes while testing prototypes and new business models; AND spaces that are also **demanding enough** for them to build global Filipino brands that have real social and environmental impact.

CSI does this by engaging the Gawad Kalinga network and by leveraging on the Gawad Kalinga community platform. The first provides access to experts and volunteers from the academe, business, government and other fields. The second allows social enterprises an opportunity to achieve scale, sustainability and impact.

### WHY WE DO IT

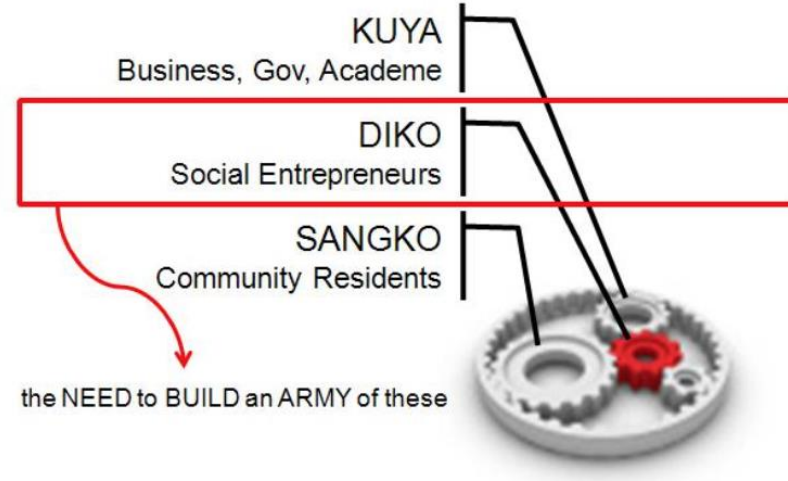
Scaling up is hard to do but there is an urgent need for social enterprises to do them. Social enterprises that achieve scale not only achieve financial sustainability but they also directly improve the lives of more Filipino families and significantly address environmental concerns. CSI therefore facilitates the transfer of resources from experts and institutions to social entrepreneurs who need them for scaling up.





The missing element in all of these is a pipeline of young leaders, potential social entrepreneurs. They have the time and the energy to immerse in communities who need to be sustainable but also have enough skills to deal with experts and build Filipino brands. CSI then partners with key institutions to ensure a steady supply of young Filipinos actually become social entrepreneurs.

## The Middle Brother Model



### WHAT YOU CAN DO

Social entrepreneurs deal with a wide range of issues and not just business-related ones. You can help us build a culture of social entrepreneurship every time you:

1. Attend CSI Nights! Wednesdays at the Enchanted Farm Cafe in Commonwealth Avenue, Quezon City. (Watch out for CSI Nights outside Metro Manila.)
2. Apply as volunteer or intern for CSI or for any of the social enterprises on its network.
3. Convince your school (present or previous) to start a course or program on social entrepreneurship. We can guide and provide templates for the school administration and faculty.
4. Share personal or business development skills via trainings for social entrepreneurs.
5. Visit the **Enchanted Farm** (in Bulacan and soon in Bacolod, Palawan, CamSur, Samar, and Butuan) and join the day to week-long camps. Regular trips are





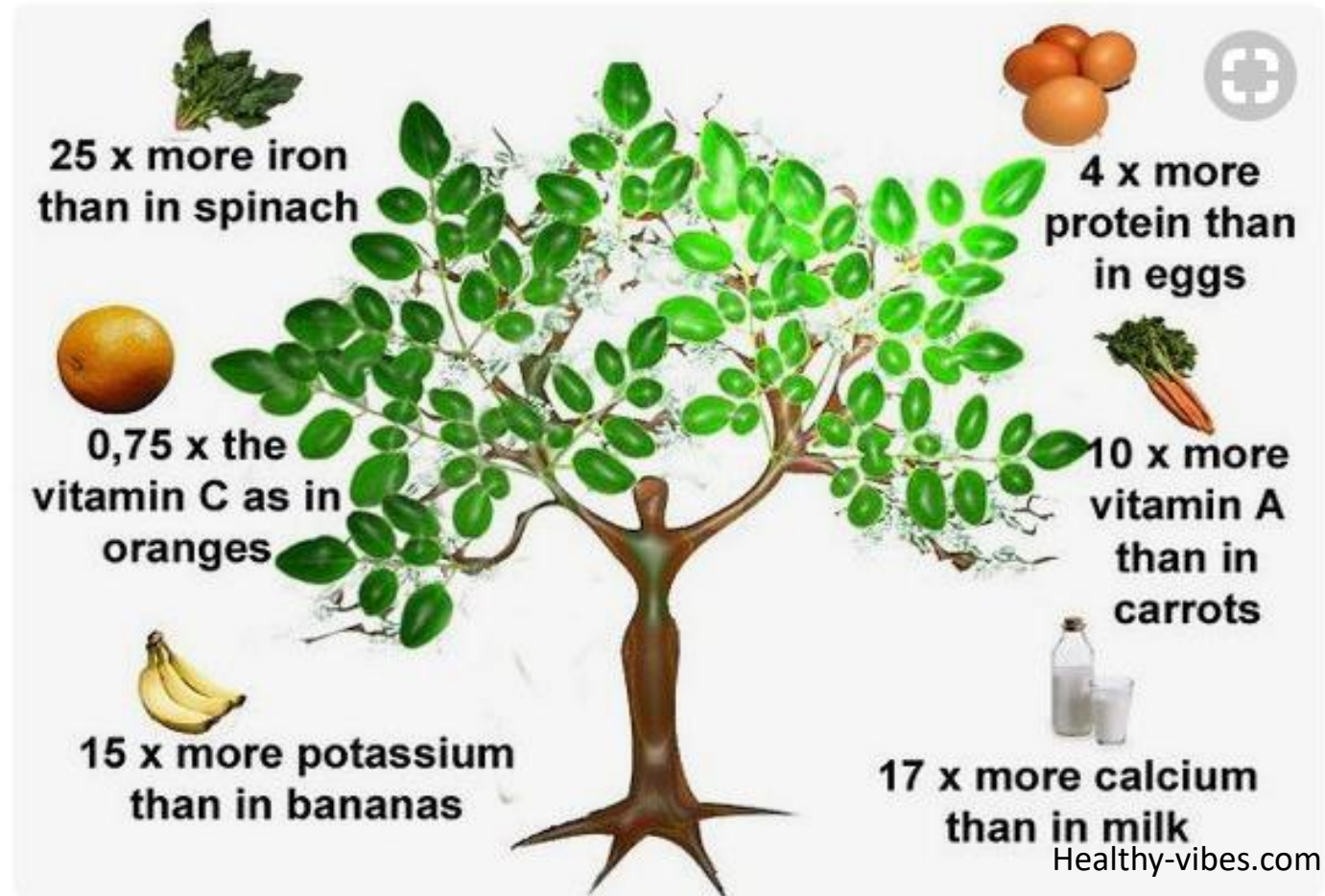


**Transforming Land. Transforming LIVES.**





# Nutritional Profile from Seeds, Leaves, and Pods of *Moringa*



Note: this picture represents the nutritional profile of the leaves only (g/g)



## Leaves

- Anti-oxidant  
(Siddhuraju P and Becker K (2003) J Agric Food Chem 51, 2144-55)
- Galactogogue  
(Almirante CY and Lim C (1996) JPMA 71, 265-272; Balahibo M et al (2001) UERMMMHC J Health Sci 4, 12-18)



## Seeds

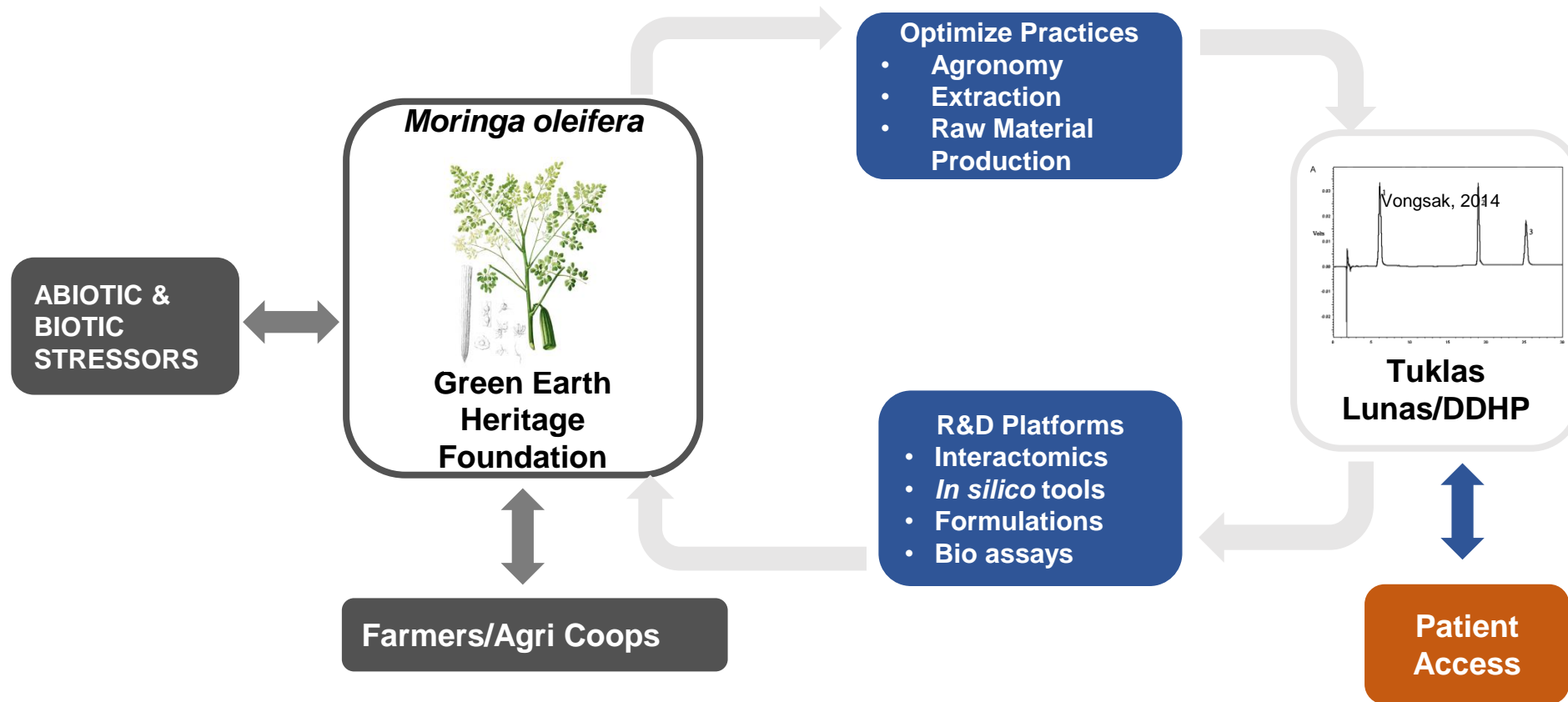
- Anti-inflammatory, anti-tumor  
(Guevara A et al (1996) PJS 125, 175-184)
- Antimicrobial  
(Ali GH et al (2004) Int J Env Stud 61, 699-708)

## Flowers

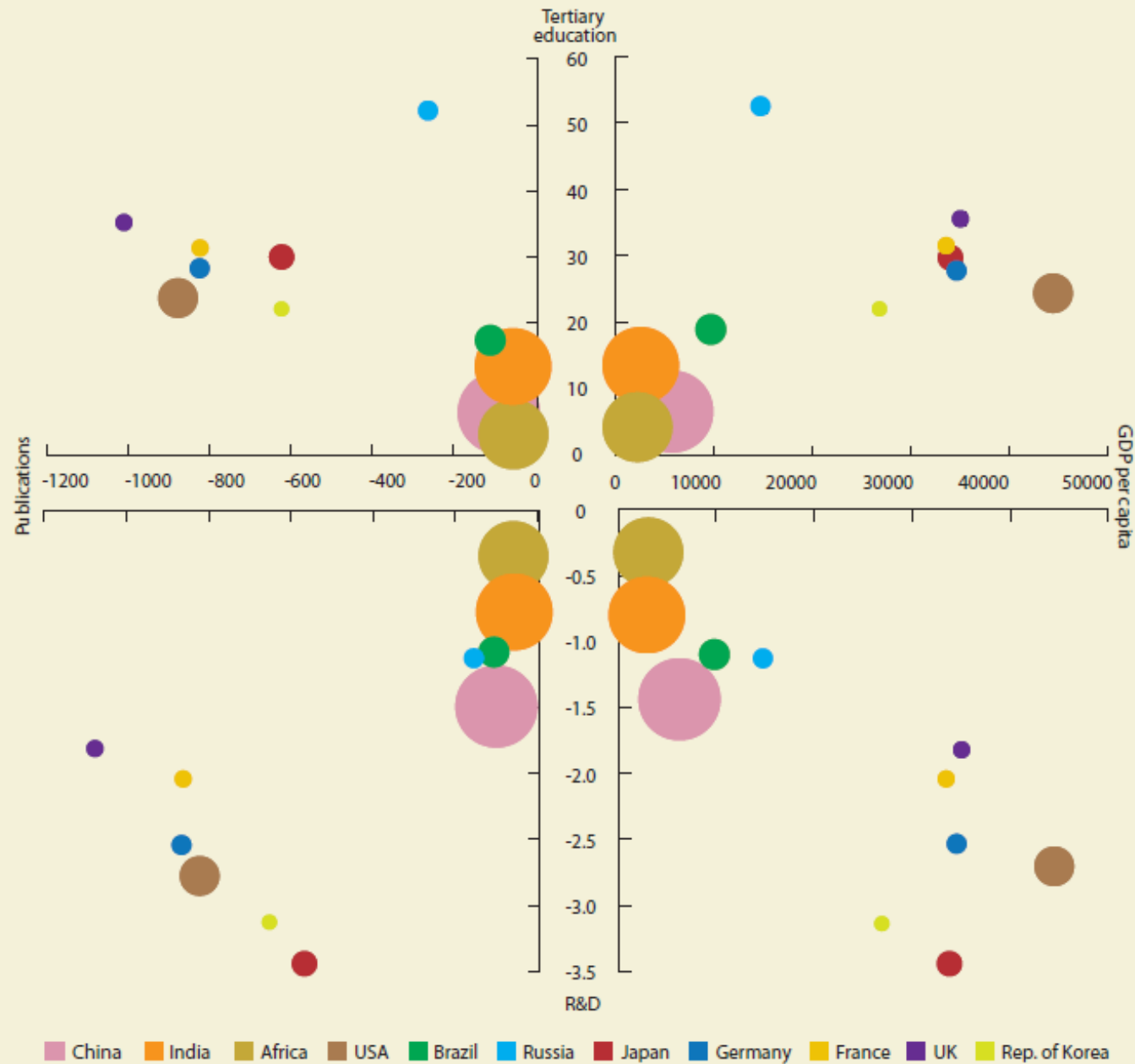


- antibiotic and antifungal (e.g., pterygospermin)  
(Fahey JW. Acta Hort. ISHS 2017. 209-224)

# Establishing a Sustainable Value Chain using High-Quality, Single-Origin *Moringa oleifera* from Farm to Market for Nutritional, Nutraceutical, Cosmeceutical and Therapeutic Products







**Why should research (R&D) be a top national priority?**

**There is a strong correlation between R&D and GDP per capita.**

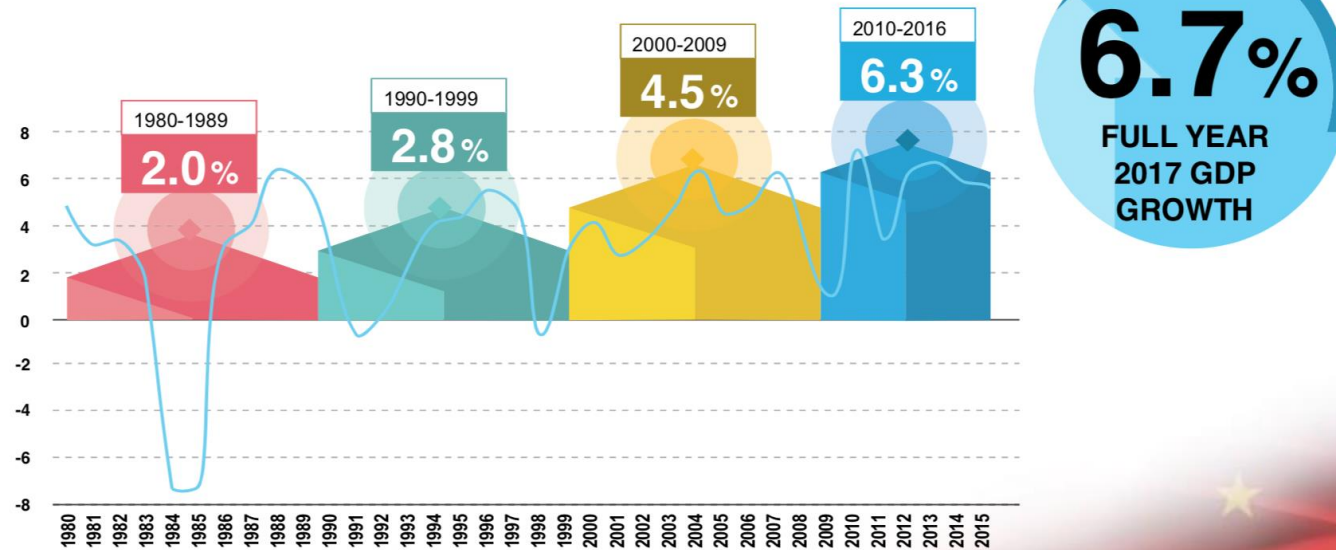
**UNESCO  
SCIENCE  
REPORT 2010**

**Figure 2**

*Note: The size of the circles reflects the population size for each country or region studied.*  
 Source: UNU-MERIT based on data from the UNESCO Institute for Statistics and World Bank

# PH economic growth in sharp upward trajectory...

Figure 1. Philippine economic growth rate, 1980-2017



Source: Philippine Statistics Authority



***Table 10.5 Employment, Unemployment, Underemployment and Labor Force Participation Rate, Calabarzon, 2012-2015***

Indicator	2012 (BASELINE)	2013	2014	2015	2016 (END OF PLAN TARGET)
Employment rate	91.1	90.8	92.0	92.0	93.9 to 94.1
Unemployment rate	8.9	9.2	8.0	8.0	8.6 to 9.4
Underemployment rate	17.9	17.9	18.6	18.2	<17.5
Labor Force Participation Rate	64.4	64.5	65.5	64.6	Increasing

**Source: PSA Region IV-A**



# UNITED NATIONS



# SUSTAINABLE DEVELOPMENT GOALS

**1** NO POVERTY

Icon representing a family of five people.

**2** ZERO HUNGER

Icon representing a bowl of food with steam rising from it.

**3** GOOD HEALTH AND WELL-BEING

Icon representing a heartbeat line and a heart.

**4** QUALITY EDUCATION

Icon representing an open book and a pencil.

**5** GENDER EQUALITY

Icon representing a female symbol with an equals sign.

**6** CLEAN WATER AND SANITATION

Icon representing a water tap with a drop of water.

**7** AFFORDABLE AND CLEAN ENERGY

Icon representing a sun with a power button symbol.

**8** DECENT WORK AND ECONOMIC GROWTH

Icon representing a bar chart with an upward arrow.

**9** INDUSTRY, INNOVATION AND INFRASTRUCTURE

Icon representing stacked cubes.

**10** REDUCED INEQUALITIES

Icon representing an equals sign inside a circle.

**11** SUSTAINABLE CITIES AND COMMUNITIES

Icon representing various buildings.

**12** RESPONSIBLE CONSUMPTION AND PRODUCTION

Icon representing an infinity symbol.

**13** CLIMATE ACTION

Icon representing an eye with the Earth as the pupil.

**14** LIFE BELOW WATER

Icon representing waves and a fish.

**15** LIFE ON LAND

Icon representing a tree and birds.

**16** PEACE, JUSTICE AND STRONG INSTITUTIONS

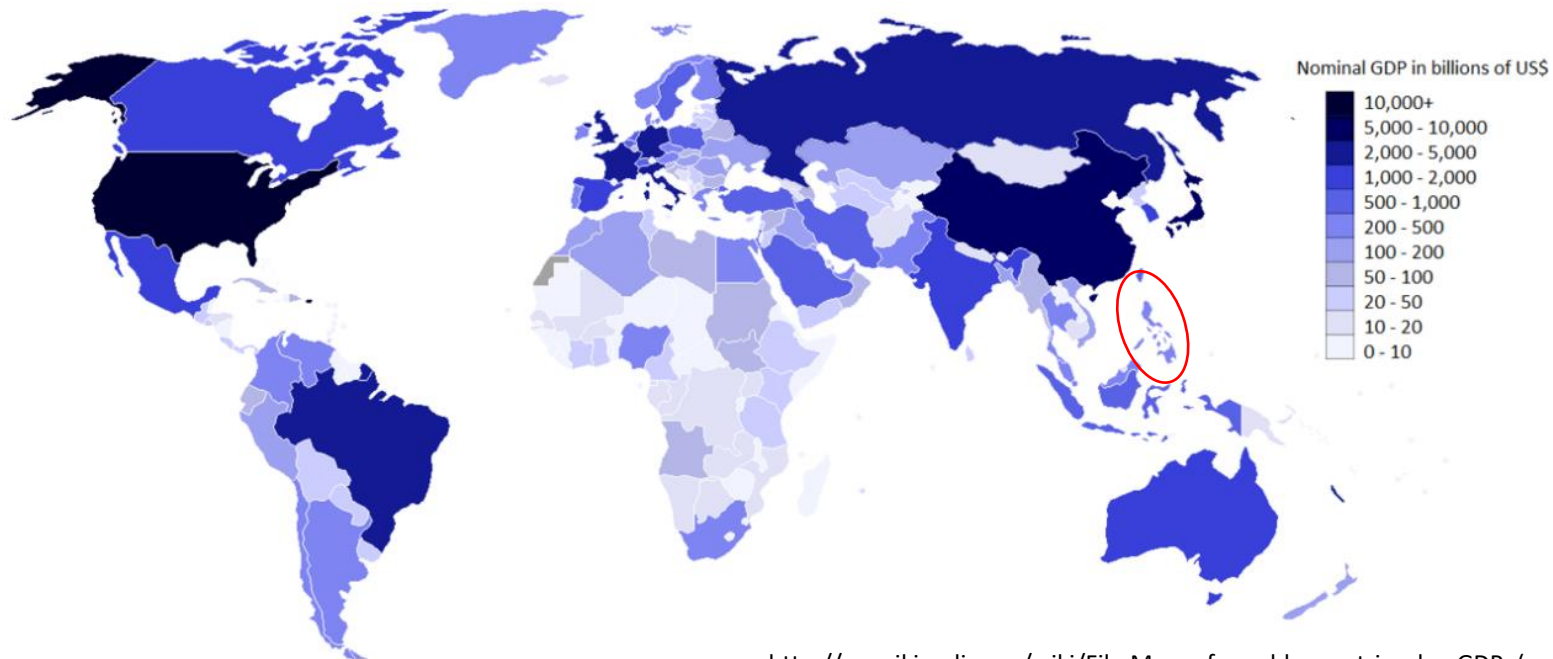
Icon representing a dove and a gavel.

**17** PARTNERSHIPS FOR THE GOALS

Icon representing interlocking circles.

# Philippine Economy

- the 40th largest in the world based on Gross Domestic Product (GDP)
- one of the emerging markets in the world
- a freedom score of 60.1, the 89<sup>th</sup> freest economy in the world and 16<sup>th</sup> in the region



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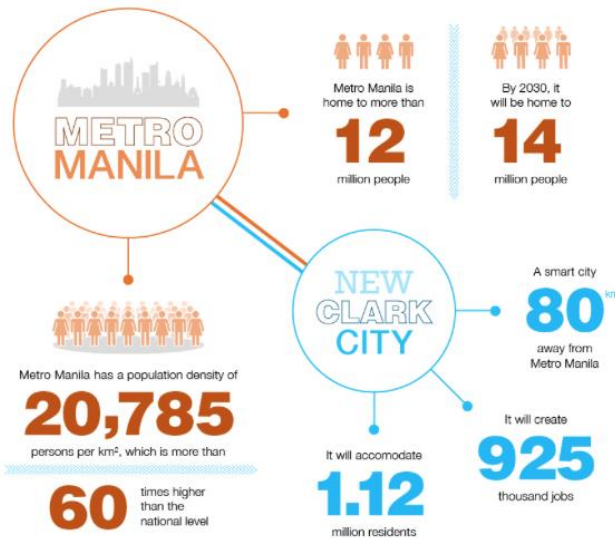
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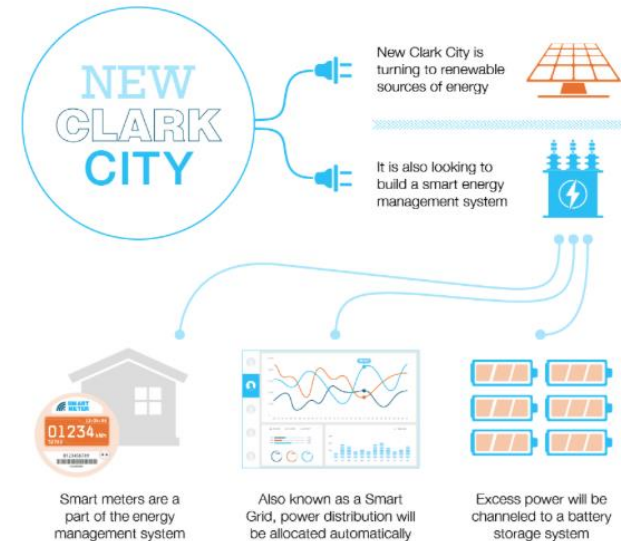
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**SOCIAL INNOVATION through**

**REGIONAL INCLUSIVE GROWTH  
POLICY**



Figure 4.1 The Development Framework



*Figure 1.2 Regional Development Plan, 2017-2022*

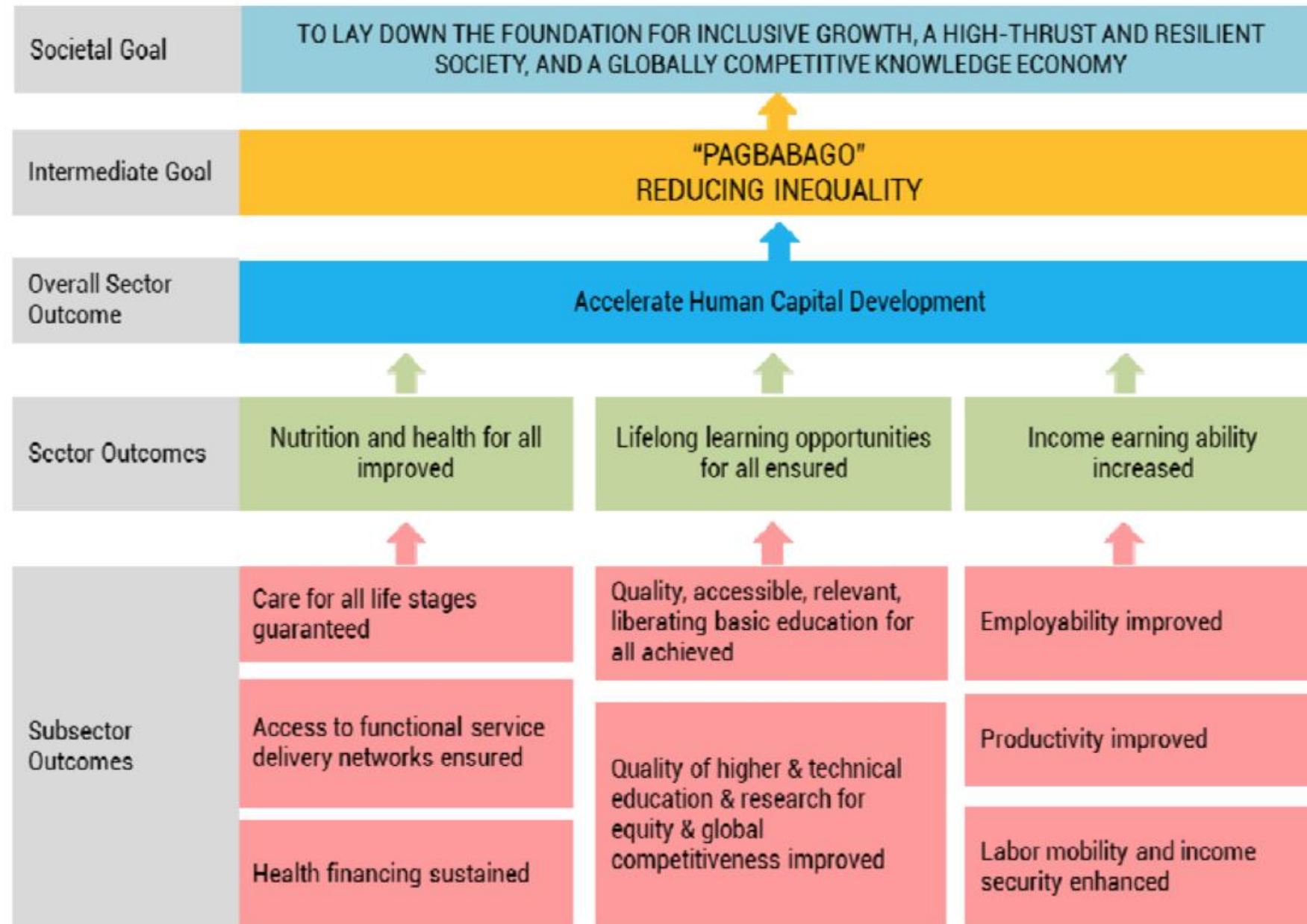


10

Accelerating  
Human Capital  
Development



**Figure 10.1 Strategic Framework for Accelerating Human Capital Development**



**Table 10.4 HEI and TVET Data, Calabarzon, 2012-2015**

Indicator	2012	2013	2014	2015	2016
	(BASELINE)				(END OF PLAN TARGET)
Accredited HEI Programs	301	407	407	469	536
Center of Excellence (COE) Programs	11	11	11	14	11
Center of Development (COD) Programs	10	10	10	12	10
Higher education faculty with MA	5,774	6,554	6,554	2,211	7,586
Higher education faculty with PhD	1,375	1,713	1,713	1,958	1,983
Students with STUFAP	8,791	5,024	46,451	11,020	Increasing
Higher education graduates increased	50,329	52,660	60,660	61,873	55,660
Higher education institutions with accredited program increased	11	19	19	7	Increasing
TVET enrollees increased	200,398	248,086	288,629	324,132	286,035
TVET graduates increased	205,183	245,992	276,940	306,874	257,431
Persons Assessed	98,752	114,669	132,408	169,242	123,778
Persons Certified	80,682	99,903	118,075	150,247	105,211
Certification rate in TVET increased	82.00%	87.10%	93.20%	88.80%	85.0%

**Source: TESDA Region IV-A and CHED Region IV-A**

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**Source: PSA Region IV-A**

## UP calls on presidential candidates to invest on knowledge capital

"Higher level education is the key to inclusive growth," says UP President Pascual.

The country can produce the high-level human resource it needs to catch up with its neighbors if the next government adopts the right set of policies.

This was the gist of a "think paper" on "Knowledge-Based Development and Governance" presented by the University of the Philippines to all the presidential candidates for their consideration.

According to UP President Alfredo E. Pascual, the study—which he calls "a road map to inclusive growth"—can form the basis for a comprehensive review of Philippine educational and human resource development policy, particularly in research and development.

The study notes that despite increasing government investments in education, not enough money has gone into research and development, and into producing and supporting more top-level researchers. This is why the Philippines has been left behind by many of its ASEAN co-members and continues to suffer from high income inequality and poverty.

"We still spend only 3 percent of GDP on education, compared to an average of 5-6 percent in the rest of ASEAN," the paper noted, sounding the alarm. "This is why even our best universities lag behind their global and regional counterparts. In 2014, the University of the Philippines ranked only 8<sup>th</sup> out of the top universities in ASEAN. In 2012, the Philippines ranked 92<sup>nd</sup> in the global Knowledge Economy Index, far

## UP THINK PAPER: KNOWLEDGE-BASED DEVELOPMENT & GOVERNANCE THROUGH REGIONAL HUBS & SPOKES

### UNDERTAKE:

large-scale foreign training of young Filipinos at the postgraduate level (scholarships)

large-scale return of foreign-trained Filipinos in every discipline (masters, PhDs, professionals, technicians)

recruitment and employment of expatriate academics and researchers

### STRENGTHEN INTEGRATION:

of geographic territories

of sectors in the development agenda

among sciences, engineering, social sciences, arts and culture

### BUILD & STRENGTHEN:

selected SUCs in regions to become research-intensive universities

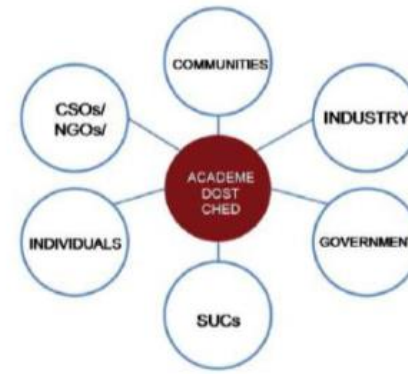
policies to support R&D, e.g., procurement, research administration



Model 1

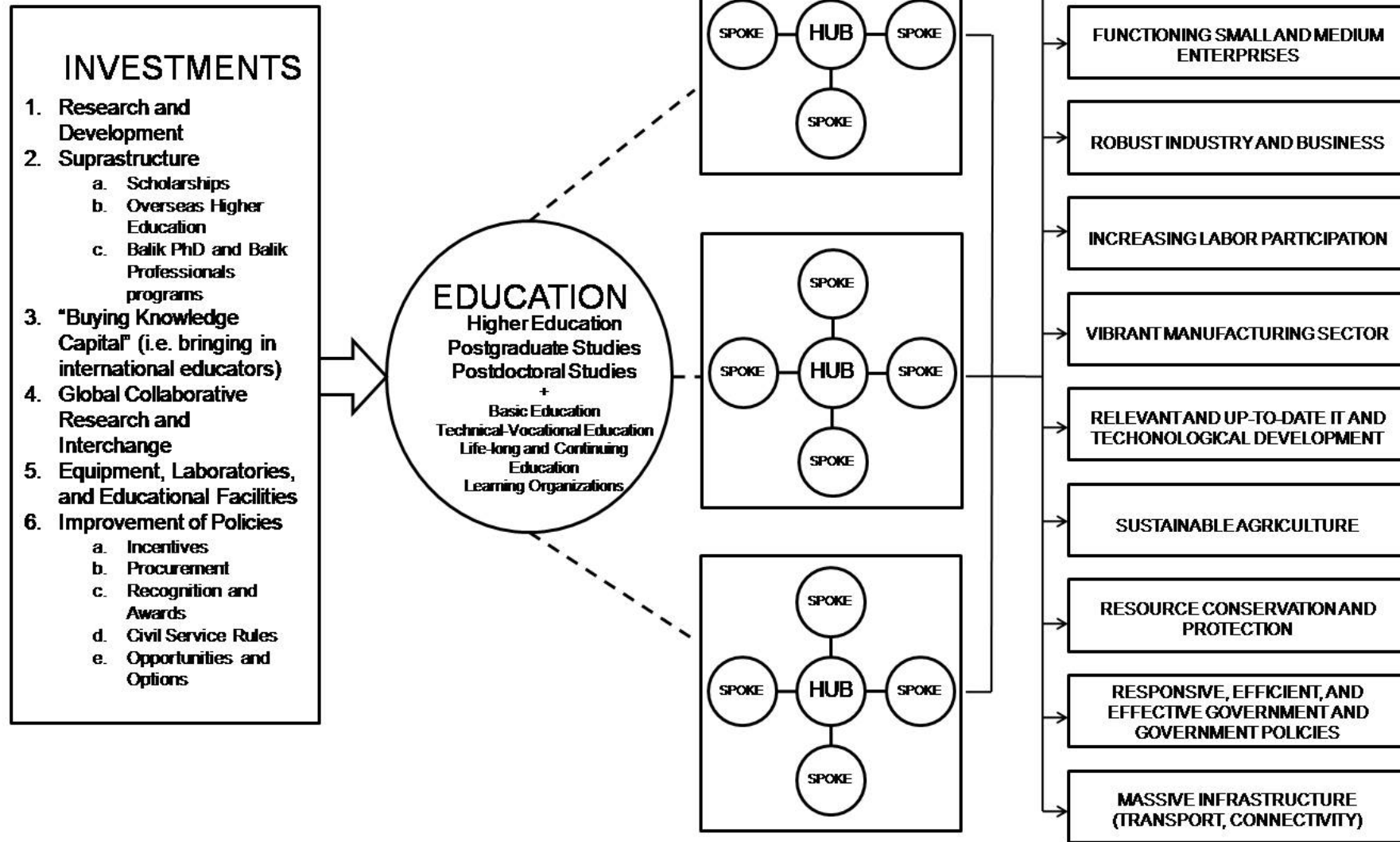


Model 2

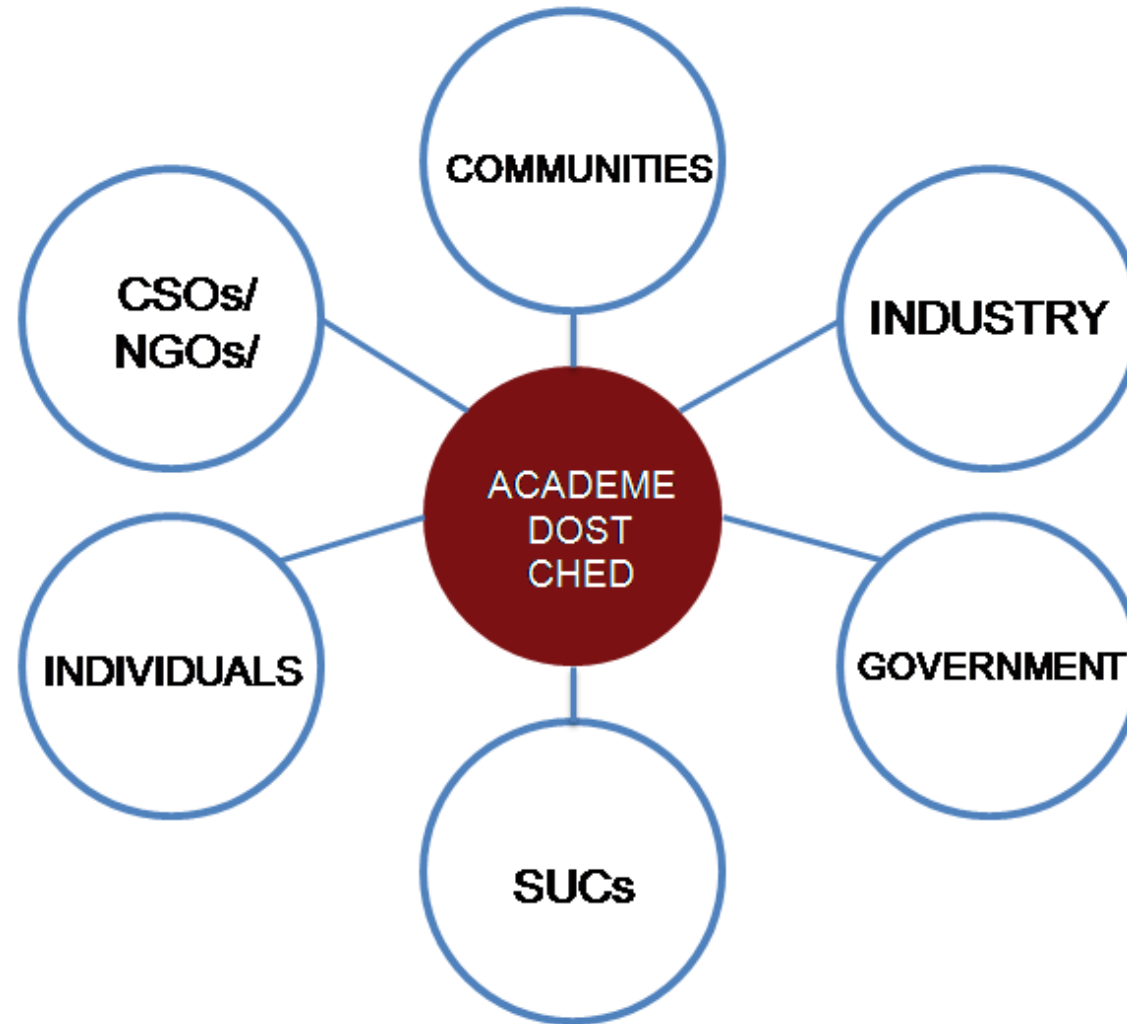


Model 3





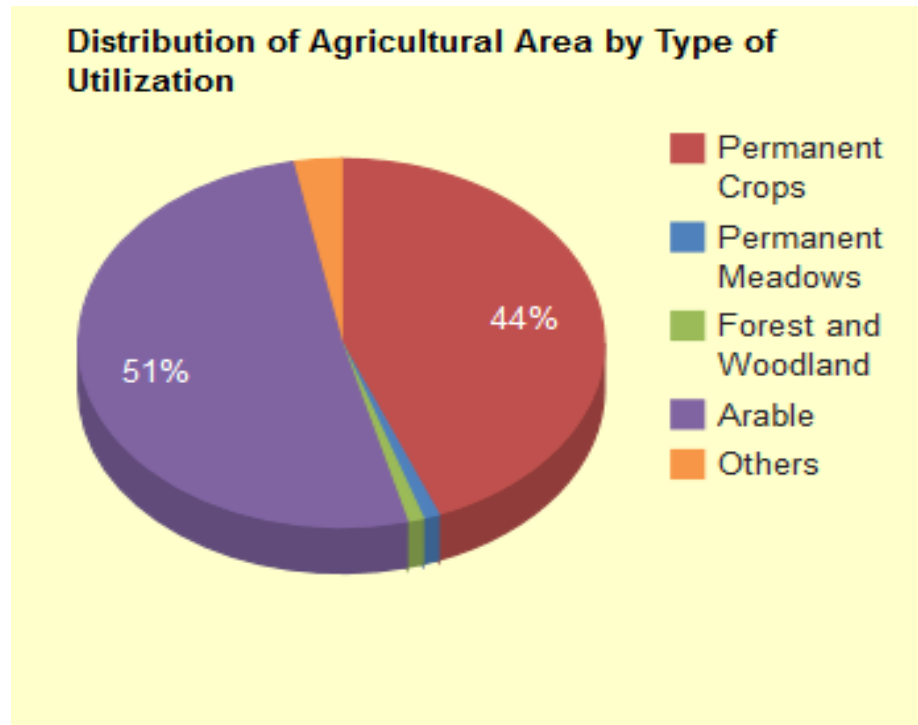
**A-Framework-for-Knowledge)Based-Development-and-Governance-**



-  
-  
**Model-3!**

# Our Country's Abundant Natural Resources

- 5th mineral country in the world, 3rd in gold reserves, 4th in copper, and 5th in nickel
- largest chromite source in the world



- 32% of Philippine land area are agricultural lands, 51% are arable, 44% are permanent croplands

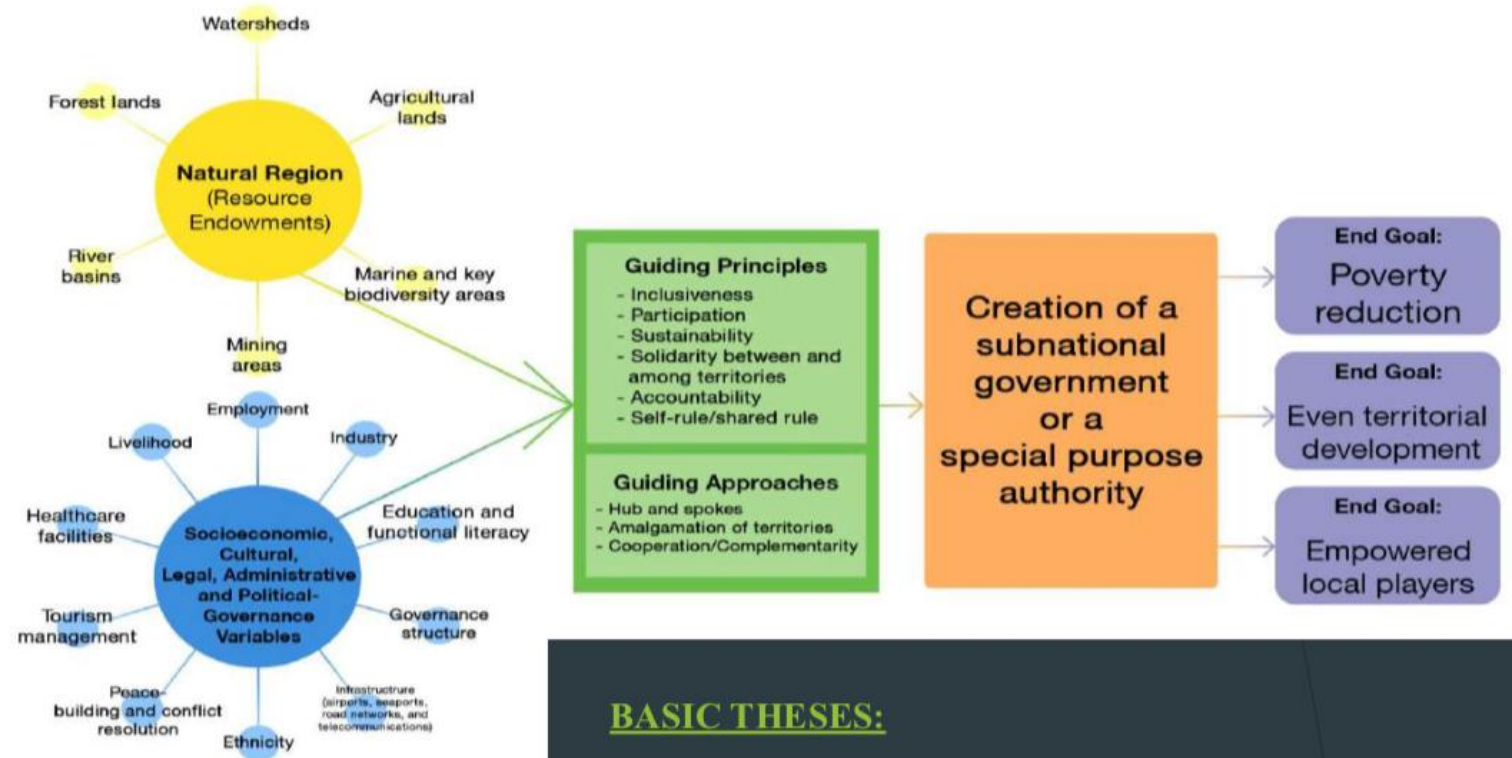
(<http://countrystat.bas.gov.ph>)



**UNITED NATIONS UNITAR  
CIFAL PHILIPPINES  
UP System**

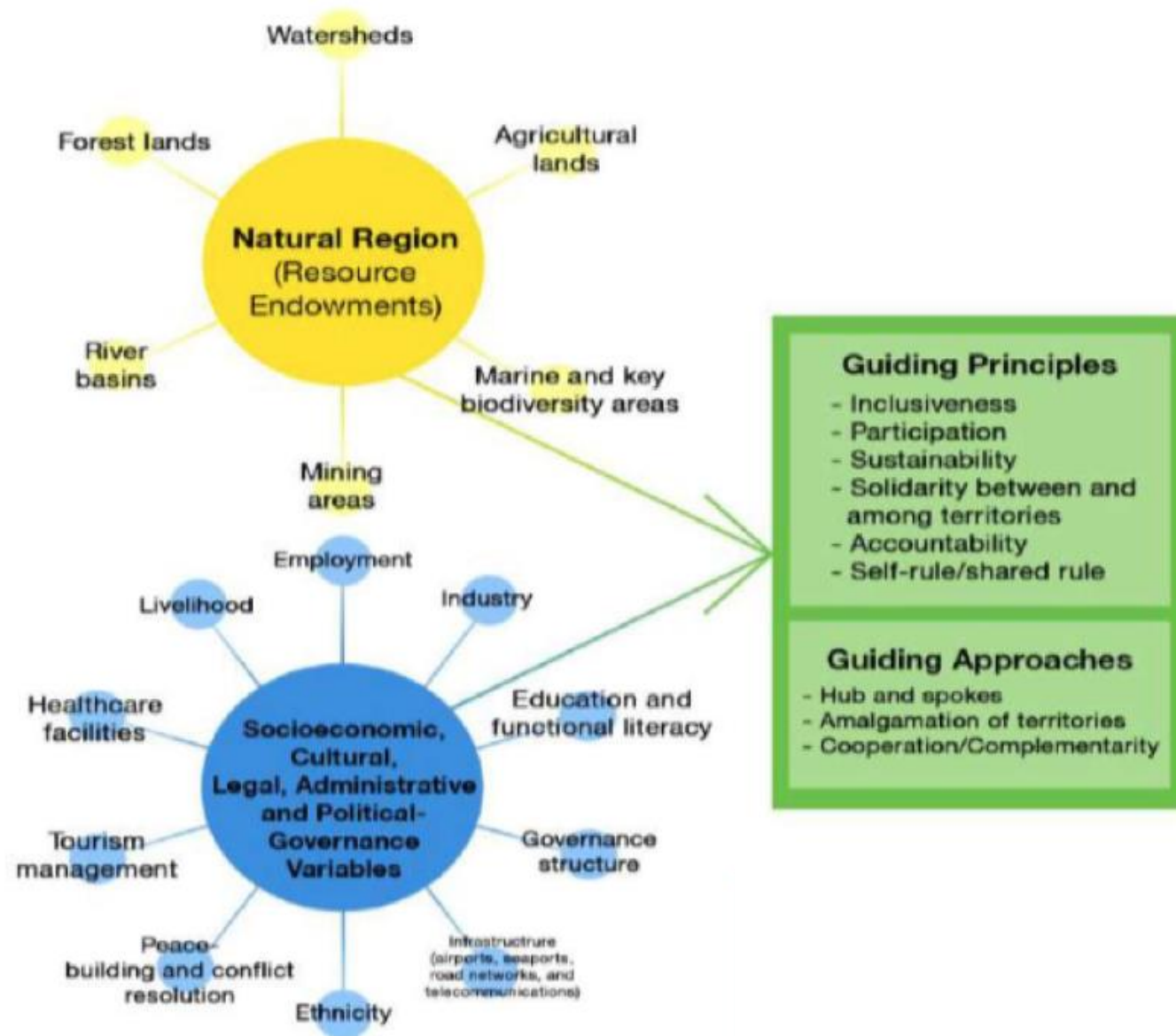
**Natural Region-based Framework**

- CIFAL PHILIPPINES is one of the 19 globally-affiliated centers of the UN Institute for Training and Research. The CIFAL mandate is to promote the UN's Sustainable Development Goals (SDG) or 2030 Agenda for Development. SDG is the universal goals and CIFAL centers such as CIFAL Philippines work for the Localization of the SDGs in the country. The SDGs revolve around :
  - people, prosperity, planet
  - peace and strong institutions
  - partnership
- CIFAL Philippines is housed at UP, and thinks, acts around universal development goals headed by
- EDNA ESTEFANIA CO, CIFAL PHIL. DIRECTOR



**BASIC THESES:**

1. BIOGEOGRAPHIC CHARACTERISTICS OF A TERRITORY ARE IMPORTANT KEY INGREDIENTS TO AN "ADMINISTERED SPACE"
2. THESE BIOGEOGRAPHIC FEATURES SHOULD BE COUPLED WITH OTHER FACTORS SUCH AS SOCIO-CULTURAL, ECONOMIC WHICH INCLUDES INFRASTRUCTURE AND CONNECTIVITY AND TOURISM, SOCIAL SERVICES LAY OUT, AND THE LEGAL, POLITICO-ADMINISTRATIVE CONSIDERATIONS



**HUMANS RELY ON  
TERRESTRIAL AND MARINE BIO-CHEMO-DIVERSITY  
AS A SOURCE OF DRUGS AND NUTRACEUTICALS.**

**THE BEST MODELS FOR DRUGS ARE DERIVED FROM NATURE.**

**HUMANS CAN LEARN IMPORTANT LESSONS  
ON CREATING SUCCESSFUL ECOSYSTEMS AND SOCIETIES FROM  
EVOLUTIONARY BIOLOGY.**

**THE SURVIVAL AND SUCCESS  
OF HUMANS AND THE REST OF NATURE  
ARE CLOSELY INTERTWINED  
AND MUST BE PURSUED HOLISTICALLY.**



**SOCIAL INNOVATION**

**THROUGH EXPERIMENTAL AND  
ONLINE EDUCATION AND  
COMMUNICATION**



# Science kit for STEM students developed

A low-cost and portable handheld device coupled with sensors has been developed by researchers from UP Diliman (UPD) and UP Los Baños (UPLB) to upgrade the Science, Technology, Engineering and Mathematics (STEM) strand of the K to 12 program of the Department of Education (DepEd).

The Versatile Instrumentation System for Science Education Research or VISSER is a science kit that allows students to conduct 120 experiments in biology, chemistry, engineering, environmental science and physics.

The device consists of fully integrated hardware, operating system or software and laboratory modules.

The VISSER's hardware consists of multi-channel data acquisition, plug and play analog and digital sensors that run on an Arduino microcontroller which acts as the brain on which various sensors can be connected and controlled to perform different experiments in science subjects. It can run or be powered by battery or a power bank.



*Tapang*



*Gomez*

The software, on the other hand, includes data storage, control, user interface and analysis tools developed using open-source applications.

The laboratory modules are descriptive manuals to guide the user doing experimentations and provide theoretical basis for the results. These are developed or patterned after the existing curriculum of the STEM strand of DepEd's K to 12 program.

According to Prof. Giovanni A. Tapang, PhD, a professor at the UPD National Institute of Physics (NIP) and VISSER's project leader, the device can be used without a computer. It can also be used as a stand-alone data logger or a programmable device (it has built-in timer and SD card) for some other purposes like robotics.

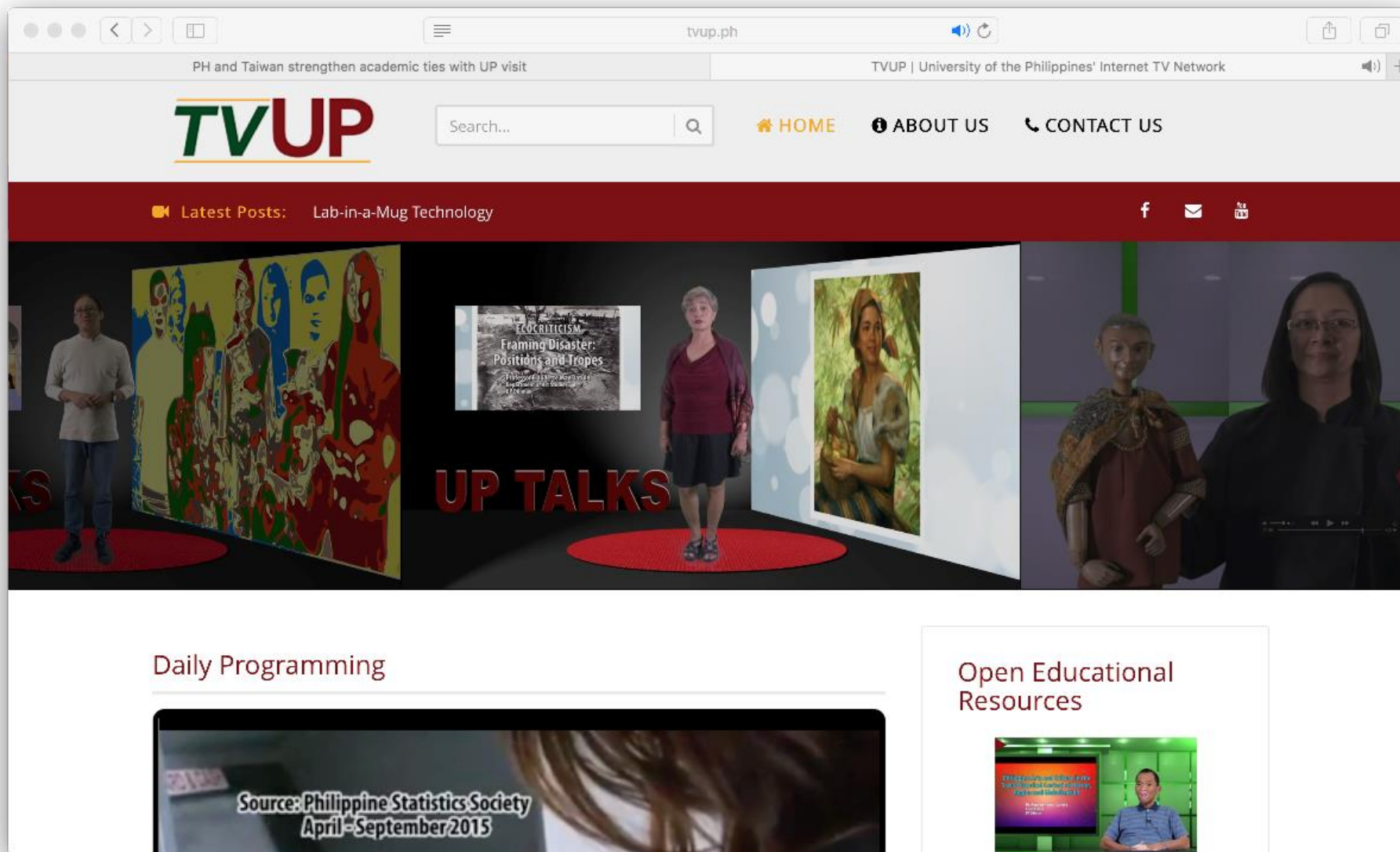


The VISSER Kit. (Photo from VISSER Team)

Since the hardware and software components of the device were developed from the open-source electronic platform Arduino, Tapang said VISSER is a lot cheaper compared to existing similar hand-held devices that are mostly made by international companies.

The project was conceived to address the severe lack of science educational equipment and laboratory modules in the Philippines, Tapang said. "Out of 12,390 high schools in the Philippines, 4,520 have no laboratories and of those with laboratories 2,800 have no access to newer digital tools. This situation is the main reason why most high school students obtain low scores in science achievement examinations."

Given the sad state of science education, in 2012, Dr. Romel D. Gomez, a UPD alumnus and a professor at the University of Maryland, College Park, USA, pitched the idea to create a microcontroller with sensors to be used by students in laboratories. Gomez was an adjunct professor at the NIP and a Balik-Scientist Awardee of the Department of Science and Technology (DOST) at that time.



uptv.com



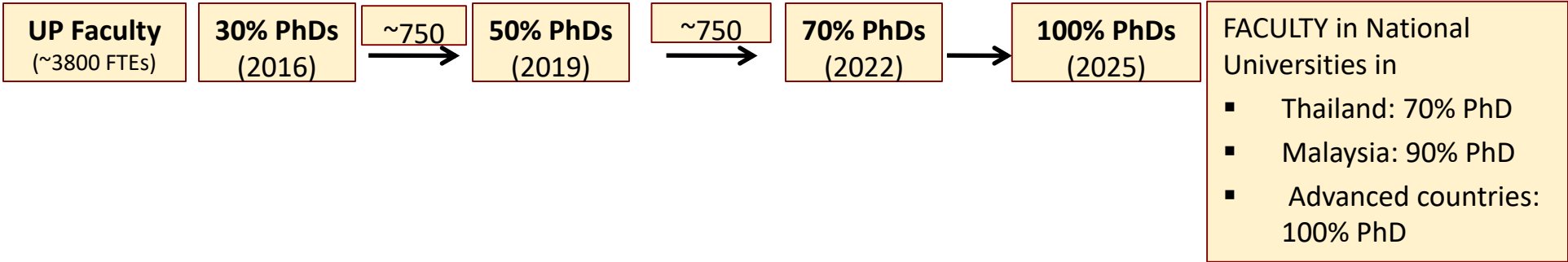
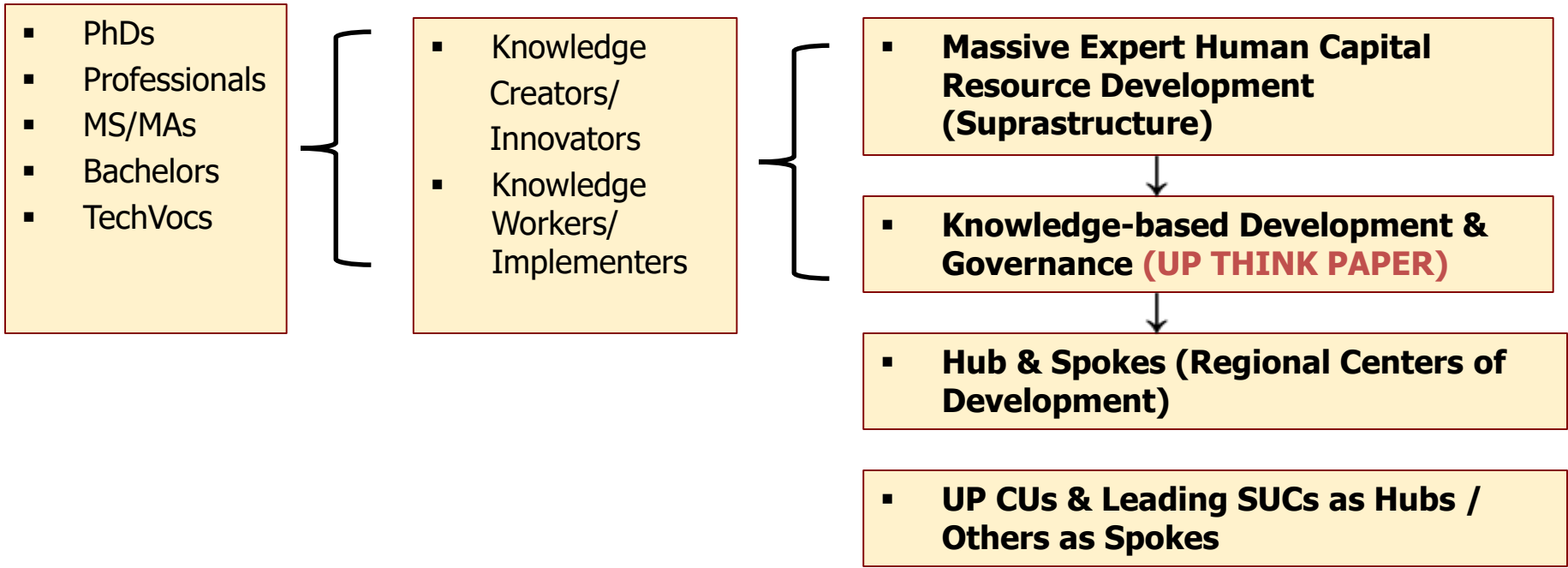
**SOCIAL INNOVATION**

**MADE COMPETITIVE**

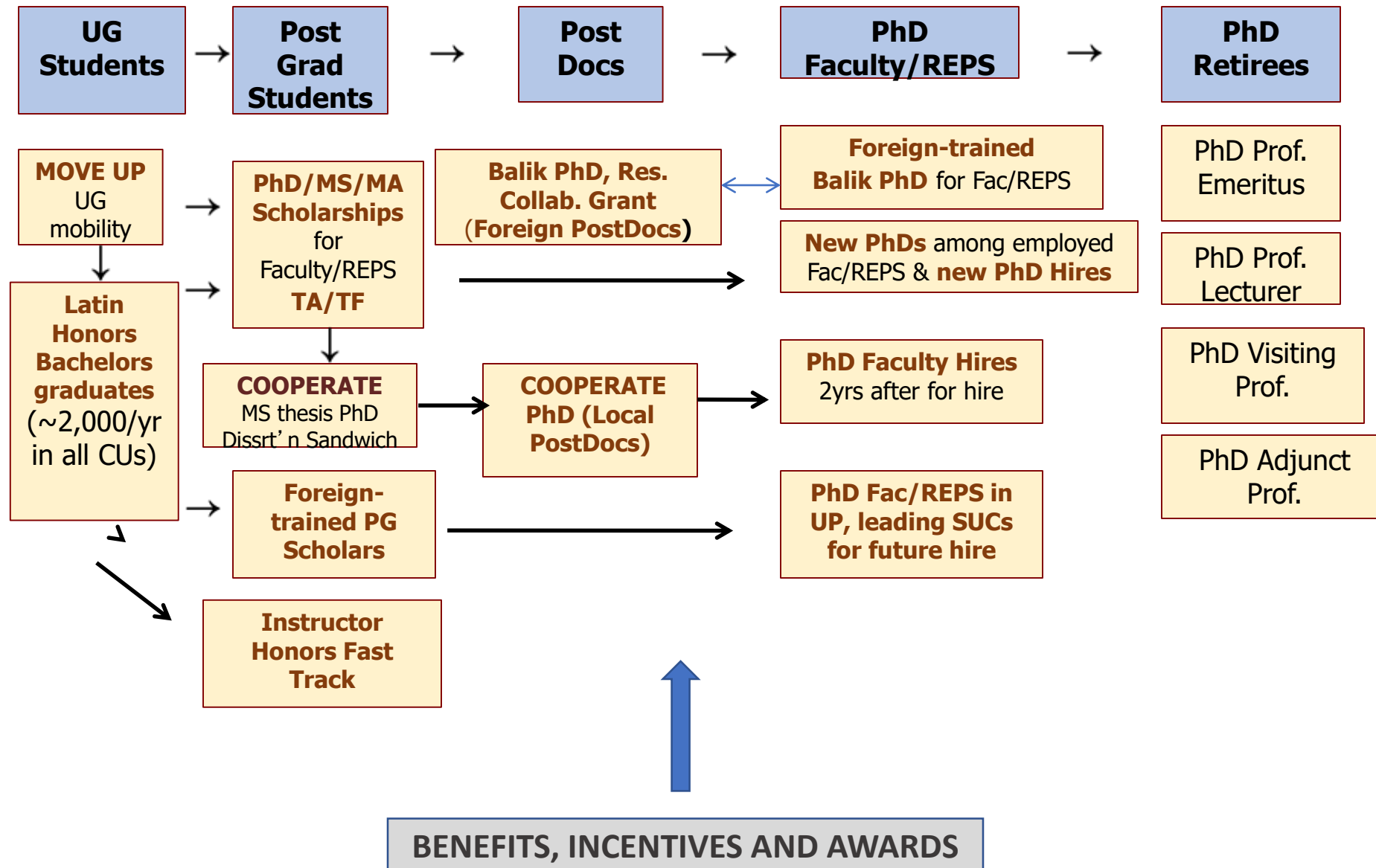
**THROUGH EDUCATION AND R&D**

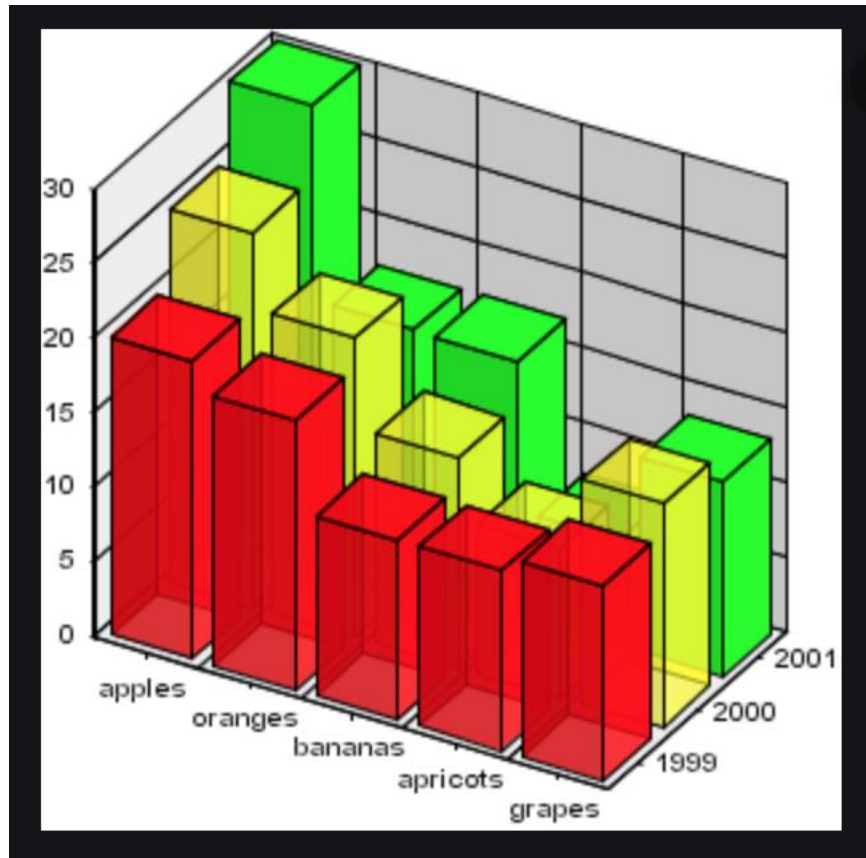


# UP's Great Challenge to Lead in Building the Country's **SUPRASTRUCTURE**



# “SHEPHERDING” the Development of UP’s Suprastructure: Knowledge Creators and Implementers (UP Academic Career Development Plan)





**Y-AXIS: EMPLOYABLE WORKFORCE**

**TECHVOCS**

**BACHELORS**

**MASTERS**

**PhDs**

**PROFESSIONALS**

**CERTIFICATED TRAINEES**

**LIFE-LONG LEARNERS**

**Z-AXIS: MANPOWER COUNT**

**X-AXIS:**

**APPLES: BASIC SERVICES WORKERS IN AGRICULTURE, WATER RESOURCES FOR FOOD SECURITY & BIOMATERIALS HEALTH, DISEASE & WELLNESS**

**ORANGES: BASIC SERVICES WORKERS IN INFRASTRUCTURE, ROADS AND WATERWAYS ENERGY & ENVIRONMENT DISASTER MITIGATION**

**BANANAS: GROWTH & DEVELOPMENT WORKERS IN ADDITIVE MANUFACTURING & 3D PRINTING MICROELECTRONICS**

**BPOs**

**DATA SCIENCE**

**ECOTOURISM (COMMUNITY-BASED AND BIODIVERSITY-BASED TOURISM, CULINARY, FABRIC, ARTS AND CULTURE TOURISM)**

**SOCIAL SCIENCE AND COMMUNICATION, ARTS AND CULTURE**

# Strengths

Majority of Philippine population are fit to be part of the labor force.

Age Distribution (%)	2006	2008	2011
0-4 years	12.6	11.9	11.1
0- 14 years	37.6	35.5	33.3
15-64 years	59.2	60.4	62.4
18 years and over	56.6	57.9	60.3
60 years and over	6	6.2	6.8
65 years and over	3.8	4.1	4.3

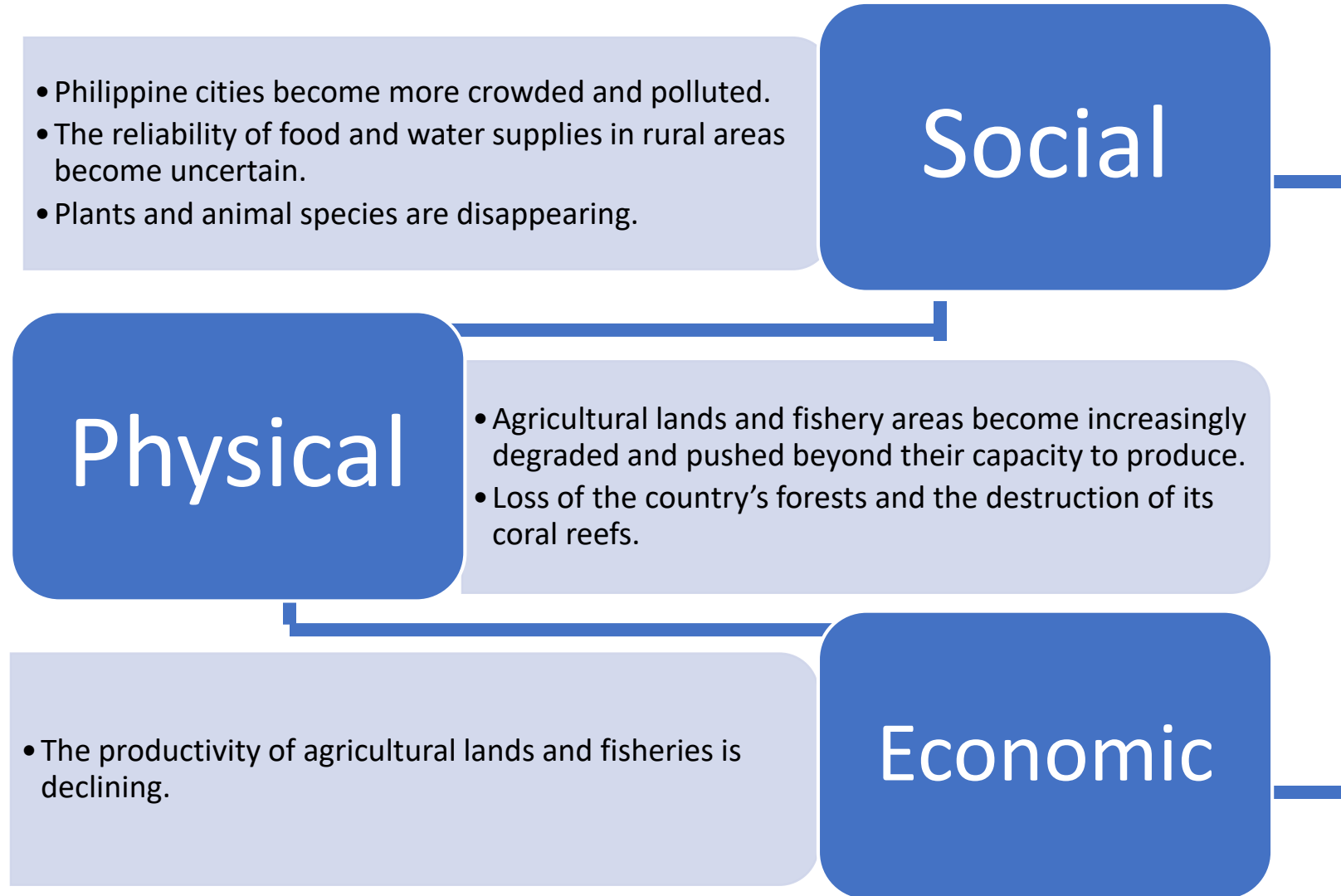
Philippine Demographics 2014, NSO



**97.5 percent literacy rate in  
2013**



# Issues to Tackle in the Philippines



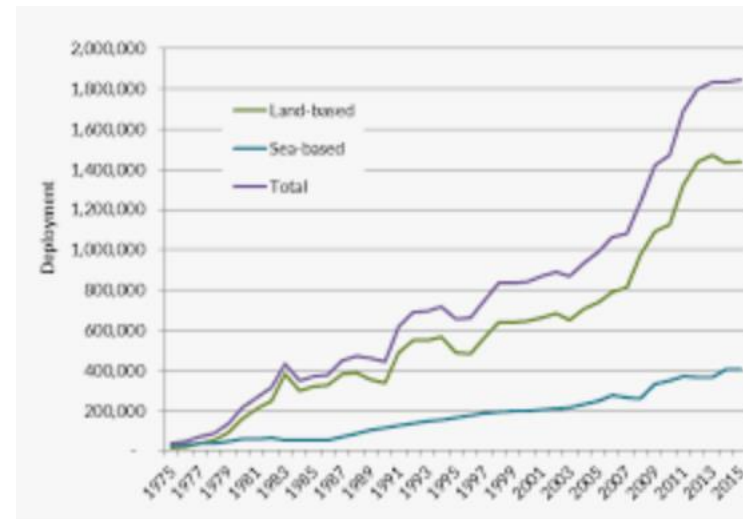
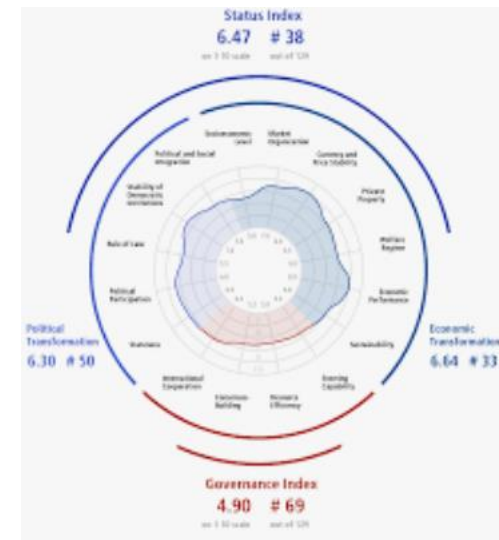
# Conference on Digital Transformation for the OFW Sector

Wednesday, June 28, 2017, 9AM - 5PM  
 Microsoft Philippines, 6750 Ayala Ave., 6750, Makati City

Partnership with:



China to open its doors for Filipino teachers



The Philippines: Beyond Labor Migration, Toward migrationpolicy.org

**OFWs**  
**Overseas Filipino Workers**  
**As Prime Agents of Social**  
**Innovation**  
**In their Communities**

The DOLE's Reintegration Services is a package of interventions and mechanisms developed and implemented social partners to facilitate the productive return of the OFWs to their families and communities upon their completion of overseas employment. It provides the OFWs and their families with opportunities for accessing projects and services that would help them mitigate the social cost of migration and cushion the impact of forced repatriation due to unexpected events. It also aims to maximize the gains of overseas employment through local employment/re-employment or business/enterprise development facilitation.

Services include programs such as:

1. Psycho-social component which consists of capacity-building through assistance in community organizing and maintaining OFW Family Circles (OFCs), and services like psycho-social counseling, stress debriefing, values formation and financial literacy;
2. Livelihood component through:
  - *Balik-Pinas, Balik-Hanapbuhay Program*, a non-cash livelihood support/assistance intended to provide immediate relief to returning member OFWs, active or non-active, who are displaced from their jobs due to war/political conflicts in host countries or policy reforms controls and changes by the host government or are victims of illegal recruitment and/or human trafficking or other distressful situations.

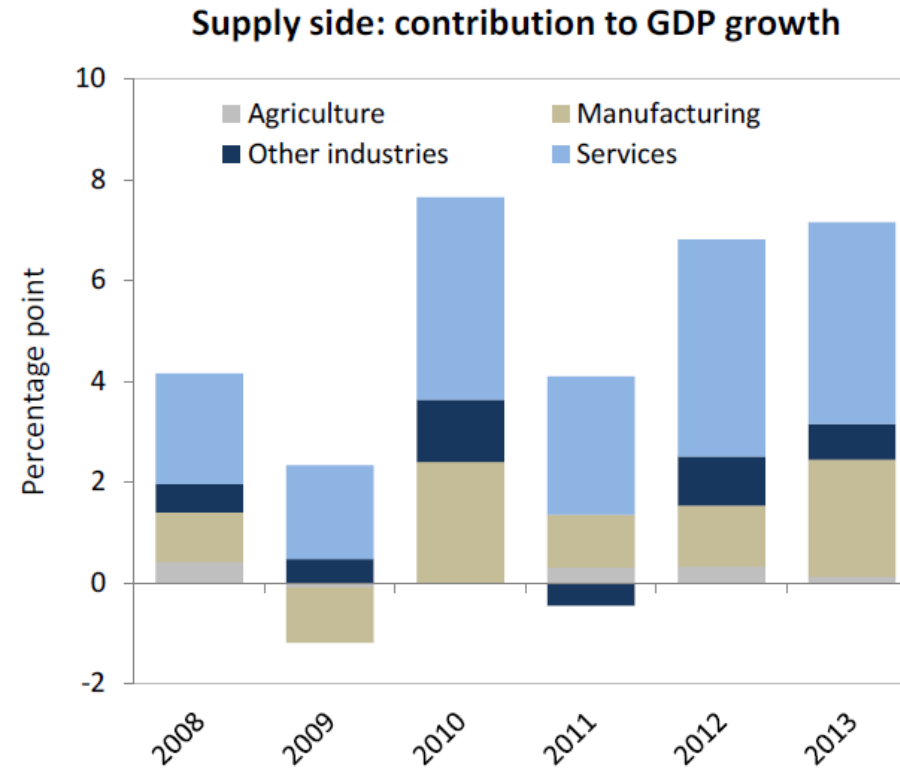


- *Balik-Pinay, Balik-Hanapbuhay Program*, provision of livelihood skills training and distribution of starter kits to enable women OFW returnees to start and to operate livelihood undertaking for self-employment. Priority is given to women OFWs who are displaced by the hostilities and conflicts in their host country, or victims of illegal recruitment and trafficking and other distressed and displaced women household service workers.
- *Financial Awareness Seminar (FAS) and Small Business Management Training (SBMT)*, training intended to assist OFWs and their families with financial literacy relative to their overseas employment and to encourage them in putting up a small business enterprise for self-employment;
- *Livelihood Development Assistance Program (LDAP)*, provide grants for livelihood assistance to undocumented returning OFWs thru livelihood starter kits; and

*Education and Livelihood Assistance Program (ELAP)*, scholarship for the dependents of OFWs who were active OWWA members at the time of death. Only one child, usually the eldest child of member-OFW, is given scholarship grant (P5,000 for elementary, P8,000 for high school and P10,000 for college). The surviving spouse, if the OFW member was married or the mother/father if the OFW was single, will also receive a livelihood assistance of P15,000.00.

# Economic Sectors

- The services sector remained the key driver of growth on the production side and manufacturing was a close second.

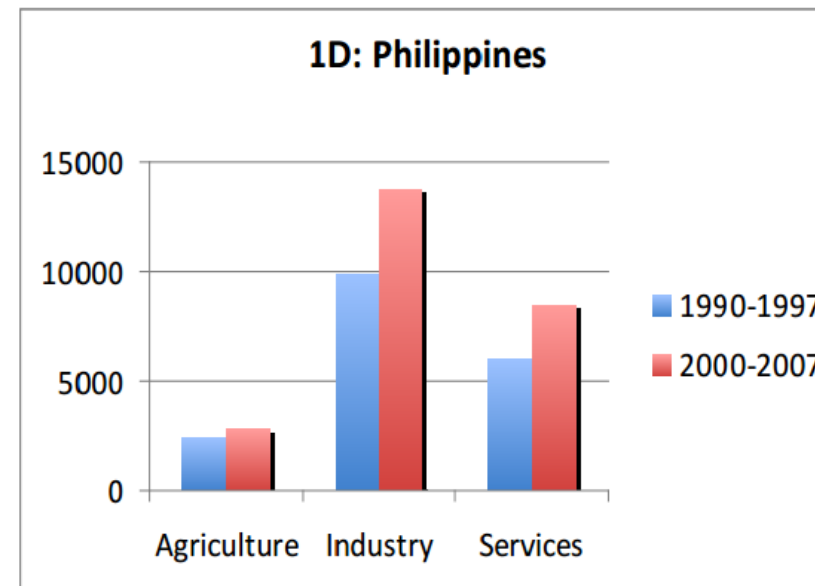
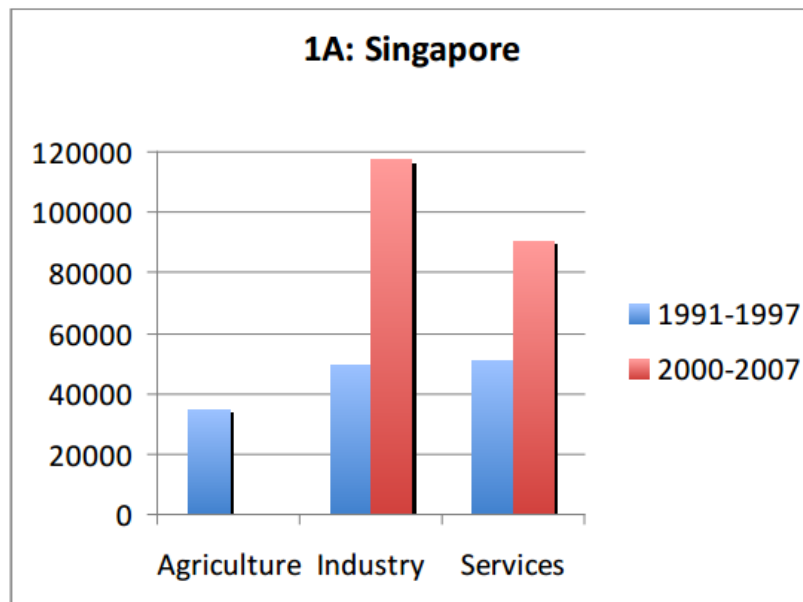


Source: PSA Philippine economic Update, March 2014, World Bank

# Economic Sectors

- Developed countries are shifting their economy structure from manufacturing and agriculture to services.

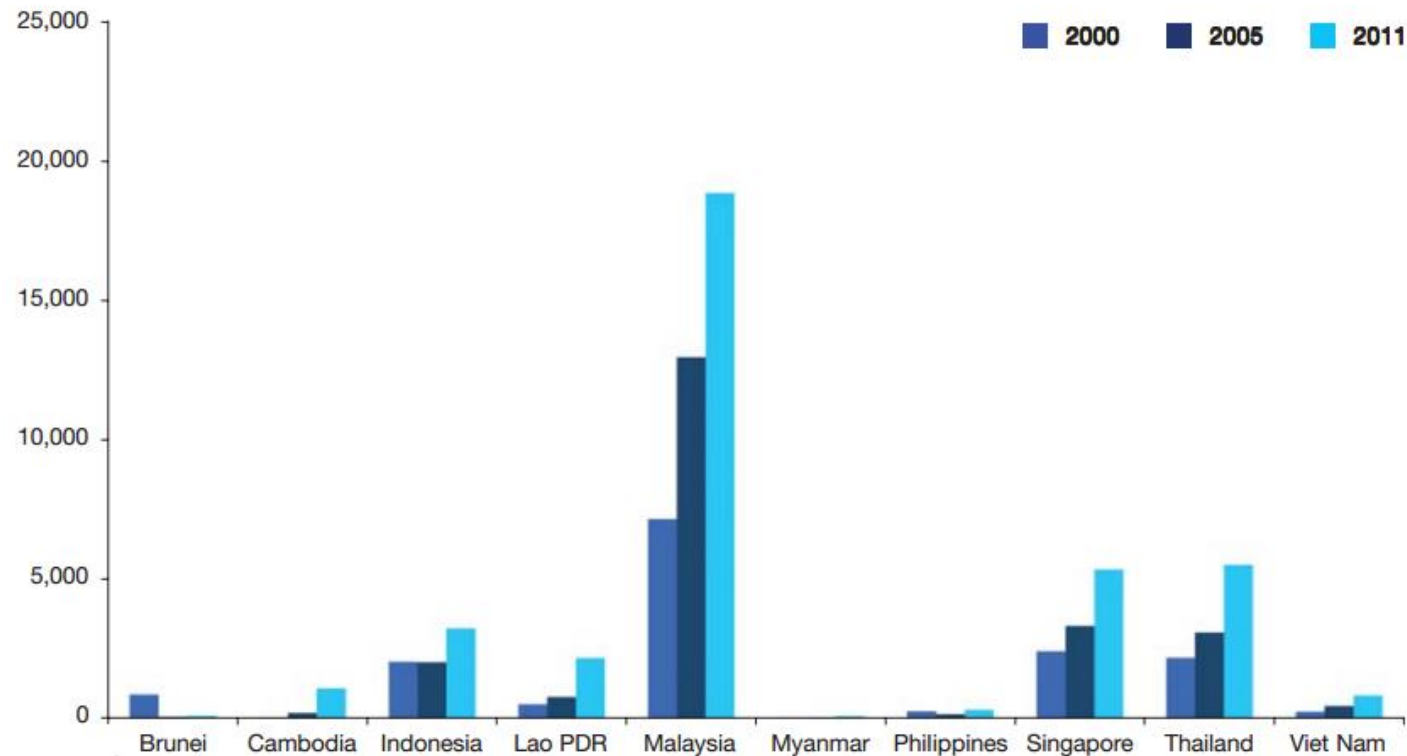
**Average Labor Productivity Level by Sector**  
(purchasing power parity [PPP] US\$ per worker)



# Under-developed Sectors

## Tourism

- Philippines has received only 4% of visitors arrivals among ASEAN member states.





# Opportunities: Tourism

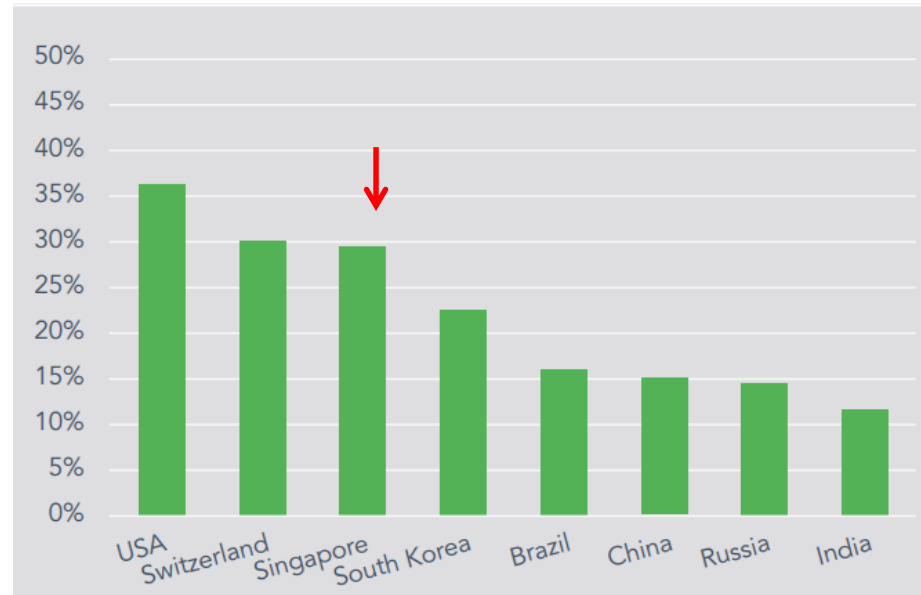
- Growth in visitor arrivals brings about a corresponding increase in capacity requirements and demand for new products, facilities and services.
- Investments in tourism estates and ecozones, historic- cultural heritage projects as well as eco-tourism, agri-tourism, and health and wellness projects.
- Philippine medical tourism target of US\$ 3 billion revenues by 2015



# Bioeconomy

- Production of renewable biological resources and their conversion into food, feed, bio-based products and bio-energy via innovative and efficient technologies provided by Industrial Biotechnology
- Singapore is among the eight mature and emerging market bio-economies.

**Scientific American Worldview Scorecard 2013**



## **BIO-INNOVATION**

**refers to**

**the development and production of high value products, services, processes and systems, using biotechnology, bioengineering, bioinformatics and other bioprocessing methods.**

**The source materials are biological materials (from microorganisms, plants, animals, humans) and information on these materials.**

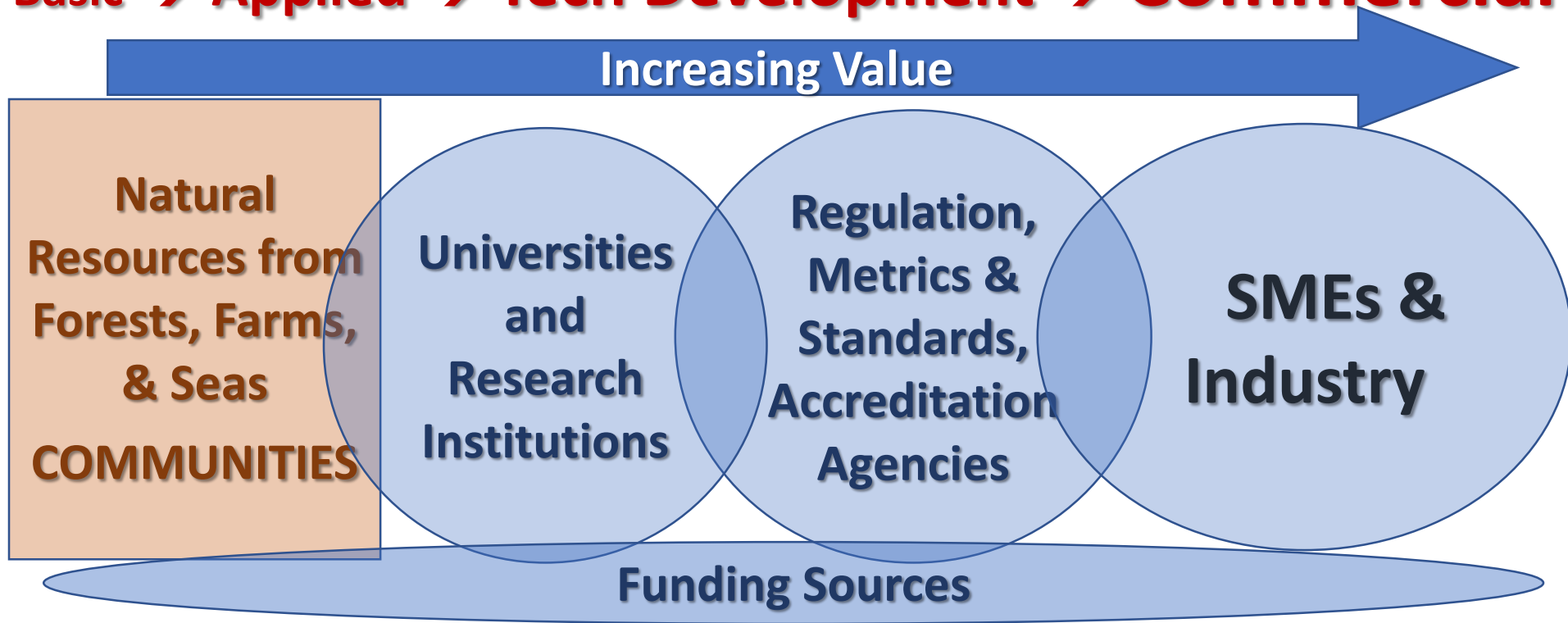


# Bio-Innovations for Philippine Competitiveness





# Basic → Applied → Tech Development → Commercial



**Publications → Patents → New Innovative Products**

# **BIOINNOVATION**

**requires critical,  
underlying support  
for the development:**

**BIOTECHNOLOGY  
BIOENGINEERING  
BIOINFORMATICS  
BIOGOVERNANCE  
BIOMANAGEMENT  
BIOETHICS**

**relies on highest and most  
unique:**

**BIODIVERSITY  
BIORESOURCES  
BIOGEOGRAPHY  
DIVERSITY OF REGIONAL &  
ISLANDIC HUMAN  
POPULATION AND CULTURES**

# Knowledge and Maintenance of Competitive Advantage

- Archipelagic Nation
- Diverse Flora and Fauna
- Mineral Reserves
- Rich Indigenous Culture
  
- **GREEN BUSINESS**  
or **ECO INDEX**

We have abundant niche areas to prioritize and develop



# From the Scientific Community to the Market

- 'Field to Lab to Market' Agenda
- Promising and Dynamic Product Development
- Market Feedback Looping
- Addressing Public Needs
- Meeting Global Standards





# Creating Decision-making Tools

## Mapping Population-Biodiversity Connections in the Philippines Project

- comprehensive population-environment mapping project

CONSERVATION  
INTERNATIONAL



**Biodiversity Management Bureau**

Republic of the Philippines

Department of Environment and Natural Resources



REPUBLIC OF THE PHILIPPINES

NATIONAL ECONOMIC AND DEVELOPMENT AUTHORITY

# “Ridge to Reef to Community” – A Complex System Network Analysis on Abra de Ilog, Occidental Mindoro (Bio-innovation for Environment Protection and Ecotourism)

Dr. Maria Helena Yap, UP MSI

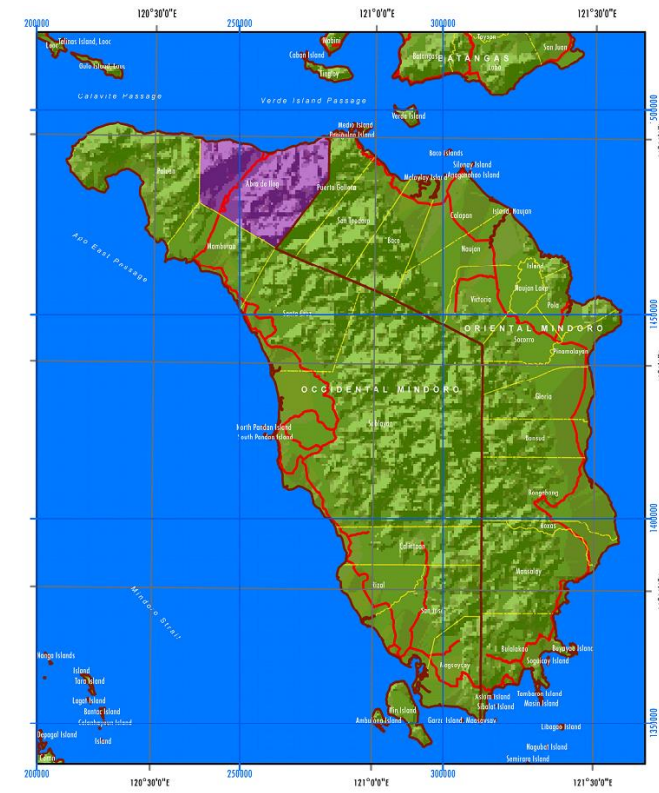
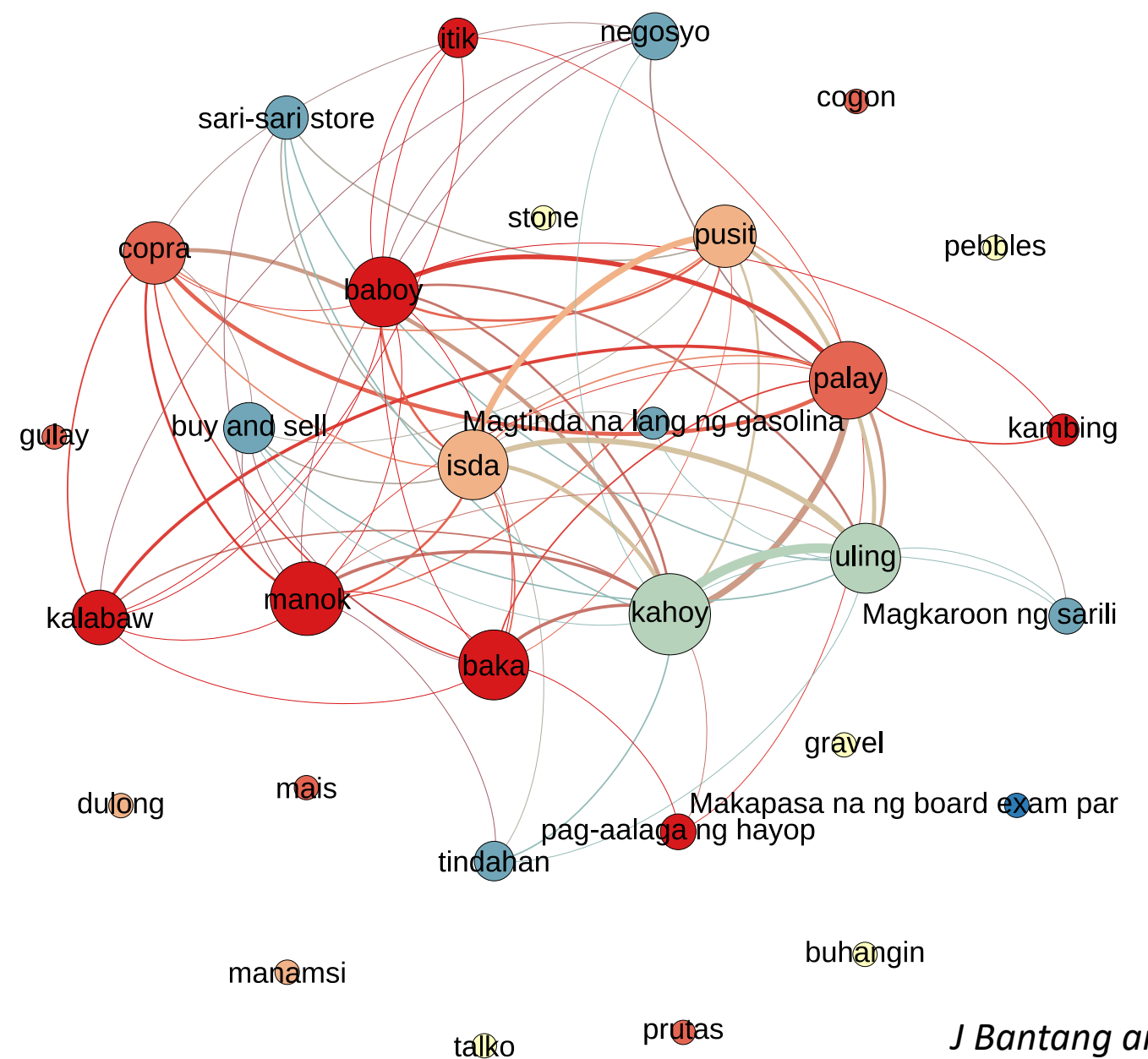


Figure 1-3  
**Municipal Index Map**  
Mindoro Island  
Republic of the Philippines

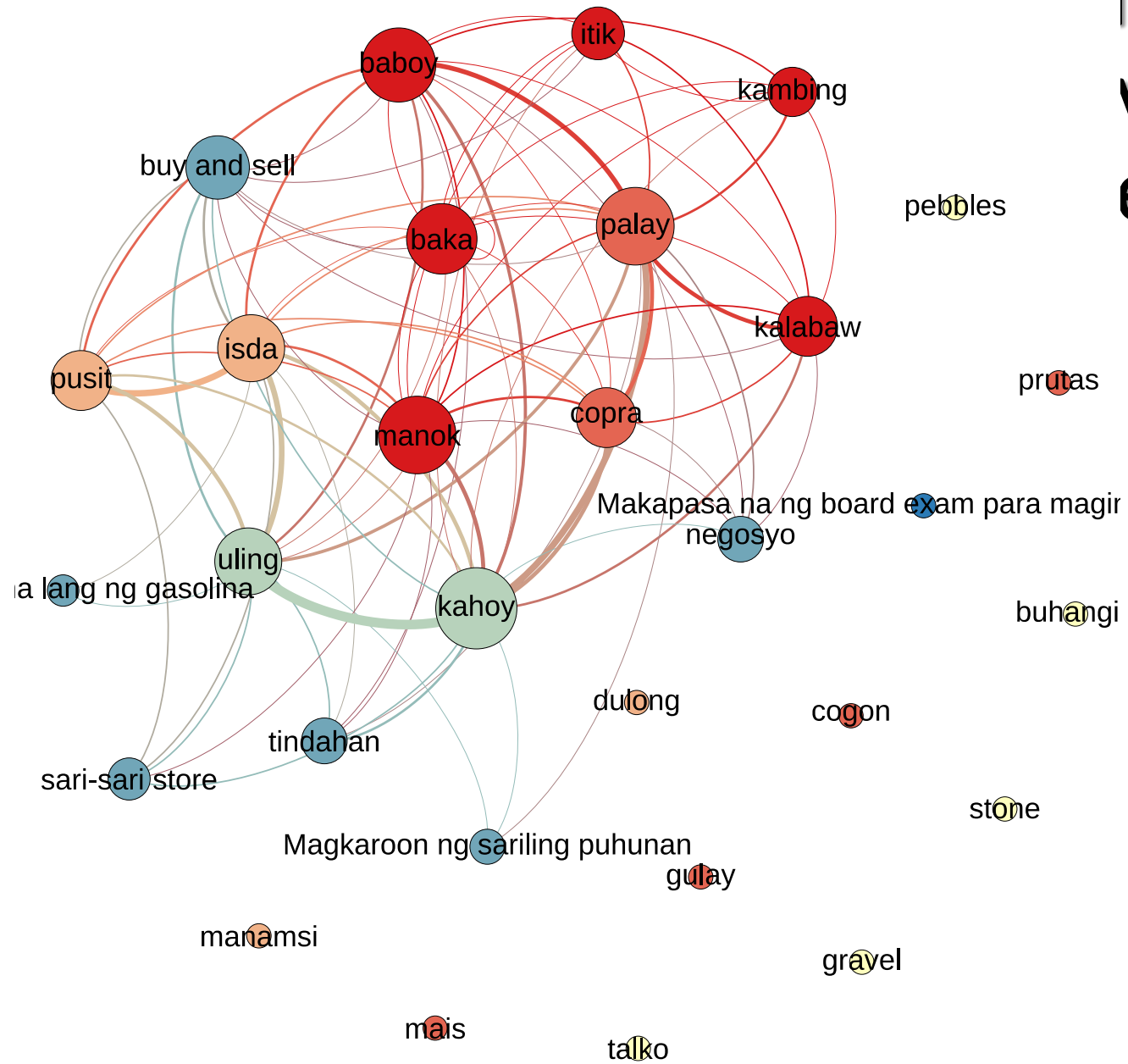
Scale: 1:800,000  
TRANSVERSE MERCATOR PROJECTION  
MINDORO ISLAND TRANSVERSE MERCATOR GRID  
DATUM: CLARKE 1866 SPHEROID

# Abra de Ilog Livelihood Network



*J Bantang and A Presbitero, MSc student*

# Alternative livelihood network





# Indigenous Ferns as a Filipino Food Alternative (Bio-innovation for Health and Nutrition)

Dr. Anabelle Villalobos and Dr. Victor Amoroso, CMSU

Propagation of ten indigenous edible ferns from Mindanao and promoting them as promising food source.



# Some edible ferns show promising bioactivity and presence of important secondary metabolites

Antioxidant Property of Flavanoids

Anti-inflammatory Property of Saponins

High Protein Content



Amoroso VB, Lagumbay AJD, Mendez RA, De La Cruz R, Villalobos A. 2014. **Bioactives in three Philippine edible ferns**. Asia Life Sciences 23(2):445-454

# INNOVATION FOR SOCIAL IMPACT

- solving specific social or environmental challenges
- through **social enterprise, policy, technology, education and R&D**
- Integrated ecosystem of solutions to build a more inclusive and sustainable society
- Involves civil society

MARAMING  
SALAMAT PO!