Data Collection Survey for Higher Education Sector in the Philippines

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Abbreviations

AACCUP	Accrediting Agency of Chartered Colleges and Universities in the Philippines
ADB	Asian Development Bank
AEC	ASEAN Economic Community
AFMS	Administration, Financial and Management Service, CHED
ALS	Alternative Learning System
AMRBS	Automatic Metre Reading and Billing System
AMRECO	Association of Mindanao Rural Electric Cooperatives, Inc.
AO	Administrative Order
AREC	Affiliated Renewable Energy Centre
ARMM	Autonomous Region of Muslim Mindanao
ASEAN	Association of South East Asian Nations
ASTI	Advanced Science and Technology Institute, DOST
AUN/SEED-NET	ASEAN University Network, the Southeast Asia Engineering Education Development Network
AY	Academic Year
BAR	Bureau of Agricultural Research
BFAR	Bureau of Fisheries and Aquatic Resources
BIO TECH	National Institute of Molecular Biology and Biotechnology
BOR	Board of Regents
BOT	Board of Trustees
BPO	Business Process Outsourcing
BS	Bachelor of Science
BSU	Benguet State University
BT Corn	Bacillus Thuringiensis toxin-producing Corn
BU	Bicol University
CAGR	Compounded Annual Growth Rate
CALABARZON	Cavite, Laguna, Batangas, Rizal, Quezon
CAR	Cordillera Autonomous Region
CCC	Climate Change Commission
CCE	Common Criteria for Evaluation
CEB	Commission en Banc
CEPALCO	Cagayan de Oro Electric Power and Light Company, Inc.
CHED	Commission on Higher Education
CHEDRO	CHED Regional Office
CIIP	Comprehensive Integrated Infrastructure Program
CLARRDEC	Central Luzon Agriculture and Resource Research and Development Consortium
CLSU	Central Luzon State University
CMO	CHED Memorandum Order
CNC	Computer Numerical Control
COD	Centers of Development
COE	Centers of Excellence
COOPERATE	Continuous Operational and Outcomes-based Partnership for Excellence in Research and Academic Training Enhancement
CSC	Civil Service Commission
CSI	CHED-Supervised Institution
DA	Department of Agriculture
DAP	Disbursement Acceleration Program

DAP (also)	Development Academy of the Philippines
DBM	Department of Budget Management
DENR	Department of Environment and Natural Resources
DepEd	Department of Education
DILG	Department of Interior and Local Government
DNA	Deoxyribonucleic acid
DND	Department of National Defence
DOE	Department of Energy
DOST	Department of Science & Technology
DREAM	Disaster Risk and Exposure Assessment for Mitigation
DTI	Department of Trade and Industry
e-ASIA JRP	East Asian Joint Research Programme
EDP	Executive Development Programme
ETEEAP	Expanded Tertiary Education Equivalency and Accreditation Program
EXECOM	DOST Executive Committee
FDI	Foreign Direct Investment
FDP	Faculty Development Program
FEU	Far Eastern University
FNRI	Food and Nutrition Research Institute, DOST
FPRDI	Forest Products Research and Development Institute, DOST
FY	Fiscal Year
G#	Grade #
GAA	General Appropriations Act
GCI	Global Competitiveness Index
GCMS	Gas Chromatography Mass Spectrometry
GDP	Gross Domestic Product
GE	General Education
GIA	Grants-in-Aid
GIFMIS	Government Integrated Financial Management Information System
GIS	Geographic Information System
GLP	Good Laboratory Practice
GMO	Genetically-modified Organism
GTS	Graduate Tracer Study
HARRDEC	Highland Agriculture and Resource Research and Development Consortium
HDD	Hard disk drive
HE	Higher Education
HEDF	Higher Education Development Fund
HEDP	Higher Education Development Project
HEIs	Higher Education Institutions
HERA	Higher Education Reform Agenda
HERRC	Higher Education Regional Research Centre
HPLC	High-performance liquid chromatography
HRD	Human Resource Development
IAS	International Affairs Staff, CHED
ICB	Institutional Capacity Building
ICP	Inductively-coupled Plasma
ICTO	Information and Communications Technology Office, DOST
IGP	Income-generating Project
IMF	International Monetary Fund
IP	Intellectual Property

IPE	Intellectual Property Enforcement
IPR	Intellectual Property Rights
IQuAME	Institutional Quality Assurance through Monitoring and Evaluation
IRRI	International Rice Research Institute
ISO	International Organisation for Standardisation
IT / ICT	Information Technology / Info. and Communications Tech.
ITDI	Industrial Technology Development Institute, DOST
JICA	Japan International Cooperation Agency
JSPS	Japan Society for the Promotion of Science
JST	Japan Science and Technology Agency
K-12	K to 12 Basic Education Programme
KORDI	Korean Ocean Research Development Institute
LCU	Local Colleges and Universities
LEB	Legal Education Board, CHED
LEP	Ladderised Education Programme
LGU	Local Government Unit
LiDAR	Light Detection and Ranging
LLS	Legal and Legislative Service, CHED
MA / MS	Master of Arts / Master of Sciences
MBA	Master of Business Administration
MECO-TECO	Manila Economic and Cultural Office—Taipei Eco. Cultural Office
MEXT	Ministry of Education, Culture, Sports, Science, and Technology
MGB	Mines and Geosciences Bureau
MIMAROPA	Mindoro, Marinduque, Romblon, Palawan
MIRDC	Metals Industry Research and Development Center, DOST
MIS	Management information system
MOA / MOU	Memorandum of Agreement / Memo. of Understanding
MOOE	Maintenance and other Operating Expenses
MOST	Ministry of Science and Technology
MPBF	Miscellaneous Personnel Benefits Fund
MSU	Mindanao State University
MSU-GenSan	Mindanao State University, General Santos City
MSU-IIT	Mindanao State University, Iligan Institute of Technology
MUST	Mindanao University of Science and Technology
NAST	National Academy of Science and Technology
NBC	National Budget Circular
NCC	National Compensation Circular
NCR	National Capital Region
NDRRMP	National Disaster Risk Reduction and Management Plan
NEDA	National Economic Development Authority
NESTS	National Environmentally-Sustainable Transport Strategy
NF	Normative Funding
NHERA	National Higher Education Research Agenda
NIGS	National Institute of Geological Sciences
NMR	Nuclear Magnetic Resonance
NRCP	National Research Council of the Philippines, DOST
OBE	Outcome-Based Education
ODA	Official Development Assistance
OFW	Overseas Filipino Worker
OGS	Other Government Schools
OIQAG	Office of Institutional Quality Assurance and Governance, CHED

OJT	On-the-Job Trainings
OPAPP	Office of the Presidential Adviser on the Peace Process
OPSD	Office of Programs and Standards Development, CHED
OSBS	Online Submission of Budget System
OSDS	Office of Student Development And Services, CHED
OVCRD	Office of the Vice Chancellor for Research and Development
PAGASA	Philippine Atmospheric, Geophysical and Astronomical Services Administration, DOST
PASUC	Philippine Association of State Universities and Colleges
PCA	Philippine Constructors Association
PCAARRD	Philippine Council for Agriculture, Aquaculture and National Resources Research and Development
PCAMRD	Philippine Council for Aquatic and Marine Research and Development
PCARI	Philippine California Advanced Research Institute
PCCSFP	Position Classification and Compensation Scheme for Faculty Positions
PCHRD	Philippine Council for Health Research and Development, DOST
PCIEERD	Philippine Council for Industry, Energy and Emerging Technology Research and Development, DOST
PCR	Polymeric Chain Reaction
PDP	Philippine Development Plan 2011-2016
PFA	Philippine Fisheries Association
PhD	Doctor of Philosophy
PHE	Public Higher Education
PHER	Public Higher Education Reform
PHERNet	Philippine Higher Education Research Network
PhilGEPS	Philippine Government Electronic Procurement System
PhiVOLCS	Philippine Institute of Volcanology and Seismology, DOST
PHP	Philippine Peso
PLDT	Philippine Long-Distance Telephone Company
PLM	Pamantasang Lungsod ng Maynila
PMA	Philippine Military Academy
PNPA	Philippine National Police Academy
PNRI	Philippine Nuclear Research Institute, DOST
PPSC	Philippine Public Safety College
PRC	Professional Regulation Commission
PS	Personnel Services
PSG	Policy Standards and Guidelines
PSHSS	Philippine Science High School System
PTRI	Philippine Textile Research Institute, DOST
QA	Quality Assurance
QC	Qualitative Contribution
QCE	Qualitative Contribution Evaluation
QS	Quacquarelli Symonds
R&D	Research & Development
RA	Republic Act
RDE	Research & Development Expenditures
RPSG	Rationalisation of Programmes, Standards and Guidelines
RUS	Regional University System
S & T	Science and Technology
SATREPS	Science and Technology Research Partnership
SEAFDEC	Southeast Asian Fisheries Development Centre

SEI	Science Education Institute, DOST
SEIPI	Semiconductor and Electronics Industries in the Philippines, Inc.
SG	Salary Grade
SOCCSKSARGEN	South Cotabato, Cotabato, Sultan Kudarat, Sarangani, General Santos
STII	Science and Technology Information Institute, DOST
StuFAPs	Student Financial Assistance Programs
SUCs	State Universities and Colleges
TAPI	Technology Application and Promotion Institute, DOST
TESDA	Technical Education and Skills Development Authority
TIP	Technological Institute of the Philippines
TOR	Terms of Reference
TRC	Technology Resource Center, DOST
TVET	Technical Vocation Education and Training
UAP	United Architects of the Philippines
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UP	University of the Philippines
UPD	UP Diliman
UPLB	University of Los Baños
UPV	UP Visayas
USAID	United States Agency for International Development
ViFARD	VISCA Foundation for Agricultural and Rural Development
VSU (ex-VISCA)	Visayas State University
WEF	World Economic Forum
ZRC	Zonal Research Centre

Executive Summary

1. Background and objective

The Commission of Higher Education (CHED) developed a reform plan called the "Higher Education Reform Agenda" (HERA) to address issues that higher education has been facing. To assist the Philippines in attaining the goals of HERA, this survey identifies the needs of human resources development from specific disciplines/sectors, and analyzes effective approaches to assist capacity-building of identified Higher Education Institutions (HEIs).

The survey was conducted in two phases.
1st field survey (Sept-Oct, 2014)

- Questionnaire: 52 respondents (46.4%) out of 112 State Universities and Colleges (SUCs).
- Interview: 7 SUCs, Industry (associations and private companies) and Government agencies

2nd field survey (Dec. 2014-Jan. 2015)

- Interview: 7 SUCs in total of 11 campuses

This survey focused on the seven (7) disciplines as below.

1. Civil Engineering (Disaster Prevention, Urban Transportation)
2. Mining/ Geological Engineering
3. Manufacturing (Mechanical/ Electrical/ Electronics/ Chemical Engineering, IT)
4. Renewable Energy
5. Biotechnology
6. Agriculture/ Agribusiness
7. Fishery/ Aquaculture

2. Overview of higher education sector

Higher education graduates are needed for upgrading the industry in the near future.

While the number of enrolment is increasing, the enrolment rate of the country is still low compared to other ASEAN member states. However, industry people perceive that the number of HE graduates is sufficient for their current operation. This implies that the industry of the Philippines is still in the process of development and the needs for HE graduates are still low compared to the number of graduates. On the other hand, the development plan of the country aims to upgrade the industry and the HE graduates are expected to play a leading role in it. Even though the industry is not matured enough to hire more HE graduates at this moment, they will need highly skilled engineers and managers in the near future.

To improve the quality of education, faculty development is crucially important.

In the Philippines, the number of HEIs and the number of enrolment have been increasing rapidly and there are concerns on the quality of education. HEIs are multiplying the number of faculty members in parallel with the increase of students. However, it is difficult to hire qualified faculty, especially in public institutions where the remuneration is low. Presently, more than 40% of faculty members do not hold graduate degrees. Those not experienced faculty members are instructing (teaching) the subject written in text books rather than what they have

learned through research activities. It is critically important to enrich the experience of faculty members, especially for those who does not have graduate degrees, in order to improve the quality of education.

Only limited number of SUCs is proactively committed to R&D projects

Even though the public expenditure on research and development is increasing, its ratio to GDP is still low compared to other ASEAN countries. HEIs are relying on government funds and the major funding agencies are CHED, Department of Science and Technology (DOST) and Department of Agriculture (DA). These funds are mostly competitive or proposal based. Only those SUCs which are capable to write good proposals are eligible to the funds. Thus, the R&D funds tend to concentrate on specific SUCs that are committed to the research.

Leading SUCs are expected to support other SUCS for research projects.

Among SUCs, University of the Philippines (UP) is highly reputed globally owing to the high quality research and qualified faculty members but other SUCs are far behind. One of the indicators adapted to measure the quality of education for SUCs is the passing rates of national license examinations. To achieve better results of the measure, many SUCs put more emphasis on instruction rather than research and in those SUCs, faculty members do not know how to make a research proposal. It will be effective if leading SUCs such as UP can support other SUCs in collaborative research.

CHED oversees higher education institutions and is playing a pivotal role in the reform.

CHED was originally established as a monitoring agency for degree programs of higher education in 1994. Under the current development plan of the country, CHED is expected to play an important role and its budget has increased significantly in past few years.

Policy measures are taken along with the roadmap of HERA's three pillars, namely, improve efficiency, upgrade quality and enhance access to the higher education. Each year, policy measures and goals are set along with the budget of CHED.

To respond to the needs from industry and society, CHED decides priority areas in consultation with relevant government agencies and industry. CHED is playing a pivotal role in higher education policy planning and implementation.

SUCs are chartered institutions and difficult to promote a reform.

More than 70% of HEIs are private and they are independently operated by themselves. Intervention by CHED for upgrading the quality of education in private institution is limited. CHED oversees mostly public institutions. Among public HEIs, there are 112 SUCs across the country. SUCs are established by law and administrated and financially subsidized by the government. As details of management are stipulated in the law, it is difficult for SUCs to promote reform requiring modification of the law. Now is the good time for reform of SUCs, since CHED and SUCs are promoting HERA. Achievements of HERA appear in the indictors of quality of education, but there remain many issues to respond to the needs from industry and society.

3. Perception and Needs on Higher Education from Industry

Industry structure of the country

Common feature among industry sectors relevant to the focal seven disciplines is that the comparative advantage of the country is abundant and inexpensive labor force. Especially for Mining, Manufacturing (factory operation), Agriculture and Fishery, a large number of field workers and/or operators are needed and engineers and managers, typical positions for HE graduates, are relatively small. For those sectors, HE graduates are expected to lead the innovation of the sector.

For other sectors such as Civil engineering, Manufacturing (engineering), Renewable energy and Biotechnology, highly skilled engineers are needed but the size of employment is not as large as Agriculture or factory operations.

Industry expects HE graduates to have more practical knowledge and key generic skills.

According to the interviews with industry people, they perceive that the number of higher education graduates is sufficient for domestic industry at present. However, they expect students and faculty members to be more exposed to the industry to understand the real situation. Issues that the industry is facing are becoming more complicated and it is difficult to solve such issues with only theoretical knowledge. Therefore, it is important to foster students who have not only theoretical background but also empirical perspective. In this context, strengthening the linkage between industry and university is crucial.

Industry people expect higher education graduates to polish key generic skills such as communication, presentation skills and logical thinking to become managers.

Innovative people are expected to realize the goal of development plan

The Philippines Development Plan (PDP) 2011-2016 indicates that the country needs the innovation to achieve an inclusive growth and upgrading the industry to higher value-added. HE graduates are expected to play a leading role in such innovation by high expertise learned from HEIs.

4. SUCs: Findings from questionnaire and interviews

SUCs need to upgrade the quality of education through faculty development and improvement of facility and equipments.

According to the questionnaire and interview survey with SUCs, SUCs perceive that they need to upgrade the quality of education, especially for faculty members and facilities and equipments.

For faculty members, in many SUCs, they are burdened with teaching loads and do not have enough time for further study to obtain graduate degree or for conducting a research project. In general, professors in Japan have to teach 6 to 7 units per week (9 to 10 hours) whereas professors in the Philippines teach around 12 to 15 hours. For training of faculty members, it is difficult to secure a time for training because of this teaching load. SUCs also indicated that

they would like to increase the exposure of faculty members to industry, but the link with industry is too weak.

As for facilities and equipments, need for improvement is very high. However, they luck in funds. For curriculum development, they are trying to adjust their curriculum into more Outcome-based Education (OBE) to be fitted to the social needs. As for the link with international universities and industry, 37.5% and 62.5%, respectively, of respondents have some links. However, especially for the link with industry, it is mostly students' on-the-job training purpose and not of the research.

Support needs differ by institution depending on the level of management and education.

In the second field survey, following 7 SUCs with totally 11 campuses were studied.

- University of the Philippines – Diliman (UPD)
- University of the Philippines – Los Banos (UPLB)
- University of the Philippines – Visayas (UPV)
- Benguet State University (BSU)
- Central Luzon State University (CLSU)
- Visayas State University (VSU)
- Bicol University (BU)
- Mindanao University of Science and Technology (MUST)
- Mindanao State University – Iligan Institute of Technology (MSU-IIT)
- Mindanao State University – Main Campus (MSU-Main)
- Mindanao State University – General Santos (MSU-Gensan)

The 11 SUCs exhibited different levels of their advancement of *Institutional Support to R&D*, *Faculty Quality* and *Facilities & Equipment* in the respective focus disciplines. SUCs can be grouped according to their comparative advantages and issues.

Tier 1 is comprised of the UP campuses (UPD, UPLB and UPV) as they were found to exhibit in their respective focus disciplines good institutional support to R&D, good faculty quality, and having complete basic equipment and facilities and some advanced equipment, with a need to acquire more advanced equipment to enable them to perform higher-level research.

Tier 2 is comprised of BSU, CLSU and VSU. BSU and CLSU lack the ability to allocate appropriate funds for instruction and R&D and motivate faculty members to pursue both instruction and research work. All three universities' faculty quality lack linkages to industries and also lack advanced equipment for research, despite having adequate basic equipment.

Tier 3 is comprised of MUST and MSU-IIT. In Institutional Support to R&D, these two universities lack the ability to allocate appropriate funds for both instruction and R&D and have not established institutional linkages for scholarship and research with industry, domestic and overseas universities, or domestic and international funding agencies. In Faculty Quality, these two universities lack the appropriate number and quality of PhD holders, linkages with industry, and mentorship among faculty members. In Facilities & Equipment, these two universities have basic equipment, but some is outdated or malfunctioning.

Tier 4 is comprised of BU. The university in terms of Institutional Support to R&D lacks the ability to motivate faculty members to pursue both instruction and research work, and the ability to balance priority of both as a matter of policy and implementation. In terms of Faculty Quality of focus disciplines, the university lacks the adequate number and quality of MS and PhD holders, linkages with industry, capability in writing research proposals for competitive research

calls, and mentorship among faculty members. In terms of facilities & equipment, BU lacks the basics. Faculty departments and corresponding facilities equipment in BU is at an early stage of development that the quality and number of faculty members and facilities and equipment still need to be increased for the university to be able to start a research program.
Tier 5 is comprised of MSU-Main and MSU-Gensan. These universities are lacking in all of the criteria, making it extremely difficult to cultivate a research program in the respective universities.

MSU-Main, compared to the other 10 SUCs, has a unique problem of peace and order, as it is located in a conflicted area, and has issues with internet connection, all of which hamper the institution's abilities and faculty members' motivation to engage in research work within the university. This, in turn, affects the arrival of any equipment to the university, as funding for research is also usually the source for funding for relative equipment. To improve or mitigate these situations, they need to work closely with the local government of Marawi City.

MSU-Gensan is moving towards acquiring some new research equipment, but the initiative may be short-lived if there is little institutional support to motivate the involvement of other faculty members in conducting research, and if management does not support the maintenance of new equipment.

5. Recommendations

Education, Research and Management of SUCs should be improved.

The human resources which industry needs from graduates of HEIs should have (1) "Key Generic Skills" and (2) "High Expertise" for their respective disciplines in order for them to contribute to the attainment of the medium to long-term national development goals of the Philippines. However, there are large gaps between industry needs and what SUCs produce. In order for SUCs to be able to produce human resources with the above qualities required by industry, the following are needed:

Education: Strengthening of curriculum, focusing on key generic skills which are expected for graduates. The content of curriculum, facilities and equipment shall be relevant to industry in order for students to acquire practical and hands-on experience.

Research: Enhancement of faculty members' skills, capabilities and expertise is necessary to improve the research activities of the Philippines, eventually they can appropriately educate students and bring out their potential as future professionals.

Management: Establishment of appropriate management structures and systems by each player of the higher educational sector and educational institutions for them to be able to acquire, allocate and manage necessary resources with a sense of responsibility to fulfil their mission in educating future professionals who can contribute to industry.

Recommended interventions

Based on the above three (3) areas to enhance in HEIs, recommended interventions to narrow the gap between industry needs and HEI outputs are the following:

a) Promoting research activities in collaboration with industries and other local / foreign universities (Collaborative R&D)

In this proposed collaborative R&D measure, SUCs are encouraged to take initiatives and approach industry and other local and/or foreign universities. It is expected that the faculty members' communication skills, logical thinking and application capability will be improved through collaborative R&D activities with external parties.

[Theme of R&D]

R&D support shall be awarded in a competitive manner. Selection criteria will be developed by referring to existing ones that are implemented by CHED or DOST. It will be required that the selection of the theme shall be done in collaboration with industry members and the output of the R&D should be usable by them. Result of R&D shall contribute to the enhancement of the specific discipline by being published in peer-reviewed journals and being presented in conferences.

[Proponents]

Proponents shall be on a scheme of industry-academe collaboration, participated in by SUCs, industry players and other local/ foreign universities. A leading SUC of a certain discipline and another SUC which has the potential of becoming a focal point in their respective region shall form a partnership. The Leading SUC shall support the development of the other SUC. If the SUC does not have any existing network, CHED shall support the SUC.

b) Improving curriculum delivery to be more practical/ problem solving oriented to reflect the industrial needs

A direct measure would be to add the development of key generic skills in the curriculum of all disciplines as mandatory subjects. Generic skills should be formally educated about its basic concepts before going into specialization. Making that subject mandatory for all should eventually contribute to enhancing the quality of industry's human resources.

c) Improving the professional capacity of faculty by upgrading their qualification through scholarships

In order to address the current state of insufficient numbers of faculty members with a high level of expertise, scholarship for faculty to acquire master and/or doctor degree by straight program or twinning/sandwich program between Philippine and foreign universities is recommended.

d) Upgrading educational and research equipment

Lack of necessary facilities and equipment is the bottleneck of R&D at most SUCs today. In order to address such situations, facilities, equipment and vehicles for field work shall be put in place. In the proposed support measure, acquiring facilities and equipment to support R&D shall be strongly considered with a condition that operation and maintenance budget need to be planned and secured by the SUC.

e) Strengthening Management of HEIs

The survey revealed that the extent of investment in capacity development of faculties, R&D, facilities for it, and efforts for creating and maintaining a source of funds for such investment are very different among universities, depending on the top leadership of the university. It is important to establish and institutionalize a solid management.

Specific measures to strengthen the management of universities will be:

- Leadership Development for University Management
- Strengthening R&D Functions

Furthermore, it is recommended that CHED strengthen the following support to SUCs.

- Support in building collaborations with the industry (networking, database, matching, etc.)
- Support in building collaborations with foreign universities (database, matching, etc.)
- Training for SUC management and faculty members (management, leadership, human skills, conceptual skills, proposal writing, etc.)

Priority disciplines

Of the seven (7) focal disciplines, three (3) priority disciplines which have larger economic and social impact and in which Japan has particular strengths are the following;

(1) Disaster Prevention (Architecture, Civil Engineering, Urban Planning)

This particular discipline has not been well established yet in the Philippines. Possible support could be provided to SUCs by matching them with a university in Japan for collaboration.

(2) Manufacturing (including IT)

The manufacturing sector is trying to shift from simple assembly to higher value-added functions. In order for the Philippines to strengthen its global competitiveness, it should focus on specific segments such as Electronics and IT, and then develop highly-skilled experts in these fields through collaboration with universities and industry players.

(3) Agriculture (including use of Biotechnology and Renewable Energy)

There has been collaboration between Philippine and Japanese Universities in the Agricultural sector. For the Philippines to be more competitive in the midst of trade liberalization trend in agricultural sector, it is necessary to improve efficiency of production and post-harvest processes, managing quality, and increasing value-added by processing the agricultural products. Possible support measures would be collaborative R&D with Japanese Universities, as well as incubation support for the utilization of R&D outcomes in agricultural businesses.

1. Background and objectives

1.1. Background

The Philippines is recognized as a highly competitive, fast-growing country in the Southeast Asian region. The country posted a strong GDP growth rate for two consecutive years: 6.2% in 2012, rising to 7.3% in 2013. The country has a large youth population—about half of the population is less than 25 years old. The growing work force population shows a high potential to boost the country's economic growth. However, the number of highly-skilled employees trained at higher education institutions (HEIs) comprises of less than 30% of the labor population. In order to enhance international competitiveness of the Philippines, the development of the Philippine higher education system has become an urgent agenda.

The Commission of Higher Education (CHED), which oversees higher education in the Philippines, raises 3 issues that higher education has been facing: (1) a lack of long-term vision and frameworks, (2) a decline in the quality of education, and (3) limited access to high-quality HEIs. To address these issues, CHED has developed a reform plan called the "Higher Education Reform Agenda" (HERA), which initiates activities such as the "AMALGAMATION" wherein State Universities and Colleges (SUCs) are integrated per region or per discipline to rationalize resources and processes in order to deliver better-quality higher education.

Japan International Cooperation Agency (JICA) recognized the necessity of enhancing the higher education sector in the Philippines and had discussions with CHED on those needs. JICA and CHED agreed upon the draft Terms of Reference (TOR) of the Survey on November 15, 2013.

This survey aims to contribute to HERA's important goals which are (1) "improving access to and promoting priority disciplines for the growth sector" and (2) "optimizing HEI roles in poverty alleviation and social development". To assist the Philippines in attaining these said goals, the survey identifies the needs of human resources development from specific disciplines/sectors and analyzes effective approaches to assist capacity-building of identified HEIs.

1.2. Objectives

Based on the Minutes of Discussion signed between CHED and JICA on November 15, 2013, the objectives of the survey are:

(1) To collect and analyze information regarding the job-skills mismatch of human resources of identified disciplines/sector needed for national development and global competitiveness;

(2) To analyze problems/challenges of the higher education sector in the Philippines, in order to identify sectors/disciplines and higher education institutions in need of assistance; and,

(3) To propose a basic framework of the prospective project(s) to address above challenges.

The identified disciplines for this survey are: 1. Civil Engineering (Disaster Management, Urban Transportation), 2. Mining/ Geological Engineering, 3. Manufacturing (Mechanical/ Electrical/ Electronics/ Chemical Engineering, IT), 4. Renewable Energy, 5. Biotechnology, 6. Agriculture/ Agribusiness and 7. Fishery/ Aquaculture

1.3. Scope of the Survey

Phases of the Survey

The survey was conducted in two phases. Methodology of the survey is shown in the table below.

Phase	Objective	Methodology	Respondents
1st field survey (Sept-Oct, 2014)	To obtain the following information: · General information about the SUC. · Current status & issues encountered with the development of the 7 disciplines. · Existing initiatives. · Future plan. To better understand the needs of industry/Government agencies on human resources (as an employer)	Questionnaire	52 respondents (46%) (as of March 31, 2015) -distributed to 112 SUCs via mail and email -previously 22 respondents (as of end of Oct., 2014)
		Interview	7 SUCs Industry (association & companies) Government agencies
2nd field survey (Dec. 2014-Jan.2015)	To understand the current status of the leading SUCs. To identify their needs on research, faculty development and equipment/facilities.	Interview	11 SUCs

Disciplines focused in the Survey

This survey focused on the seven (7) disciplines as below. The disciplines were pre-determined jointly by CHED and JICA based on the national development plan and agenda.

1. Civil Engineering (Disaster Management, Urban Transportation)
2. Mining/ Geological Engineering
3. Manufacturing (Mechanical/ Electrical/ Electronics/ Chemical Engineering, IT)
4. Renewable Energy
5. Biotechnology
6. Agriculture/ Agribusiness
7. Fishery/ Aquaculture

1.4. Counterpart Agency

Commission on Higher Education (CHED)

2. Overview of higher education sector

The higher education sector in the Philippines play a vital role in human development of the country. It is in the process of upgrading the quality of education to meet the needs from society and to enhance the competitiveness of the country globally. This chapter describes the current status, issues and reform agenda of the higher education sector.

2.1. Education System of the Philippines

2.1.1. School Education System

The structure of the school education system in the Philippines comprises of three levels, primary, secondary and tertiary education. For primary and secondary education, tuition fee for public schools are free.

The duration of primary education is six years. The enrolment age for primary school used to be seven years old, but it was lowered to six years old since the Academic Year of (AY) 1995-1996. The duration of secondary education (high school) is four years. A prerequisite for enrolment is accomplishment of six years of primary education. Thus, in general, when a student graduates from high school, he/she is sixteen years old. The tertiary education, especially Higher Education Institution (HEI), offers four to six years education for a degree program. Because of this educational system, some part of general education are taught in HEIs, HEI shall spare time for those instructions.

The school education system described above (Primary-Secondary-Tertiary: 6-4-4 years) is one or two years shorter than other ASEAN member states. In 2011, in order to extend two years of basic education, the Philippines government launched "The K to 12 Basic Education Program (K-12)" in which two more years of secondary education will be added as "Senior High School". (Figure 1)

In June 2012, the first G1 students enrolled to primary education under the K-12 system. The first generation will graduate higher education in 2024. During the transition period, especially in 2022 and 2023, the higher education graduates are expected to be very few. The K-12 is still in process of implementation, the curriculum provided in HEIs are currently reviewed. It's a good opportunity for HEIs to rearrange their curriculum, it is expected to align with needs from industry.

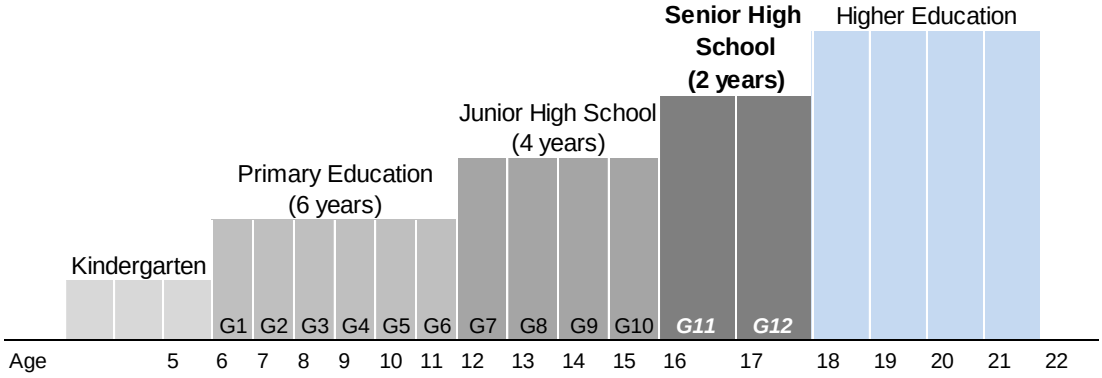


Figure 1 School Education System in the Philippines

Source: Commission on Higher Education

2.1.2. Types of Higher Education Institutions

Public and Private Institutions

As for the types of higher education institutions (HEIs) in the Philippines, there are private institutions and public institutions. Under the Spanish rule, HEIs were private and sectarian (missionary) schools. The first private university was the University of Santo Tomas established in 1611. The private HEIs have longer history than public institutions.

During the American rule, to widespread education throughout the country, state institutions started to be established. The University of the Philippines was established in 1898 as the first state HEI. In those early days of American rule, state universities were established to meet the needs for qualified faculty members, technical skills in industrial development and support staff in business and industry. Since then, state HEIs increased in number and there are 112 institutions in operation today.

While the state HEIs have increased, there have emerged more needs for HEIs that are free from either government or church control. To respond to these needs, non-sectarian, proprietary and totally independent HEIs have been established. Private institutions were very quick to respond to the needs for tertiary education after the Second World War. Today, more than 70% of HEIs in the Philippines are private[1].

Types of Institutions

Among public HEIs, there are also various types of institutions, namely, State Universities and Colleges (SUCs), Local Colleges and Universities (LCUs), Other Government Schools (OGS), CHED-Supervised Institutions (CSI) and special HEI.

State Universities and Colleges, or SUCs, are public higher education institutions established by law and administered and financially subsidized by the government. SUCs have their own charters, although their institutional management is independent, increasing of the number of faculty or changing curriculums are regulated by government agency. The highest policy-making body of a state university is the Board of Regents (BOR); for the state college, it is the Board of Trustees (BOT). The CHED Chairperson heads all these boards. All of SUCs are under the umbrella of the Philippine Association of State Universities and Colleges (PASUC).

Local universities and colleges (LUCs) are established by the local government units (LGUs) through resolutions or ordinances. LUCs are financially supported by the local government.

CHED-Supervised Institution (CSI) is a non-chartered, public, post-secondary education institution, established by law and administered, supervised and financially supported by the government.

Special HEIs are public organizations offering higher education programs related to public service. They are operated and controlled in accordance with the special law that created these institutions, providing special academic research and technical assistance programs pursuant to the basic mandates of their parent agencies. (e.g. The Development Academy of the Philippines (DAP), Philippine Military Academy (PMA), Philippine National Police Academy (PNPA), Philippine Public Safety College (PPSC), and National Defense College).

[1] Adriano A. Arcelo (2003), "In pursuit of continuing quality in higher education through accreditation: the Philippine experience", International Institute for Educational Planning, UNESCO, concisely summarizes the history of state and private higher education in the Philippines.

Other Government Schools (OGS) are public secondary and post-secondary technical-vocational education institutions that offer higher education programs.

Private HEIs are established under the Corporation Code and are governed by the special laws and general provisions of this Code. Non-sectarian private HEIs are duly incorporated, owned and operated by private entities that are not affiliated to any religious organization; while sectarian private HEIs are usually non-stock, non-profit, duly incorporated, owned and operated by a religious organization.

Although CHED monitors and supervises the quality of education of private HEIs, the management of private institutions is independent. Especially those top HEIs which are recognized as "autonomous" where the government does not intervene. For other HEIs, the government instructs them to improve the quality of education.

2.2. Number of Higher Education Institutions and Enrolment

As the population of the Philippines increases rapidly, it is important to maintain and improve the access to higher education. This section overviews the current status of access to higher education.

2.2.1. Number of HEIs

In academic year 2013-2014, there was a total of 2,374 HEIs (including satellite campuses of SUCs), among which 675 (28.4 %) were public and 1,699 (71.6%) were private (Figure 2).

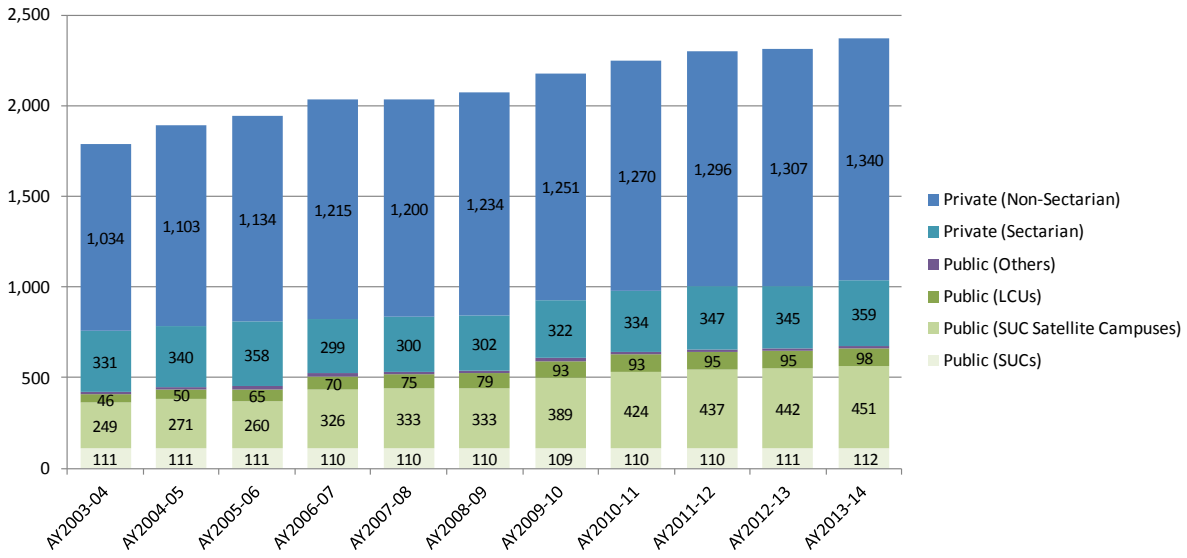


Figure 2 Number of HEIs by Institution Types AY2003-2013
Source: Commission on Higher Education, "Higher Education Data: 2014"

In the past ten years, the total number of HEIs in the Philippines increased by 585 institutions and the compounded annual growth rate (CAGR) was 2.9%. The number of State Universities and Colleges (SUCs) main campus remains almost the same (112 in AY2013-14) while satellite campuses of SUCs increased by 202 during the ten years. The largest increase was in private, non-sectarian HEIs which grew from 1,034 to 1,340. (Table 1)

The number of institutions increased for various reasons. In general, along with the economic development of the country, more people pursue higher education and public and private institutions are responding to these demands. As for private institutions, in some cases, local politicians set up colleges as a way of contributing to the community. In other cases, an affluent family establishes a college as a venture business.

As for SUCs, it is observed that the number of main campuses has not increased significantly but satellite campuses have grown. As long as it is approved by the governing board of the institution, satellite campuses can be set up. As a consequence of this rapid increase in campuses, there is some duplication of disciplines in a region and some of the satellite campuses are allocated only a small budget. This is one of the reason why CHED needs to proceed "amalgamation policy" of SUCs which will be discussed later in this report.

Table 1 Number of Higher Education Institutions by Institution Types

Higher Education Institutions (HEIs)	AY2003-04	AY2004-05	AY2005-06	AY2006-07	AY2007-08	AY2008-09	AY2009-10	AY2010-11	AY2011-12	AY2012-13	AY2013-14
Total HEIs (excluding SUCs Sattelite campuses)	1,540	1,619	1,683	1,710	1,701	1,741	1,791	1,823	1,862	1,871	1,923
Total HEIs (including SUCs Sattelite campuses)	1,789	1,890	1,943	2,036	2,034	2,074	2,180	2,247	2,299	2,313	2,374
Public	175	176	191	196	201	205	218	219	219	219	224
State Universities and Colleges (SUCs)	111	111	111	110	110	110	109	110	110	111	112
SUCs Satellite Campuses	249	271	260	326	333	333	389	424	437	442	*451*
Local Colleges and Universities (LCUs)	46	50	65	70	75	79	93	93	95	95	98
Others (include OGS, CSI, Special HEI)	18	15	15	16	16	16	16	16	14	13	14
Private	1,365	1,443	1,492	1,514	1,500	1,536	1,573	1,604	1,643	1,652	1,699
Sectarian	331	340	358	299	300	302	322	334	347	345	359
Non-Sectarian	1,034	1,103	1,134	1,215	1,200	1,234	1,251	1,270	1,296	1,307	1,340

Source: Commission on Higher Education, "Higher Education Data: 2014"

As for the geographical location, HEIs are unsurprisingly concentrated in National Capital Region (NCR), Region III (Central Luzon) and Region IV (CALABARZON and MIMAROPA), which are all regions in Luzon Island where population and industry are also concentrated. (Figure 3)

However, according to the interviews with industry employers, recruiting excellent graduates in Luzon Island is a severe competition. As a result, many are trying to make recruitment connections with universities outside of Luzon Island.

The location of HEIs is democratized and spread out throughout the country, but due to this fact, some are located in rural area where virtually no industry exists in vicinity and, therefore, lack linkage with industry.

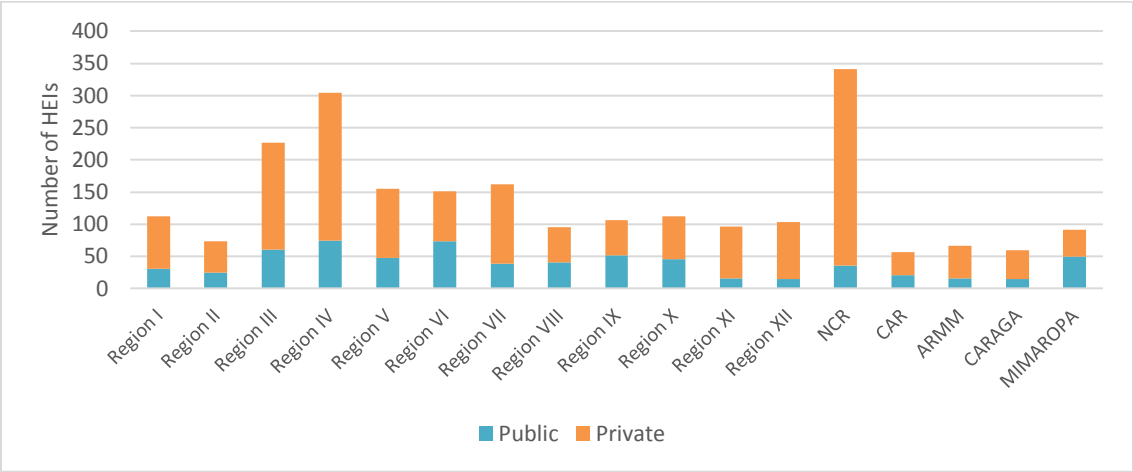


Figure 3 Number of HEIs per Region for AY 2012 to 2013

Source: Commission on Higher Education

2.2.2. Number of enrollments

The gross enrollment ratio of tertiary education for the Philippines in 2009 was 28.2%, which was slightly higher than the world average of 27.8%. The ratio for the Philippines in 2001 was 30.4%, which was the second highest among ASEAN member states at that time. However, the ratio has gradually diminished since then. Meanwhile, the ratio for Malaysia and Indonesia became 36.0% (2011) and 31.5% (2012) respectively. Vietnam and Brunei are also catching up at around 25%. (Figure 4, Table 2)

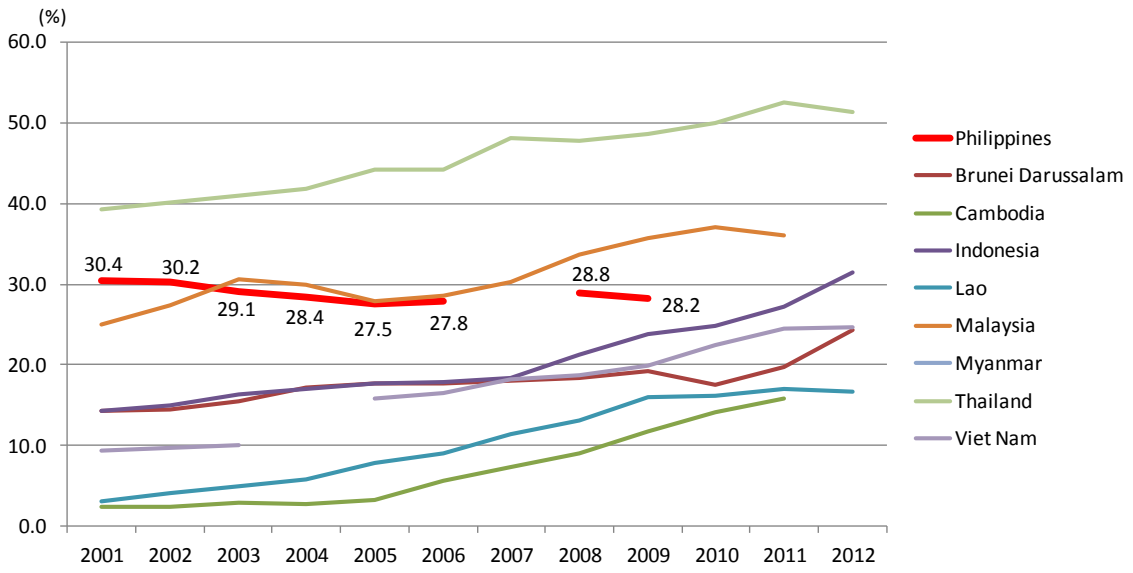


Figure 4 Gross Enrolment Ratio for Tertiary Education

Note: No data is available for Singapore.
Source: UNESCO Institute of Statistics (Database)

Table 2 Gross Enrollment Ratio for ASEAN countries from 2001 to 2012 (%)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Philippines	30.4	30.2	29.1	28.4	27.5	27.8		28.8	28.2			
Brunei Darussalam	14.2	14.5	15.5	17.2	17.7	17.8	17.9	18.3	19.2	17.6	19.7	24.3
Cambodia	2.4	2.5	2.9	2.8	3.3	5.6	7.3	9.1	11.7	14.1	15.8	
Indonesia	14.4	15.0	16.3	17.0	17.7	17.9	18.4	21.3	23.7	24.9	27.2	31.5
Lao	3.1	4.2	4.9	5.7	7.8	9.0	11.4	13.1	16.0	16.1	17.1	16.7
Malaysia	25.0	27.4	30.5	30.0	27.9	28.6	30.2	33.7	35.7	37.1	36.0	
Myanmar	10.3						10.1				13.8	
Singapore												
Thailand	39.2	40.0	40.9	41.9	44.2	44.2	48.1	47.7	48.6	50.0	52.6	51.4
Viet Nam	9.4	9.6	10.0		15.9	16.5	18.2	18.7	19.9	22.4	24.4	24.6
Japan	49.9	50.7	51.8	53.6	55.0	57.1	57.8	57.6	57.7	58.1	59.9	61.5

Note: No data is available for Singapore.
Source: UNESCO Institute of Statistics (Database)

According to interviews with industry people in the Philippines, their needs on HE graduates is higher quality students rather than a great quantity number of them. For the short term, it is more important to enhance the quality of education, rather than expand the capacity of the higher education. However, Philippine Development Plan indicates that the country is going to transform and upgrade the industry and there will be more needs on HE graduates in the future.

In AY2013-2014, a total of about 3.563 million students enrolled; 43% in public and 57% in private. For the past ten years, enrolment for both public and private HEIs has increased but the compound annual rate of growth of public enrollees was 6.4% which was higher than the rate for private enrollees (2.4%). Especially in the past five years, the number of enrollments in public institutions increased significantly. In concert with the people's demand for higher education, the number of institutions has been increased.

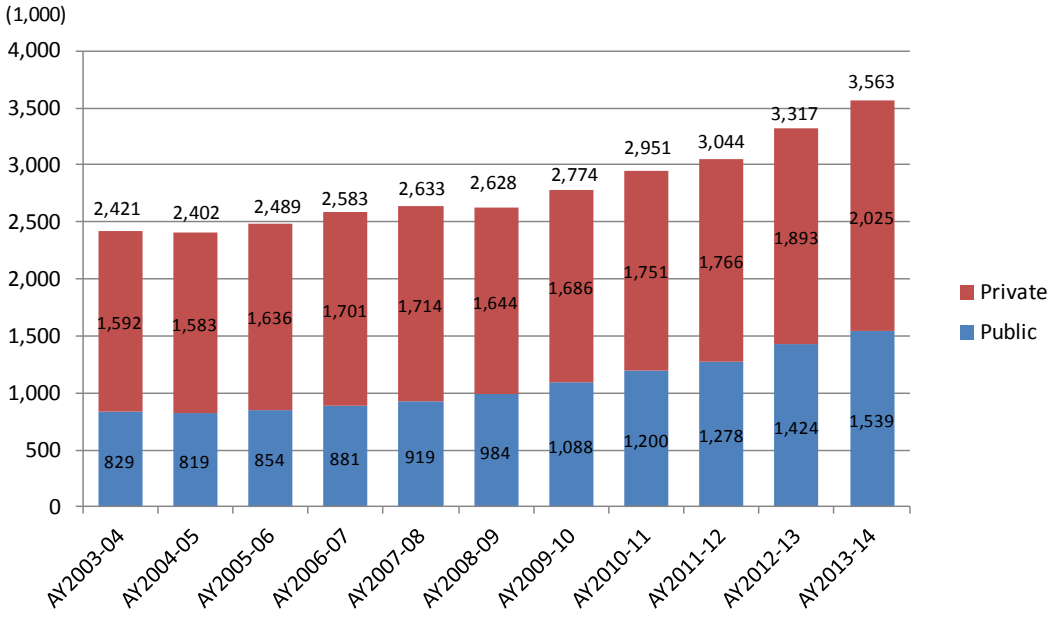


Figure 5 Number of Enrolment by Type of Institutions

Source: Commission on Higher Education, "Higher Education Data: 2014"

As for the number of enrollment by priority disciplines[2] in AY2013-2014, the enrollees for Teacher Education (624,254) was the largest, followed by IT Related disciplines (425,416), Engineering and Technology (424,143), and Medicine and Health Related disciplines (228,484). (Figure 6)

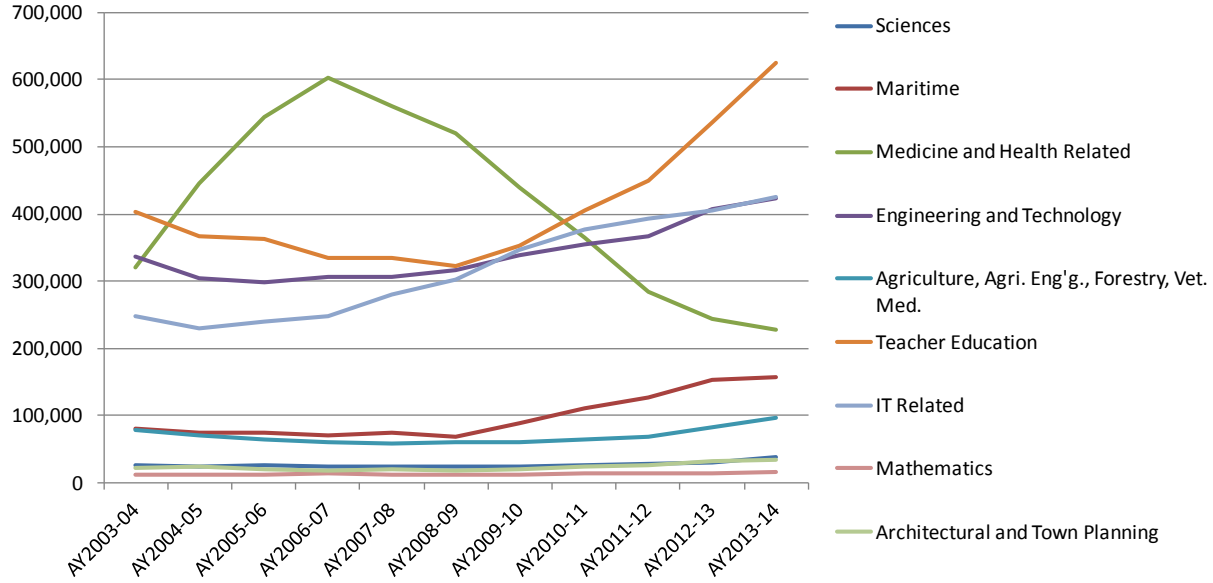


Figure 6 Number of Enrollment by Priority Disciplines

Source: Commission on Higher Education, "Higher Education Data: 2014"

[2] Nine priority disciplines are set by CHED, namely Sciences, Maritime, Medicine and Health Related, Engineering and Technology, Agriculture, Agriculture Engineering, Forestry and Veterinarian Medical, Teacher Education, IT Related, Mathematics and Architectural and Town Planning

During the past ten years, enrollment trend by discipline have changed. Until AY2006-2007, the enrollees of Medicine and Health Related disciplines increased and was always the largest, but it has declined rapidly since then. This is due to the continuous decreasing demand of nurses and the closure of some substandard nursing schools. On the other hand, enrollees for other disciplines have increased in the past five years. Notably, Teacher Education, IT Related disciplines, and Engineering and Technology are the three major disciplines among priority disciplines.

The number of enrollments reflect job opportunities, not only in the Philippines but also overseas. The Philippines Government encourages its citizens to work abroad. Those who work abroad are called Overseas Filipino Workers (OFWs) and the total as of December of 2012 is recorded more than 10 million[3] (as of December of 2012). For students in higher education, finding a job in a foreign country is one possible career path after graduation where the salary may be higher. It is said that nurses, school teachers and engineers (including IT engineers) are some of the major occupations of OFWs and these occupations are relevant to the disciplines with high enrollees, such as Teacher Education, Engineering and Technology, IT Related discipline and Medicine and Health Related discipline.

It is difficult to measure the size of job opportunities of domestic industry for higher education graduates. In terms of the size of Gross Domestic Product (GDP) by industry in 2014, Manufacturing had the largest share (20.5%) in the GDP, followed by Trade and Repair (17.7%), Real Estate (12.2%), Agriculture and Forestory (9.8%) and Other Services (9.5%) (Table 3).

Table 3 GDP by Industry and Share

Industry	2004		2014	
	GDP	%	GDP	%
Agriculture and forestery	676,966	13.2%	1,232,464	9.8%
Fisihing	4,330	0.1%	197,216	1.6%
Mining and Quarrying	54,215	1.1%	124,226	1.0%
Manufacturing	1,226,259	23.9%	2,592,040	20.5%
Construction	255,909	5.0%	814,106	6.4%
Electricity, Gas and Water Supply	191,898	3.7%	415,650	3.3%
Transport, Storage and Communication	394,960	7.7%	788,191	6.2%
Trade and Repair	817,162	16.0%	2,238,553	17.7%
Financial Intermedeiation	280,672	5.5%	983,572	7.8%
Real Estate, Renting	491,461	9.6%	1,540,731	12.2%
Public Administration and Defense	225,668	4.4%	507,879	4.0%
Other Services	500,936	9.8%	1,199,434	9.5%
Total	5,120,435	100.0%	12,634,062	100.0%

Source: National Statistics Coordination Board

In recent years, foreign direct investment into the manufacturing sector, especially the electronics and machinery sub-sector, contributed to strengthening the economy. Business Process Outsourcing (BPO) and IT related sub-sectors have also been competitive in employing engineers. Domestic consumption has been booming and thus, service, construction and manufacturing for the domestic market have also been growing.

Those expanding sectors are, in general, employers of higher education graduates. However, the size of the industry does not necessarily correlate to the number of jobs for college graduates. For example, many

[3] Commission on Filipino Overseas, "Stock Estimate of Overseas Filipinos as of Dec. 2012"

large manufacturing companies are engaged in simple assembling processes where a large number of factory workers are employed as opposed to high level managers or engineers. Often higher education graduates are working as factory workers despite their qualifications. The dearth of well-paid job opportunities for higher education graduates is one of the major reasons they seek jobs in foreign countries.

Philippines will need more higher education graduates from now on to upgrade its industry in order to be competitive in the global economy. The simple assembling process is, in general, a low-value added process in a global value chain. In the manufacturing sector, development of new products with high technology is needed and it should be led by college graduates.

2.3 Quality of Higher Education

This section reviews the quality of higher education in terms of graduation rate, the number of faculty members and its ratio to students, qualification and development of faculty, license examination passing rate and international reputation of the Philippine HEIs. The needs from industry suggest that basic human skills and understanding of industry are lacking among HE graduates[4]. Presumed causes of the issue are quality and experience of faculty members, relevance of curriculum and the management of HEIs. This section mainly focuses on the indicators of the quality of education and faculty members. Other factors will be examined in Chapter 5.

2.3.1. Number of faculty and ratio to students

In AY 2013-2014, there were 142,673 faculty members. The number of faculty in the public HEIs has been increasing steadily. The average annual growth rate of faculty members in the public HEIs is 9.1%, higher compared to the private HEIs (2.3%). To keep up with the increase of students, faculty members are also increasing, however, it includes hiring faculty with bachelor degree which is not qualified, it doesn't necessarily mean the quality of faculty has been improved.

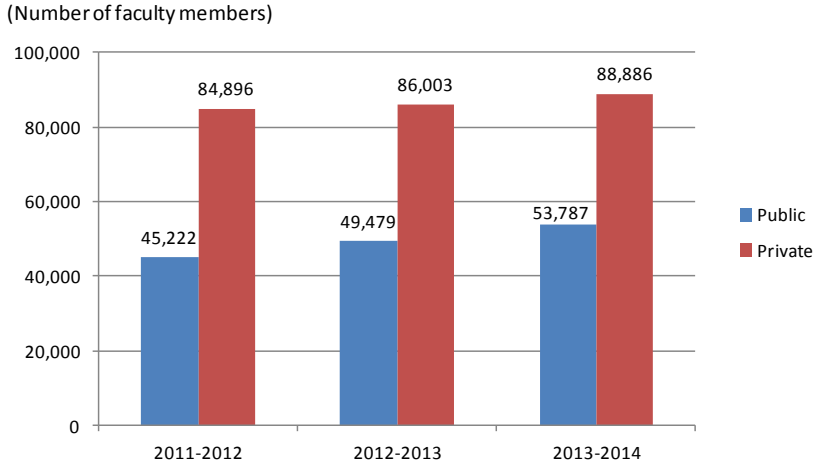


Figure 7 Number of Faculty Members for Public and Private HEIs

Source: Commission on Higher Education

[4] Needs from industry on higher education graduates will be discussed in detail in Chapter 4.

For the past three academic years, faculty to student ratio for public HEIs has been around 1 faculty member to 29 students whereas the ratio for private HEIs was around 1 faculty member to 22 students. For public institutions, as the number of students is rapidly increasing in recent years, they have to increase the number of faculty members to maintain the ratio. However, in order to increase the number of faculty at each SUC, SUC shall request government agency for the budget (plantilla budget) which rarely approved by the government.

After the Second World War, private non-sectarian institutions rapidly expanded and were criticized that they sacrificed the quality of education in their haste to acquire a large enrolment. (Adriano A. Arcelo (2003)) The rapid increase of SUC is also on the same stage as non-sectarian institutions used to be, the quality of education is questionable due to acquiring a large enrolment.

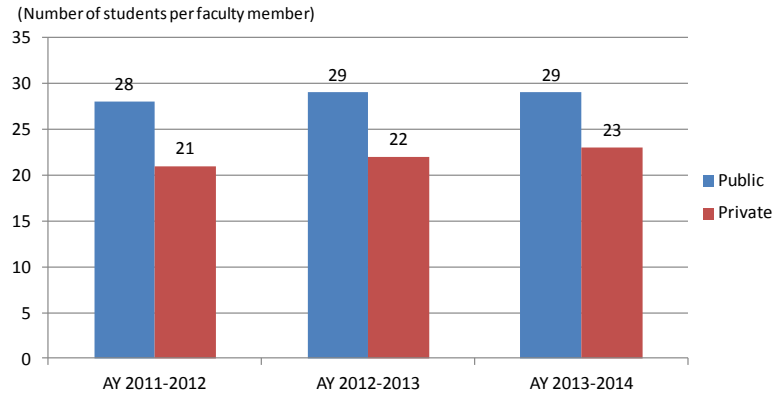


Figure 8 Faculty-Student Ratio

Source: Commission on Higher Education

As for the number of facutly members by discipline, the largest number of faculty is in the field of Education Science and Teacher Training with 34,869 faculty members for both public and private HEIs in AY 2013-2014, followed by Business Administration and Related courses with 17,544 faculty members and Engineering and Technology with 13,840 faculty members (Figure 9).

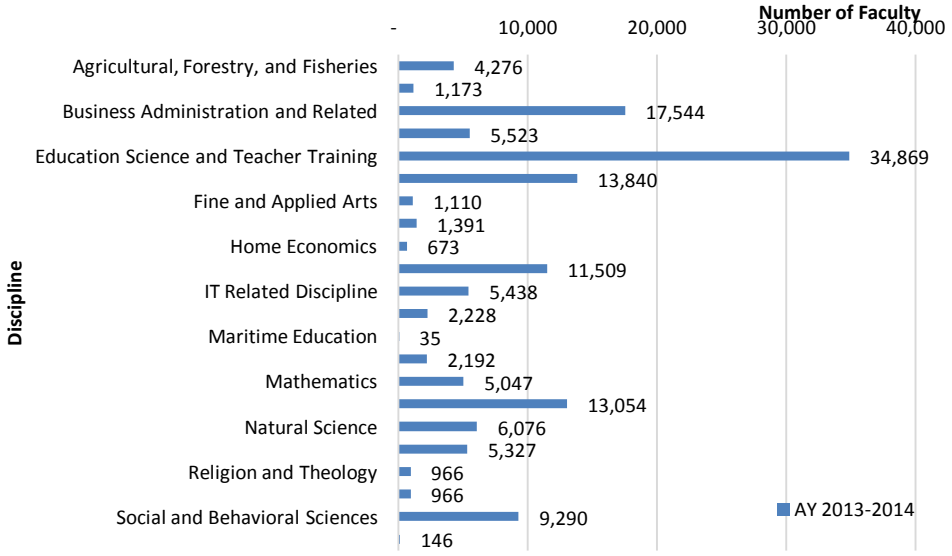


Figure 9 Number of HE faculty members per discipline in AY 2013-2014

Source: Commission on Higher Education

By discipline, faculty to students ratios for IT Related discipline(78.2), Service Trades discipline(70.1) and Business Administration and Related discipline (55.3) are high among others. Those disciplines, of which the enrollment increased rapidly in the past ten years, have high ratios. This implies that the number of faculty does not simulate with the increase in students. (Figure 10)

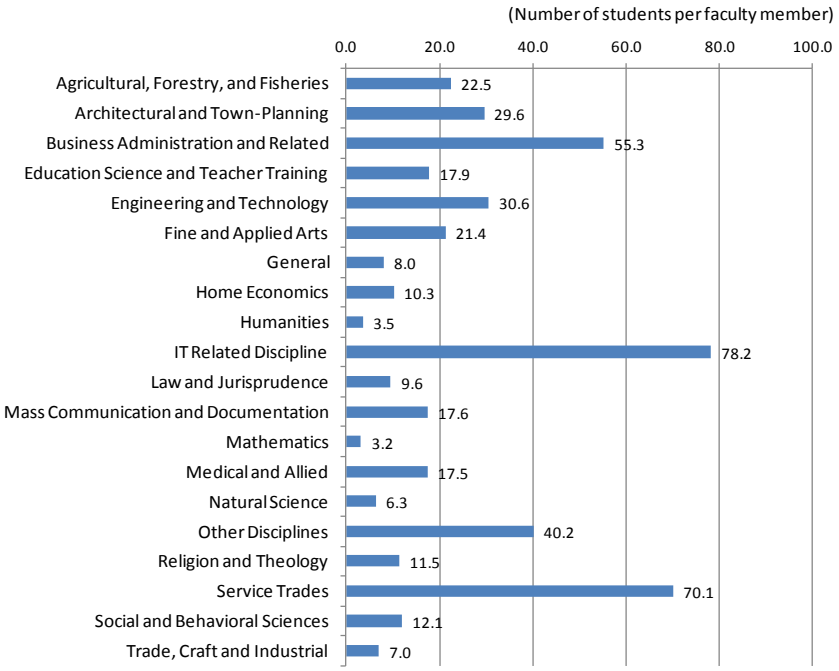


Figure 10 The Students to Faculty Member Ratio by Discipline in AY2013-2014

Note: Reliable data for Maritime Education was not available. The number of faculty members categorized under "Discipline Not Indicated" is excluded.
Source: Commission on Higher Education

2.3.2. Qualification and development of faculty

Recruitment and Appointment System of Faculty Members

The government sets the primary standards for the faculty recruitment, evaluation and compensation the release of CMO No. 30, 2009. Under CMO No. 40, 2008 titled 'Manual for Private Higher Education', the policies and standards in determining the qualifications of the faculty are indicated in the manual. This became applicable to SUCs. Position of the faculty members in SUCs are considered to be closed career positions, scientific and highly technical in nature under the presidential decree no. 807 or the "Civil Service Decree of the Philippines".

Recruitment of faculty members for each SUC depend on its need. Each SUC has a fixed number of plantilla items or personnel. Although there has been a rapid increase of enrollment in SUC and programs being offered over the years, the number of plantilla items remains the same. If ever, they have additional funding, SUCs usually hire contractual or substitute faculty members to meet the growing demand and maintain the quality of education being delivered.

The minimum qualifications set by CHED is that the faculty member should, at least, be a holder of master's degree. For professional courses, a bachelor degree holder may teach provided that they have a professional license. Due to low availability of qualified applicants, SUCs also hire bachelor degree graduates as lecturers or instructors. To maintain the quality of education being delivered to the students, SUCs only hire top graduates to their respective courses.

The percentage of master's degree holders of faculty members has increased from 30.1% in AY2003-2004 to 40.9% in AY2013-2014. However, total percentage of master's and doctoral degree holders is still around 50% of faculty members. (Figure 11)

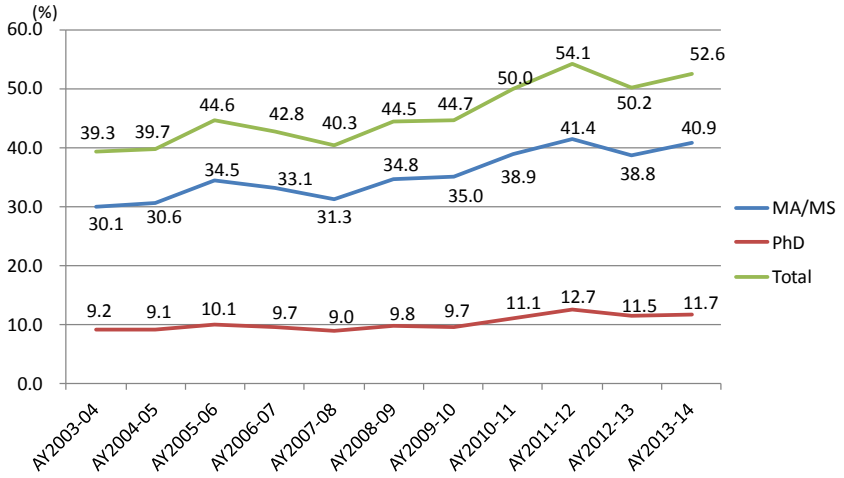


Figure 11 Percentage of Masters or PhD Degree Holders of Faculty Members

Source: Commission on Higher Education

SUCs use the revised and updated common criteria for evaluation (CCE) and the modified point allocation (MPA), a point-based evaluation system devised by PASUC and CHED, as basic instrument for recruitment and promotion such as assigning the faculty rank and determining the appropriate salary grade. Currently, there are 5 major faculty ranks and sub-ranks in it which varies per salary grade. In the SUCs, the quota rank of "Professor" shall be 20% of the total faculty positions.

Table 4 Faculty Rank System

Faculty Rank	Sub-Rank	Salary Grade
College/University Professor	-	30
Professor	I – VI	24 - 29
Associate Professor	I - V	19 -23
Assistant Professor	I – IV	15 - 18
Instructor	I – III	12- 14

Source: NBC no. 461 series of 1998

Table 5 CCE Point System

Factors	Number of Points
Educational Qualification	85
Experience and Professional Services	25
Professional Development, Achievement and Honors	90
Total	**200**

Source: NBC no. 461 series of 1998

For promotion, SUCs follow the point-based Qualitative Contribution Evaluation (QCE) which determines the eligibility of a faculty member to a higher rank based on his/her Qualitative Contribution (QC) in all four (4) functional areas of the institution: instruction, research, extension and production. For the faculty members to be promoted to the desired higher sub-rank or rank, they must reach the number of points for the rank.

For each faculty rank and sub-rank, the applicants are required to meet the following requirements and qualifications indicated in CSC no. 19 series of 2005 in terms of education, experience, training, research output and community extension service. For eligibility, based on Republic Act no. 1080, any bar or board examinations conducted by the government are recognized as civil service examinations. Any of the faculty members may also be promoted provided that he/she meets the minimum requirements for the position including the performance rating of very satisfactory during the last 2 performance evaluation period. The applicant may also submit documents which will be considered as evidence of his/her accomplishments.

Since it is difficult to hire and retain qualified faculty members, HEIs are hiring bachelor degree holders. One of the reasons of the difficulties is the compensation of faculty members for persons with a high educational background and fluency in English, there may be other career paths with better payroll. Another possible reason is that the research environment in some HEIs may not be attractive, due to heavy instruction load, administrative works and obsolete research facilities.

Faculty Development Program (FDP)

Based on the CMO No. 40 of 2008, CHED requires the faculty members in the HEIs to have at least a master's degree in their respective fields to be able to teach. However, most HEIs are still incapable of meeting these requirements of CHED. The qualification and competency of the faculty members reflect the quality of education being taught in HEI. This, in turn, affects the learning achievement of the students which will ultimately affect the performance of the students in the professional licensure examinations and the graduate's productivity in their respective fields. Hence, faculty development programs have been a primary concern of the HEIs as they seek to upgrade the faculty qualification and enhance the faculty performance within their institution.

CHED's faculty development program's initial objective was to develop the professors handling the General Education (GE) courses. To fully maximize the development of the faculty, CHED accredited the universities and colleges which have acquired the centers of excellence (COE) or centers of development (COD) in specific disciplines to be the delivering institutions to the grantees. Over the years, CHED was able to provide other faculty development grants such as dissertation grants, visiting research fellowships, thesis grants and support for paper presentations and conferences. In partnership with private companies, they have added continuing professional education courses and trainings.[5]Based on the CMO No. 26 series of 2009, CHED has identified the priority disciplines, scholarship grants allocating and the privileges for the scholars. (Table 4)

[5] Source; Interview with CHED

Table 6 CHED-FDP Priority Areas & Scholarship Grants

Priority Areas	Engineering, Humanities & Communication, Information Technology/Systems, Social Sciences, Mathematics, Natural Sciences, Agriculture and Marine Sciences, Environment and related programs, Health and related programs, Other COE/COD disciplines, Other priority fields identified by the commission
Scholarship Grants	Non-thesis Master's Degree Program Master's degree program with Thesis Full Ph.D. Program (Local) Ph.D. Sandwich Program (Foreign) Continuing Professional Education (non-degree program)

Note: effective till now
Note2: "Priority areas" were identified specifically for Faculty Development Program (FDP). These areas are not necessarily the dame to the "priority disciplines" which are priority for quality improvement of higher education.
Source: CMO No. 26 series of 2009

SUCs also provide opportunities for the faculty to upgrade their skills and knowledge and of the current industry trend. Usually, SUCs provide scholarships grants and tuition fee is waived. For instance, the tuition fee is waived if they will be pursuing a higher degree inside the university they are employed in. Furthermore, through linkages, the faculty may pursue their higher degrees locally or abroad under a scholarship program while receiving the same compensation and benefits they enjoy in the university. SUCs also provide opportunities for the faculty members to attend a seminar or conference abroad and/or subsidize all the expenses for paper presentation.

To increase the participation of the faculty members in research collaborations, some SUCs implement a "deloading" policy wherein the number of instruction units could be converted into research units depending on the role or function of the faculty member in the research study. Added to that, there are other special incentives such as monetary prizes or awards for papers presented or research conducted which may motivate the faculty members to participate in the programs.

These faculty development programs have been effective, as it has seen the number and percentage of graduate degree holders increasing. However, approximately half of the faculty members are still bachelor's degree holders and need to be developed.

2.3.3. Licenses applied to seven disciplines

In the Philippines, there is a license system for various professions. License is not necessarily a prerequisite for doing business. However, for some area of business, they have to acquire license if they want to work as a professional. For example, in the case of a civil engineer or an electrical engineer, they cannot prepare or sign any legal document without a license of the profession. Even if there is no such requirement, graduates take the licensure examination and obtain a license to get the advantages of employment. Some companies require or prefer license holders upon hiring and salary is generally higher than non-licensed employees.

From SUCs' perspective, the passing rate of licensure examination is one of the indicators of quality and effectiveness of education. The rate is used as a basis of accreditation for the institution, and is also considered as an output of education to be used for normative funding for MOOE budget. SUCs can get higher score based on the outputs, this is one of the institutional reason why instructions in SUCs are focused on.

Certifications or board examinations for licensures are in place for a number of professions, most of which are required by prospective employers of graduates of the respective disciplines. The professional licensure is regulated and facilitated by the Professional Regulation Commission (PRC). The table below lists licensure examinations that are related to the seven disciplines/sectors, the focus of this survey.

Table 7 Licensure Examinations related to seven disciplines

Discipline	Licensure Examinations
Civil Engineering	Architecture License Civil Engineer License Environmental Planner License
Mining/Geology	Chemist License Chemical Engineering License Geodetic Engineering License Geologist License Mechanical Engineering License Metallurgical Engineering License Mining Engineering License Plant Mechanic Engineering License Sanitary Engineering License
Manufacturing	Chemist License Chemical Engineering License Electrical Engineering License Electronics Engineering License Mechanical Engineering License
Renewable Energy	Chemist License Chemical Engineering License Electrical Engineering License Electronics Engineering License Mechanical Engineering License Plant Mechanic Engineering License
Biotechnology	Chemist License Chemical Engineering License
Agriculture/Agribusiness	Agriculturist License Agriculture Engineering License Mechanical Engineering License
Fisheries/Aquaculture	Fisheries Technologist License

Source: Professional Regulation Commission

It should be noted that the licensure examination for Fisheries Technologist has been suspended since 2012. Although this is the case, it does not greatly affect the employment in the fisheries sector since it is not a major requirement for that specific industry. Here we can see the latest board passing rates of the licensure examinations related to the seven (7) disciplines. Table 8 shows the latest result of passing rate of licensure examinations. Passing rate of most licenses fall in 30% and 60%, the average passing rate being 50%. The highest passing rate was 84.25% of Mining Engineering License, the lowest passing rate was Fisheries Technologist License.

Table 8 Latest Licensure Examinations Passing Rate

#	Licensure Examinations	No. of Applicants	No. of Passers	Passing Rate (%)	Date*
1	Agriculturist License	623	313	50.2%	July 2014
2	Agriculture Engineering License	5,022	1,808	36.0%	June 2014
3	Architecture License	1,803	1,100	61.0%	June 2014
4	Chemical Engineering License	438	242	55.3%	May 2014
5	Chemist License	571	320	56.0%	Sept. 2014
6	Civil Engineering License	4,289	1,862	43.4%	May 2014
7	Electrical Engineering License	1,648	574	34.8%	Feb 2014
8	Electronics Engineering License	2,574	907	35.2%	March 2014
9	Environmental Planner License	197	88	44.7%	June 2014
10	Fisheries Technologist License	376	95	25.3%	Sept. 2012
11	Geodetic Engineering License	479	179	37.4%	Aug. 2014
12	Geologist License	234	125	53.4%	Aug. 2014
13	Mechanical Engineering License	1,310	793	60.5%	March 2014
14	Metallurgical Engineering License	15	7	46.7%	Feb. 2014
15	Mining Engineering License	146	123	84.3%	Aug. 2014
16	Plant Mechanic Engineering License	42	22	52.4%	March 2014
17	Sanitary Engineering License	166	106	63.9%	Aug. 2014

Note:*Latest data available.
Source: Professional Regulation Commission

In terms of the relevance to the needs from industry, more human skills are needed rather than technical skills across targeted industries. Human skills include communication, leadership, logical and critical thinking and innovation mindset. (Details will be discussed in chapter 4.) To offer an education for these skills, faculty members need to understand the context of management in industry and to have broad experience on research and development in which they can nourish critical thinking and innovation mindset. Nevertheless, as stated above, nearly half of the faculty members do not hold a graduate degree. Faculty members are occupied with instruction and do not have enough time or chance for real exposure to industry and R&D. (Details will be discussed in chapter 3.) Therefore, in response to the needs from industry, upgrading the quality of faculty members through research and development is essential.

2.3.4. International reputation of universities and colleges in the Philippines

In the Quacquarelli Symonds (QS) 2014 World Rankings, a website rating of higher education institutions worldwide , UP (380th) has garnered the highest rank among the other Philippine HEIs in the world's top 800 (Table 11).

QS 2014 World Rankings also monitor an Asian ranking. For Asian rankings, the UP is ranked at 63, but the next highest ranked SUC was the University of Southeastern Philippines which was ranked below 300. The difference between UP and other SUCs is wider compared with other private institutions.

The method of gathering data is through a global survey. QS ratings consider research, teaching, graduates' employability, facilities, internationalization, innovation, engagement in the local community and accessibility to students as indicators for the rankings. (Table 11)

Table 9 QS World Rankings in 2014

QS Rank	HEI
380	University of the Philippines
501-550	Ateneo de Manila University
601-650	De La Salle University
701+	University of Sto. Tomas

Source: QS World Rankings, 2014
Note: Highlighted universities are SUCs.

Table 10 QS Asian Rankings in 2014

QS Rank	HEI
63	University of the Philippines
115	Ateneo de Manila University
141	De La Salle University
151-160	University of Sto. Tomas
251-300	Ateneo de Davao University
301+	University of Southeastern Philippines
301+	Adamson University
301+	Central Mindanao University
301+	Xavier University
301+	University of San Carlos
301+	Siliman University
301+	Mapua Institute of Technology
301+	Polytechnic University of the Philippines
301+	Saint Louis University, Baguio

Source: QS World Rankings, 2014

Table 11 QS World Ranking Criteria

Criteria	%
Academic Reputation	40%
Citations per Faculty	20%
Student-to-Faculty Ratio	20%
Employer Reputation	10%
International Faculty Ratio	5%
International Student Ratio	5%

Source: QS World Rankings, 2014

University of the Philippines is highly reputed among Filipino universities, mostly because the quality of faculty members is generally high and they are committed not only to the instruction, but also to the research. Consequently, they obtained high rates for the ranking and the reputation from employers is also noteworthy.

2.4. Research and Development

Research and Development (R&D) is one of the main functions of the HEI as a knowledge-generating and sharing institution. Active involvement in R&D provides an opportunity to enhance the R&D skills of both the faculty and the student and to form close linkages with the industry and the government. Subsequently, the topics for R&D can be prioritized by simulating it with the needs of the industry and gearing towards national development.

2.4.1. Expenditure on R&D

Major players of R&D in the country are private industry, higher education institutions, government institutions and other research institutions. As for the macroscopic data of R&D expenditure below, all those players are included.

In the Philippines, the national R&D expenditure in 2011 was about 13 billion pesos and it has increased by 49% from 2009. Even though the expenditure on R&D has been steadily increasing for the past several years, the growth rate of GDP has continuously surpassed it. Over the years, the ratio of R&D expenditure to GDP fell down from 0.15% in 2002 to 0.11% in 2009, but the ratio eventually recovered to 0.13% in 2011. (Figure 12)

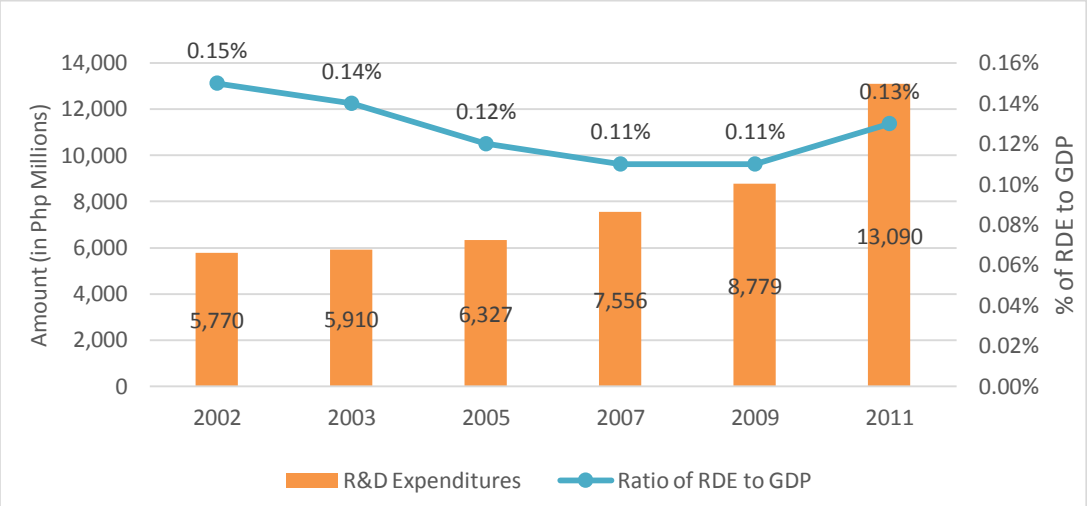


Figure 12 National R&D Expenditures of all Sectors and the Ratio of R&D Expenditure to GDP

Note: National R&D expenditures includes expense of private industry, HEIs, and government agencies.
Source: DOST, "Compendium of Science & Technology Statistics", and National Statistical Coordination Board

Based on the R&D expenditure per sector, there has been a rapid growth in R&D expenditures in the private sector from 2009 to 2011. Technically, some categories such as Professional, Scientific and Technical Services and Administrative and Support Service Activities were added in the statistic. This contributed to Php 2.24 billion worth of increase in R&D expenditures in the private sector in 2011. The R&D expenditures in the private HEIs also escalated from 367 million pesos to 602 million pesos within a span of two years.

There has also been an increase of public expenditure on R&D, especially in the Higher Education sector. The R&D expenditures for Public HEIs almost doubled within 2 years from 1.7 billion pesos in 2009 to 3.4 billion pesos in 2011. Based on an interview with CHED, the public expenditure on R&D could have been stimulated when the National Higher Education Research Agenda-2 (NHERA-2) starting in 2009 (until 2018) was implemented. Learning from NHERA-1, CHED has made changes in NHERA-2 which improved the accessibility of R&D funding to SUCs.

Most of the R&D expenditure in the Philippines is being spent by private industry, followed by the higher education sector (Figure 13). The R&D expenditure by private industry in 2011 was 61.0% of the total R&D expenditure of the Philippines, while R&D expenditure by higher education was 22.0%. For the past several years, this composition remains the same. Compared to the year 2002, the share of higher education doubled in 2005 and onward. In recent years, HEIs are, in general, more actively committed to R&D activities and are becoming an important player in the country. This improvement

can show that the environment for R&D activities in HEIs has been changed, HEIs became research oriented and faculty are motivated to be involved in R&D.

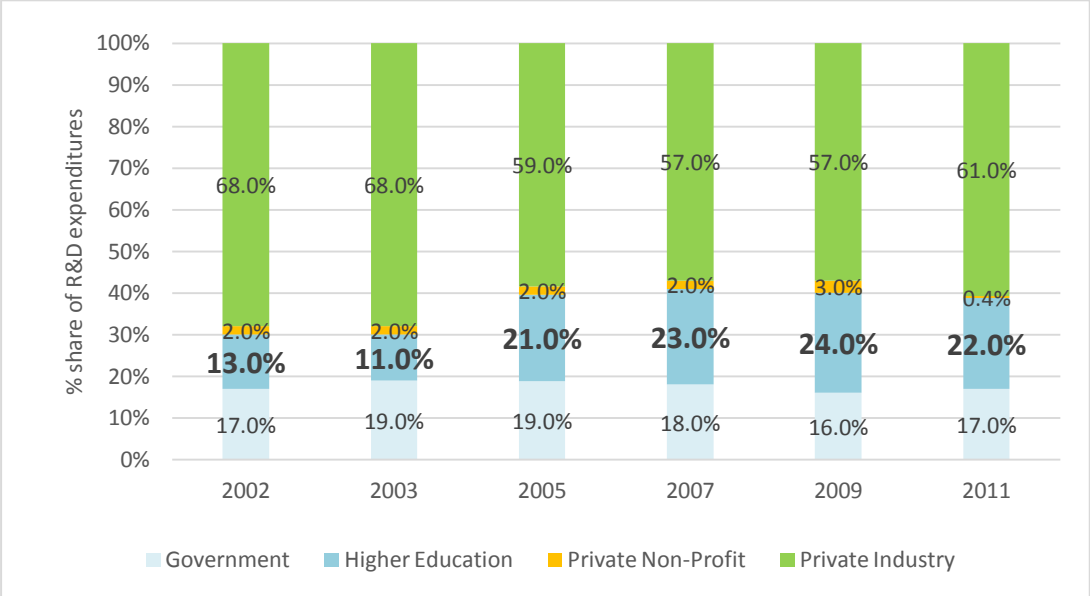


Figure 13 Percentage of R&D Expenditure per Sector

Source: DOST, "Compendium of Science & Technology Statistics", and National Statistical Coordination Board

Comparing to ASEAN countries, Philippines has the least spending on R&D (Figure 14). As early as 2002 and 2006, countries such as Malaysia, Vietnam & Myanmar have overtaken the Philippines in terms of expenditures for their R&D. For the number of R&D personnel, Philippines has one of the lowest number per million population (Figure 15). As early as 2002, Vietnam already overtook Philippines in terms of the number of R&D personnel.

Singapore, Malaysia and Thailand are these ASEAN member states with higher GDP per capita and ratio of R&D expenditure to GDP than the Philippines. R&D is important for upgrading the value of the economy in order to catch up with forerunners. This low rate of R&D expenditure of the Philippines may cause concern for sustainable development of the country in the near future.

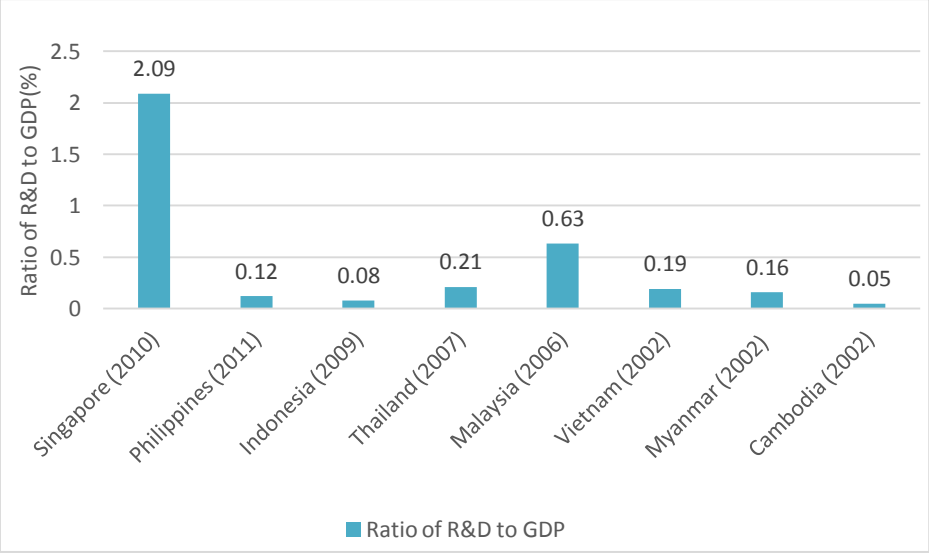


Figure 14 Expenditure on R&D as a % of GDP in selected ASEAN Countries

Source: National Statistical Coordination Board

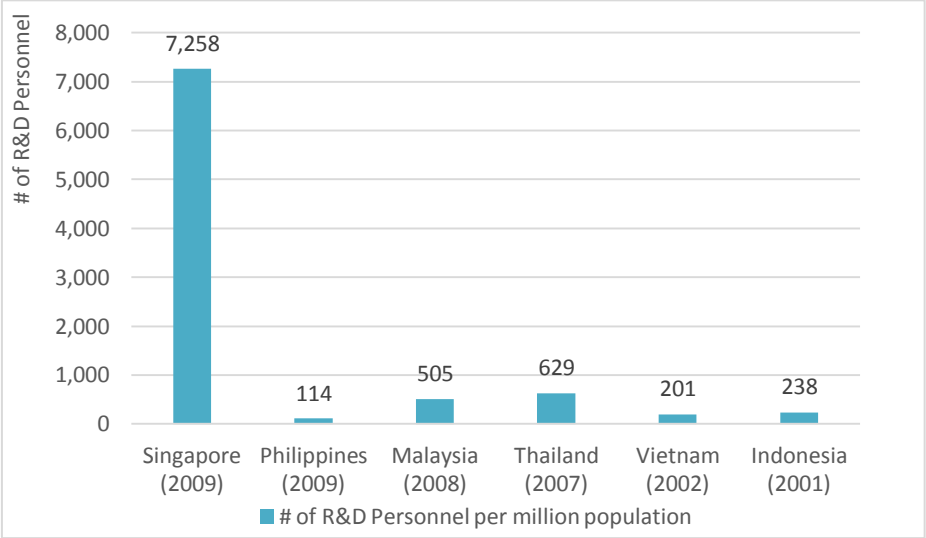


Figure 15 Number of R&D Personnel (Full time) per million population

Source: DOST, "Compendium of Science & Technology Statistics

2.4.2. Financial source of R&D

For the SUCs, there are two types of research and development funds. One is a fund allocated in their budget given by the national government and the other is a fund which they have to submit a proposal to be approved by a funding agency. This section describes the latter.

For R&D of the public HEIs, the government provides the highest funding since 2003 followed by funds generated by the institutions themselves and foreign funding. In general, government funding has been increasing over the years and is the main financial source of R&D for public HEIs. (Figure 16)

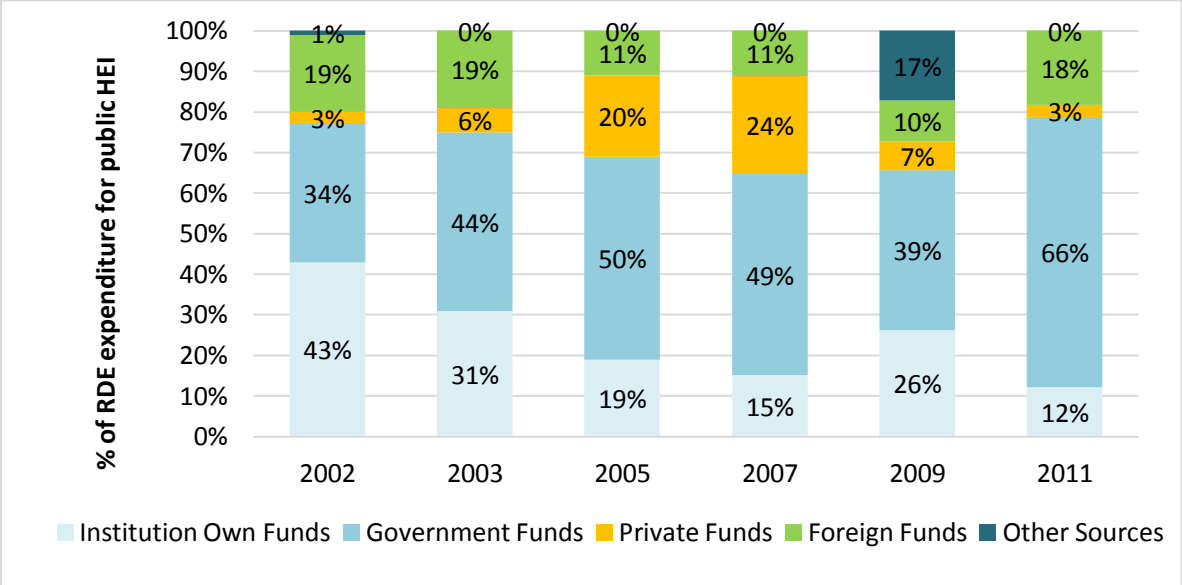


Figure 16 R&D Expenditures by Funding Source for Public HEIs

Source: DOST, "Compendium of Science & Technology Statistics "

Table 12 shows the R&D Budget and Expenditures of Major Government R&D Performing/Funding Agencies in 2014. Total R&D budget among major government agencies is Php 10 billion, and the DOST has the largest budget of Php 4 billion followed by the Department of Agriculture (DA).

Table 12 R&D Budget of Major Government R&D Performing/ Funding Agencies in 2014

Major Government R&D-Performing & Funding Departments	R&D Budget (Php) (2014 GAA)
Department of Science & Technology	4,017,343,586
Department of Agriculture	2,251,546,000
Department of Energy	32,635,000
Department of Health	1,343,670,000
Commission on Higher Education (CHED) Research and Scholarship Project	1,763,000,000
Selected R&D performing SUCs	233,476,000
University of the Philippines System	539,387,000
Total	10,919,363,586

Source: DOST

2.4.3. Major Programs of R&D offered by the Government

Research & Development program of CHED

Research & Development is one of the major functions of HEIs. CHED initiated a project to create a National Higher Education Research Agenda-2 (NHERA-2) 2009-2018 which sets the general policies and direction for the higher education research. Its goal is to produce a globally competitive workforce and develop technology which enhances productivity and quality of life. It shall pursue the following objectives:

- Improving the research capability of HEIs towards international competitiveness
- Enhancing research productivity of HEIs
- Generating new knowledge needed for the advancement of higher education as well as for national development
- Promoting and facilitating dissemination and utilization of research outputs

It took into consideration new challenges and opportunities posed by the rapid developments in ICT, emergence of new fields such as nanotechnology, globalization and knowledge-based economy. The following priority disciplines for research in higher education level for 2009-2018 are listed below:

Table 13 Priority Disciplines stated in NHERA-2

	Priority Disciplines clusters	Priority Themes for Multidisciplinary Research
1	Science and Mathematics	Food Safety and Security
2	Education and Teacher Training	Enhancing indigenous renewable energy in the domestic energy mix
3	Health and Health Profession	Development of vaccines and diagnosis kits using indigenous materials
4	Information and Communication Technology	Disaster Risk Management
5	Engineering, Maritime and Architecture	Pollution Control
6	Agriculture	Climate Change specifically on the issue of global warming

7	Environmental Science	Future ASEAN
8	Humanities	Peace Process and Conflict Resolution
9	Social Sciences	Food Safety and Security
10	Other disciplines as identified by the Commission	

Source: CHED, National Higher Education Research Agenda 2
Note: it has also set the CHED priority research areas in Education, Natural Sciences and Social Sciences

To stimulate the research activities of HEIs and improve the research capability of the HEI faculty, CHED has integrated a grant component which ensure the provision of technical and funding assistance of HEIs. The CHED Research Grants-in-aid is one of NHERA's components in promoting research productivity in the HEIs. The topic of the research proposal must be in line with the priority disciplines listed in NHERA, which was developed through various consultations with DOST, DA and DA-BAR. CHED aligns its priority disciplines with DOST, DA and DA-BAR to prevent any duplication of projects. As part of their general process for research proposal evaluation, they forward the submitted research proposals to DOST for checking.

Table 14 List of Grant Component in NHERA-2

Government Agency	Program	Description
CHED	CHED Research Grant-in-Aid	To stimulate research activities in the HEIs
CHED	Commissioned Research	To stimulate research activities in the HEIs especially those which have a proven track record
CHED	Visiting Research Fellowships	To show recognition to the professors in HEIs across various disciplines for their contribution and output
CHED	Research Professorial Chairs	To show recognition to professors who actively engage in CHED funded-research
CHED	Thesis/Dissertation Grants	To support the faculty members in earning their MA/PhD degrees

Source: CHED, National Higher Education Research Agenda-2

Other Research Initiatives of CHED

To further expand the reach of CHED in developing research capabilities of HEIs, CHED added another component which has established 12 zonal research centers over the Philippines. Based on CMO no. 38 series of 2008, these zonal research centers (ZRCs) were established on HEIs that have met the following criteria:

- Institutional leadership within the zone
- Strong research tradition and track record
- Accredited graduate program
- Centers of Excellence/Centers of Development

These HEIs are tasked to promote research and provide assistance in building research capabilities of the institutions within their zone. They are tasked to formulate a zonal research program which is reflective of the development needs of the zone and medium & long-term plans of the Higher Education sector. ZRCs normally conduct trainings/seminars for capability-building activities and review research proposals.

Through CEB resolution No. 316-2011, to further boost the research capacity and capability of the Philippine higher education, starting 2012, the ZRCs have been transformed into the Philippine Higher Education Research Network (PHERNet) and Higher Education Regional Research Centers

(HERRCs). Currently, there are 9 HEIs identified to be part of PHERNet and 13 HEIs to be part of HERRCs.

Table 15 List of PHERNet and HERRCs HEIs

#	Name of HEI
1	UP System – UP Diliman & UP Los Banos
2	De la Salle University
3	University of Santo Tomas
4	Ateneo de Manila University
5	University of San Carlos
6	MSU – Iligan Institute of Technology
7	Siliman University
8	Central Luzon State University
9	Visayas State University

#	Region	Name of HEI
1	Region I	Mariano Marcos State University
2	Region II	Isabela State University
3	Region III	Angeles University Foundation
4	Region IV-A	Manuel S. Envarge University
5	Region V	Bicol University
6	Region VI	West Visayas State University
7	Region IX	Ateneo de Zamboanga University
8	Region X	Central Mindanao University
9	Region X	Xavier University
10	NCR	UP Manila
11	NCR	Philippine Normal University
12	CAR	Benguet University
13	CAR	St. Louis University

Source: CHED, Commission-en-Banc Resolution No. 316-2011

PHERNet and HERRCs-recognized HEIs have similar roles and functions in terms of forming linkages between HEIs and foreign counterparts abroad and participating in collaborative activities (government-industry-academe). However, HERRC-recognized HEIs are focused on conducting R&D activities in line with their field of excellence and responsiveness to the needs of the region, undertaking research capability building activities and promoting the utilization of output and lastly, facilitating technology transfers from the academe to the industry in their respective region. Meanwhile, PHERNet-recognized HEIs are focused on conducting basic and applied interdisciplinary research in the priority areas identified in NHERA-2 and providing high quality post-graduate education and training environments for researchers. If HEI is recognized to be part of PHERNet or HERRCs, the HEI will receive the following financial support from CHED:

- Php 824,800 for one year subscription of Scopus and Science Direct
- Php 10 million pesos /per year

Research & Development program of other governmental agencies

Enhancing the capability and performance of R&D in the country could be achieved through various programs and initiatives. Government agencies such as DOST & Bureau of Agricultural Research (BAR) under the Department of Agriculture (DA) has offered R&D programs for the developing the R&D capability of an individual and an institution (Table 18).

Table 16 R&D Programs of epartment of Science and Technology and Bureau of Agricultural Research

Government Agency	Sub-Agency	Program	Description
DOST	-	Grants-in-Aid	Providing support to project proposals to utilize and improve the country's scientific and technological capabilities for the sustainable economic development of the country
DOST	Philippine Council for Industry, Energy and Emerging Technology Research and Development	Support for R&D	Providing support for the conduct of R&D projects
DOST	Philippine Council for Industry, Energy and Emerging Technology Research and Development	Human Resource Development (e.g. Faculty Immersion, Scholarships)	Develop and enhance the Filipino R&D capabilities and support to meet the present and future human resource needs in the industry
Department of Agriculture	Bureau of Agricultural Research (BAR)	Competitive Research Grant	Support projects that are in line with the National and Regional Integrated RDE Agenda and Programs and provide funding support to studies that address current needs and problems of the Agriculture and Fisheries sectors
Department of Agriculture	Bureau of Agricultural Research (BAR)	Institutional Development Grant	Enhance the capabilities and improve the quality of research outputs through the provision of state-of-the-art laboratory equipment and facilities within international standards
Department of Agriculture	Bureau of Agricultural Research (BAR)	Human Resource Development Program	Increase the number of post-graduate degree holders for the improvement of efficiency in the conduct of Agriculture and Fisheries research
Department of Agriculture	Bureau of Agricultural Research (BAR)	Scientific Publication Grant	Financial grant to support the publication of books, journals, technical papers etc. in the field of Agriculture and Fisheries

Source: Department of Science and Technology and Bureau of Agricultural Research
Note: Eligibility of Proponent for R&D programs of DOST, BAR are public and private entity.

DOST is one of the key agencies that advocates the development of science-related R&D in the country. Out of the DOST's total (organization's) budget of 12 billion pesos, 4 billion pesos (36%) is allocated to funding R&D projects.[6] It is divided among DOST's sub-agencies: three (3) sectoral planning councils, seven (7) research institutes, eight (8) S&T service institutes, two (2) collegial bodies, sixteen (16) regional offices and 79 provincial S&T centers.

One of DOST's largest R&D funding is in their Grants-In-Aid (GIA) program which aims to utilize and improve the country's scientific and technological capabilities towards the sustainable economic

[6] Estimated amount based on the R&D budget allocation for each DOST sub-agency in the 2014 General Appropriations Act

development of the country.[7] For the year 2014, the GIA program has an allocated budget worth Php 1.9 Billion pesos. 89% (or Php 1.7 billion pesos) has already been allocated to R&D programs in GIA. This budget is directly under the DOST-Central Office, separate from the individual R&D budget of DOST sub-agencies. According to DOST officials interviewed, the R&D funding for GIA is estimated based on the on-going multi-year projects per program, the number of projects that are currently being processed and R&D plans for the succeeding year.[8]

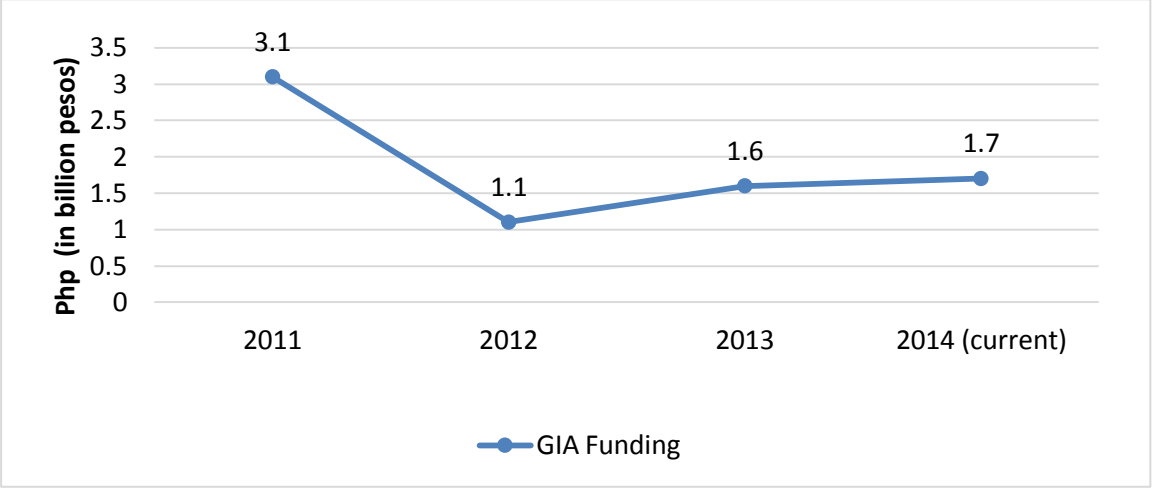


Figure 17 GIA Fund Expenditure from 2011 to 2014

Source: Department of Science and Technology

GIA is open to all individuals, government agencies and private companies who are interested in conducting research & development, human resource development and others for the benefit of the Filipino people.

Other than the GIA, DOST has Joint Research Programs with overseas countries. For example, Japan Society for the Promotion of Science (JSPS), a bilateral exchange program between Japanese and Filipino researchers in accordance with their mutual agreement on international scientific collaboration, initiated in March 1979.

[7] Source: Department of Science and Technology, "AO no. 5 series of 2013"
[8] Source: Interview with DOST

Table 17 List of joint research program

Program	Partnering Agency, budget and project period	Focal discipline
Manila Economic and Cultural Office - Taipei Economic Cultural Office (MECO-TECO)	Ministry of Science and Technology (MOST), Taiwan Php 20 million pesos per year Average five(5) million pesos (maximum) per project Project period: Three(3) years	Genomics, Nanotechnology and Biotechnology in application to Agriculture and Health Omics for Personalized Medicine Volcano, Ocean, Typhoon, and Earthquake Climate Change and Environment Use of Sensors towards Smart Cities (i.e. intelligent transport system, smart buildings, road condition monitoring and digital health for senior citizens)
DOST-JAPAN SOCIETY FOR THE PROMOTION OF SCIENCE (JSPS)	Japan Society for the Promotion of Science (JSPS), Japan ¥ 2.5 million per year(Japan) Php 1.25 million per year(Philippines) Project period: Maximum three(3) years	Alternative Fuel Biotechnology Information and Communication Technology Environment Pharmaceuticals/Medicine
e-ASIA Joint Research Program (e-ASIA JRP)	Japan Science and Technology Agency (JST) (Japan) Ministry of Science and Technology (MOST) (Vietnam) ¥ 36 million in total for each project (Japan) Php 15 million in total for each project(Philippines) Project period: three(3) years	Infectious Diseases Dengue Fever (including early-warning systems thereof) Malaria Influenza Tuberculosis Leptospirosis
SATREPS	Japan Science and Technology Agency (JST) (Japan) ¥ 36 million per year (Japan) ¥ 60 million per year for non-Japanese countries Project period: Five(5) years	Environment and Energy Resolution of global-scale environmental issues Advanced energy systems for low carbon society Bioresources Sustainable utilization of bioresources Disaster Prevention and Mitigation Research on disaster prevention and mitigation measures attuned to the needs of developing countries Infectious Diseases Control Research on measures to address infectious diseases control attuned to the needs of developing countries

Source: DOST, e-ASIA JRP

The DOST-JSPS joint research program is considered to be a competitive program since only one research proposal will be selected per year. The selection procedure is similar to the GIA program with an additional step such as the involvement of JSPS in screening the Japanese researchers, choosing the priority proposal to support for the year and share in covering the expenses.

2.4.4. Procedure of CHED Grants-in-Aid for R&D

Application of R&D for CHED Grants-in-Aid (GIA) is competitive in nature, proposal-based similar to DOST & BAR. Due to limitations on budget, only few proposals, mostly coming from leading SUCs, are usually approved. The topics must generally be in line with the research priority agenda of CHED listed in NHERA-2 as it aims to address the relevant issues and urgent concerns. From application until final approval, the proposal undergoes a rigorous screening process with the involvement of various offices and experts.

Any individual from public & private HEIs may apply as the proponent as long as they are able to meet the necessary requirements and they are endorsed by his/her agency's head. The project is an agency-to-agency partnership between the involved HEIs and CHED.

Last March 2013, CHED implemented CMO no. 3 series of 2015 or known as "Policy Reforms for the grants-in-aid funds of the commission on higher education (CHED) for research, development and extension. Under this reform, CHED directs the research sphere of HEIs into a multidisciplinary approach and develop the young generation of researchers, actualizing the strategic direction stated in NHERA-2.

Table 18 Multidisciplinary and Trans-disciplinary research platforms

#	Research Topic	Goal
1	Food Production and Security	To serve the desired national development goal of increased agricultural productivity as well as the availability and accessibility of safe and nutritious food
2	Environment, Disaster Prevention, Climate Change and Energy	To improve knowledge and understanding of the global environment and climate change and develop appropriate technologies, systems and tools in preparation for natural disaster
3	Terrestrial and Marine Economy: Biodiversity and Conservation	To generate sustainable development strategies for activities based on the use of land and ocean resources
4	Smart Analytics and Engineering Innovations	To harness the potential data in making informed decisions
5	Health Systems	To improve evidence-based knowledge and understand on how to optimize health service delivery using a systems approach
6	Education	To generate innovations in undergraduate education Science, Technology, Engineering, Agriculture-Fisheries and Mathematics (STEAMs

Source: CHED, "Policy Reforms for the Grants-in-Aid funds of the commission on higher education (CHED) for research and development, and extension.

The process starts with a call for proposals by CHED's Office of Planning, Research and Knowledge Management (OPRKM) which will include the following: (a) specific terms of reference, (b) expected deliverables and (c) predetermined measures of performance. The number of call for proposals per year depends on the availability of budget. Last March 2015, the first call for proposals under the new CMO was implemented. During the call for proposals, CHED will conduct an orientation regarding the government standard procedures for CHED specifically on grant administration, procurement, accounting and auditing rules.

Afterwards, proponents are to submit their proposal and necessary requirements to OPRKM. The project timeline should be maximum of two years and the proposed budget should not exceed Php 10 million.

CHED has created a new set of metrics which will be used to assess the proposals. Some of the items are similar to the old requirements such as justifying the feasibility of the working & financial plan, methodology and the capacity of the proponent to carry out work plan. In line with CHED's reform to outcome-based education, HEIs must also include an outcome-based action plan to develop and produce researchers. As much as possible, there should be involvement of doctoral students, Ph.D. candidates or post-doctoral follows since this research projects is also designed as a staging ground in developing a new generation of young faculty researchers. In addition, HEIs should also produce a specified number of published journals in ISI/SCORPUS journals.
CHED explicitly requires them to show proof of counterpart contribution of the HEIs. This could be in the form of academic deloading, use of facilities & equipment or account for part of the research budget needed by the proponent.

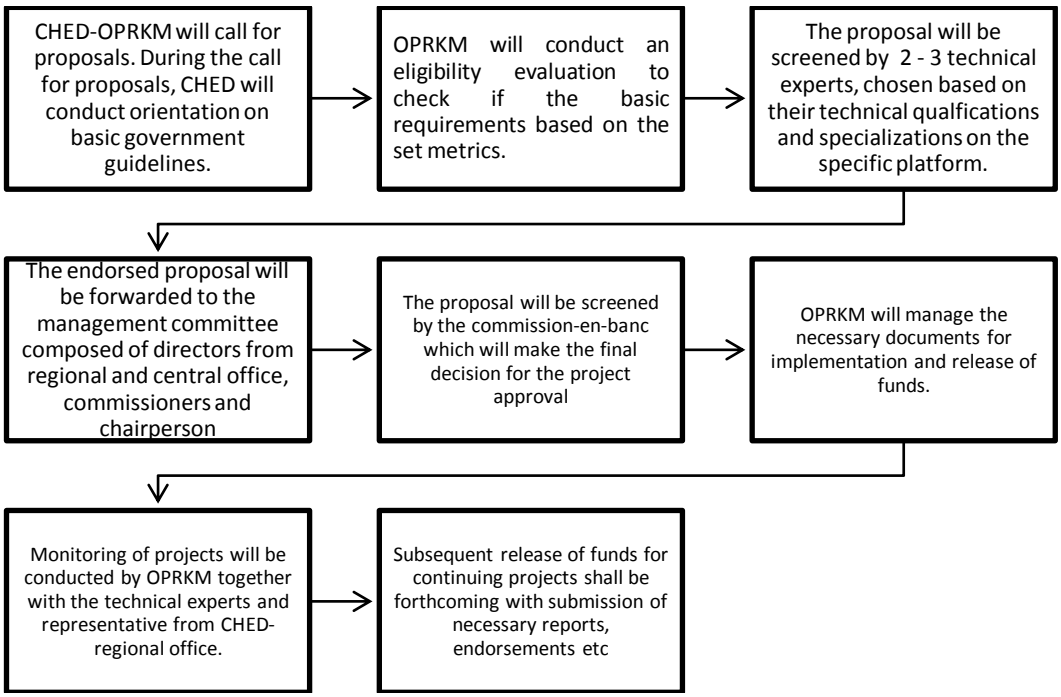


Figure 18 Screening Process of CHED Grants-in-Aid application

Source: Interview with CHED

The recipients of the grants tend to be concentrated on limited number of SUCs, mostly leading SUCs which have means in developing their research capacity and faculty who could write research proposals. Prevailing issues in small SUCs such as overloaded instructional workload, lack of internal funding for research and lack of linkages have hindered the faculty members to conduct research and left their capability to write research proposals underdeveloped. The research GIA are only being granted to same universities, leaving small SUCs behind. To address this issue, CHED such as facilitating workshops on writing grant proposals & journals, project management and creating a registry of HEI scientists and experts.

2.4.5 Procurement of equipment and facility

With regards to the equipment procured for the project, the ownership of said equipment and materials will be placed under funding institution such as DOST.[9] This may be procured through public bidding if the equipment amounts to more than Php500,000, through canvass if less than Php500,000 or depending on the MOA between the DOST and the counterpart private funder, if any. The current issues on procurement for R&D is its process. Issues with funding agencies, such as delays of fund release and long procurement processes are a challenge for the university. It causes

[9] Source: DOST, "AO no. 5 series of 2013"

delays with project implementation and complicates the yearly release of funds. The fund release could be delayed up to 6 months. The government's bidding process for equipment procurement takes, at least 2 to 3 months. It discourages the faculty from engaging in research through external funding. Given the internal funding for research is already limited, the faculty are deterred from pursuing research.

According to discussions with SUCs, existing R&D schemes do not provide funds for facilities required for the study. Some of the focused disciplines such as disaster management though require experimental facilities. A competitive research fund which could also be used for facilities may contribute to promoting R&D in focused disciplines. However, such facilities and equipment may be used continuously over the years, thus requiring maintenance expenses for the long term. A new type of such funds should be carefully designed to include a long term plan and finance towards the maintenance.

2.5. Administration of Higher Education

2.5.1. Government Agencies and Institutions

Since 1994, the education administration of the Philippines adapted a "trifocal" structure. It focuses on basic education, higher education and technical vocational education and training (TVET). Each education level is administrated by the following government agencies. The Department of Education (DepEd) is responsible for basic education, The Commission on Higher Education (CHED) is responsible for higher education, and the Technical Education and Skills Development Authority (TESDA), which is affiliated with the Department of Labor and Employment, is responsible for TVET. The focus area of the government agencies are summarized below.

Table 19 Focus Area of each Education-related Government Agency

Government Agency	Focus Area	Particular
DepEd	Basic Education (Primary and Secondary)	Mainly focused on the provision and development of quality basic education accessible to all.
CHED	Higher Education	Promoting relevant and quality higher education and ensuring such quality education is accessible to all.
TESDA	Technical-Vocational Education	Providing a holistic direction, policies and standards for the technical-vocational education and training system (TVET) for the skills development of the country's human resources

Despite this definition, there does not seem to be a unified roadmap for the education sector generated among the three agencies that direct the actions of the entire education sector[10]. At most, coordination among the three agencies has been on a per-issue basis. Some instances wherein each party coordinates with another are the following:

- CHED, TESDA and DepEd worked together to develop and implement the national qualifications framework for the effective transition of TVET to Higher Education.
- CHED set up the standards of the Teacher Education for DepEd.
- For the ladderized programs of TESDA, CHED is currently undertaking the accreditation of these programs to be recognized as academic units in higher education.

From the next section, the survey focuses on CHED which is governing higher education of the country.

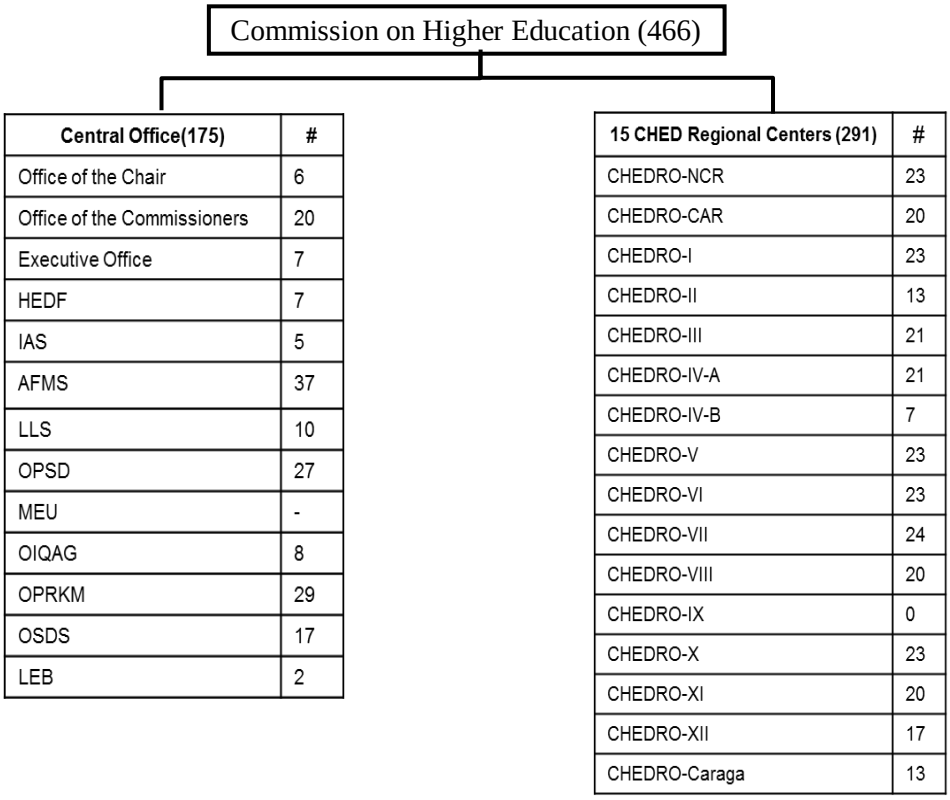
[10] Source: Interview with DepEd

2.5.2. Organizational structure of Commission on Higher Education (CHED)

RA 7722, known as the "Higher Education Act of 1994", led the drive towards development of the higher education in the Philippines and the establishment of the Commission on Higher Education (CHED). CHED serves as the governing body to facilitate, manage and develop the Higher Education sector. CHED is an attached agency to the Office of the President. CHED was originally established as a monitoring agency for degree programs of higher education.[11]

The main mandate of CHED is to promote a relevant and high quality education accessible to all and guarantee the academic freedom for continuing intellectual growth. CHED is tasked to lead the communication with other stakeholders in building the country's human capital and innovation capacity to achieve growth and sustainable development. CHED Memorandum Order (CMO) serves as a medium in delivering policy changes through the higher education system.

CHED is composed of 466 officers and personnel as of October 2014. 175 of its personnel are in the central office wherein the different departments are located. The remaining 291 of its personnel are located in the CHED regional centers. ()



Central Office(175)	#
Office of the Chair	6
Office of the Commissioners	20
Executive Office	7
HEDF	7
IAS	5
AFMS	37
LLS	10
OPSD	27
MEU	-
OIQAG	8
OPRKM	29
OSDS	17
LEB	2

15 CHED Regional Centers (291)	#
CHEDRO-NCR	23
CHEDRO-CAR	20
CHEDRO-I	23
CHEDRO-II	13
CHEDRO-III	21
CHEDRO-IV-A	21
CHEDRO-IV-B	7
CHEDRO-V	23
CHEDRO-VI	23
CHEDRO-VII	24
CHEDRO-VIII	20
CHEDRO-IX	0
CHEDRO-X	23
CHEDRO-XI	20
CHEDRO-XII	17
CHEDRO-Caraga	13

Figure 19 Organizational structure of CHED, with number of employees per group
Source: Commission on Higher Education

The role of the central office is mainly to formulate and recommend development plans, policies, priorities and programs on higher education and research, and to monitor and evaluate the performance of programs and institutions, accredit programs, and recommend the budgets of public institutions of to the Department of Budget and Management (DBM). Central office also identifies and develops potential centers of excellence or centers of development in program areas, and set minimum standards for programs and institutions recommended by panels of experts.

[11] Source: Interview with CHED

The most crucial role of regional offices is to monitor the implementation of policies and programs and to evaluate the performance of higher education institutions. Another important role of regional offices is to collect and analyze information of higher education institutions in the region and relay this information to central office. Since regional office is defined as an empowered frontline unit by central office, it works closely with higher education institutions in the region to assist their development by providing technical assistance and developing training programs.

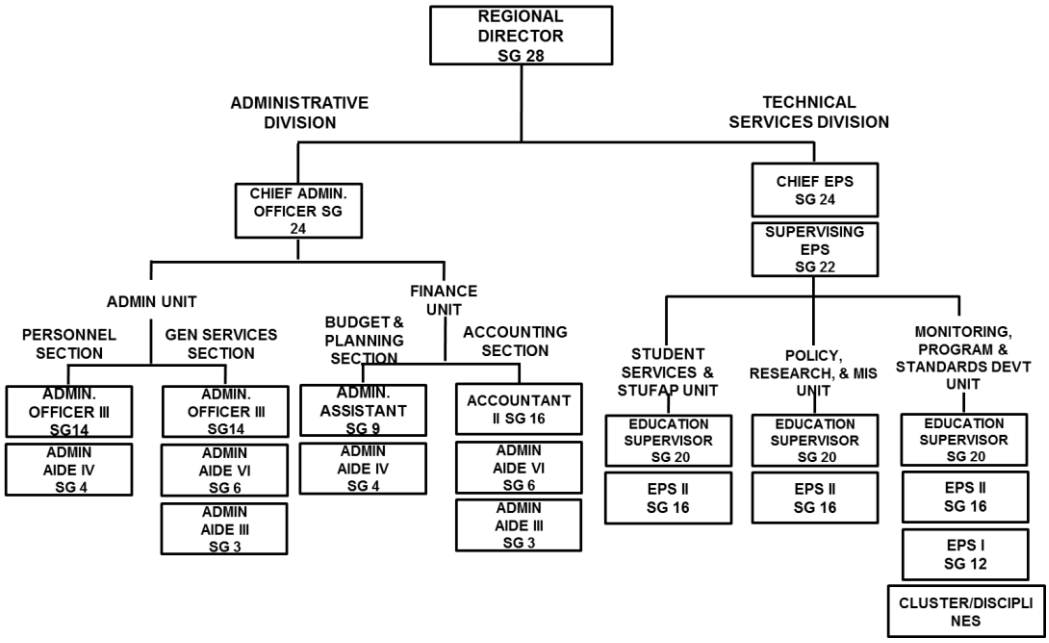


Figure 20 Organizational Structure per Regional Office

Source: Commission on Higher Education

2.5.3. Program Implementation

CHED bases its programs, such as its Strategic Plan mainly on the Philippine Development Plan 2011-2016 (PDP). In consistent with the Strategic Plan, CHED created a Higher Education Reform Agenda (HERA) which outlines reform directions for higher education, and from which a Roadmap for Public Higher Education Reform (Roadmap for PHER) is derived. CHED's Department Performance Targets are adapted from the Strategic Plans and the Roadmap for PHER. The Department's Performance Targets are used as basis for providing employees of CHED with their performance-based bonus. In addition to the Department Performance Targets, CHED commissioner cascades the Chairperson's Priority Commitment, which is a list of programs that are regarded as of utmost importance and are monitored by CHED's Chairperson herself. The Department Performance Targets and the Chairperson's Priority Commitment, in turn, are the basis for work of each of CHED's individual offices. This scheme is illustrated in Figure 21.

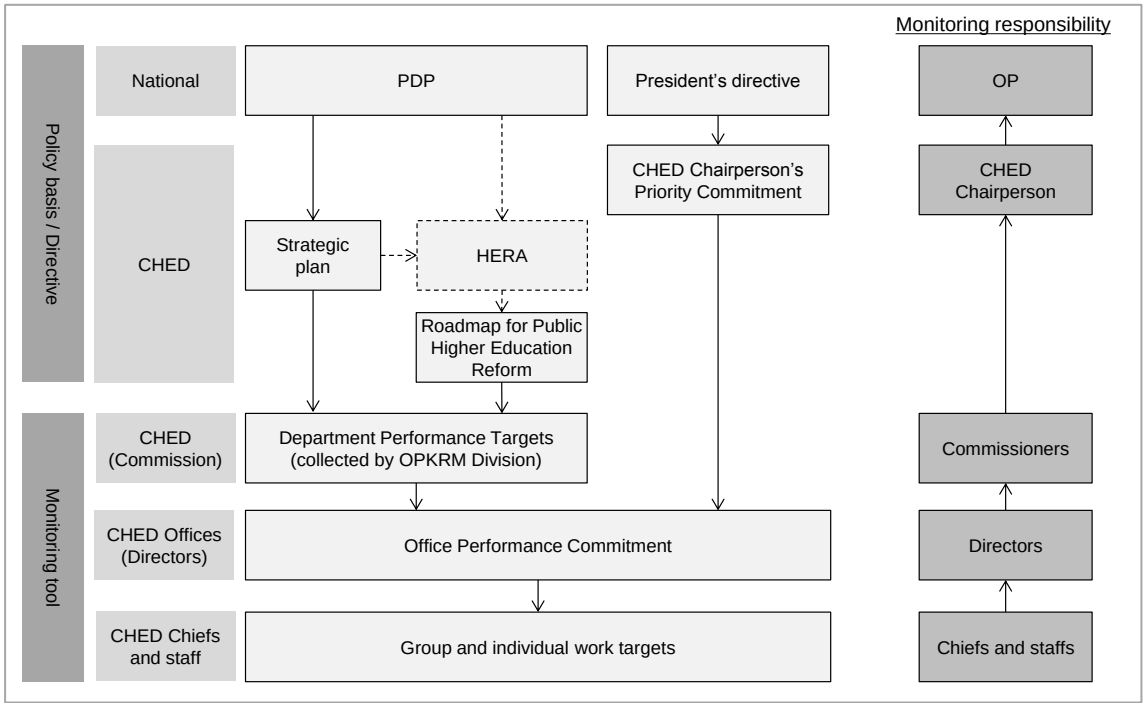


Figure 21 Scheme of cascading policies into program implementation, and corresponding monitoring responsibility

Source: Interviews with CHED

The alignment of policies (i.e., Strategic Plan, Roadmap for PHERA) and CHED's work plan (i.e., Department Performance Targets) are structured in a way that items in the latter are consistent with priorities stated in the policies. However, CHED faces challenges in monitoring the consistency of Department Performance Targets to the Roadmap for PHERA as there is no such group within CHED tasked to check this consistency. This is particularly notable as some revisions are made as years go by, and improvements in management of the Offices require a change of leadership, which more often than not, involves a change in priority activities.

2.5.4. Initiatives and plans of CHED in collaboration with other stakeholders

CHED's previous experience with Official Development Assistance (ODA) has mostly been in the form of grants and, to date, it does not have any record of availing an ODA loan. Recently, they have been active in establishing linkages and collaborations such as international linkages with SUCs.

CHED has noted one project which are currently on-hold and one on-going project. The first is a proposal from USAID. The latter is the government-funded Philippine-California Advance Research Institute Project (PCARI), a 5-year project in partnership with 2 American universities. Through this partnership, CHED, along with government agencies such as DOST and DOH, aims to develop the R&D skills of Filipino researchers and scientists. Last November 2014, DOST and DOH have approved 8 out of 25 project proposals. CHED has been providing assistance to local HEIs in fine tuning and revising its proposals to meet the standards set by DOST. [12]

[12] Source: Interview with CHED

2.6. Budget of Higher Education sector

This section describes the budget for higher education. Government expenditure on higher education, budget of CHED and state universities and colleges are reviewed.

2.6.1. Government expenditure on higher education

The current government's policy direction is to decrease the fiscal deficit and increase the investment for inclusive growth. Education is one of the focused areas of investment. During the past ten years, public expenditure on education has steadily increased. The share of education as a percentage of GDP has also gradually moved from 2.3% in 2005 to 2.8% in 2013. This implies the strong will of the government to improve the education. As for the share of education as a percentage of total public expenditure, it also increased from 13.8% in 2005 to 16.4% in 2013. In 2012, because expenditure on power and energy increased, the share on education decreased by 0.8% points compared to the previous year, though it soon recovered in 2013. (Figure 22)

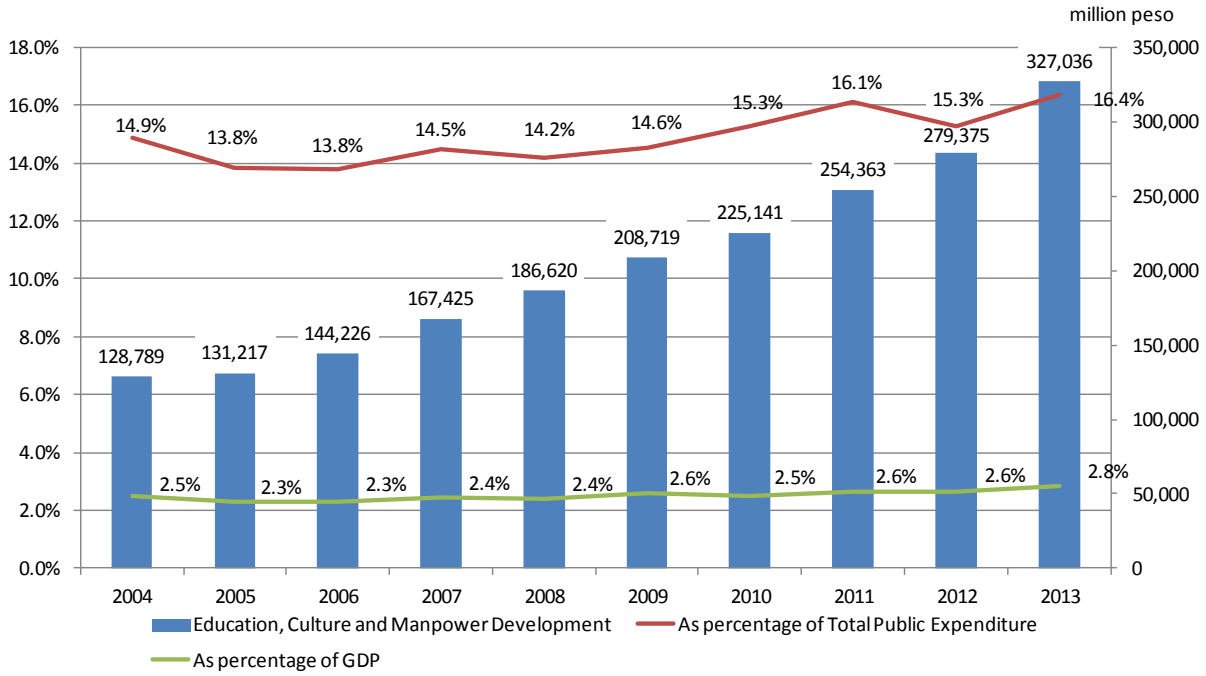


Figure 22 Public Expenditure on Education and its share to GDP and Total Public Expenditure

Source: Department of Budget Management, "Fiscal Statistics Handbook 1984-2013"

Compared to selected ASEAN countries, Philippines has the second lowest government expenditure on higher education sector, just above Myanmar. Philippines, though, is the lowest for public expenditure on higher education as a percentage of total public education expenditure. This also indicates that the allocation of public funds for higher education is low. This is partly due to the fact that a quarter of higher education institutions are private which receive very little financial support from the government[13]. Public expenditure on education is allocated more on basic education.

Table 20 Public Expenditure on Education

[13] According to Adriano A. Arcelo (2003), only 1 % of the total budget of private institutions is the given support from the government.

	Total Public Expenditure on Education		Public Expnediture on higher education as a % of public education expenditure	Public Expenditure on higher education as a % of GDP	Fianncial year ended in
	as a % of GDP	as a % of total government expenditure			
Cambodia	2.6	13.1	14.5	0.38	2010
Indonesia	2.8	15.0	18.9	0.53	2011
Malaysia	5.9	20.9	37.0	2.18	2011
Myanmer	0.8	4.4	19.1	0.15	2011
Philippine	2.7	13.2	12.0	0.32	2009
Singapore	3.1	20.5	35.6	1.10	2011
Thailand	5.8	24.0	13.8	0.80	2011
Viet Nam	6.3	20.9	14.7	0.93	2010

Source: UNESCO Institute for Statistics, "Higher Education in Asia" (2014)

2.6.2. Budget of CHED

In the 2014 General Appropriations Act (GAA), the budget of CHED was 6.94 billion pesos. Over the years, CHED budget has been increasing rapidly due to their increasing expenses on the formulation of higher education plan and provision of assistance, scholarships and grants. (Figure 23)

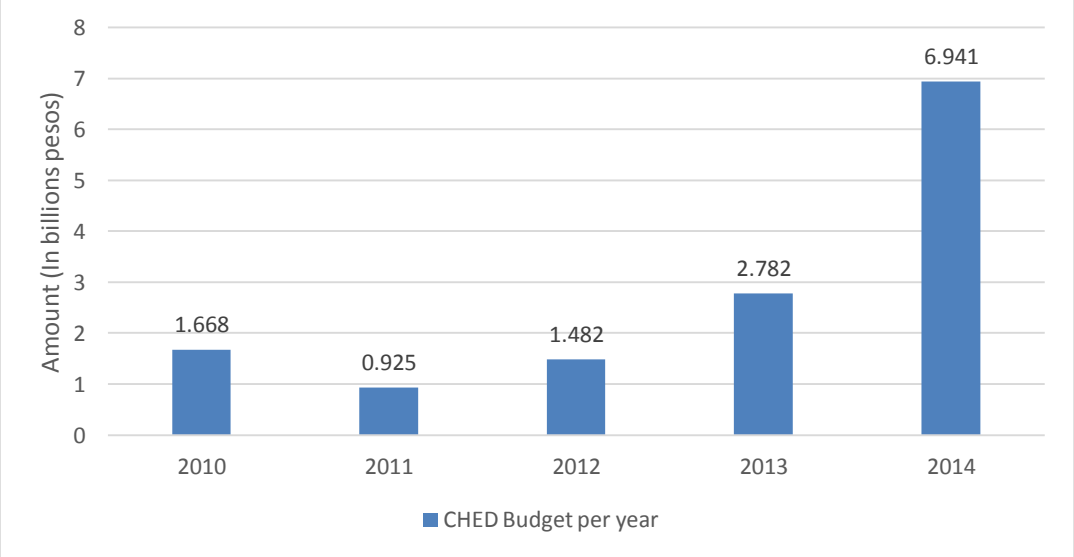


Figure 23 CHED Budget from 2010 to 2014

Source: Department of Budget Management

The budget of the CHED is categorized into four major parts, namely General Administration and Support, Support to Operations, Operations and Projects. Among these categories, Operations account for 73.4% of the budget (5,174 million pesos), followed by Projects (1,767 million, 25.5%). Higher Education Development Services, which is mostly provision of assistance, incentives, scholarships and grants, account for 93.1% (4,743 million pesos) of the Operation budget. In addition to the appropriated funding in the GAA, the requirements for maintenance and other operating expenses and capital outlays of the CHED shall be charged to the Higher Education Development Fund (HEDF). HEDF is a fund dedicated to supporting the strengthening of higher education in the country and is comprised of funds from Government agencies (e.g. Philippine Charity Sweepstakes Office, Philippine Regulation Commission and Philippine Tourism Authority) and donations from private sector sources.

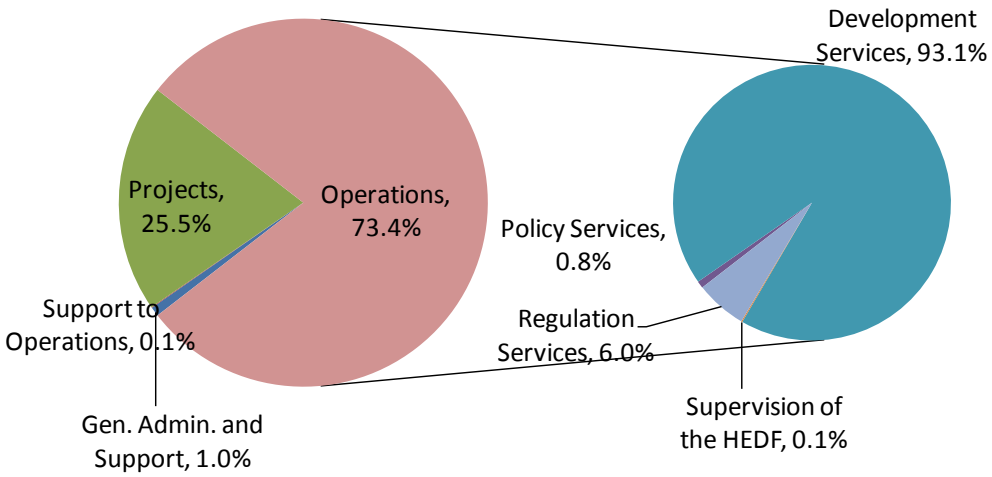


Figure 24 CHED Budget Allocation for 2014

Source: Department of Budget Management, "General Appropriations Act FY 2014"

The second largest allocation of the budget of CHED is "Projects" (25.5%), which is mainly composed of research and scholarship projects and study grants.

The majority of the budget is used for development of higher education including a fund for scholarships to students. On the other hand, budget for improving quality of education is relatively smaller; for example, the budget for the provision of scholarship for faculty members and HDI administrators is 79 million pesos (only 1.1% of the total budget) and a budget for development of strategies and schemes to establish linkages with international institutions for higher learning is 6.8 million pesos, just 0.1% of the total budget.

In addition to the appropriated funding in the GAA, the requirements for maintenance and other operating expenses and capital outlays of the CHED shall be charged to the Higher Education Development Fund (HEDF). HEDF is a fund dedicated to supporting the strengthening of higher education in the country and is comprised of funds from Government agencies (e.g. Philippine Charity Sweepstakes Office, Philippine Regulation Commission and Philippine Tourism Authority) and donations from private sector sources.

Table 21 Budget Breakdown of CHED

Items	Appropriation (peso)	% of total
General Administration and Support		
General management and supervision	72,115,000	1.0%
Support to Operations		
Provision of Legal Services	5,755,000	0.1%
Operations		
Higher Education policy Services	42,080,000	0.6%
Formulation of higher education plan and policies / priorities on research and planning for a systematic documentation, publication and dissemination of information on higher education	20,973,000	0.3%
Development of strategies and schemes to establish linkages with international institutions of higher learning	6,793,000	0.1%
Formulation of policies and guidelines on student affairs and provision of student services	14,314,000	0.2%
Higher Education Development Services	4,743,287,000	68.3%
Provision of assistance, incentives, scholarships and grants	4,663,644,000	67.2%
Provision of scholarship to faculty members and HEI administrators	79,743,000	1.1%
Supervision of the Higher Education Development Fund	6,544,000	0.1%
Management of receipts and payments in relation to the Higher Education Development Fund	6,544,000	0.1%
Higher Education Regulation Services	304,260,000	4.4%
Monitoring and evaluation of performance of higher education programs and institutions and provision of appropriate incentives as well as imposition of sanctions	239,633,000	3.5%
Development of standards for higher education programs and institutions	56,900,000	0.8%
Development of standards for the Expanded Tertiary Education Equivalency Accreditation Program	4,713,000	0.1%
Ladderlized Education Program	3,014,000	0.0%
Sub-total, Operations	5,096,171,000	73.4%
Total Programs and Activities	5,174,041,000	74.5%
Locally-Funded Projects		
Tertiary Education	1,767,000,000	25.5%
Research and Scholarship Project	1,763,000,000	25.4%
Study Grant Program under the Payapa at Masaganang Pamayanan	4,000,000	0.1%
Total Projects	1,767,000,000	25.5%
Total New Appropriations	6,941,041,000	100.0%

Source: Department of Budget Management, “General Appropriations Act FY 2014”

In accordance with the aforementioned RA 7722 (Higher Education Act of 1994), and CMO no. 57 series of 2007, CHED is tasked to supervise the HEDF. The utilization of fund contribution to HEDF in 2013 was an impressive total of 928.7 million pesos. This is a profit of the fund utilized for higher education in addition to the budget of the CHED. (Table 22)

For funding, government-financing institutions such as Philippine Charity Sweepstakes Office are requested by the commission yearly to contribute 3% to 5% of their unimpaired surplus of its immediate preceding year. CHED is required to raise a portion of its funding through private donations, gifts and others. This finance is an autonomous buffer fund that can be availed by the SUCs, private HEIs, government agencies, and NGOs for activities and programs that are in-line with its priority areas.

Table 22 Utilization of Fund Contribution of HEDF (million pesos)

Priority Areas	2009	2010	2011	2012	2013
Institutional Development	234.7	185.7	179.3	119.1	215.7
Research and Development	85.6	73.7	115.6	103.3	115.4
Rationalization of Programs, Standards & Guidelines	95.0	89.4	116.5	114.6	89.5
Scholarship Program	472.4	442.1	454.9	385.4	508.1
Total	887.7	790.9	866.3	722.5	928.7

Source: CHED, "Utilization of Fund Contribution to HEDF by Year as of Dec. 31, 2013"

Its primary objectives are focused on the development of academic programs, support of research, development and extension (RDE), improvement in the quality of higher education through quality assurance systems and improvement of management capacities and information systems (MIS). More than half of contributions were used for Scholarship Program (508.1 million pesos) and about a quarter for Institutional Development (215.7 million pesos).

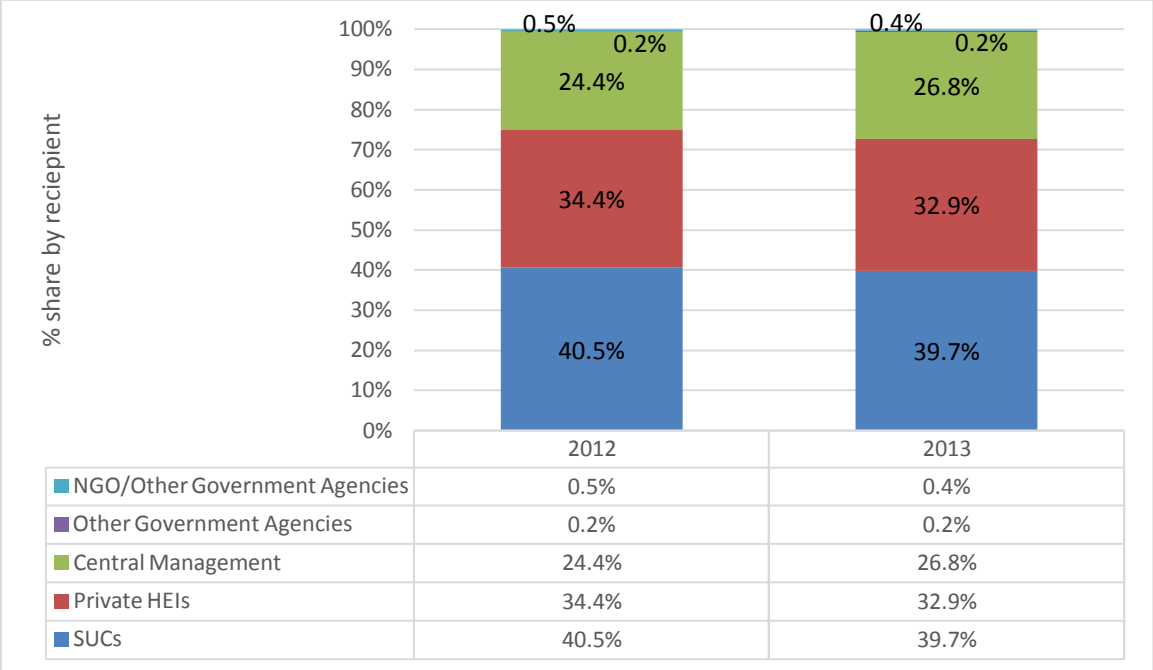
As for the recipients of the fund, SUCs gain the highest share for HEDF in 2012 and 2013 at 40.5% and 39.7%, respectively. The second highest share goes to private HEIs. (Figure 25)

Compared to the appropriated fund of CHED, the fund contributions of HEDF are allocated more in institutional capacity building. However, a large amount of the fund is used for scholarships rather than strategic investment for a long-term quality improvement in education.

Table 23 Utilization of Fund Contribution of HEDF by Programs and Projects

Items	2013	
	Amount	% of total
Institutional Development		
Higher Education Institutions		
Higher Education Institution Developmental Intervention	120,757,906.00	13.0%
Centers of Excellence / Development	27,840,968.00	3.0%
Leadership and Management Program for HEI Administrators	82,867.87	0.0%
Central Management - CHED		
Higher Education Management Information System	39,580,888.93	4.3%
Strengthening International Cooperation	6,029,765.48	0.6%
Other Programs and Project for ICB	21,396,755.53	2.3%
Total - Institutional Capacity Building	215,689,151.81	23.2%
Research and Development		
Research and Development Program National Education Research Agenda		
Research, Manpower and Capacity Building	102,633,238.52	11.1%
Thesis Grant	940,000.00	0.1%
Dissertation Grant	1,210,000.00	0.1%
Support for Paper Presentation in International Conference	4,769,930.68	0.5%
Research Promotions and Awards	236,141.53	0.0%
Journal Accreditation System	4,559,227.34	0.5%
Job Skills Matching Program	563,672.32	0.1%
Other Programs and Projects for Research		
Philippine - California Advanced Research Institutes (PCARI)	511,000.00	0.1%
Total - Research	115,423,210.39	12.4%
Rationalization of Programs, Standards& Guidelines		
Polices, Standards and Guidelines Formulations		
Programs		
Technical Panels	68,238,070.76	7.3%
Autonomous and Deregulated HEIs	158,504.18	0.0%
Enforcement, Monitoring and Evaluation		
Central Monitoring and Evaluation		
Strengthening the Monitoring and Policy Enforcement Functions	3,241,783.46	0.3%
Strengthening of the Higher Education Development Activities		
Taskforce on the Strengthening of the Regulation, Investigation & Enforcement Power of the CHED	4,416,868.98	0.5%
Regional Monitoring and Evaluation	0.00	0.0%
Quality Assurance		
IQUAME	6,639,295.64	0.7%
Accreditation	4,035,734.40	0.4%
Strengthening Student Services	2,425,202.04	0.3%
Other Programs and Projects for RPSG	300,000.00	0.0%
Total - Rationalization of Programs, Standards & Guidelines	89,455,459.46	9.6%
Total - Progams and Projets	420,567,821.66	45.3%
Scholarship Progams	508,085,533.51	54.7%
Grand Total	928,653,355.17	100.0%

Source: Commission on Higher Education, "Transparency Summary of Programs Project Fund Utilization as of Dec. 31 2013"



	2012	2013
NGO/Other Government Agencies	0.5%	0.4%
Other Government Agencies	0.2%	0.2%
Central Management	24.4%	26.8%
Private HEIs	34.4%	32.9%
SUCs	40.5%	39.7%

Figure 25 Breakdown of HEDF utilization by Recipient

Source: Commission on Higher Education

2.6.3. Budget of SUCs

Procedures of budget determination of SUCs under the General Appropriation Act

The Philippine government provides funding for the operation and maintenance of the SUCs. Each SUC budget is listed in the General Appropriation Act (GAA), supervised by the Department of the Budget Management (DBM). SUCs have fiscal autonomy to propose their budget for the year, but it will undergo a screening process through CHED and Congress before being approved. Each SUC budget undergoes a yearly process wherein the SUCs propose their budget to CHED. The budget call by DBM is issued in December. CHED then reviews and defends the budget to the DBM. DBM, in turn, reviews and approves the proposed budget of the SUC.

The SUC budget has been increasing over the years. In 2014, the total SUC budget was Php 35.9 billion, an average of Php 320 million per SUC. Currently, the overall SUC budget in the GAA is composed of 1.6% of the 2014 National Budget. (Figure 26)

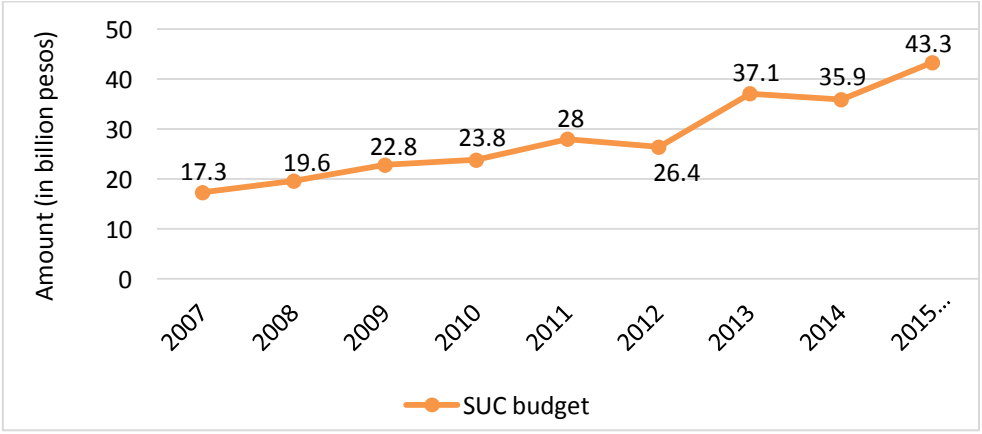


Figure 26 HE Budget Allocation to SUCs

Source: Department of Budget Management

Their budget follows the normative financing scheme wherein the budget-per-student measures the performance of the whole university. This system does not necessarily reflect the financial needs of the disciplines. The science and technology disciplines, in general, need more investments in facilities, equipment and experimental materials.

Out of the total SUC budget from the GAA, the salary of their personnel (64%) has the highest allocation, while capital outlay (11%) has the lowest budget allocation (Figure 27). It is notable that even in Science & Technology (S&T) Universities, capital outlay budgets typically have the lowest allocations. In the GAA, there's an additional separate budget for capital outlay for the SUCs which is directed towards the development and improvement of the science laboratories. This will be discussed later on.

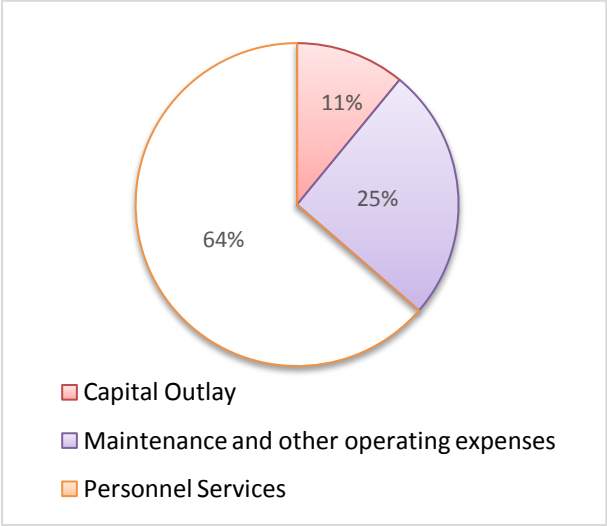


Figure 27 Overall SUC Budget Allocation for 2014

Source: DBM, "General Appropriations Act FY 2014"

Financial source other than GAA

The SUCs also receive additional funding from various government agencies and programs such as the Higher Education Development Fund (HEDF), Miscellaneous Personnel Benefits Fund (MPBF) and Disbursement Acceleration Program (DAP).

Miscellaneous Personnel Benefits Fund (MPBF) and Disbursement Acceleration Program (DAP)
MPBF is a special purpose fund allocated in answering the personnel salary in the public institutions. In 2012, it dispersed Php 2 billion for the personnel services of SUCs.[14]

As for DAP, based on the CMO no. 9 series of 2012, the disbursement acceleration fund worth Php 4.284 million was allocated to some SUCs to support the Reform Agenda for Public Higher Education Allocation of funds will vary per program component. Interested SUCs submit requirements and proposals to be able to access these funds. (Table 30)

[14] Source: DBM, "General Appropriations Act FY 2012"

Table 24 Budget Allocation per Program Proponent

Program Proponent	Amount of Allocated Fund (million pesos)
Institutional Capacity Building of Leading Universities	3,356.6
Infrastructure and Facilities Upgrade	2,631.6
Grants-in-Aid for Research, Development & Extension	560.0
Executive Development	165.0
Institutional Capacity Building for Developing Universities	427.0
Students' Grant-in-Aid Program for Poverty Alleviation	500.0
Grand Total	4,284

Source: Commission on Higher Education, "CMO No. 9 series of 2012"

Tuition Fees

Even though SUCs collect tuition fees from students, the allocation of the budget from the tuition fee is stipulated by a circular. Under the CMO no. 20 series of 2011, it specified the budget allocation for SUCs from the tuition fees collected within the current calendar year. Instruction (50%) has the highest budget share from the tuition fees. (Table 25)

Table 25 Prescribed Budget Allocation in SUCs

Breakdown of Budget Allocation	**% share in Tuition fees**	**Conditions**
Instruction	50%	Fixed at 50% but can be reduced as long as the reduction of budget allocation shall not fall below 7.5%
Faculty and Staff Development	12.5%	
Curriculum Development	12.5%	
Student Development	12.5%	
Facilities Development	12.5%	
Research Services	10%	Fixed at 10% after deducting allowance for college wide common administrative costs.
Extension	10%	Fixed at 10% to ensure delivery of the materials to the community.
Production[15]	10%	Fixed at 10% for the establishment of an income-generating project and ensuring the delivery of the projects implemented. However, this may be reduced provided that the SUC will allocate the portion to other functions
Administrative Services	10%	Fixed at 10% of tuition fees to ensure the effective delivery of general administrative services.
Mandatory Reserve	10%	Fixed at 10% which will be allocated to emergency circumstances beyond the control of the SUC administrators
Grand Total	100%	

Source: Commission on Higher Education, "CMO no. 20 series of 2011"

[15] Production includes the income-generating projects of the SUCs such as crop production, small-scale manufacturing etc.

Development Fees

The development fee is a part of the miscellaneous charge for various development allocations, (e.g., development of facilities, cultural activities, sports programs, and others). Its percentage share on the budget should conform to its specified budget target. Typically, the development fee ranges from Php 400 up to Php 1,000 pesos per semester per enrollee. The development fee makes up 6% to 11% of the tuition fee depending on the course.

There has been an issue with the development fees being charged as a part of the tuition fee in public and private HEIs. The CMO no. 20 series of 2011 provided authority for the SUCs to collect the development fees, but, under the Commission-en-Banc (CEB) resolution No. 221-2012, this practice of charging development fees was abolished, since it does not clearly state its purpose. Given the active implementation of CEB resolution No. 221-2012, any collection of school fees should clearly state its purpose and shall be treated as fiduciary funds.

Although the budget of SUCs from GAA has been increasing rapidly, it is mainly used for personnel services (salary of faculty and administration staff). Among other financial sources, the allocation of budget from the tuition fee is stipulated in detail and development fees were recently abolished. If an SUC wishes to invest more into facilities or equipment, they have to utilize the Disbursement Acceleration Program. In general, SUCs do not have enough latitude for investment other than personnel expenditure.

Oversight of CHED over SUCs' use of budget

While CHED is considered by DBM as the recommendatory body for allocating budgets for each SUC, it does not have power to control how SUCs manage their respective budgets. Moreover, CHED cannot control income generated from non-GAA sources, such as the SUC's own income-generating activities (e.g., rental of equipment, sale of agricultural products, etc.), grants for research and scholarships, and others. CHED, instead, provides guidelines on how SUCs can manage their respective GAA budgets and criteria on how to allocate additional resources. However, this is still subject to SUCs' cooperation. Currently, CHED is in the process of strengthening its influence in managing the movement of higher education reforms with coordination activities in which SUCs express cooperation through MOU or MOAs.

2.7. Policy on Higher Education

The Philippines Government is engaged in various issues on higher education. There are some major reform programs that are being conducted, namely CHED Strategic Plan, Higher Education Reform Agenda (HERA) and K to 12.

To tackle the issues and to upgrade the quality of education, the higher education sector is undergoing major changes, in line with changes being taken in the entire education sector in the Philippines; The implementation of K-12 in basic education and other reform activities are deemed necessary to meet the goals set by the Philippine Development Plan (PDP) 2011-2016. Not only has it undertaken the function of developing human resources to meet the industry and civil society's standards, but it is also gearing towards a technology-driven national competitiveness through the advancement of innovation. This will be the central strategy targeting poverty reduction, enhancement of employment opportunities of the students and rationalization of the Higher Education system.

2.7.1. Strategic plan and Higher Education reform agenda

In line with the Philippines Development Plan 2011-2016, CHED Strategic Plan for 2011-2016 was created. The plan reorients the mission and mandate of the CHED and states the objectives, strategies, and programs and projects.

CHED addresses Strategic Plans 2011-2016 where the overall societal goal is the attainment of inclusive growth and sustainable development, while the higher education sub-sector goals are: the formation of high-level human resource, and generation, adaptation, and transfer of knowledge and technology for national development and global competitiveness. The CHED aimed to achieve the following objectives in those five years:

- Improve the relevance of Higher Education Institutions (HEIs), programs, systems, and research to respond to the thrusts of the Philippine Development Plan (PDP), 2011 – 2016
- Upgrade the quality of higher education institutions, programs and systems in the country towards achieving international standards
- Broaden access to quality higher education for those who seek it
- Efficiently and effectively manage the higher education system
- Ensure transparency and integrity in its programs and activities as its commitment to moral ascendancy
- Strengthen the Commission on Higher Education and other major stakeholders

The CHED Strategic Plans 2011-2016 enumerates the projects and programs for the development of higher education which target rationalizing the Higher Education system, improve the quality and standards of higher education and enhance the access to higher quality of education especially to the lower income and disadvantaged groups.

The plan covers almost all the important issues related to higher education. Programs, activities and some selected projects of the plan are shown below. (Table 32)

The plan is comprehensive rather than focused, since various issues related to higher education are identified to achieve the Philippines Development Plan 2011-2016 and the CHED is expected to take countermeasures to meet them. The important point of the plan is that it reorients the vision and mandate of the CHED. When established, the main role of the CHED was monitoring and supervising higher education. However, to address the issues, a more strategic approach and authority for governing HEIs is needed. For example, amalgamation of HEIs is one of the key issues since unregulated rapid expansion of campuses of SUCs is now causing a concern for the deterioration of the quality of education.

Table 26 Programs, Activities and Selected Projects of CHED Strategic Plan for 2011-2016

Rationalization of HEIs and Programs			
	Aligning HEI programs with national developmentgoals		
	Typology and Mapping of HEIs and Programs		
	Amalgamation of HEIs and Programs		
Quality and Standards			
	Quality Assurance Projects		
	Quality Improvement Projects		
		Faculty Development Program	
		HEI Management Development Program	
		Establishment of Research & Development (R&D) Centers	
		Centers of Excellence (COEs)/Centers of Development (CODs)	
		Contributions to K-12	
	Participation in International and Regional Networking		
Access to Quality Higher Education			
	Student Financial and Assistance Programs (STUFAPs)		
	Promoting Alternative Learning System (ALS)		
		Ladderized Education Program (LEP)	
Transparent, Morally Ascendant and Efficient and Effective Management System			
	Governance Reforms in SUCs		
	Simplification of Frontline Services through IT Systems		
	Tibay Edukasyon		
Organizational Development			
	CHED Human Resource Development		
	Rationalization, Modernization and Upgrading of Physical Plant		

Source: CHED Strategic Plan for 2011-2016

2.7.2. Higher Education Reform Agenda (HERA)

The Higher Education Reform Agenda (HERA) was developed by CHED to reform weaknesses of the Philippine Higher Education and to align the entire Higher Education system to an advanced accountability of outcome and impacts.

The CHED has identified three fundamental and long-running weaknesses of Philippine Higher Education[16]. These three weaknesses are as follows:

- Lack of overall vision, framework or plan for higher education
- Deteriorating quality of higher education
- Limited access to quality higher education by those who need it most and who have the potential to maximize its benefits

As mentioned above, the main mandate of the CHED was previously to monitor and supervise higher education. Therefore, an overall vision, framework and plan for higher education were clearly lacking.

[16] Source: Roadmap for Public Higher Education Reform, CHED

The HERA provides the following strategic directions in developing the higher education sector:

- Restructuring Higher Education Institutions by amalgamation among regional systems and specified institutions
- Developing and implementing a typology of HEIs and an incentives scheme to support quality assurance
- Rationalizing programs through moratorium/phase-out of oversubscribed, inefficient, duplicative programs and channeling more support of priority programs
- Leveling the playing field in higher education through harmonization between public and private HEIs
- Institutionalizing and strengthening partnerships with Basic Education
- Reviewing organizational structures and rationalizing resources for higher education
- Strengthening quality assurance
- Upgrading qualifications of faculty
- Achieving excellence and global competitiveness
- Enhancing institutional governance through an executive development program
- Strengthening student financial assistance programs
- Optimizing roles in poverty alleviation and social development

CHED focused on reforming the Public Higher Education sector, and prepared a Roadmap for Public Higher Education Reform, which outlines action plans and targets from 2011 to 2016 that conform to HERA's strategic directions. The HERA is divided into 3 objectives and 1 cross cutting program:

- Objective A: Rationalizing of Public Higher Education (PHE) system
- Objective B: Upgrading quality of Public Higher Education
- Objective C: Enhancing access to quality higher education
- Cross cutting program: Executive Development Program

The first three programs will be tackled in the next few paragraphs based on CHED's monitoring of Department Performance Targets submitted annually to DBM. The said Department Performance Targets include items that correspond to CHED's Strategic Plan. However, it does not contain all of the items in the Roadmap and so, the Roadmap is monitored, at most, in a partial manner. Some of the set targets in the roadmap are no longer being monitored since these may have been achieved already during the previous administration or identified to be irrelevant as a performance indicator. The program for executive development program will not be thoroughly discussed due to lack of updates.

Table. Brief summary of updates of the targets in Roadmap for Public Education Reform

Objective A. Rationalizing of Public Higher Education (PHE) System	· Mapping of programs and institution has been finalized in 2011 and yearly updated which will help identify the duplication of programs among institutions. · There has been minimal progress in establishing regional university system and pilot-testing for specialized universities due to lack of cooperation of SUCs and political intervention. · Despite the current 10 state colleges are currently being evaluated for compliance to be converted into state universities · Digitalization and automation of SUC operations was also taken as an initiative, but this is not being adapted yet by SUCs with the exemption of the online submission of budget system implemented by DBM.
Objective B. Upgrading Quality of Public Higher Education	· Currently, the SUC leveling is being revised to fit the reform of CHED. The instrument for measuring and defining institutions has not been completed and is still being made in consultation with the Department of Budget and Management (DBM).

	· CHED is also currently revising the traditional curriculum into an outcome-based education (OBE). · Normative funding formula is in effective and yearly adjusted · 661 (81%) out of 825 sub-standard programs has been successfully closed. · 2,472(99%) faculty scholars and continuing professional educational beneficiaries have been supported by the faculty development program of CHED. · 16 RDE centers and 112(93%) COE/COD programs in HEIs were supported by CHED in 2014. · CHED has encouraged SUCs to submit business plans for income generating activities, but all of the submitted business plans were not approved due to lack of relevance of content
Objective C. Enhancing Access to Quality Higher Education	· CHED has assisted 112 SUCs in modernizing its facilities and allocated Php3.9 billion pesos for the capital outlay of SUCs last 2014. They proposed to increase it further to Php8.25 billion in 2015. · CHED offers merit scholarships, grants-in-aid and student loans which were accessed by more than 400,000 beneficiaries as of 2013.
Cross Cutting. Executive Development Program	· As of FY 2014, only 1,725 (68%) out of 2,550 SUC managers were trained. · The Higher Education Academy has not been established yet.

Source: CHED Department Performance Targets Accomplishment Report, 2012, 2013 and 2014; CHED Chairperson's Budget Presentation to Congress for 2015 Proposed Budget; Interviews with CHED's Office of Planning and Knowledge and Resource Management, Office of Programs and Standards, Office of Institutional Quality Assurance and Governance

Objective A: Rationalizing of Public Higher Education (PHE) System

CHED targets to have an efficient system in delivering high quality of public higher education. Eventually, rationalization of SUCs and LUCs would lead to amalgamation. Initiatives set in the roadmap were directed through restructuring the public higher education system to streamline better the allocation of resources and prevent duplication of programs.

One of their initiative is through mapping of programs and institution to be able to identify the areas which are still underserved or may have duplication of programs etc. CHED was able complete and finalize a GIS-based map updated yearly. Along with it, 525 new programs (100%) were mapped which will later be assessed to identify the possible duplication of program. However, their other initiatives was not able to progress such as the establishment of regional university system or progressed too slowly such as pilot testing of specialized universities and creation of blueprint for Public Higher Education System. Lack of cooperation of SUCs to amalgamate and political intervention were seen to be the major reasons for its slow progress.

Harmonization of programs standards and complementation is one of the required outcome to reach amalgamation and meet the needs of the country & industry. With that, CHED has been active in updating their instruments in leveling and changing their curriculums to typology-based or outcome-based. CHED will be harmonizing the criteria of horizontal typology classification with SUC leveling criteria after it has been reviewed. This will provide a more accurate output in evaluating the capacity of SUCs. Currently, CHED is evaluating 10 state colleges for compliance to requirements of conversion into a state university. Meanwhile, being responsive to the needs of the industry, CHED has developed 7 programs in the priority disciplines which will hopefully entail job generation and economic development.

Due to the limited resources, good utilization and management of resources is a vital aspect to efficiently rationalize the public higher education system. CHED has accomplished in reviewing and

revising the Normative Funding Formula used to determine a small percentage of the allocation of SUC budget, which promote and reward delivery of quality higher education. CHED makes into a point that it's being updated on a yearly basis to make adjustments of formula elements. Digitalization and automation of SUC operations is also one of CHED's initiatives, but this is not being used yet by SUCs, only DBM has implemented it in its operations for online submission of budget.

Aside from the resources provided by the government, CHED also include in its initiatives to develop the SUCs to be more independent in generating their resources. One initiative is to design and adapt a socialized tuition fee scheme wherein the financially capable families will pay higher than those who are from the poorer families. It is initially planned to be pilot tested first by 10 SUCs. Currently, it's under study phase. The names of the participating SUCs have not been decided yet. Another initiative is for SUCs to generate their own business plans in utilizing their resources for income generating activities. So far, 10 SUCs have submitted proposals but were not approved due to lack of relevance of its contents.

Objective B: Upgrading Quality of Public Higher Education

CHED sought to strengthen the quality assurance of its programs to be able to deliver a good quality of public education. It has been aggressive for the past few years to implement its initiatives and meet its set targets. Elements needed in upgrading the quality of education requires setting the right standards, improving the current capability of HEIs to deliver education and its faculty as well and encourage knowledge-generating activities to further expand it into advancement.

Last 2012, CHED took its first step when they implemented CMO no. 46 series of 2012 or "Policy-standard to enhance quality assurance (QA) in Philippine Higher Education through an outcomes-based and typology-based QA", a policy which aims to enhance the quality assurance of higher education in the Philippines. It has led to a major shift to a more outcome-based education which required them to review and review the curricula, policies, standards and guidelines of programs. Currently, the SUC leveling is being revised to fit the reform of CHED. The instrument for measuring and defining institutions has not been completed and is still being made in consultation with the Department of Budget and Management (DBM).

To strengthen the quality assurance in SUCs and LUCs, CHED has been conducting strict monitoring and evaluation of its programs. CHED has been aggressive as well in closing down the sub-standard and phased-out programs which no longer meet the standards set of CHED even if met with resistance from the HEIs. It has led to close 661 (81%) out of targeted 826 sub-standard programs as of FY 2014.

CHED shows recognition to the capability or potential of the HEI in delivering high quality of undergraduate and graduate education and conducting research to promote the leading SUCs in meeting the international standards. CHED awarded HEIs with COE/CODs which have programs known to serve as models for specific disciplines for its good curriculum & advanced research and resource centers to other HEIs. Currently, CHED has awarded 112 COE/CODs to various HEIs.

CHED also allocated funding to upgrade science laboratories, R&D facilities and equipment. Furthermore, CHED also show recognition to local institutions who are productive in publishing or patenting its R&D outputs. CHED provides funding in establishing R&D centers with state of the art facilities to further encourage them to produce more R&D outputs. They're currently supporting 16 RDE centers, meeting the targeted goal of 15 RDE centers before 2016.

Faculty development program is also one of the major undertakings of CHED to upgrade quality of public higher education and upgrade the academic qualification of the faculty members. In just a matter of 5 years, CHED was able to support 2,472 (99%) out of 2,500 faculty scholars and continuing professional educational beneficiaries that it has targeted to meet by 2016.

Objective C: Enhancing Access to Quality Higher Education

CHED would like to enhance the access of quality higher education especially those students coming from poor families. CHED sees fit to enhance it by focusing on two items: (1) modernize the facilities of developing SUCs and (2) strengthen the student financial programs.

Improvement of facilities were highly prioritized as this will improve their capacity to deliver its priority programs. As of FY 2014, CHED has generally assisted 112 SUCs in modernizing facilities and resources of SUCs with the program budget amounting to Php 3.9 billion. They target to increase it further to Php 8.25 billion in 2015.

Assistance for students especially for students identified to be part of the poorest of the poor is one of the largest projects in terms of the budget of higher education policy. CHED offers different forms of student financial assistance programs such as merit0based scholarships, grants-in-aid, students' Grants-in-Aid program for poverty alleviation and student loans, increasing accessibility to public higher education. Currently, there are more than 400,000 beneficiaries (Table 27)

Table 27 List of Assistance being offered for Students

Program	Particular	Amount
Study Grant Program for Solo Parents and their dependents	This grant is intended for the all the solo parents and their children.	Php 6,000/sem
DND-CHED-PASUC study grant program	This grant is intended for the dependants of killed-in-action, battle related, Complete Disability Discharged (CDD-Combat) and active military personnel of the Armed Forces of the Philippines	Php 5,000/sem
OPAPP-CHED study grant program for rebel returnees	This grant is intended for former rebels and their legitimate dependents, broadening access to opportunities such as college education	Php 5,000/sem
CHED special study grant program for congressional district/senate	This grant is intended for the constituents of senators, party-list representatives and congressmen.	Not specified
Study Now, Pay Later Plan	This student loan program expands access to college education for poor but deserving students in the form of an education loan.	Php 7,500/sem

Source: Commission on Higher Education

Cross Cutting: Executive Development Program

As of FY 2014, CHED trained 1,725 (68%) out of 2,550 SUC. However, the contents of the training or details were not available based on the documents provided by CHED. The detail of the Higher Education Academy that is one of the target is also not clearly stated.

Challenges that CHED's offices face in implementing the HERA are those that involve, political pressure, lack of cooperation on the part of SUCs and poor SUC management

Lack of cooperation from SUCs is notably challenging in the HERA's first strategic direction, which involves restructuring HEIs at a regional level, where the main thrust is regional amalgamation of SUCs. According to CHED, SUCs will usually not concede to effects of amalgamation, such as limitation in budget and reduced range of program offerings, especially if the SUC is not assigned as the lead university in a particular region. Lack of cooperation is also manifested in more minor things, such as, among others, non-submission of accurate and timely data to CHED, minimizing the offering of popular courses instead of focusing on nationally-defined priority courses, and allowing faculty members to overload on instruction instead of encouraging involvement in more research.

Poor SUC management is one challenge that SUC faces in terms of managing its programs and planning provided that the proposals submitted of the SUCs for business plans of income-generating projects were all not approved. This hinders SUCs to implement the identified priority programs based on standards set by CHED and building the capability to deliver high quality of higher education. Even if CHED will be successful in meeting the target goals, the accomplishments achieved by CHED will only be temporary.

Overall, CHED has been aggressively achieving their set targets since the implementation of the Roadmap, but some items remain to have a minimal progress due to lack of cooperation of SUCs, poor SUC management and political pressure. The support needed in some of their initiatives is to develop the capacity of SUCs in maximizing its resources and come up with income-generating activities. Strengthening the SUC management, with the help of CHED, will establish strong ties between institutions and develop the SUC to meet the standards set of CHED, which will greatly contribute to the progress of CHED in their set targets.

2.7.3. Other Programs and Projects

National Higher Education Research Agenda (NHERA)
As one of the mandates of CHED to promote and support the HEIs in their research and instruction functions, the National Higher Education Research Agenda (NHERA) aims for the enhancement of the Philippine Higher Education research through partnership and collaborations with HEIs and other institutions. NHERA guides higher education research, presents strategies and initiatives to develop research and enhance research productivity in Higher Education Institutions, and identifies priority areas for research and research-related programs.

Roadmap for Public Higher Education Reform
The Roadmap for Public Higher Education Reform, along with an action plan, serves as a guide in reforming the public HEIs as these serve as public investment in providing relevant and quality higher education to all and develop the human resources needed by the industry. A public higher education framework has been outlined focusing on the rationalization of the Philippine public higher education system, improving the its quality and standards and enhancing the access to it.

2.7.4. Implementation of K-12

K-to-12 Education
The present action of the administration in fully implementing the K-12 program has led a major shift in the HE sector. Two years shall be added onto basic education, and these years contain educational content present in General Education (GE) subjects that are within the curriculum of higher education. Thus, GE subjects in higher education will need to be reconfigured. Currently, DepEd, TESDA and CHED are working together in ensuring the successful adoption of the K-to-12 Education Program in the Philippine Education Sector.[17]

The GE curriculum contains the basic subjects that all undergraduates must take regardless of their courses. The curriculum focuses on the development of the basic intellectual competencies and civic capacities of the students, resulting in a more broad-ranging understanding in of various disciplines. With the implementation of the K-to-12 Education Program, this will provide an opening for the revision of the GE curriculum in the HE sector based on college readiness standards.

Revision of the GE curriculum will lead to a decrease in the number of HE years that students must take. Only 36 units of GE curriculum from the present 63 or 51 units of GE in the HE will remain

[17] Source: Interview with CHED

after implementation[18]. CMO No. 20 series of 2013 provides the rationale of the GE curriculum and in-depth discussion of its undergoing changes.

Table 28 Proposed revision of the number of HE years

Courses	Current number of years	Proposed by CHED
General Courses	4	3
Engineering Technical Programs	5	4

Source: Interview with CHED

Based on the CMO no. 20 series of 2013, the senior high school curriculum is partially based on the college readiness standards. With the senior high school curriculum, some parts of the present GE curriculum will be considered irrelevant and may lead to another revision of the GE curriculum. Currently, the core curriculum consists of English, Filipino, literature, communication, mathematics, natural science, social science and philosophy (Table 29). Three tracks will be added that are intended to prepare the students for work or college. The three tracks that students could choose from are the following:

- Technical-Vocational-Livelihood
- Academic
- Humanities, Education and Social Sciences (HEISS)
- Science, Technology, Engineering and Math (STEM)
- Business, Accountancy, and Management (BAM)
- Sports and Arts

Table 29 Senior High School Curriculum Academic Track*

Subject		Grade 11		Grade 12		Total Hours
		1st sem	2nd sem	1st sem	2nd sem	
Core Curriculum	English	54	54			108
	Filipino	54	54			108
	21st Century Regional Phil. Literature			54		
	21st World Literature				54	
	Media and Information Literacy			54		
	Math	54	54			
	Philosophy of the Human Person				54	
	Life/Physical Sciences	54	54			
	Contemporary Issues	54	54			
Tracks	Strands	108	108	270	270	756
Total Hours		378	378	378	378	1,512
Hours/Day		4.2	4.2	4.2	4.2	

Source: CMO No. 20 series of 2013
**Note*: Approved by DepEd and CHED on 5 December 2012

CHED has a proposed GE Curriculum for the Higher Education sector that will be adopted by HEIs by the AY 2018-2019 (Table 30). SUC faculty members are currently undergoing training enable these changes by 2018. However, even with the current implementation schemes, SUCs still have some underlying issues that need to be addressed, such as the displacement of GE Faculty in HEIs, the

[18] Source: Interview with DepEd.

revision of the curriculum and configuration of supporting facilities, management and organizational structures

Table 30 Proposed General Education curriculum for HEIs

Proposed General Education Curriculum (AY 2018-2019)	
Core Subjects	**Units**
Understanding Oneself	3
Readings in Philippine History	3
The Contemporary World	3
Mathematics in the Modern World	3
Purposive Communication	3
Art Appreciation	3
Science, Technology & Society	3
Ethics	3
Mandatory Subjects	
Life and Works of Rizal	3
Electives	
Mathematics, Science & Technology	3
Social Sciences and Philosophy	3
Arts and Humanities	3
Grand Total	36

Source: Commission on Higher Education

The implementation of the K-12 Program displaces the General Education (GE) faculty in the Higher Education (HE) sector. Although they will be transferred to basic education level, the GE faculty has raised concerns regarding this shift, such as differences in salary between HE and Basic Education, licensure requirement to teach in secondary level, and others.

2.8. Analytical Summary

Number of Higher Education Institutions and Enrolments

In recent years, the number of HEIs has rapidly increased. In the case of public SUCs, the number of main campuses remains the same whilst satellite campuses are sharply escalating. Setting up a satellite campus is relatively easier than a main campus and it is difficult for the Government to regulate this expansion. It is necessary to respond to the increasing needs of people for higher education, however, maintaining the quality of education is of equal importance.

HEIs are located throughout the country to offer better access to higher education to people in local areas. On the other hand, job opportunities for HE graduates tend to be concentrated in large cities. Networking of local HEIs and industry in large cities will be needed for more successful matching of jobs.

Even though the number of HEIs and enrolments has been rapidly increasing in the Philippines, the gross enrolment rate is still low compared with other ASEAN member states. Expansion of higher education without deterioration of the quality of education will be continuously needed.

The trend in the number of enrollments by discipline reflects the job opportunities either inside or outside the country. It is important for HEIs to adjust to these changes.

Quality of Higher Education

The qualification of faculty members is improving but still the rate of graduate degree holders is low. Even though the minimum requirement for a faculty member is a graduate degree, it is difficult to recruit and retain degree holders when the number of HEIs and enrollees are increasing rapidly.

The completion rate of students is gradually rising, but the passing rates of licensure examination for some disciplines remain low. This implies that the curriculum may not fit industrial needs.

Among SUCs, while the University of the Philippines gains a global reputation for high quality of education, others fall far behind.

Research and Development

Expenditure on Research and Development has been increasing in the Philippines, but the growth rate is lower than that of GDP of the country. It is also lower than other ASEAN member states.

Industry is still the main player of R&D activities followed by HEIs, which are the second largest player accounting for more than 20% of total R&D expenditure. HEIs' R&D is funded mainly from the government's appropriations. Government agencies such as DOST, DA-BAR and CHED are also major funding agencies of the R&D projects in HEIs.

R&D funds provided by DOST, DA-BAR and CHED are usually gained through a competitive screening process wherein a proponent has to submit a proposal to receive the fund. Only few proposals, usually the most relevant and feasible proposals, are awarded with funds. However, the main issue for SUCs is that many faculty members who are not accustomed to write such proposals. It will be discussed in Chapter 3.

Administration, budget and policy of higher education

Expenditure on education is growing in the Philippines, but it is still low compared with other ASEAN member states. The budget of CHED grew considerably in recent years. Among detailed items of the budget, the component of scholarship is large. The budget under GAA is determined in Congress, so it can be a dole-out type of finance allocation.

For the budget of SUCs, a large portion under the GAA is used for the personnel cost. As for infrastructure improvement, they are utilizing other financial sources such as Disbursement Acceleration Fund.

Current policies on higher education have been designed to be implemented from 2011 to 2016. Major focuses of these policies are about improving the quality and access to higher education. The CHED is mandated to direct the Higher Education Institutions, in turn addressing the issues of the sector.

3. Perception and Needs on Higher Education from Industry

To pursue outcome-based education, it is important to understand the perception and needs of industry on higher education graduates of the country. This chapter describes the perception and needs on higher education from industry based on interviews with industry associations, individual companies and government sectors as employers.

3.1. Overview

Industry Structure of the Country

Among industry sectors relevant to the seven disciplines, agriculture (including fishery) is important for their size of employment and manufacturing is significant in terms of economic activities such as value added and export.

In terms of the number of employment, Agriculture (including Fishery) account for one third of total employment of the country. (Table 31)

Table 31 GDP by Industry Sector and its Share

Industry sector	Employed persons	Share
Agriculture	12,167	32.3%
Industry	5,688	15.1%
Service	19,814	52.6%
Total	37,670	100.0%

Source: National Statistics Office, Philippine Statistics Authority

In terms of share of the Gross Domestic Product (value added), Manufacturing is the largest sector having 20.5% share to GDP followed by Trade and Repair (17.7%) and Real estate (12.2%). Agriculture and fishery are also large sector counting 11.3% of GDP. (Table 32)

Table 32 GDP by Industry Sector and its Share

One million peso

Industry	GDP by sector	Share
Agriculture, Hunting, Forestry and Fishing	1,429,679	11.3%
Mining and Quarrying	124,226	1.0%
Manufacturing	2,592,040	20.5%
Construction	814,106	6.4%
Electricity, Gass and Water Supply	415,650	3.3%
Transport, Strage & Communication	788,191	6.2%
Trade and Repair	2,238,553	17.7%
Financial intermediate	983,572	7.8%
Real estate	1,540,731	12.2%
Public Service and Defense	507,879	4.0%
Other services	1,199,434	9.5%
Total	12,634,061	100.0%

Source: National Statistical Coordination Board

Among sub-sectors of Manufacturing, electronic products are the largest and outstanding export goods which count for more than 40% of the exported goods of the country. (Table 33) A typical operation of electronic products is to import raw materials, process and assemble intermediate goods

and export them to other countries. Comparative advantage of the country is inexpensive labor force (workers, operators and technicians) for simple processing and assembling. For consumer goods, the domestic market is growing rapidly and more companies are investing in sales network. Among consumer goods, durable goods such as automotive and motorbike have assembling lines domestically, since the transpiration cost of final goods is high. As for fast moving consumer goods, foreign companies may not invest in factory since they may be imported from other countries.

Table 33 Top Ten Export Products and its Share to the Total Exports

Top 10 Export Products	Value (in M US$)	Share
Electronic products	23,931.4	42.2%
Other manufacturers	5,491.0	9.7%
Woodcrafts and furniture	3,337.2	5.9%
Chemicals	2,619.5	4.6%
Machinery & Transport Equipment	2,087.7	3.7%
Other Mineral Products	1,865.3	3.3%
Ignition Wiring Sets and Other Wiring Sets Used in Vehicles, Aircrafts and ships	1,731.1	3.1%
Metal Components	1,684.8	3.0%
Articles of Apparel	1,580.2	2.8%
Coconut oil	1,005.6	1.8%
Others	11,364.2	20.0%
Total	56,697.9	100.0%

Source: National Statistics Office, Philippine Statistics Authority

Common perception on higher education graduates from industry

During the course of interviews, there have been similar perceptions and opinions mentioned across the industrial sectors. In most cases, the number of higher education graduate is sufficient for its current operation. However, in terms of quality of graduates, respondents expect students and faculty members to be more exposed to the industry to understand the real activities and the situations to which they would be exposed.

The background of this expectation is that the competitive environment of the industry is changing rapidly and becoming more complicated. For example, in the Philippine Development Plan (PDP), the mining sector is expected to expand their supply chain from digging business to downstream manufacturing business which uses mineral resources as primary materials. In this context, the mining sector needs not only specialists of minerals, but also of processing, for example. The requirements from industry are becoming more multi-disciplinary and applicable to real world, rather than theoretical.

PDP is aiming at expanding the supply chain of industry to achieve inclusive growth and upgrading industry to a higher value to survive in a more competitive environment, especially in the ASEAN Economic Community. In complying with the goals of the PDP, quality and contents of higher education must be adjusted to the needs from industry.

3.2. Civil Engineering

3.2.1. Overview of the industry sector

Civil engineering is explored in two main categories: (1) disaster management and (2) urban transportation. These categories are, in most of the cases, operated by public sector. While there is no available aggregate information on demand for civil engineering graduates specializing in disaster management or urban transportation, indications in the form of some government policies may lead to the conclusion of a possible increased competency requirement among companies in both fields.

Disaster management
The Philippine Government recognizes the following hazards brought about by the most typical natural risks to its population: hydro-meteorological hazards such as tropical cyclones, rain, windstorms and floods, as well as seismic hazards such as earthquakes and volcanic eruptions. It is in light of the Philippines' vulnerability to such risks that the Government has adopted a National Disaster Risk Reduction and Management Plan (NDRRMP) from 2011-2028.

Civil engineering as a discipline is relevant to the NDRRMP, as it outlines infrastructure-related plans under "Thematic Area 4", "Disaster Rehabilitation and Recovery", which directs the construction of houses and public infrastructures that are to be rebuilt or repaired to be more resilient to natural disasters. NDRRMP's road map includes integration of disaster risk reduction and management to land use, urban planning, public infrastructure and housing. Planned developments relevant to Civil Engineering graduates are (1) planned creation of development guidelines on infrastructure redesign and/or modifications, and (2) modification of building standards to integrate disaster risk reduction and management and climate change adaptation.

Because of the NDRRMP, it is seen as important that Civil Engineering graduates have updated knowledge about infrastructure and building requirements and have sufficient skill in adapting to any future changes brought about by government policy and generally any events that may be related to disaster risk reduction and management.

More importantly, the NDRRMP's planned developments look forward to inputs from infrastructure professionals on what guidelines or standards are appropriate for disaster risk reduction and management. It is for this reason that graduates and practitioners of infrastructure-related disciplines, such as civil engineering and architecture should have sufficient competency to recommend cutting-edge methods or technology that is appropriate for the Philippines' context. This connotes an awareness of global standards and practices, as well as sufficient expertise to be able to engage in projects that are of global standard, among practitioners and new graduates alike.

Urban transportation
The Philippine Government has laid out plans for public investments in transport-related infrastructure. A framework for transport infrastructure is drawn up in the National Environmentally-Sustainable Transport Strategy (NESTS) 2011-2018, while transportation that is already programmed is detailed in the Comprehensive Integrated Infrastructure Program (CIIP).

The NESTS proposes to integrate public transportation across local government units and calls for studies for people-friendly infrastructure. As the Government relies on external consultants (i.e., private companies) to make plans for and construct publicly-invested infrastructure, the NESTS gives an indication of a need for competent graduates of Civil Engineering with specialization in urban planning for planning transportation in each and across local governments.

The CIIP, on the other hand, outlines already programmed infrastructure for a certain period of time. The National Economic Development Authority (NEDA) currently lists infrastructure programmed from 2009-2013; however, an updated CIIP is not yet published. There has been recent activity to plan out transportation infrastructure in the Philippines, such as the "Roadmap for Transportation Development for Metro Manila and the Surrounding Areas" that was conducted by JICA and approved by NEDA in 2014. This indicates that Government is on the way to concretizing items for infrastructure programming. This continuous programming of public transport infrastructure highlights continuous need for services in monitoring urban development, in which graduates of civil engineering may be employed.

Moreover, the need for urban planning specialists is relevant to the rise of mixed-use land developments. Based on interviews with an architecture firm, they have observed a rise in mixed-use land developments in the country. According to industry associations for construction and architecture,

urban planning in the Philippines is dependent on architects rather than civil engineers, so specialization for urban planning in the engineering profession is not widely recognized. Despite this, urban planning as a specialty is offered in the Philippines only in UP as part of their Master in Engineering program; however, it is not a subject that is deeply discussed at the undergraduate level in either civil engineering or architecture.

The Philippines' infrastructure is considered "poor" and ranked 91 out of 144 in the 2014 Global Competitiveness Index (GCI) of the World Economic Forum (WEF), wherein the country's air transport and sea transport infrastructure are noted to be very lowly-ranked (108th and 101st, respectively). This reflects the gap that infrastructure professionals have to fill in order for the country's infrastructure to compete with other countries for the purpose of attracting foreign direct investments (FDI) and facilitating general economic activity. For this reason, infrastructure professionals, i.e., both architects and civil engineers, must have enough competence and expertise for planning ahead and executing construction of infrastructure relevant for the country's development and eventual competitiveness.

3.2.2. Needs of related industry players for graduates

New graduates of civil engineering are observed by the interviewed construction organizations as lacking operational skills. While it is recognized that the new graduates are competent in terms of theoretical skills, they will need training of 6 months to 1 year for them to be fully qualified in companies in which they are employed. Those that require employees with highly-specialized competencies (i.e., MS or PhD holders) are also reporting difficulty in finding such graduates because there are not many who pursue such advanced degrees. This is attributed to a lack of urgency in taking up further studies, as engineers would rather advance their careers by pursuing jobs overseas.

Technical and non-technical competencies for which construction organizations have issues with new graduates of civil engineering are summarized in Table 34 below.

Table 34 Summary of manpower and competency issues in civil engineering

Manpower pool	The following HEIs are reputed for their civil engineering graduates: University of the Philippines MAPUA Institute of Technology Far Eastern University (FEU) Pamantasan ng Lungsod ng Maynila (PLM) Polytechnic University of the Philippines Technological Institute of the Philippines (TIP) Manpower supply situation is not problematic. There are enough civil engineering graduates on a yearly basis.
Technical competencies	Lack of exposure to the field and equipment frequently used in the industry; graduates lack the capacity to operate even small equipment. Lack of project management skills. Lack of general knowledge on safety, construction management etc. Lack of specialized knowledge on public infrastructure and environmental engineering.
Non-technical competencies	Lack of critical thinking. Lack of communication skills (oral and written).

Source: Interviews with industry association and private companies

A lack in either technical or non-technical competency is attributed to not having enough industry exposure during the time of schooling. The industry observes that faculty and curriculum in HEIs lack exposure to industry setting, which translates to low sharing of real industry experience to students.

Another reason for the lack of competencies of graduates is the shortage of facilities in HEIs that may be used to teach or expose students to industry practice.

Faculty personnel in universities have reportedly little experience in industry or do not have advanced degrees in civil engineering. There are only a few universities where advanced degrees in civil engineering are abundant (e.g. UP) and even fewer that can afford to employ practitioners or former practitioners (e.g. private universities). Moreover, universities (especially SUCs) lack access to facilities that are needed to expose students to industry situations, and much less on advanced research situations. The result is that students are taught civil engineering that is considered basic and theoretical, whereas industry would prefer to hire employees who have specialization and practical competencies. Some construction companies have taken a step towards this by not hiring new graduates and rather settling for experienced engineers. These issues are summarized below in Table 35 below.

Table 35 Summary of issues on faculty, facilities and curriculum in civil engineering

Faculty	Solely focuses on teaching theoretical knowledge. Lacks awareness of the current trends in the industry. Lacks capacity to conduct a research & development study that is relevant to the industry.
Facilities	Lacks facilities or use of equipment from which students can learn their operation. There are certain universities which have some advanced equipment such as UP system, but it is still insufficient.
Curriculum	Association and companies invest heavily on training and courses for their members and employees, especially in the following areas: safety, construction management, quantity surveying, materials management, etc. For them, these are some of the courses that many universities lack, even if it is considered to be a fundamental knowledge or skill by some of the companies.

Source: Interviews with industry association and private companies

Industry players have taken steps to remedy competency inadequacies in their labor force. It is not unusual for construction companies to send their civil engineers to training in necessary fields such as project management, safety, construction management, and others, as well as expose them to various work settings under senior employees so that they can improve their communication, critical thinking and other non-technical competencies. Some companies have taken a step further and coordinated with universities to sponsor the final schooling year of students with potential, with the intention of hiring them after graduation.

The construction industry association, Philippine Constructors Association (PCA), and the architects' association, United Architects of the Philippines (UAP) also offer training courses for their members on a wide range of topics, and attempt to manage the standard of quality of competency that is accepted within their respective professions. An example is the construction and architecture associations' coordination with related associations in neighboring countries on the harmonization of competency standards, so as to further guide each country on competencies needed for training and recognizing the skills of civil engineers and architects, respectively, in light of the ASEAN Economic Community (AEC). The AEC envisions that professionals in participating countries are able to freely practice their fields across all participating countries. This means that common understanding of an infrastructure professional's skills or capabilities will be established in the form of standardization or certification, by which it would be recognized across countries, and thus qualifying them to participate in certain infrastructure projects. This standardization or certification is somehow seen as a tool to include or exclude professionals in projects based on their competence, thereby placing an economic sanction to it, and as such, groups like the PCA and UAP see urgency in increasing their members' competitiveness in the region by upgrading their skills and specializations.

3.3. Mining/geological engineering

3.3.1. Overview of the industry sector

The mining industry contributes to the Philippine economy by exports of about USD 267 billion (2013), employment of about 247,000 people (2013), and investments of about USD 6.67 billion (2004-2013) (Table 36).

Although the size of the industry is not that large, mining is one of the key sectors for investment promotion and industrial development in the PDP 2011-2016. The Mines and Geosciences Bureau (MGB) identifies that out of the 30 million hectares of total Philippine land area, 9 million hectares (30%) are identified as having high mineral potential, of which only 3.11% (0.932 million hectares) are currently covered by mining permits.

Table 36 Summary of exports, employment and mining investments

Exports	USD 267 billion (2013) Top mineral exports: Copper, gold and nickel Major destinations: Japan, Australia, Canada, China
Employment	About 247,000 (2013)
Mining Investments	USD 6.67 billion from 2004 to2013 (investments in exploration and mining projects)

Source: Mines and Geosciences Bureau

Metals mined in the Philippines include gold, silver, copper, chromite, nickel, zinc, and iron. Major non-metal mines are limestone and shale, silica, aggregates, dolomite, clay, sand and gravel (Figure 28).

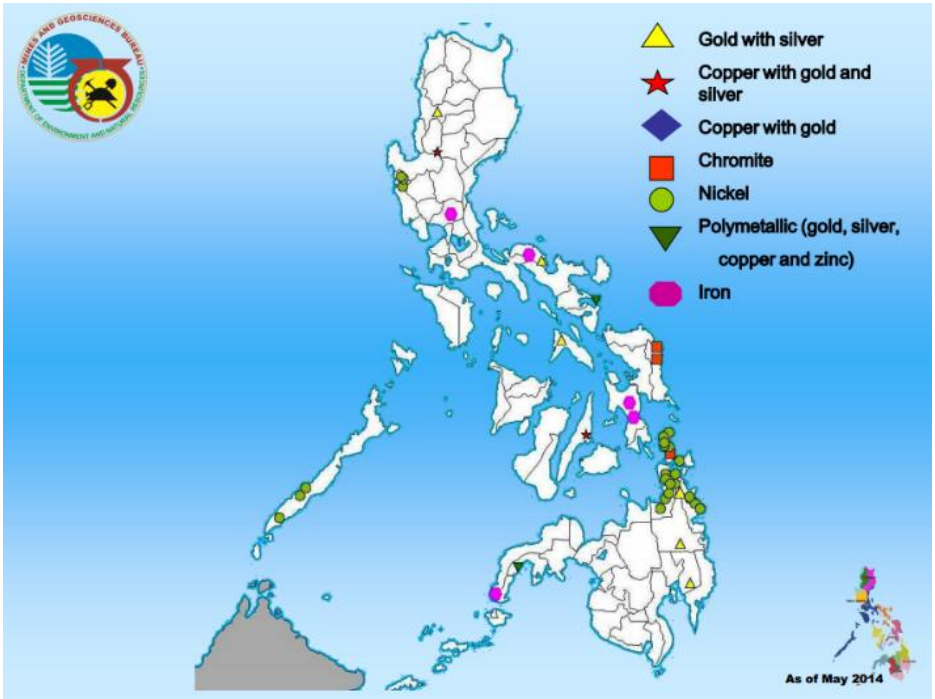


Figure 28 Metal mines in the Philippines

Source: Mines and Geosciences Bureau

In the PDP 2011-2016, the mining sector is expected to be developed further, not only to produce raw materials, but also to extend the value chain of the sector into downstream processing industries to manufacture industrial products. This goal will be realized by technological development and R&D program with efficient and state of the art technologies.

According to the industry players, at present, there are enough mining engineering or geologic engineering graduates in a year for their annual hiring needs. However, to achieve the goal of the PDP, more engineers in mining and metallurgical disciplines will be needed.

Currently, retention of employees is an issue for the sector. Interviewed companies have experienced the sudden exit of some mining professionals who look for work in other countries where compensation is higher (e.g. Australia). New graduates usually resign within one to two years after hiring to work overseas (Table 37).

Table 37 Summary of manpower issues in the mining sector

Manpower pool	Source of new graduates for mining engineering is limited to the following HEIs: UP (comprises about 70% of all Mining Engineering graduates), Mapua Institute of Technology, St. Louis University, Cebu Institute of Technology, Bicol University, and Adamson University. At present, there is no shortage of Mining Engineering graduates on an annual basis.
Retention	High turnover. Fresh-graduate engineers usually resign after 1-2 years to go to overseas mining companies. Case: Company A hires 20 new engineers every year. Among engineers hired 4 years ago, only 3 of them remain with the company.

Source: Interview with private companies

3.3.2. Needs of related industry players for graduates

Interviewed mining companies reported no urgent need for a significant improvement among newly-graduated employees of mining engineering or geologic engineering in terms of quantity. However, companies mentioned that there are various areas in which they can improve.

Engineers are typically assigned supervisory roles in mining companies and so they are expected to have project management (including planning and cost estimation) and leadership skills. Being assigned supervisory roles also requires them to have some knowledge of equipment being used at the mining site, while being required to operate specialized computer systems used in mining (e.g., GEMCOM). Issues of interviewed mining organizations with new graduates of mining engineering are elaborated in Table 38.

Table 38 Summary of competence issues in the mining sector

Technical competencies	Lack exposure to using mining equipment. This is important as newly-graduate engineers are assigned supervisory positions. Lack of competency in using mining computer systems, such as GEMCOM, which is used by major mining companies in the country.
Non-technical competencies	Supervisorial and leadership ability, as engineers are usually assigned to supervisorial tasks. Planning skills and cost estimation Ability to adapt to conditions of the mining site. Humility; suppressing a high ego that asks for high positions without earning it through work.

Source: Interview with private companies

Mining organizations attribute the above inadequacies to a lack of industry experience among faculty members in HEIs, lack of industry-grade facilities or equipment used in instruction and inadequate content of curriculum with regard to industry experiences. These issues are elaborated in Table 39 below.

Table 39 Summary of issues on faculty, facilities and curriculum in mining related disciplines

Faculty	Faculty are usually not practitioners in industry.
Facilities	Lack of facilities and equipment which are frequently used by the industry such as GEMCOM (computer software used for mining).
Curriculum	Mining is discussed in HEI in a general perspective with little in-depth discussion of prevailing practices, use of equipment, methods being used, etc. Does not include use of mining software, such as GEMCOM. Lack of safety and disaster preparedness. Too much theoretical knowledge lacking practical application.

Source: Interview with private companies

Respondent mining companies have integrated training into their recruitment program, as a way of preparing their new-hires for work. It is through this program that new-hires are oriented and exposed to the actual mining setting, which is reportedly often the first time for many of the graduates. Graduates are trained to be familiarized with techniques used in operations, as well as to be prepared for work conditions in mine sites.

In conclusion, mining is one of the key sectors in PDP 2011-2016 and, even though the sector does not currently face a shortage of HE graduates employees, it will need more engineers who will contribute to increase value-added by making a linkage with downstream manufacturing sub-sectors. This may require multi-disciplinary knowledge, applied technology and experience of real business. In this sense, faculty members and students are expected to be more exposed to the industry to design a solution for further development of the sector.

3.4. Manufacturing-related disciplines

3.4.1. Overview of the industry sector

Manufacturing comprises a large part of the number of establishments (11%, second in rank) and a 25% share of total employment (first in rank) in the Philippines as of 2010. The manufacturing sector contributes one-third to the country's total value-added. It is also the largest industry sector and is on a growing trend. (Figure 29)

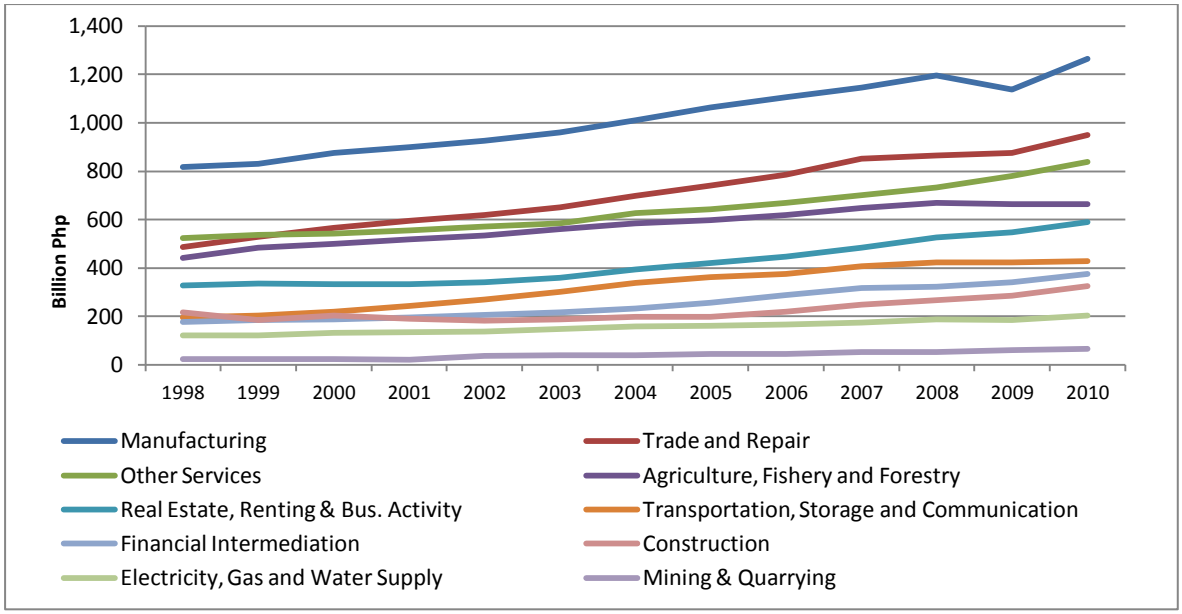


Figure 29 Gross Domestic Product by industrial origin, 1998-2010, in billion pesos in constant 2000 prices

Source: National Statistics Office

As described in the overview section of this chapter, electronics in the broad sense is the major sector of manufacturing. The comparative advantage of the country is the abundant and inexpensive labor force and many foreign companies have invested in processing and assembling plants. They import materials and process and assemble them into parts or components, then export the products to other countries. As for final goods such as motorbike and automotive, they import major materials and components from other countries and conducting only assembling process in the Philippines, by utilizing inexpensive labor cost. For these labor intensive manufacturing processes, a large number of factory operators and technicians are needed but the number of engineers is relatively small.

While as the "manufacturing" function in the Philippines tends to be labor intensive and low cost operations, the country has strength in "engineering" function using the information technology (IT). For example, many international plant makers have a designing section in the Philippines where Filipino engineers are drawing and simulating by using a Computer Aided Designing (CAD) system or a Computer Aided Engineering (CAE) system. IT related function of the manufacturing sector is one of the highly potential areas as job opportunities for HE graduates.

In the PDP, the Manufacturing and Service sectors are recognized as engines of economic growth of the country. The Manufacturing sector is expected to absorb a large number of the work force in labor-intensive sub-sectors, and to promote innovation in shifting towards a more inclusive and higher value-added industry.

Even though Manufacturing is an essential sector of the Philippines, it will face a drastic change of the business environment in the near future. After the accomplishment of integration of ASEAN member states into "ASEAN Economic Community", competition among member states will become more intense than ever. The Philippines industry has to improve its competitiveness and undertake structural reform for a higher value-added industry.

For example, semiconductors and hard disk drives have been typical major manufactured products of the country for a long time. However, for the semiconductor, most of the companies are operating post-process which is a simple assembling of the parts. To attract investments in pre-process, which is technology-oriented and a higher value-added process, the country needs to foster more highly

educated engineers[19]. For the hard disk drive, because of the withdrawal of companies from the Philippines and a declining domestic market trend, companies in the supply chain are looking for business opportunities in other sub-sectors, such as automotive. To respond to the technological change from electronics to automotive, companies need more engineers to develop an appropriate solution.

To make a shift from simple assembling to a technology and engineering-oriented industry, manufacturing sector needs highly educated engineers who are already exposed to the industry to provide a solution for shifting towards a higher value-added industry and to improve competitiveness.

3.4.2. Needs of related industry players for graduates

Manufacturing companies need graduates of a wide range of engineering backgrounds for their operations, but mainly mechanical and electrical engineering for manufacturing in general, and other types of engineering (e.g. electronics engineering, metallurgical engineering and chemical engineering) and basic sciences such as physics and chemistry for more specialized manufacturing such as electronics manufacturing.

Respondent manufacturing organizations observe that new graduates of related courses have theoretical competency but lack operational skills due to lack of exposure to industry situations. Technical competencies that industry expects, such as familiarity with industry-specific machines and analysis tools (e.g. Six Sigma) mean graduates must train for six months to one year to be functional. This is problematic for companies as employees typically resign after two to three years. This is especially problematic for electronics manufacturing companies where changes in technologies and subsequent manufacturing processes require an already-competent workforce instead of new hires. High-tech companies with proprietary technology and processes need internal experts so that the companies can evolve into producing a higher-value output. These issues are summarized in Table 40 below.

Table 40 Summary of manpower and competency issues in the manufacturing sector

Manpower pool	There is a shortage of MS or PhD graduates for high-tech industries such as electronics manufacturing. These graduates are needed for higher-value work such as R&D. Yearly supply of new graduates for general manufacturing is enough. University of the Philippines is considered a good source of graduates, but other HEIs with engineering courses may also be considered.
Technical competencies	Low exposure to industry or project conditions. Need to train between six months and one year to be functional, but will need one to two years more training to be fully competent Lack of knowledge on industry-specific machines. Equipment demonstrated in HEI is not equal to what is used in industry. Lack of training on analysis tools needed for electronics manufacturing, i.e., Six Sigma (method) and Minitab (software for Six Sigma). Note: Basic theoretical knowledge is sufficient.
Non-technical competencies	Lacks “innovation” mindset or passion.
Retention	Fast turnover. Engineers often leave for other domestic or overseas companies after two to three years.

Source: Interview with industry association and private companies

[19] One of interviewees, who is running a post-process of semiconductor in the Philippines, suggested that Malaysia could be a destination of pre-process of semiconductor, because of its abundant of electronics engineers.

Respondent companies attribute students' lack of exposure to industry situations to weak faculty, facilities and curriculum, particularly pertaining to SUCs. They have observed that faculty in SUCs lack exposure in industry settings, thus the content of instruction remains theoretical. Facilities that support instruction are either non-existent or outdated and irrelevant, as these are usually too expensive for SUCs. Linkages with relevant industries also have been weak. The curriculum is not relevant especially to high-tech industries whose adopted technologies change rapidly. While the curriculum is solid on textbook theory, it is short on what is being used in current industry. Especially for SUCs, it is not as flexible as the changes in industry technology, and professors are not flexible enough to catch up and teach these technological changes. To adapt to this, companies suggest that HEIs allot more time and place higher importance on internship especially for engineering students. These are summarized in Table 41.

In the PDP, ten strategies for globally competitive and innovate industry and services sectors are indicated. Among them, "harness science, technology and innovation" and "enhance competence of labor" are relevant to the higher education graduates. As mentioned above, the competitive environment is changing rapidly and innovation needs multi-disciplinary ideas. In this context, exposure to real industry is essential for HE students.

Table 41 Summary of issues of faculty, facilities and curriculum in the manufacturing sector

Faculty	SUC professors lack experience in industry settings. Professors have little or no experience in industry and as a result their lectures remain theoretical. Low wages in SUCs are not attractive to practitioners in private companies.
Facilities	Training equipment is outdated and irrelevant to high-technology industries (e.g. mechatronics equipment in HEIs with regard to electronics manufacturing). Resulting learnings are not applicable to industry.
Curriculum	Irrelevance to industry (especially high-tech industries) Curriculum is usually based on textbooks, with seldom input from industry experience. Curriculum is not adjusted to facilitate learning that is relevant to some currently-prevalent industry in the country. (e.g., large hard disk drive manufacturing in the Philippines but there is no specialization track for storage devices in any university). Some SUCs have low interaction with industry in adjusting their curriculum. Private HEIs are more flexible in changing their curriculum (e.g. University Perpetual Help approached SEIPI (Semiconductor and Electronics Industries in the Philippines, Inc.) to consult with curriculum. Technology-related curriculum must be flexible enough to adapt quickly to fast-changing technology. Internship/OJT requirements are limited. In engineering courses, low required hours of exposure to industry settings. Industry internships during schooling is delegated to the student's free time, instead of being a part off the curriculum. Some OJT experience is not related to the course. (e.g. Economics graduate doing only clerical work as an intern.) Lack of national direction for science and technology, resulting in low quality education. There is no national direction for the advancement of high technology through curriculum content, from basic education to higher education. Curriculum is technologically behind technology-advanced areas in other countries, e.g., Taiwan, Silicon Valley.

Source: Interview with industry association and private companies

3.5. Renewable energy

3.5.1. Overview of the industry sector

The Philippine Government plans to almost triple (281%) the power generation capacity from renewable sources from 2010 to 2030 (Figure 30). Large parts of the power generation shall come from hydro, geothermal and wind sources.

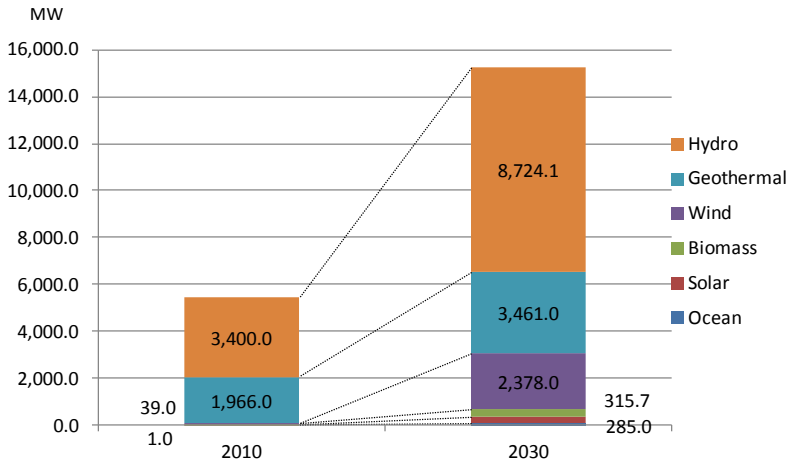


Figure 30 Planned installed capacity for power generation from renewable sources by 2030

Source: Department of Energy, "Renewable Energy Plans and Programs 2011-2030"

Renewable energy, as an industrial sector, is not a large employer itself, but it will have a spillover effect to other sub-sectors, including manufacturing. Developing and installing renewable energy requires the latest technologies in various fields, such as material engineering in general, chemistry, machinery, electrical and electronics, among others.

Future expansion is an indication of the potential expanded need for competent graduates that are adept on renewable energy technologies and general power engineering. However, renewable energy as an industry sector is such a multi-disciplinary and applied technology industry. The sector requires experienced engineers in different fields and managers who are capable of controlling the operation of projects. In this sense, exposure to industry is vital.

3.5.2. Needs of related industry players for graduates

Renewable energy as a discipline requires competencies in engineering (e.g. mechanical engineering, electrical engineering, electronics engineering, chemical engineering, metallurgical engineering, material engineering), geosciences (e.g. geology, geophysics), and basic sciences (e.g. physics, chemistry).

Some renewable energy organizations observe that new graduates of Engineering have low exposure to power engineering. According to sources, power engineering is typically given only six units in a typical electrical engineering course. Apart from power engineering subjects, graduates are observed to have little exposure to working on projects in general, which translates to poor project management, communication, critical thinking and related values.

Renewable energy organizations also note a general lack of exposure to both power plant situations and renewable energy technologies among new graduates. This is attributed to a lack of exposure of the faculty themselves to industry situations and lack of industry introduction (i.e. the power sector) or industry's involvement in undergraduate education, such as in mentorship of research activities by industry practitioners. The above issues are shown in Table 42 and Table 43 below.

Table 42 Summary of manpower and competency issues in renewable energy

Manpower supply	The annual supply of mechanical engineering and electrical engineering graduates is enough. Some universities with courses that lean towards renewable energy are: · MS Energy Engineering: University of the Philippines · Solar program: University of San Carlos, De La Salle University · Biomass program: UP Los Banos Campus, Central Luzon State University, · Renewable energy program: Central Bicol State University, Camarines Sur State University, Siliman University, Mindanao State University
Technical competencies	Too theoretical; lack of experience or background on working on projects. Reflects HEIs' lack of industry linkages and lack of faculty members' experience in industry or projects. Practitioners may be too busy in their companies to engage in teaching. Power engineering exposure in electrical engineering school is typically 6 units. Lack of developed project management skills
Non-technical competencies	Poor communication skills Lack of critical thinking, as a result of weak exposure to industrial situations. Lack of a broader view of problems (e.g. project-wide), and simply focusing on the technical side. Values: Lack of direction, indecisiveness, non-persistence, focus on materialistic returns.
Retention	Fast turnover rate. Fresh-graduate geologists usually resign after 2 years to work in a Philippine-based or overseas company.

Source: Interviews with industry association and private companies

Table 43 Summary of issues of faculty and curriculum in renewable energy

Faculty	Faculty are not experienced in power sector industry settings Practitioners are too busy in their work to engage in teaching. Lack of mentorship to students when it comes to research & development Lagging behind with industry's trends and changes
Curriculum	Low exposure to industry (e.g. Power plant situations: Units in power engineering are normally just 6) Low mentorship in research with practitioners. There are only a few practitioners who are available to mentor undergraduates in their research. Courses that specialize in energy are rare (e.g. Masters in "Energy Engineering" offered only by UP). Australia reportedly has an undergraduate course on renewable energy. Usually focusing on theoretical background, but this is seen as an advantage if the execution will develop a strong theoretical background of the graduate. Practicum requirement of the universities is weak. Lacking provision of project management subjects which may strengthen their leadership skills Lack of introduction to the industry itself

Source: Interviews with industry association and private companies

New graduates basically go through a cadetship program for six months to one year, and undergo formal trainings in necessary competencies, such as project management, and informal training in terms of exposure to the work setting in the power sector. Tenured employees are sometimes offered scholarships in advanced degrees in overseas universities.

Some companies offer internship programs to HEIs that are within close proximity to their project site. This allows the company to identify students with high-potential for employment, as well as increase their image as a strong employment option for students after graduation.

Renewable energy requires synthesizing various types of cutting-edge technology. It is a new type of industrial technology as well. Therefore, a conventional and theoretical approach will not be effective. A multi-disciplinary approach and exposure to industry is essential.

3.6. Biotechnology

3.6.1. Overview of the industry sector

Brief overview of the policy

There is no specific policy or plan for biotechnology as an industry, although biotechnology is expected to contribute to Agriculture and Fisheries in the Philippine Development Plan 2011-2016. The PDP points out that the adoption of technologies by farmers or fisher folk has been slow despite availability of science and technology packages and products such as organic fertilizer, high-yielding varieties, cost-reducing farming practices and value-adding technologies. It states that the slow adaptation is caused by: (a) weak links between technology producers and extension workers and farmers/fisher folk; (b) lack of media and public awareness of the benefits of the technologies; and (c) financial or capacity constraints of intended users. The Philippine Government also aims to build local R&D capabilities for transformative, cutting-edge and sustainable technologies with broad applications (e.g. information and communications technology (ICT), biotechnology, advanced manufacturing technology and new materials technology among others) to make local industries competitive and innovative and to address local issues. Biotechnology is considered one of the core technologies to contribute to the development of the country.

Human resource needs to support the policy

As the PDP mentioned, the linkage between farmers/fisher folks and technology producers is weak in this country. Although the outcome of biotechnological research is available, it is not accessible to mass users and only the people located near the institutions where the technology was invented can utilize it. If biotechnology is expected to contribute to agriculture and fisheries, there should be a human resource to bridge both sides in national level and local community level. Since utilization of biotechnology in the agricultural or fisheries field in the local community shall be implemented with appropriate information and education, people who studied the biotechnology discipline are needed to work for the local community. The human resource element needed in the biotechnology discipline is researchers for sustainable R&D to support industry and local community, and people to disseminate the invented technologies to users such as farmers and fisher folks and to assist them in using those technologies.

Current situation of the industry

Biotechnology is a cross-disciplinary field that has repercussions in sectors of agriculture, fisheries, and pharmaceuticals. Agricultural and pharmaceutical biotechnology are the two main types of biotechnology that are present in the Philippines today, however agricultural biotechnology is more actively focused on within the industry. As agriculture is one of the main industries in the Philippines, the market is attractive for companies selling hybrid seeds or fertilizers. The Philippine Government focuses on agriculture as a strategy of poverty alleviation, and is pushing the utilization of agricultural biotechnology in the local community so the market is expected to continue growing. On the other hand, pharmaceutical biotechnology is seen as an emerging field. There are constant demands to develop pharmaceutical biotechnology products such as chemotherapeutic drugs, anti-cancer drugs and monoclonal antibodies for cancer. There are also prospect demands for product evaluation services shifting from the United States to emerging countries in Asia due to lower labor costs. However, there are very few domestic pharmaceutical companies that practice pharmaceutical biotechnology in the Philippines, and very few companies with research facilities that will absorb graduates and drive the industry. This leads to another issue of people studying biotechnology related

courses, then having difficulty finding a company to employ them domestically to perform advanced biotechnological work.

There are reportedly an abundance of advanced degree holders of agricultural biotechnology. However, employment for these graduates is limited to government agencies, such as the Department of Agriculture, public universities such as the UPLB, or specialized research institutes such as the International Rice Research Institute (IRRI). There may be little to no employment in actual agricultural biotechnology positions offered among private companies. Private companies that commission agricultural biotechnology-related research work (e.g. food manufacturers) often commission academic institutions on a project basis and seldom maintain facilities or staff for research and development.

3.6.2. Needs of related industry players for graduates

Since agricultural biotechnology has been studied and implemented in the country since the 1990s, human resource is sufficient for the subject in terms of number of graduates and its competency. On the other hand, pharmaceutical companies need more competent graduates who studied subjects related to pharmaceutical biotechnology. Based on interviews with a domestic pharmaceutical company, they need graduates who have studied molecular biology at an undergraduate level, but there are very few or no universities or colleges offering this as a course. They train graduates who have studied biology, microbiology, chemistry, medical technology and veterinary medicine as undergraduates, to be researchers in the company. However, graduates lack basic skills in experimental design and execution. This is attributed to a relatively low emphasis on experimentation in related courses. Pharmaceutical biotechnology-related courses are often preliminary courses to medicine, so activities in research and experimentation are given lower priority in schooling. This also results in lower awareness for good laboratory practices among students. Graduates who have studied biology or other related courses tend to proceed to medical school and as a result, this trend makes it difficult for pharmaceutical companies to hire staff. The abovementioned issues are summarized in Table 44 below.

Table 44 Summary of manpower issues in biotechnology

Manpower pool	Manpower is sufficient for agri-biotechnology. There is an abundant supply of PhD holders in agriculture. Lack of graduates who studied molecular biology and cell biology Lack of manpower in the application of pharmaceutical biotechnology There are very few who would pursue MA/PhD directly in medical or pharmaceutical biotechnology.
Retention	Biology-related new graduates eventually resign to pursue medicine. Many students of biology intend to proceed to medical school and few pursue their career in biotechnology industry.

Source: Interview with private companies

Table 45 Summary of competency issues in biotechnology

Technical competencies	Require more knowledge of molecular biology and cell biology Lack of basic skills required in the pharmaceutical biotechnology industry Lack of skills to design experiments Lack of ideas of good laboratory practice(GLP) Lack of knowledge of bioinformatics
Non-technical competencies	Graduates do not follow-through. They are aggressive in finding a job, but lack persistence in developing themselves within their jobs. Leadership skills observed in graduates of bigger universities, but seldom seen in graduates of lesser known universities. Desire for improvement is low. Some employees refuse to join development initiatives of companies (e.g. support to earn advanced degrees), so management

	opts instead to hire personnel who have earned doctorate degrees. Some of the graduates from lesser known HEIs are passive but eventually, through experience and exposure, they are able to voice their ideas.

Source: Interview with private companies

According to interviews with private companies, incompetence among new graduates is attributed to inadequacies in faculty, facilities and curriculum (Table 46). There are many faculty members in the agricultural biotechnology field because many courses are offered and research activities are conducted to support Government's policy. However, there are few faculty members in pharmaceutical biotechnology, especially faculty with degrees in molecular biology. There is no available data showing how many faculty with the said degree exist in the country, but reportedly the course is only offered in UP and St. Luke's Medical Center (Table 46).

Table 46 Summary of Issues on faculty, facilities and curriculum in biotechnology

Faculty	Declining number of PhD holders in the faculty shrinks the imparted knowledge to students. Low number of faculties which are MS/MA or PhD holders. Poor guidance to students in terms of conducting experiments Professors are the only ones who have the knowledge to use the experimental equipment.
Facilities	The advanced equipment acquired by the university is not well instructed to students for utilization. HEI do not have equipment which enables faculty and its research to simulate production.
Curriculum	There are very few institutions offering courses of molecular biology and biotechnology (UP and St. Luke's Medical Center only). HEIs which have thesis tracks on their courses can enhance the development of research and leadership skills of the students. Lack of curriculum structure and development in terms of specialization to biotechnology. Lack of structure and experimental design when conducting researches Orientation of teaching biology is towards medicine. Curriculum is too focused on academic theory, needs aspects of what is applied in industry. No courses for bioinformatics available.

Source: Interview with private companies

The role of higher education institutions is to supply human resource to industry and also provide technology to support industry and local community. Although agricultural biotechnology has a longer history in the country than pharmaceutical biotechnology, the resources of humans, facilities, and knowledge is still limited in certain research centers or universities. To utilize the outcome of national level-invented agricultural biotechnology in the local community, the contribution of provincial universities is essential. Provincial higher education institutions shall develop faculty in biotechnology related disciplines and faculty shall in turn deliver this knowledge to students so that graduates can contribute to industry or community where practices and utilization of biotechnology are needed. In particular, graduates with knowledge of molecular biology are necessary but higher education institutions are not ready to provide human resources in this field. Higher education institutions should consider the needs for the pharmaceutical biotechnology to support the industry.

3.7. Agriculture / Agribusiness

3.7.1. Overview of the industry sector

The PDP 2011-2016[20] has planned a target annual growth in the Agriculture, Forestry, and Fishery sector at 4.3-5.3% by the end of 2016. However, since the introduction of the PDP, the sector achieved only 2.8% in 2012 and even this figure decreased in 2013. This is in contrast with other sectors (i.e. Industry and Service sectors) which have grown since 2011 and recorded growth of above 7% (Figure 31). As a result, the share of the Agriculture, Forestry, and Fishery sector to total GDP has fallen from 14% in 2000 to 10.4% in 2013 (Figure 32).

The employment ratio of the agriculture sector to total labor force also decreased from 33% in 2001 to 27% in 2013 (Figure 33). According to interviews, the decrease in labor force can be attributed to preference among the youth to avoid a career in agriculture, particularly in farming, as it is viewed as a more lowly form of employment compared to working in industry or in services. Work in industry or services are also viewed as requiring less physical work and typically offering a better and more stable income than farming.

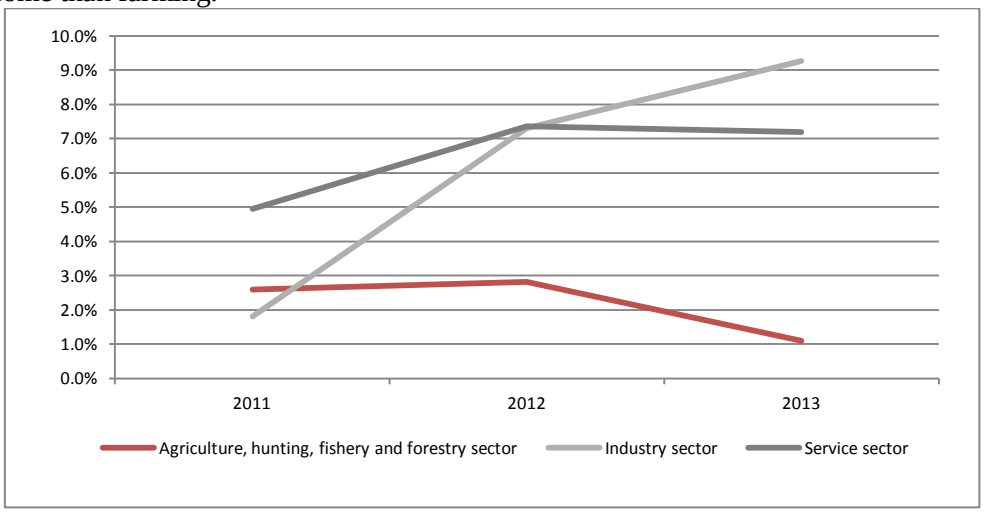


Figure 31 GDP growth rate per industry, 2011-2013

Source: Philippine Statistics Authority

[20] PDP 2011-2016 Midterm Update, with revalidated results matrices, published 2014 by NEDA

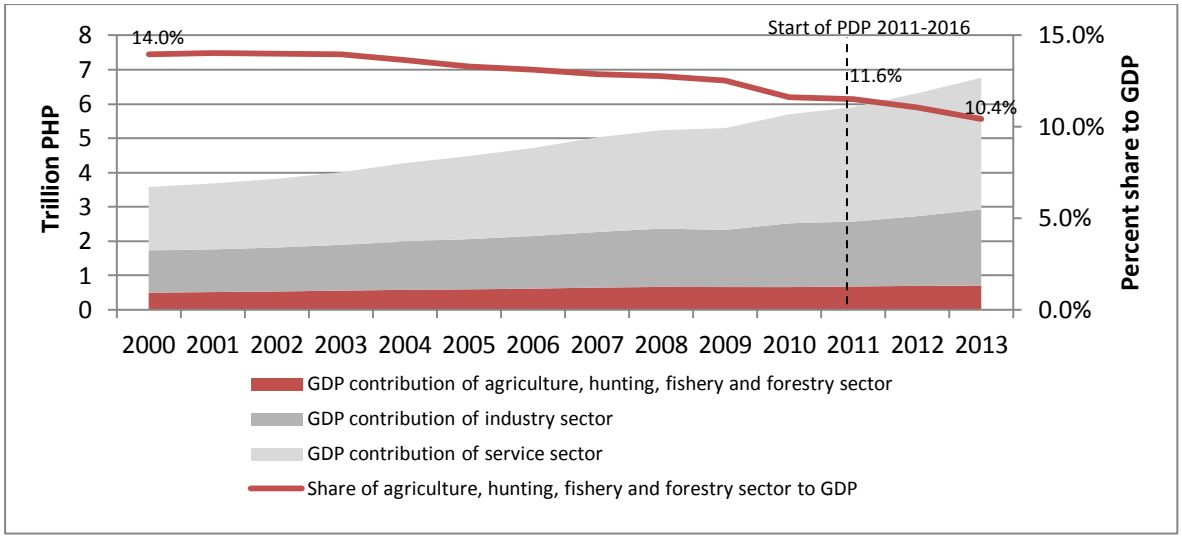


Figure 32 GDP contribution per industrial origin, 2000-2013 (in constant 2000 prices)

Source: Philippine Statistics Authority

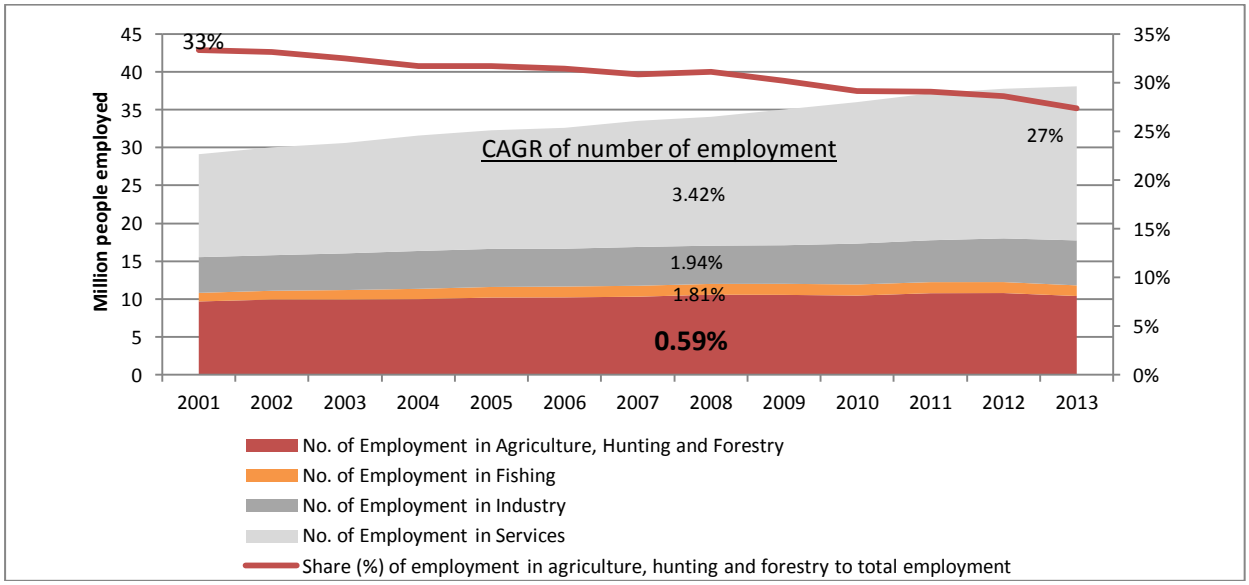


Figure 33 Employment per sector and share of employment in Agriculture, Hunting and Forestry to total employment, 2001-2013

Source: Philippine Statistics Authority

Note: Employment data are averages of 4 quarters in a year. Data in 2012 for No. of Employment in Agriculture, Hunting and Forestry and No. of Employment in Fishing have data missing for 1 quarter (July 2012). The figures for 2012 presented in the graph for these subsectors are averages of the 3 remaining quarters.

HEIs are identified by the PDP to contribute to meeting targets in the realms of improving productivity, particularly in the PDP's encouragement of partnerships among HEIs, LGUs, and private business sectors for increased investments in RD&E (Research, Development and Extension). It is expected to generate appropriate technologies and innovations to improve farm productivity. The contribution of HEIs may also be relevant in dealing with issues related to vulnerability to climate change and disasters and inadequate risk-resilient technologies, as recognized by the PDP as relevant to the agricultural sector.

The PDP has identified strategies to help achieve their targets, but the slow growth in the Agriculture sector, as previously mentioned, shows ineffectiveness of related activities to take effect in the mid-term. In the case of RD&E, where HEIs have a role, the continued implementation of the PDP from 2013-2016 intends to increase percentages of RD&E budget, although the target percentage is not explicitly written as a key indicator in the PDP's results matrix. NEDA reports in the PDP 2011-2016 Midterm Update that the National budgetary support as of 2011-2013 for R&D is an average 9% of total agriculture budget, while National support for extension, education and training services is an average of 13%. NEDA reports that these figures are still inadequate and need to increase in the coming years.

HEIs must, thus, be well-equipped and competent enough to conduct research that is relevant to meeting the PDP's targets. Previous sections have already identified challenges in conducting agricultural research among HEIs, such as an access to equipment and linkages to other stakeholders; both of which will enable HEIs to be more involved in agricultural research and develop new technology that will contribute to increased agricultural productivity.

3.7.2 Needs for higher education competency in the industry

Employment of higher education graduates in Agriculture exists in government agencies such as the Department of Agriculture and the private sector such as Food Manufacturing (which includes large-scale sugar milling, fruit production and packaging, etc.), or organizations conducting research in biotechnology[21]. The Food Manufacturing sector shares similar kinds of graduate and manpower needs with Manufacturing (see separate section on Manufacturing), but it adds graduates from Agriculture and Biology to their manpower requirements. The employment of agricultural biotechnology is discussed in the previous section.

Agriculture/agribusiness-related organizations observe that new graduates lack operational knowledge in Agriculture and Food manufacturing, although basic theoretical knowledge is good. On a non-technical side, new graduates lack oral and written communication skills and need improvement on logical/critical/analytical thinking. These issues are summarized in the table below.

Table 47 Summary of competency issues in agriculture/agribusiness

Technical competencies	Basic theoretical knowledge is relatively good. Need knowledge of environmental management.
Non-technical competencies	Lack of oral communication skills, especially observed in graduates from provincial universities. Lack of report-writing skills Logical, critical, analytical thinking

Interview with Government agency and private companies

The insufficiency in technical or non-technical skills was attributed by respondent organizations to lack of exposure to actual business processes. Facilities of HEIs lack demo manufacturing plants or mills in which they can learn about processing of agricultural products. In terms of the curriculum, research activities that are needed by industry are improvement of seeds, post-harvest efficiency and financial analysis. These issues are summarized in the table below.

Table 48 Summary of issues on faculty, facilities and curriculum in Agriculture/Agribusiness

[21] Source: Interview with industry association, government agency and private companies

Faculty	Lack of exposure to actual business process.
Facilities	Lack of facilities such as demo plants to apply their knowledge.
Curriculum	Lack of integrated research activities (e.g. improvement of seeds, post-harvest efficiency). Lack of specialized fields such as sugar technology. Lack of general subjects which are needed by the industry such as financial analysis. Lack of awareness on Agribusiness – "More into business than Agriculture"

Interview with Government agency and private companies

Companies involved in agriculture provide relevant training to their graduates, but only in as far as familiarization to the industry setting. Large food manufacturers may provide opportunity for further education for their agricultural engineers or process engineers, but smaller entrepreneur-scale agricultural companies have less emphasis on investing in higher education and innovation, compared to their will to invest in production. Innovation and R&D are often left to external consultants, who are faculty of nearby universities.

As a conclusion, the Agriculture sector needs more R&D in technology development (i.e. improvement on productivity, coping with climate change and disaster vulnerability, etc.) to achieve the Government target. For that, HEIs are expected to have higher exposure to actual business processes for innovation.
Another expected role of HEIs is to increase the awareness of Agribusiness among the youth to attract employment by showing Agribusiness as a profitable and distinguished form of business and prepare them to be equipped with management capability.

3.8. Fisheries/Aquaculture

3.8.1. Overview of the industry sector

The PDP 2011-2016[22] targets to expand the Fisheries sector by 2% to 3% annually. The sector has grown an average of only 0.5% from 2012-2014 (Figure 34), so it can be said that the sector so far is not growing as fast as planned. It contributed a range of 1.1%-1.2% to total GDP from 2012-2014, with contraction of an average of 7.1% over 3 years.

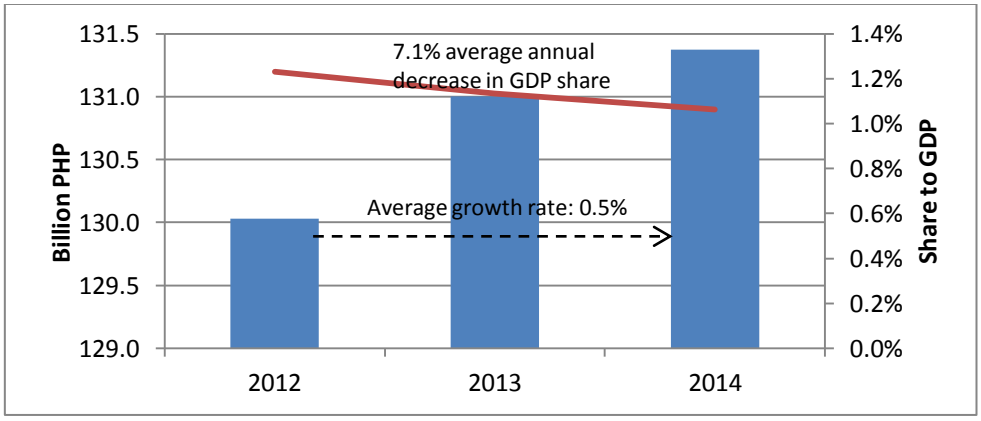


Figure 34 Share of fishing to GDP, 2012-2014

Source: Philippine Statistics Authority

[22] PDP 2011-2016 Midterm Update, with revalidated results matrices, published 2014 by NEDA

Employment in the fishery sector grew with a CAGR of 1.81% from 2001 to 2013, and reached 1.4 million employed in 2013 (Figure 35). The rise in employment coincided with the rise of aquaculture, a relatively newly-grown industry that doubled its output in the past 10 years, surpassing outputs of commercial fishing and municipal fishing.

Fishery/aquaculture organizations[23] report that there is not enough of a supply of graduates who are interested in aquaculture for the same reasons as in agriculture; that is, students do not see Fishery as a viable career option, compared to working in Industry or Service.

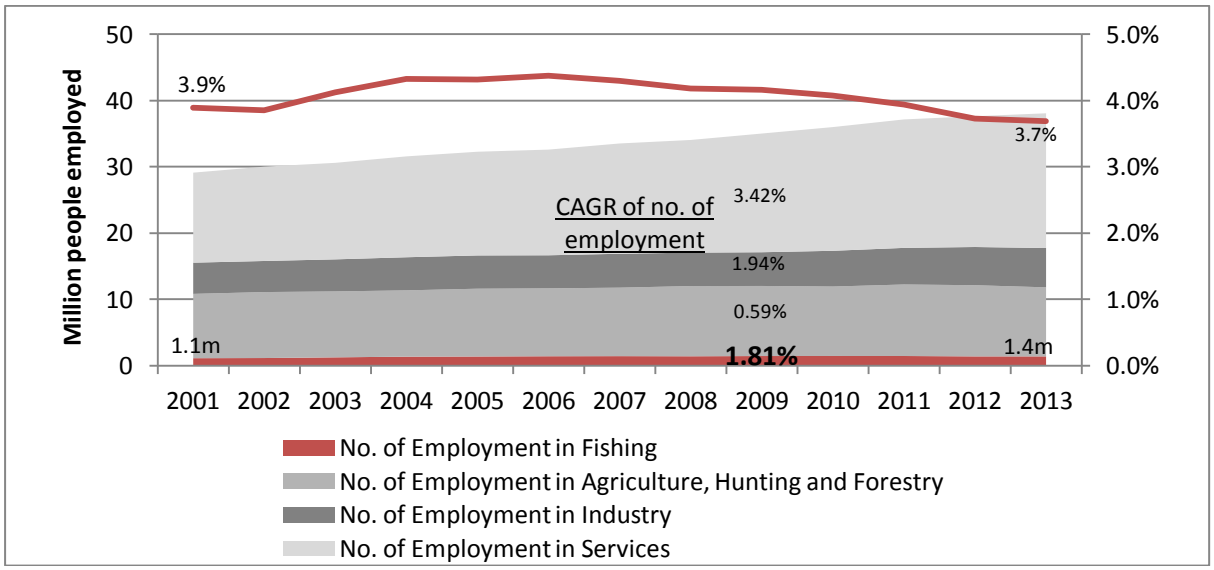


Figure 35 Employment per sector and share of employment in fishing to total employment, 2001-2013

Source: Philippine Statistics Authority
Note: Employment data are averages of 4 quarters in a year. Data in 2012 for No. of Employment in Agriculture, Hunting and Forestry and No. of Employment in Fishing have data missing for 1 quarter (July 2012). The figures for 2012 that are presented in the graph for these subsectors are averages of the 3 remaining quarters.

3.8.2. Needs of related industry players for graduates

Higher education graduates are employable in the Fisheries sector particularly in aquaculture companies, specifically those who became involved in biotechnology (especially in the management of desirable species) and process improvement.[24] Employment with the Government, on the other hand, is limited due to inflexibility in hiring policies and a current hiring moratorium. Government requires services of experts only on a project basis, often participated in by members of academe.

[23] Source: Interview with PFA and BFAR
[24] Source: Interview with Philippine Fisheries Association (PFA) and Bureau of Fisheries and Aquatic Resources (BFAR).

Respondent fishery/aquaculture organizations report that new graduates need to be educated more on the process of fisheries and aquaculture business, and acquire some knowledge in marketing. On a non-technical aspect, new graduates should improve their oral communication and report-writing skills (Table 49).

Table 49 Summary of competency issues in Fishery/Aquaculture

Technical competencies	Need to have knowledge on entire process of fisheries/aquaculture business. Increased marketing knowledge needed.
Non-technical competencies	Report writing. Oral communication skill.

Source: Interview with industry association and government agency

Lack of knowledge among relevant graduates is mainly attributed to curriculum, where there are reportedly no courses to address seaweed aquaculture and other big aquaculture-related fields. Respondent organizations mention the need for emphasis on basic subjects such as fishery technology and marine ecology, as well as improving advanced subjects such as biostatistics, biochemistry, molecular chemistry and organic chemistry, for them to be at-par with other ASEAN countries. They also mention a need to improve related facilities and equipment used in instruction, so that students may be made aware of international standards.

The organizations also anticipate some demand for DNA profiling for management of species. This is an expertise that is often sourced from overseas experts and facilities due to its unavailability in the Philippines. For this, faculty with competency in DNA profiling, and the corresponding equipment is essential.

Table 50 Summary of issues on faculty, facility and curriculum in Fishery/Aquaculture

Faculty	Faculty with knowledge and skill of DNA profiling may be needed to address potential demand.
Facilities/ equipment	Private universities tend to have equipment only for research & development pertaining to fisheries, although SUCs, such as University of the Philippines – Diliman and Central Luzon State University are known to have related equipment. There is a need to build the capacity of the facilities and update the equipment being used to comply with international standards.
Curriculum	No specialized fields such as seaweed aquaculture, etc. There is a need for basic subjects such as fishery technology, marine ecology. There is a need for advanced subjects such as biostatistics, biochemistry, molecular chemistry and organic chemistry to be in line with other ASEAN countries

Source: Interview with industry association and government agency

There is little indication that private companies involved in fisheries or aquaculture train their employees in advanced education. Similar with Agriculture, Fishery and Aquaculture companies may be more concerned with production than innovation or R&D, which, in turn, are left to external consultants.

The fisheries section needs almost the same competency from higher education, namely in R&D and familiarity with the actual business operation, not only for production but also marketing, finance, etc.

3.9. Needs from Governmental Agencies

The survey collected perception and opinions from governmental agencies of the Philippines as well. National Economic and Development Agency (NEDA) pointed that priority development sectors are those identified in PDP and the Investments Priority Plan (IPP) 2013. They accept priority disciplines that CHED identified, since they are decided based on consultation with relevant agencies including NEDA.

Department of Trade and Industry (DTI) mentioned that they are preparing roadmaps in the Manufacturing Revival Program. They pointed that engineers who will become managers and leaders of the industry. Fostering entrepreneurs and instructors for SMEs were also mentioned.

Philippines Economic Zone Authority (PEZA) put emphasis on investments from Japan and investments into semiconductor sub-sector. In terms of comparative advantage of the country, they perceive that Business Process Outsourcing (BPO) and semiconductors are two major sub-sectors. Especially they showed expectations on Japan to support in enhancing semiconductor sector. More practical education with the latest equipments and up-to-date curriculum are needed.

3.10. Analytical summary

a. Key Generic Skills

Key Generic Skills necessary for adult members of society are defined as communication, interpersonal and conceptual skills. Technical skills referred to technical knowledge and practical skills needed for specific disciplines are also needed in engineering field of industry. In HEIs' programs, knowledge such as basic theories, methods and processes and basic use of machineries and tools are taught. However, companies expect HEI graduates to function at the managerial level and operational tasks are often handled by non-HEI graduates. HEI graduates are required to have Key Generic skills as they are expected to be future managers.

In Key Generic skills, communication skills and negotiation skills that are necessary in establishing and maintaining good relationships with others. HEI graduates are expected to serve as team leaders and managers within a few years of hiring. At such positions, they are expected to perform their jobs by communicating with subordinates, superiors, other departments, and even with external parties. Interpersonal skills are required at all times, unlike technical skills which are required only when necessary. Also, interpersonal skills cannot be acquired quickly by attending training. These must be nurtured and developed through daily practice. Conceptual skills include logical thinking, problem solving and application capabilities. It seems that such skills need to be strengthened in the Philippines, as industry players have voiced so in the present study. For graduates of HEIs to eventually drive businesses and the country as managers and executives, they must have the capability to build systematic structures of existing knowledge and information, to understand abstract matters and ideas from global perspectives, and to connect them to the solution of issues and problems. Such logical thinking and application capability can only be built when one has the basic foundation of knowledge. Furthermore, application capability and problem-solving capability requires information and knowledge not only of the discipline of one's specialization, but also of a wider field. HEIs are expected to equip students with such fundamental skills or "social common sense" from a wide perspective.

Technical skills must be acquired when one joins a certain organization, takes up certain job responsibilities and performs his/her job. However, the skills to understand the meaning of technology and apply it, and communication skills to teach or instruct in the organizations are fundamental skills to be professional and generally applied across all organizations and professions. In business administration courses, they already have curriculum that covers the basics of such fundamental skills. However, science courses tend to be specific in their discipline and technology, while arts courses tend to be biased toward academic studies. Faculty members do not recognize the importance of such fundamental skills.

This is why there are many cases wherein companies conduct such training themselves or send their employees to top private universities that offer such curriculum. Many large enterprises and government agencies send their employees who are potential future executives to earn an MBA from top universities.

When looking at the issue from a country-level perspective, it is very inefficient if each individual company has to provide training on these fundamental skills to be a professional. If HEIs could provide education for such fundamental skills, it will allow companies to focus their resources on training in specialized fields. Thus shortening the time needed to prepare HEI graduates to be ready to perform duties as leaders and managers, as expected by their employers.

b. High Expertise

For industries in the Philippines to strengthen their global competitiveness, it is necessary for them to shift from labor-intensive and low value-added areas to higher value-added areas. In most sectors surveyed in this study as candidate sectors for support, what is greatly needed is "creation" of new value-added. "Creativity", which includes logical thinking and capability to apply knowledge, is the clear weakness of the Philippines. "Creation" occurs when one, with wider perspectives, intersects with diverse knowledge, information and people. Human resources with high expertise in their respective discipline are needed to incorporate such creation to National policies and directions. HEIs are expected to propel "creation" and provide high expertise.

c. Aligning contents of education to the needs of industry

Generic skills are not taught in a specific discipline, but they are nourished through proactive and interactive participation to the classes. However, if the education is only one way transfer of knowledge from faculty members to students, then it does not make any difference from the secondary education. By implementing "K to 12" program, some part of general education will be transferred to the secondary education and HEIs will be able to upgrade the curriculum to be more advanced and relevant to the needs from industry and society.

Both faculty members and industry people pointed that faculty members are, in general, not much exposed to industry and they do not understand well about the real situation and needs on HE graduates from industry.

"K to 12" is such a good chance to review the contents and methodology of education at HEIs and it should aligned with the needs of industry.

4. SUCs: Findings from questionnaire and interviews

This chapter describes the outline and findings of questionnaire and interview surveys for SUCs conducted for the purpose of this project.

4.1. Outline of questionnaire and interview survey

The objective of the questionnaire and interview survey is to gather data which can be used for analyzing the current status of the 112 SUCs in the Philippines.

4.1.1. Questionnaire Survey

The questionnaire was used to obtain the following information:

1. General information about the SUC
2. Current status & issues encountered with the development of the seven disciplines
3. Existing initiatives of the SUC (e.g. extension programs, industry linkages)
4. Future plan for developing courses for the seven disciplines

Two methods were used to disseminate the questionnaire to ensure distribution of the available channels of the SUCs: (1) Postal mail and (2) Electronic Mail. The survey was conducted from October 2014 to March 2015. The survey collection rate is 46.4%, 52 out of 112 SUCs responded to the questionnaire.

Table 51 Survey Collection Rate

No. of Target Respondents	No. of Collected Questionnaire	Collection Rate
112	52	46.4%

4.1.2. Interview Survey

The rationale of the interview meeting is to verify the information in the questionnaire to better comprehend the current situation of the SUCs. The interview was conducted for two weeks between October 13 to October 24, 2014. The team conducted interviews with the following six (6) SUCs:

- University of the Philippines, Los Banos
- Mindanao State University, Marawi
- Mindanao State University, Iligan Institute of Technology
- Mindanao University of Science and Technology
- Visayas State University
- Bicol University

The above SUCs were chosen through a process of consultation with CHED. Some SUCs were suggested by CHED, while some were mentioned by private companies who employ SUC. Mindanao University of Science and Technology (MUST) was not suggested by CHED or private companies, but it was listed as a Center of Development and its President (who stood as respondent of the interview), is also the President of Philippine Association of State Universities and Colleges (PASUC), which is one of the stakeholders of the Philippines' higher education sector. It is because of this that MUST is included for interview.

4.1.3. Participating SUCs

Participated SUCs are listed in the Table 52. The results stated are based only on initial responses from SUCs, 52 out of 112 SUCs participated in the initial stages of the survey.

Table 52 List of participating SUCs

	Region	Name of University/College
1	Region I	Ilocos Sur Polytechnic State College
2	Region I	Mariano Marcos State University
3	Region I	Pangasinan State University
4	Region I	University Of Northern Philippines
5	Region II	Nueva Vizcaya State University
6	CAR	Benguet State University
7	Region III	Aurora State College of Technology
8	Region III	Bataan Peninsula State University
9	Region III	Bulacan Agricultural State College
10	Region III	Central Luzon State University
11	Region III	Pampanga Agricultural College
12	Region III	Tarlac College Of Agriculture
13	Region III	Tarlac State University
14	Region IV-A	Batangas State University
15	Region IV-A	Cavite State University
16	Region IV-A	Laguna State Polytechnic College
17	Region IV-A	Southern Luzon State University
18	Region IV-B	Marinduque State College
19	Region IV-B	Mindoro State College of Agriculture and Technology
20	Region IV-B	Occidental Mindoro State College
21	Region IV-B	Palawan State University
22	Region IV-B	Romblon State University
23	Region IV-B	Western Philippines University
24	Region V	Bicol State College Of Applied Science And Technology
25	Region V	Bicol University
26	Region V	Camarines Norte State College
27	Region V	Camarines Sur Polytechnic Colleges
28	Region V	Central Bicol State University Of Agriculture
29	Region V	Catanduanes State University
30	Region V	Partido State University
31	Region V	Sorsogon State College
32	Region VI	Carlos Hilado Memorial State College
33	Region VI	Central Philippines State University (Negros State College Of Agriculture)
34	Region VI	Northern Negros State College Of Science And Technology
35	Region VI	Western Visayas College of Science and Technology
36	Region VII	Cebu Normal University
37	Region VII	Negros Oriental State University
38	Region VIII	Naval Institute of Technology
39	Region VIII	Samar State University
40	Region VIII	Visayas State University
41	Region VIII	Eastern Samar State University
42	Region IX	Zamboanga State College of Marine Sciences and Technology
43	Region X	Bukidnon State University
44	Region X	Mindanao University of Science and Technology
45	Region XI	Davao del Norte State College
46	Region XI	Southern Philippines Agri-Business and Marine and Aquatic School Of Technology
47	Region XII	Mindanao State University Main Campus (Marawi)
48	Region XIII	Caraga State University
49	Region XIII	Surigao Del Sur State University
50	Region XIII	Surigao State College Of Technology
51	ARMM	Sulu State College
52	NCR	University Of The Philippines System

4.2. Current issues and needs of SUCs

This section summarizes findings from the survey (questionnaire and interviews), in terms of faculty qualification, faculty development and training, facilities and equipment, curriculum development and linkage with overseas universities.

4.2.1. Faculty

The faculty members have three main functions in the university: (1) Instruction (2) Research, and (3) Administration. Instruction is one main function of the professors on which they are presently most focused. To increase the qualified individuals in each program, SUCs offer faculty development programs which could be in the form of a scholarship grant, training programs and/or thesis/dissertation grants.

Research is also one main function of faculty members that facilitates the knowledge generation and development of both them and students. Many SUCs aim to develop their research capabilities which can be measured quantitatively by, for example, the number of research conducted, number of published journals, number of inventions patented, etc. SUCs start building up the competencies of its faculty members in conducting research through proposal -writing training sessions and intellectual property seminars. SUCs also identify the specializations needed for its focal research areas and strengthen these using linkages through possible research collaboration, faculty exchange and scholarship opportunities.

To retain faculty, SUCs provide additional incentives and compensation like scholarships or opportunities for faculty development. SUCs provide special incentives for faculty members who have published their papers in internationally recognized peer-reviewed research journals, or present in national and international conferences. Those who have attained advanced degrees abroad receive administrative positions or are provided funding to conduct further research based on the specialization they have gained.

Despite these, SUCs have pointed out three main issues: (1) qualification, (2) development and training, and (3) compensation

Faculty qualification

Generally, meeting minimum standard requirements for faculty qualifications is a challenge for the SUCs. Most of the interviewed SUCs stated that the number of faculty who have MS/PhD degrees is inadequate, especially in SUCs located in provincial areas. In one department, the number of PhD degree holders is normally less than 10, or in some cases none at all, especially for newly-established disciplines. This lack of PhD degree holders could be attributed to limited opportunities for growth in the SUC.

Faculty members are usually focused on teaching. There has been a rapid increase of students over the years in the SUCs, but the tenure positions are slow to expand. Usually overloaded with instruction responsibilities, it provides little opportunity for the faculty members to pursue higher degrees. Additionally, limited scholarship opportunities disable them from pursuing higher qualifications and demotivate them from remaining in academe.

The wage, compensation and scholarship opportunities in the SUCs are uncompetitive with the private sector. It is difficult for the SUCs to compete against the private sector since the salary grading for the faculty is based on a national standard set by the Government. Subsequently, and not surprisingly, the faculty members transfer to the private sector to seek out better opportunities.

These issues greatly affect the university especially the quality of education in the long run. Many PhD faculty members are retiring and SUCs find it difficult to fill the available positions due to a lack of qualified individuals. Hence, most faculty members only possess a bachelor's degree, not meeting

the minimum standards set by the Government. This limits the knowledge taught in class. Furthermore, this has hindered the SUCs from offering specialized PhD programs, since they need qualified faculty who could serve as an adviser for the students. Two universities mentioned that a PhD in engineering is difficult to attain locally since only one university, UP, offers such a program since they are the only university to have qualified faculty members.

Given the limited scholarship opportunities and degrees offered in the university, the qualification of the faculty remains the same and the quality of education being delivered to students in the long run continues to be at risk. Institutional support, such as scholarship grants, is generally needed by the SUCs to enhance the qualification of their faculty members.

Faculty development and training

Each SUC has a faculty development program which selects and recommends training needed by the faculty. Challenges regarding the faculty development and training comprise of 3 main issues: (1) limited availment of scholarship opportunity, (2) retention of faculty members, and (3) lack of faculty immersion to industry.

Many SUCs seek faculty scholarships from other institutions to enhance the qualification of their own faculty members. However, by sending out their faculty members to a faculty development program, SUCs in turn, decrease the number of faculty members teaching. To maintain the quality of education being delivered to the students, SUCs only allow 20% of its faculty to leave for scholarship. To fill the teaching units left vacant by the grantee or the researcher, SUCs either hire substitute instructors or divide the teaching load among remaining faculty members. Hiring substitutes remains problematic as there is likely (1) a lack of internal funding and (2) a possible mismatch in teaching specialization. Thus, the education being delivered may not meet the curriculum followed by the department.

Although SUCs provide faculty development and training programs, tough manpower competition against the industry has left SUCs with only minimal number of qualified faculty members. This continues even during and after participation of the faculty in a scholarship program abroad. There were cases wherein, during the scholarship grant, the grantee found jobs with other companies and chose not to go back to the academe. Even those faculty members who finished their scholarships did so, since the industry offers better opportunities in terms of financial and career gains. Those who returned to their SUCs with value-added knowledge lack opportunities within the SUC to apply it due to lack of funding for research, appropriate equipment, etc.

There are also faculty development opportunities which could be sought outside the university. Faculty immersion in industry serves as an outlet to refresh the faculty members' knowledge and update them about the industry's trend and direction. This also provides an opportunity for them to use the modern facilities and equipment that the SUCs lack.

Lack of faculty exposure to the industry has been identified by SUCs as a problem which reflects the education being delivered to students and which must be addressed. However, lack of industry linkage hinders SUCs from providing this. This may be due to the SUCs' location where the industry is not active in their surrounding area or SUCs do not know how to make connections with it.

SUCs need strong institutional support to enhance their faculty development programs, retain faculty and provide opportunities for growth. SUCs need help in establishing linkages with industry which in turn could open up a lot of opportunities for faculty development through faculty exchange, research collaborations, etc.

4.2.2. Facilities and Equipment

In the questionnaire survey, many of the SUCs expressed interest to improve their current facilities and equipment. Out of 52 SUCs, 41 (79%) have stated in their strategic plans or expressed their interest on establishing and upgrading their current facilities and equipment. The most frequent mentioned need of the SUCs is the procurement and/or upgrade of equipment (Table 53). Facilities and equipment needed are mostly concentrated on the Engineering discipline, followed by the Agriculture discipline.

Table 53 Number of Respondents per SUC need

Needs of SUC	# of respondents	%
Establishment and/or improvement of general facilities (R&D facilities, classrooms etc.)	41	79%
Procurement and/or Upgrade of Equipment (e.g. disaster warning devices)	24	46%
Establishment and/or improvement of science laboratories	24	46%
Establishment of research centers (e.g. Mindanao Sustainable Minerals Research Center, Alternative Energy Research Center)	16	31%
Establishment of Training Facilities for faculty and students	6	12%

Note: Items with less than 5 respondents are not shown.
Source: SUC Questionnaires

Table 54 Facilities & Equipment needed by discipline

Facilities & Equipment needed by discipline	# of respondents	%
Engineering (e.g. civil eng., sanitary eng.)	15	29%
Agriculture	14	27%
Fisheries	8	15%
Biotechnology	6	12%

Source: SUC Questionnaires
Note: Other fields such as biotechnology, fisheries, mining and renewable energy have been mentioned. Note: Items with less than 5 respondents are not shown.

SUCs are keen on establishing research centers to build the research capabilities of their students and faculty members. Sixteen (16) of 52 SUCs (31%) have stated in their strategic plans and the questionnaire that they are interested to build or develop a research center(s) on their campus which would be its central facility for conducting R&D activities and housing the facilities & equipment needed. For example, Pampanga Agricultural College established an Affiliated Renewable Energy Center (AREC), funded by DOE, focused on biogas and solar energy. The function of the center is to give their students a hands-on experience in developing home system models for communities which have no access to electricity.

Aside from the research centers, 24 out of 52 SUCs (46%) make it a part of their strategic plan to construct and improve their laboratories for instruction and research use. These serve as a medium to explore the specialized areas such as disaster management, renewable energy and biotechnology.

Current Status & Issues

Facilities and equipment in SUCs are still generally insufficient, lacking the basics needed for instruction and research. Especially for disciplines focused on sciences and engineering, a bigger investment towards facilities and equipment is needed so that students and faculty members can apply their theoretical knowledge to practical work.

The funding for facilities and equipment is greatly dependent on the allocated government budget for capital outlay and its income-generating activities. Given that it is only minimal, the SUC needs to see other sources of funding. SUCs could also procure equipment through research grants awarded by various funding agencies such as DOST, CHED and DA and through its linkages with the industry and overseas universities. However, strong competition among HEIs for research grants and limited linkages with industry and overseas universities hinder the SUCs in this area.

However, even with basic facilities and equipment, SUCs have observed that their faculty members lack theoretical knowledge and expertise to use these. The faculty's knowledge may no longer relevant especially with modern equipment. Students, in effect, have similar problems operating equipment, lowering its life-span. Without the required basic principles needed to understand the operation of such equipment and facilities, they will not be used or maintained well.

SUCs generally need assistance in enhancing and maintaining their facilities and equipment. Currently, SUCs are reliant on outside assistance, such as linkages with industry and overseas universities, income-generating projects, outside-funded research collaborations with industries and other Government institutions despite the appropriations from the national treasury. Establishing strong connections could serve as initial point to help the university obtain good-quality facilities and equipment.

4.2.3. Curriculum development

The major issue for curriculum development is that SUCs have to revise their curriculums to align with the Outcome Based Education policy and any changes in the education system due to the implementation of K-to-12 policy. It is indicated that revising the curriculum to reflect the latest situation of industry is difficult for SUCs, since it is changing so fast.

SUCs have been complying with the CHED memorandum order and any needs that may arise for the curriculum change. Based on the interviews with SUCs, at least eight (8) SUCs have stated that they are currently revising their old curricula to meet the new Outcome Based Education guidelines. Due to the implementation of the K-to-12, SUCs have also been revising their curriculum and implementing training programs for their faculty. However, at least three (3) SUCs are still unclear about the implementation of the K-to-12. Some SUCs have mentioned that they are currently awaiting more amendments to their GE curriculum from CHED.

Even with the current processes and curriculum development program, SUCs reported that there is a need to revise the curriculum in specialized fields in Engineering and Sciences. They are having difficulty developing a curriculum for their programs that will reflect industry needs since the industries within these disciplines are changing rapidly. To be able to keep up with the industry, active and constant consultation with the industry is required.

4.2.4. Linkage with overseas universities

In the questionnaire survey, 20 of 52 respondents (38%) have linkages with overseas universities, 39 of 52 (75%) are planning to increase or establish their relationships with overseas universities for possible faculty & student development through exchange and scholarship programs and to enhance their research collaboration. Thirty-five (35) of 52 (67%) have linkages with industry. Most of these linkages are for On-the-Job Training (OJT) of students, not for collaborative research. (Table 55)

Table 55 Linkages with overseas universities and industry

Linkage	# of respondents	%
Have linkages with overseas universities	20	38.4%
No current collaboration with overseas universities	24	46.1%
Plan to establish linkages with overseas universities	39	75.0%
Have linkages with industry	35	67.3%
No current collaboration with industry	9	17.3%
Plan to establish linkages with industry	39	75.0%

Source: SUC Questionnaires

4.2.5 Linkages with industry and issues

The linkages between industry and SUCs are mostly established by On-the-Job Training (OJT). Most students studying at engineering, agriculture, or fisheries courses undergo On-the-Job Training (OJT) at the last year of the university to learn the actual practices in the industry. The type of industry that accept OJT from each discipline are;

Table 56 Linkages with overseas universities and industry

Discipline	Type of industry	Sample contents of OJT
Civil Engineering	· Government (e.g.DPWH) · Construction company	· Pre-practice in the field of civil engineering · Estimation/Inspection/Designing works
Mining/ Geological Engineering	· Mining company · Heavy duty equipment manufacturer	· To be exposed in large/scale/ commercial operation · Learn actual machine operation and maintenance
Manufacturing, Renewable Energy (Engineering courses)	· Electronic manufacturing company	· Laboratory techniques, or in carrying out procedures/processes · To be exposed in large/ scale/ commercial production
Agriculture/Biotechnology	· Food processing company · Large scale farm · Oversea country · Oil mills · Feed company	· Laboratory techniques, or in carrying out procedures/processes · To be exposed in large/ scale/ commercial production of commodities/goods · To be exposed to technologies which the HEI can not showcase or pilot because of the cost or scale of operation
Fisheries/Aquaculture	· Feed company · Seaweed company · Aquaculture(farming) · Food processing company	· To be exposed in large/ scale/ commercial production (e.g.rocessed food, hatchery) · To be exposed to technologies which the HEI can not showcase or pilot because of the cost or scale of operation

The contents of the OJT are decided by the host company, the students usually assist the small part of the production line or experience the entire process of production. Companies take this OJT opportunity as a part of recruiting process, they screen the students through OJT, then offer a job to the selected student. Manufacturing companies located in industrial area in Luzon island offer OJT to SUCs located in provincial area to recruit better students. Based on their hiring record and employees' performance evaluation, they recognize that the students from provincial SUCs are more patient and have good working attitude compared to the students from universities located near industrial area. This is relatively said since there are less employment in provincial area, the students from provincial area are more serious and hard working on the assigned job. Because of this reason, the manufacturing company especially Japanese manufacturing companies visit provincial SUCs to establish the OJT linkage. Although some SUCs are active on approaching companies to tighten their linkage with industry to secure the employment, it seems that the most approaches were made by industry side, not initiated by SUC side. The issues of the linkages with industry is that it's only for the connection providing manpower through OJT. There is no collaborative output between SUCs and industry. For example, SUCs traces the reputation of the student sent to OJT, however they don't reflect feedback from industry to enhance their curriculum. The manufacturing company sometimes donate their used production machine to improve SUCs program, but SUC can't utilize the machines because of the lack of knowledge operating machines. Since their curriculum or faculty knowledge are not updated, they don't know how to operate them or don't know how to utilize them into their curriculum.

Current linkages with overseas universities per discipline and issues

Establishing local and international linkages for SUCs provides opportunities not only to share knowledge and ideas, but also to facilitate the development of the university through student and faculty exchange programs and research collaborations. These connections facilitate the knowledge transfer from industry & overseas universities to SUCs especially on newly-established disciplines such as disaster management, renewable energy and biotechnology. Through these, SUCs are also given assistance in upgrading their facilities and procurement of equipment. Collaborating with industry provides opportunities such as receiving updates about industry trends and direction, income-generating projects, research development and faculty immersion.

Based on the data collection survey and interviews conducted, most of the collaborations between SUCs and overseas universities are for research purposes as most SUCs aim to develop their R&D capability. To support their research funding, SUCs submit research proposals to external funding agencies such as DOST, DA and USAID. Compared to other disciplines, Agriculture and Fisheries have more external linkages for research collaborations and exchange (Table 57). Since these disciplines pertain to important industries of the Philippines for poverty alleviation, this result seems to be aligned with government direction.

However, some SUCs have problems with their linkage arrangements. One is limited funding which affects the sustainability of the partnership. Also, based on feedback that they received from their students, topics covered in the OJT programs are not related to their courses. Other than that, SUCs have an issue with intellectual property management with private companies for the research being done by the faculty members.

Table 57 The Number of Linkages Mentioned in the Survey by Discipline

Discipline	Student/Faculty Scholarship	Research/ Consultations	Student/Faculty Exchange	Others
Civil Engineering	1	8	0	0
Mining/Natural Resources	2	6	1	0
Manufacturing	2	1	0	1
Renewable Energy	2	0	0	0
Biotechnology	5	4	0	1
Agriculture/Agri-business	2	9	2	3
Fisheries	2	15	2	2

Source: SUCs interviews & Questionnaire

Future need for linkages

All SUCs want to establish linkages with industry and overseas universities since this is a clear opportunity for SUCs to further develop the research skills of the faculty members and their students and increase specialization in their respective disciplines (Table 58).

Table 58 Future Plans & Needs of the SUCs

Research Collaboration on the following focal research areas: Science & Technology (Engineering), Biotechnology, Renewable Energy, Agriculture, Fisheries & Disaster Management	There has been growing interest to establish collaboration for disaster resiliency which the SUCs lack presently. Opportunity for the Agriculture & Fisheries concentrated SUCs to explore the areas of Biotechnology & Renewable Energy (e.g. Pampanga Agricultural College, MSU-IIT) Opportunity to enhance the skills and competencies of faculty members & students in conducting research
More opportunities for Faculty Development through Scholarship Grants	Increasing the faculty qualifications through graduate & post graduate degrees Facilitate the knowledge transfer especially in specialized fields Encourage & develop research interests & skills of their faculty members
Establish & Strengthen collaborations with the private sector	Getting the advice of industries for the revision of curriculum, programs etc. Facilitate the knowledge transfer from the industry to the academe Increase research and OJT opportunities

Source: SUCs interviews & Questionnaire

4.3. Analytical Summary

The nature of this issue is that the quality of education is difficult to maintain whilst the quantity is expanding rapidly. The population of the Philippines is increasing by two percent (2%) per year. To keep pace the number of higher education institutions and faculty members has also been increasing. Even though efforts to upgrade the quality of education have been implemented and some have been effective, much room remains for further improvement.

The quality of education and research could be improved through networking with industry or other universities. However, especially for those SUCs located in rural areas difficulties arise because there is no relevant industry nearby.

As mentioned in the previous chapter, while the reputation of UP is high, other SUCs lag far behind. Employers seeking better graduates expect those SUCs to catch up with UP. SUCs are caught in a

vicious cycle of heavy teaching loads which keep faculty members from committing to research, as do obsolete facilities and equipment. Also, compensation is less than what private universities or industry offers, making competent faculty members hard to recruit and retain. As a consequence, it is a huge challenge to improve the quality of education and research.

Aside from UP, there are some highly potential SUCs in each region for specific discipline. In fact, some of them have established a research center(s) which works as a research base in the region. A support program for those potential SUCs in faculty development, facility and equipment improvement and establishing linkages with industry and other universities will be effective not only for the recipient institutions, but also for others in the region.

4.4 Findings of 2nd survey-study of selected SUCs

4.4.1 Overview of the 2nd field survey

Respondents from industry that were interviewed in the previous chapter clearly did not have positive impressions of graduates from current schools. They found graduates to be moderately adequate at most, but lacking in many competencies that are necessary in industry situations. Among the more salient factors attributed to this void is the quality of education provided by their HEI in terms of content, being a function of the quality of an HEI's faculty members, and available equipment that simulates industry-relevant conditions. In particular, the quality of an HEI's faculty members is seen as a major key contributing to the quality of education. Questionnaires and interviews to SUCs also showed that the quality of faculty is one of their issues. The number of faculty who have MS/PhD degrees is inadequate, especially in SUCs located in provincial region, it contributes to a few experts of the discipline in SUCs. Based on the findings of the 2nd survey, SUCs have the common issues such as, underdeveloped faculty, lack of time for R&D, lack of fund for R&D, lack of facilities and equipment are observed. Details will be addressed in the each SUC study.

4.4.2. Research items

Information collected and analyzed from each respondent SUC fall under three categories: (1) link with overseas universities and industry, (2) research activities and (3) facilities and equipment.

Link with overseas universities and industry is a key to enhance faculty member's knowledge in industry practices and up-to-date concepts and technology. Research activity is also seen as an important action for development as it provides for an improvement in faculty members' expertise in a particular field of study, especially if it is done in collaboration with industry members and overseas institutions.

Facilities and equipment are seen to enable faculty members to both conduct R&D and simulate industry practice during instruction. Current status and future needs in these three aspects will therefore be discussed.

4.4.3. Respondent SUCs

Eleven SUCs' in-depth information was collected as shown in Table 59 below. Their respective geographic locations are presented in Figure 36.

SUCs were chosen firstly based on their record of having COE or COD and their being perceived with good records by industries that were interviewed as well as with subsequent internal consultations within CHED A shortlist of SUCs was then created and consulted by the research team with the CHED. CHED then recommended including Mindanao State University-Main Campus and Mindanao State University-General Santos because of their unique mandate to cater to marginalized areas.

Table 59 Respondent university and focal disciplines

Region	Respondent University	Focal Disciplines
Luzon	University of the Philippines – Diliman	Civil Engineering, Manufacturing, Renewable Energy
	University of the Philippines – Los Banos	Agriculture, Biotechnology
	Central Luzon State University	Agriculture, Fisheries, Renewable Energy
	Benguet State University	Agriculture
	Bicol University	Civil Engineering, Manufacturing, Mining, Renewable Energy
Visayas	University of the Philippines – Visayas	Fisheries
	Visayas State University	Agriculture, Renewable Energy
Mindanao	Mindanao State University – Main Campus	Manufacturing
	Mindanao State University – Iligan Institute of	Biotechnology, Civil Engineering,

	Technology	Manufacturing
	Mindanao State University – General Santos	Fisheries
	Mindanao University of Science and Technology	Manufacturing

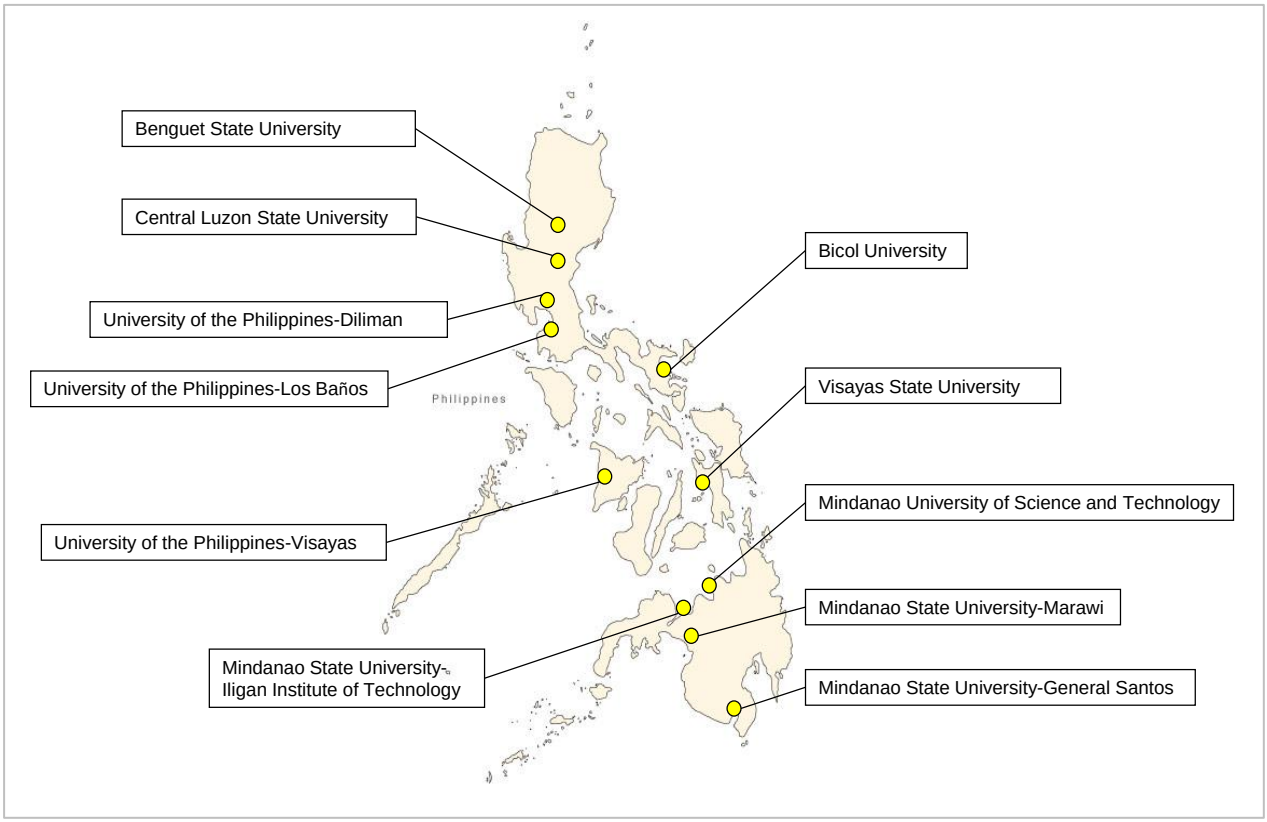


Figure 36 Geographic distribution of respondent SUCs

4.4.4. Method

Data was collected through interviews and site visits to the selected SUCs. Respondents were selected from the SUCs' respective academic departments that handle the focal disciplines and research coordination offices. Interviews and site visits were conducted from December 2014 to January 2015.

4.4.5 Findings per respondent SUC

Presented in this section are findings that were collected in the 2nd field survey. Each SUC will be presented individually, analyzed according to their linkage with overseas universities and industry, research activities and facilities and equipment.

4.4.5.1 University of the Philippines – Diliman

UP Diliman is recognized to be the leading higher education institution in the country, having the most advanced research & facilities and best experts in various fields. Among the focal disciplines, UPD is regarded as the leading SUCs for civil engineering, mining, manufacturing (engineering) and renewable energy.

Linkages

Linkages with oversea universities

The university continuously provides institutional support for the research activities and maximize external opportunities such as linkages and scholarship opportunities. There are currently more than 300 MOA/MOU with universities and organizations locally & abroad. Japan has the highest number of linkages with UP followed by Korea and the United States. For scholarship, the United States has always been the top choice for the faculty to pursue their advanced degrees, followed by Japan and Australia. Currently, 15 to 20% of the faculty scholars are currently pursuing their advanced degrees in Japan. The majority of their current linkages for scholarship are developed through previous academic experience in various universities. To better manage and disseminate information about the activities, they will launch an E-UP for internationalization, which serves as the database of the current linkages.

Linkage with industry

UPD invites practitioners from the industry to help with setting the research direction of the laboratory aligned with the direction of the industry. UPD also collaborates with a private company to set up a graduate program where the employees from the company can conduct research and earn degree.

Research activities

Future needs on R&D

Slow faculty development is a challenge for UPD. Only 20% of the faculty pool can be allowed to take their scholarship degree, a limited number of faculty could leave for their studies. Based on the questionnaire and interview, the number of the students of engineering courses doubled in the last 10 years while the number of faculty remains the same. The current faculty-students ratio is 28(1 faculty: 28 students), one faculty from mechanical engineering has instruction workload with 15 units per week while the ideal instruction workload is said as 6 units per week. The higher workload hinders faculty to develop themselves and spare time for R&D. Hiring substitutes is one of the solutions, but it's also difficult since the budget is limited. To develop faculty with scholarship program, both of financially support to hire substitutes and increasing the number of faculty to share the workload are needed.

Facilities and equipment

As being the national leading university, adequate facilities and equipment is needed to sustain and improve the research activities and linkages ahead of other SUCs. One of the most critical issues on R&D environment in UPD is lack of facilities and equipment. Most of respondents from UPD insisted a need of a research re-entry grant for the returnees to immediately utilize what the scholar has learned. Since faculty in UPD relatively have better opportunity to get scholarship to study abroad, providing R&D environment to scholars with necessary equipment is effective to continuously improve their expertise.

Facilities of UP Diliman, especially the mechanical engineering department, are relatively old. The mechanical engineering department has relatively advanced equipment for the Philippines acquired through various research projects, but it is still limited in number. One piece of their advanced equipment was donated by the Department of Energy (DOE) when the department was commissioned to test the biofuel mixing rate in gasoline. However, most of their equipment is still outdated.

Figure 37 Equipment in the mechanical engineering department for small-scale simulation of vehicle behavior

Figure 38 Simulation system to evaluate fuel efficiency of gasoline mixed with biofuel

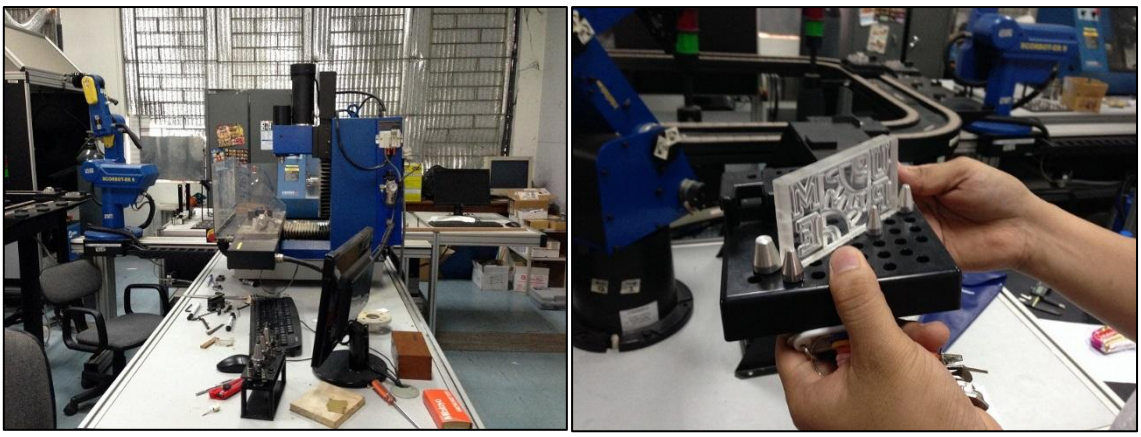


Figure 39 Scorbot-ER9 equipment used for laser cutting and sample end-product

4.4.5.2. University of the Philippines – Los Baños

Linkages

Linkages with oversea universities

UPLB has already established its reputation as the leading research institution for agriculture and biotechnology, having expertise in both those fields. UPLB can easily be approached to set-up linkages with industry and foreign universities because of its reputation, however, connections with overseas universities are usually initiated by personal linkage of faculty members.

Linkages with industry

UPLB have been collaborating with agro-industries, such as fertilizer or feed manufacturer, they are commissioned of feasibility test. Despite of experiences of collaborative research with industry, UPLB still has challenge on IPR issue with private industry. IP issues are commonly addressed by other SUCs, this, most of SUCs have been struggling to understand and well implement the regulation from the government.

Research activities

Future needs on R&D

Since UPLB is the leading SUC for agriculture and biotechnology with long history of research activities, there are sufficient faculty with PhD, however they still need to upgrade degree of young faculty.

The faculty from the biotechnology and agriculture disciplines have expressed a desire to conduct advanced research such as in nanotechnology. Although they have many research projects on agricultural and biological basic research, they haven't proceeded to higher technological research due to lack of equipment. Since the Philippines has rich agricultural resource, UPLB needs to improve their research capability to continuously lead the agricultural research and become competitive institution. Thus, faculty development for young generation and providing stable facilities and advanced equipment is most prioritized issues on UPLB.

Facilities and equipment

UPLB needs more stable infrastructure especially electricity for sustainable research activities. Frequent fluctuating power is the most critical issue for UPLB. It damages and decrease the life span of the equipment, moreover, it usually disrupts research projects, and causes delay to the project which increase its costs. For instance, after a powerful typhoon in 2014, the university experienced 3 weeks without electricity. Stable power supply or a generator which could hold the electrical capacity of the sensitive equipment is needed.

The National Institute of Molecular Biology & Biotechnology (BIOTECH) already have the basic equipment. The facilities for biotechnology are located under one area which houses multiple laboratories and outdoor space for their experiments. The laboratories are well-equipped with basic and a few highly-specialized equipment acquired through projects. Due to lack of space inside the facility, several equipment are stored along the hallway.

Figure 40 Old equipment being used for research purposes

The college of agriculture has multiple laboratories. Most of the facilities are old, but well-maintained. Some of the laboratories are well-equipped depending on the research activity of the faculty. Most of the equipment is procured through external funding and can be used for instruction and research purposes.

Figure 41 Pictures show various laboratories in the college of agriculture, used for instruction and research purposes

Figure 42 Pictures show old equipment donated by JICA

4.4.5.3. University of the Philippines - Visayas

Linkage

Linkage with overseas universities

UPV is known as the leading university for fisheries and ocean aquaculture. It has effectively streamlined its policies and standards to stimulate research activity in the university and enhance the skills of the faculty members. UPV is capable of setting up linkages with foreign universities by its experience over the years. One example would be their research collaboration with Kagoshima University. Originally funded through the JSPS program from 1998 to 2008, UPV has maintained their research collaboration with them until now and currently, 29 universities are part of this collaboration (16 Japanese universities and 13 Philippine SUCs). They also have collaborative research overseas universities or institutions, such as Wageningen University (Netherlands), Korean Ocean Research Development Institute (KORDI), Research Institute for Humanity and Nature (Japan), University of Tokyo (Japan) and Tokai University (Japan). They have been developed faculty through collaborative research with overseas universities, currently they have 15 faculty with PhD, 13 faculty with MS degree. Since the faculty-student ratio of fisheries discipline is 12, it suggests that their instruction load is not heavy very much, they have capability to conduct R&D.

Linkage with industry

Their linkage with industry is established through OJT. The university sends students to food processing company, manufacturing company, feed manufacturing company, hatchery, or government organization located not only Visayas region, but also in Luzon area. UPV currently doesn't have any collaborative research with industry.

Research activities

Future needs on R&D

UPV envisions to have collaboration with local industry focusing on joint research and product development, and seek for possible opportunities for faculty immersion. Since the location of UPV is accessible to Cebu, Leyte, or Mindanao where ocean aquaculture is active, and they have faculty with expertise, once they can establish the linkage with local industry, the research activities or faculty immersion will be easily implemented. What UPV needs to utilize their capability is assistance in connecting to local industry.

Facilities and equipment

Facilities are physically old, but the interior of the laboratories have been renovated. Each department has their own facility with 2-3 laboratories. There is enough space allocated to perform experiments, especially in the fisheries discipline.

Figure 43 Facilities in two different projects for the fisheries discipline funded by DOST

Equipment is used both for instruction and research use. Some faculty members also develop and design equipment for research and extension activities.

Figure 44 Equipment used in a laboratory.

Figure 45 Automatic Top Feeder for Milkfish

Maintenance of laboratories and equipment are overseen by specifically-assigned laboratory technicians. Typically, when procuring equipment, the equipment supplier trains the technician and the faculty members in the basic operations and maintenance procedures.

4.4.5.4. Mindanao State University – Main Campus

Linkage

Linkages with overseas universities

MSU-Main has linkages with other universities, however these are built though faculty's personal connection, not institutional linkages that have MOUs or MOAs. MSU-Main recognizes that they are weak in generating linkages and so the university has organized an International Linkages Office that is intended to be a coordinating office for scholarship or research with international institutions.

Linkage with industry

They have linkage with local government unit and private companies. Mechanical Engineering has a linkage with local government unit for the pilot test for micro hydro plant, Chemical engineering has a linkage with mining company for inspection work, Information and Communication Technology course has a linkage with software developing company for pre-market testing.

Research Activities

Issues on R&D

Research activity in MSU-Main is low, faculty members in MSU-Main spend little time in R&D and instead focus their time on teaching. There are 146 PhD holders and 462 Master's degree holders in the university but there are only 12 ongoing researches university-wide. This low activity indicates that the faculty members' research activities are confined to the accomplishment of their respective Master's or PhD degrees, not progressing onwards to their academic careers. The college of engineering, the focal discipline of MSU-Marawi, there are 4 faculty with PhD, 10 faculty with MS, and 45 faculty with BS, and the faculty-student ratio is 20. This ratio is relatively low compared to other SUC, however due to the lack of funding and equipment, the faculty can't conduct research. The faculty with PhD are required to be at administrative position addition to instruction workload, it also prevent the faculty from conducting R&D. As financial issues on R&D, there are 2 ongoing internally funded research activities which are "patriotic" research. It means faculty researchers finance it by themselves, and it is considered as internally-funded so that the faculty members are allowed by the university to de-load some of their teaching work load into their respective research activities.

Special issues on MSU-Main Campus

As the special issue of MSU-Main, the problematic peace and order situation hampers research activities. It limits the time that some faculty members can allot to be on university campus or in Marawi City (the university's location). To avoid being kidnapped, faculty shall leave the MSU-Main campus before 4:00pm. Hence the time spent inside the campus for instruction or research is limited. In addition to kidnapping problem, some research equipment had also been reported to be stolen from campus premises. Due to this peace and order situation, they also have difficulties to collaborate with other institutions outside of Marawi area.

Future needs on R&D

MSU-Main needs to involve its faculty members more to research through linkages to other research groups in academe or industry, and the university also needs basic equipment for research and facilities that can be used aside from instruction.

The lake Lanao located near MSU-Marawi is known for the rich resource of indigenous plants, the potential of its effectiveness for drug discovery is expected. However, MSU-Marawi itself has lack of capability to conduct drug discovery alone, and hardly get a collaborative partner due to peace and order situation. Thus, in order to utilize the domestic resource, assistance in developing capability of faculty by upgrading their degree and establishing linkage with other universities inside or outside of the Philippines.

Facilities and equipment

Facilities and equipment in the university is generally old and many are malfunctioning (Figure 46&47). Even basic supplies and equipment for instruction are inadequate and students use plastic bottles of drinking water for their experiments (Figure 48). Figure 49 shows Universal Testing Machine which is the only functioning equipment in the College of Engineering. They also have testing equipment in the electronics laboratory donated by Alexan, a Philippine distributor of varied electronics equipment and supplies (Figure 50).

Figure 46 Non-functional equipment for electronics engineering

Figure 47 Engineering laboratory converted into a storage room for non-functioning equipment

Figure 48 Chemical engineering students using improvised equipment in class

Figure 49 Universal testing machine

Figure 50 Electronics laboratory with testing equipment, donated by Alexan

4.4.5.5. Mindanao State University – Iligan Institute of Technology

Linkage

Linkages with overseas universities

College of Engineering participates in AUN/SEED-Net, they have linkages with Tokyo Institute of Technology (Japan), Chulalongkorn University (Thailand), Ho Chi Minh City University of Technology (Vietnam), and Universiti Teknologi Malaysia (Malaysia) through the network of AUN/SEED-Net. Aside from AUN/SEED-Net, they submitted a proposal for joint research with Waseda University about smart power system under the project of East Asia Joint Research Program on Intelligent Infrastructure. Most of their linkages with overseas universities are established by faculty's personal connection from his/her scholarship.

Linkage with industry

MSU-IIT has linkages with mining companies for student's OJT, and some companies provide scholarship for students. They used to have faculty immersion program that sent faculty to private company, but due to the limitation of available time of faculty, they stopped. MSU-IIT is active on hosting visiting professor workshops of their Biological Sciences Department, and holding a science & technology fair, "Technovation" that showcases to members of industry, Government and members of the private sector, research and engineering outputs that are developed by students and faculty.

Research activities

Issues on R&D

Lack of time spent on R&D is one of the major issues of MSU-IIT. Civil Engineering is weak in research activity because of the lack of facilities and equipment, human resource, and time. There are 7 faculty in civil engineering, and the current faculty-student ratio is 38. Since the faculty-student ratio used to be 20, it suggests the number of the students rapidly increased. The faculty have instruction workload with 12 to 15 units per week in average, if the faculty has administrative position, he/she has additional units for administrative work on the top of that. Since the number of faculty with a PhD is very few, and the average age of the faculty is 54 years old and most young faculty are occupied with instruction, it hinders the faculty from conducting research. The faculty of college of engineering also have instruction workload with maximum of 24 units because of the high faculty-student ratio which is 45, they shall spend Saturday and Sunday to conduct research.

Future needs on R&D

The SUC plans to increase its linkages with foreign universities and industries as a way to participate in more research activities. For this, the SUC needs assistance in referrals and procedures in how to participate. In addition, the university would like to increase the skills of its faculty members in writing project proposals, particularly for faculty members in civil engineering and younger faculty members university-wide.

The flourishing of the field of biotechnology in drug discovery seems to be a promising area in which MSU-IIT can gain competitive advantage over schools in the surrounding area. The university's already available competency, equipment and linkages are uncommon among nearby SUCs, they will be able to take initiative in the research area. The university must institutionalize its biotechnology research capabilities so that it expands to other faculty members, and encouraging participation of SUCs from surrounding areas in research collaboration or use of research facilities.

Facilities and equipment

Equipment in MSU-IIT is generally old except for those in biotechnology-related disciplines, and mostly used for instruction and student research. Especially in the engineering fields, there is a little available equipment that is used for faculty research. Renewable Energy research has no dedicated laboratory, and projects in Renewable Energy are kept and tested in makeshift spaces within the university premises. Figure 51 shows Coconut charcoal powered engine that is stored in an outdoor general storage area (shown in Figure 52).

Figure 51 Coconut charcoal powered engine

Figure 52 Storage area for the coconut charcoal-powered engine

There are faculty members who are actively engaged in biotechnology research, and whose project budgets allow the university to acquire research equipment. For instance, an on-going project started in March 2014 for extraction of drugs from certain plants is currently funded by DOST with Php 11.5 million. Some equipment that was acquired in this project is presented in Figure 53. Equipment in biotechnology is almost entirely used for research in drug discovery from indigenous plants.

Figure 53 Newly-acquired laboratory equipment for biotechnology that was acquired through a project funded by DOST

Figure 54 Extraction equipment donated by Niigata University

4.4.5.6. Mindanao State University – General Santos

Linkages

The university has made little or no attempt to create linkages with companies or overseas universities for research activity. Currently, the university has no office with the function of accepting or promoting research linkages with overseas universities or other groups.

Research activities

Current issues on R&D

The university generally has a low experience of R&D, especially in competitive research. This is due to a lack of priority of the university in encouraging research, manifested by the low budget for research and a strong emphasis on instruction. This direction of university has led faculty members to decrease initiative for research and instead choose to focus their time on instruction. The faculty have instruction workload with 25 units per week in average. The university is also not enforcing the requirement to faculty members to accumulate a certain number of researches, thus there is no consequence for faculty members if they do not engage in research work.

Total budget for research in 2014 is Php 680,000 to be shared by all of MSU-Gensan's colleges. Furthermore, there is no budget allocated to acquiring substitute teachers that will allow some faculty members to pursue research work.

MSU-Gensan also lacks inherent skills for research. Of the university's 225 faculty members, there are only a total of 25 who have PhDs. 60% of the university's faculty will reportedly retire within the next 5 years, so it is vital to prepare the remaining 40% and accumulate enough replacements to fill the gaps after retiring faculty would leave. The focus discipline of fishery, particularly, has only one faculty member with a PhD. There are about 100 faculty members with Master's degrees but not many of these are capable of obtaining external research grants. There are reportedly only about 10 faculty members in the entire university who have been able to prepare research proposal and get external funding in recent years.

Future needs on R&D

Training for faculty to be able to write research proposals is needed. Due to the lack of internal funds for research, faculty members have to source their research funds from external sources. However, the current situation shows that faculty members are not capable on proposal writing. To develop the capability of faculty, they have to have the fundamental skill to start research activity.

Researching also needs vehicles that are difficult to acquire given current university policies and policies with research grant agencies such as DOST, CHED, DA or DENR, which prohibit the purchase of vehicles in their respective budgets for research equipment. Vehicles are necessary for researchers to reach far-flung places on which to do data-gathering. These isolated places are usually inaccessible through public transportation and require vehicles capable of going off-road.

Facilities and equipment

Faculty who do want to engage in research work find very little support in terms of available equipment or facilities in the university. MSU-Gensan's College of Fisheries has an established research station for fishery and aquaculture (Figure 55). The research center is 3.3 hectares, of which 1 hectare is in-use containing 18 fish pens, laboratory rooms, and feed processing machines, and is used by students for their thesis work. It is not used by faculty members for their research work.

Figure 55 College of Fisheries Research Station

Top row picture: Wide view of the research station showing a laboratory building towards the left and fish pens towards the right.
Bottom row from left to right: (1) Signage by the facility's entrance (2) Rooms for laboratories that are currently used as classrooms or storage (3) Feeds processing equipment

The College of Fisheries has just constructed a building that will house laboratories for fish processing and nutrition analytics (Figure 56). It currently has newly-acquired equipment for laboratory and fieldwork in nutrition analysis and fisheries that have yet to be used (Figure 57). The facility also houses a laboratory for microbiology, for which equipment is also newly-acquired and yet to be used (Figure 58), a fish processing laboratory with incomplete equipment (Figure 59), and aquaculture laboratory rooms, for which equipment has not been purchased (Figure 60).

Figure 56 Building for fish processing and nutrition analytical laboratories

Figure 57 Newly acquired and unused laboratory and fieldwork equipment for nutrition analysis and fisheries research

Figure 58 Laboratory for microbiology with newly acquired and unused equipment

Figure 59 Fish processing laboratory

Figure 60 Aquaculture laboratory facilities for which equipment have not been acquired

4.4.5.7. Central Luzon State University

Linkage

Linkage with overseas universities

Linkages with overseas universities remain minimal, only initiated and maintained by the faculty members themselves. The sustainability of the linkages is delicate, since it depends on the tenure of the faculty member and thus, if the faculty member in the SUC or overseas university retires or resigns, the linkage can also easily sever.

Linkage with industry

For industry linkage, it continues to be minimal due to low institutional initiative to coordinate with the industry.

Research activities

Issues on R&D

The university encourages faculty members to submit research proposals to funding agencies to get the fund from external source since internal fund for R&D is not sufficient enough. However currently, only 22% of the faculty members are conducting research. Faculty of some disciplines are lack of proposal writing skill, the university provides training for research proposal preparation and writing. CLSU is recognized as the leading SUC for inland aquaculture (fisheries) and agriculture, and has generated research outputs, however, they have not yet fully maximized the feasibility of its research outputs for commercial use since it has not been fully active in marketing.

Future needs on R&D

CLSU needs assistance in partnering linkages with industry and overseas universities, which match their research priorities and agenda, and in creating formal procedures on how to establish such linkages. This will provide opportunities to create possible research collaborations and scholarship opportunities for the faculty. Furthermore, the linkage with industry would facilitate the product and technology transfer to the industry.

The Fisheries discipline has expressed a desire to create a gene bank center for DNA profiling. However, only one faculty member is known to have experience with biotechnology-related work. In order to build the CLSU's capability to create and sustain this center, development of the faculty is first necessary. Through appropriate linkages, scholarship opportunities and faculty exchanges could be attained. Eventually, facilities, equipment, curriculum development and research capacity is needed to formally establish biotechnology as a discipline and make it possible to create a center.

Assistance on promotion of research outputs to contribute to local industry is needed. This will lead an income-generating activity for CLSU, make them to be self-sufficient in terms of budget allocation for funding further research activities. This will further strengthen the linkage with local industry and contributing to the needs.

Facilities and equipment

The facilities are already old, but still usable since they have been maintained well. The condition and availability of the equipment vary depending on the discipline. Most of the equipment in the agricultural field is used both for instruction and research. The majority of the equipment was acquired through research grants. Figure 61 shows that some of the equipment are relatively new, acquired through projects, and some are obsolete, dating back to as early as the 1950s, donated by the US after the WWII. This limits the scope of research that a faculty member is able to conduct.

Figure 61 Facilities and equipment for the Agriculture discipline

The Fisheries discipline has numerous laboratories in their well-maintained building. Their equipment is relatively new and well-maintained (Figure 62). The equipment in the laboratories was acquired through various projects and research collaborations.

Figure 62 Facilities and equipment for the fisheries discipline

For Renewable Energy discipline, there is no formal facility yet, but they have converted an outside shed for its use. There is a plan to develop a facility to house the equipment and for experimental use.

Figure 63 Outside shed was used as a storage area for the equipment of renewable energy

4.4.5.8. Benguet State University

Linkage

Linkage with overseas universities

BSU have no current active linkages with overseas universities. They used to have JSPS joint research with Hokkaido University and UPLB about conservation of animals in 1998-1999, and they also collaborated with Tokyo Universityand UPLB about highland vegetable production in 2001 and 2003. Research collaborations with other SUCs in their region are active since they are the regional SUC of the Cordillera Administrative Region (CAR). As part of their initiative, BSU provide assistance in developing the technical capabilities of the other SUCs in CAR by conducting proposal preparation training for less-capable SUCs.

Linkage with industry

Currently, they don't have any linkage with industry. Their main objective is to contribute to the local community in Cordillera Region, they are working on solving the problems in the community.

Research activities

Issues on R&D

Instruction is considered to be the first priority for the faculty members especially the senior faculty. On average, they allocate 40 hours per week for instruction and the rest for R&D and administrative function.

Future needs on R&D

BSU is reported to have enough expertise on agriculture discipline as of the moment, but they expect a gradual decrease of experts over the years since many of their faculty members will be retiring. To fill the gap based on expected retirees, they need to develop their young faculty members through scholarship assistance. Cultivating a research environment especially a research career of the faculty members is a long-term initiative from building up the technical capability of the staff through linkages to sustaining the active research activities. This issue significantly needs institutional support of the BSU's management.

To further stimulate their research activities, BSU would like to increase its linkages with domestic & overseas universities and industries. They need assistance in partnering with institutions which match their research strengths and priorities.

Facilities and equipment

BSU's facilities are generally old, but several laboratories have undergone renovation or are currently undergoing renovation as a requirement for the equipment they have procured. Improvement of the general facilities is needed, especially for the proper storage of equipment and chemicals to provide a safe research-conducive environment.

Figure 64 Pictures show exposed chemicals in the laboratories

Some equipment of the agriculture laboratories are new, obtained by the faculty members who are actively engaged with several external projects with DA-BAR and CHED. Some of the equipment was internally-funded. However, they still lack basic equipment which constrains them to conduct the research aligned with their timeline.

Figure 65 New equipment in propagation laboratory funded by CHED

BSU has one laboratory technician per laboratory who supervises the use of the equipment. They also have an internal policy where the maintenance of the equipment, which has been acquired through project, falls under the responsibility of the proponents.

4.4.5.9. Bicol University

Linkage

Linkages with overseas universities

BU is known for is their Fisheries discipline which is recognized by CHED as a center of development. They have active research collaborations with Kochi University in Japan since 2006 concentrated on the Kuroshio current which runs along the Philippines and Japan sea channel. They don't have active research collaboration with other overseas universities, however, the president of BU is involved in the university president forum which aims to collaborate within ASEAN countries on research, student exchange, and faculty exchange. Currently, they have contacted universities in Thailand, Cambodia, and Vietnam.

Linkages with industry

BU has linkages with manufacturing companies through OJT program, some Japanese companies actively visit BU to recruit undergraduate for OJT. One of those companies donated their machines used in the factory to enhance their curriculum, however, since no faculty can operate it, the donated machines are left unutilized for instruction or research.

Research activities

Current issues on R&D

Overloaded with instruction responsibility, the faculty members in the College of Engineering have little research experience, technically they are lack of capability of conducting research. The average instruction workload of the faculty is more than 18 units per week, the faculty-student ratio is 37. It is also significant that there is no faculty with PhD out of 47 faculty members from engineering and mining discipline. For Civil Engineering, there are 12 facutly, but only one faculty has PhD, and the faculty-student ratio is 52. Their instruction workload per week is 18-27 units. Under this severe condition for the faculty of civil engineering, they are able to conduct only one internally-funded research despite the BU started research initiatives since 2011.

BU has been shifted the direction to R&D oriented, the management encourages faculty to conduct more research. However, one of the respondents at interview said it is not easy to change the mind-set of faculty from focusing on instruction to conducting R&D. One of the reason is that having more lectures generates more salary, but spending time on R&D earns less. Another reason is that instruction is still prioritized to achieve higher passing rate of board exam. Changing the R&D culture of the institution will not be achieved unless the institutional management takes strong leadership.

Future needs on R&D

The overall R&D management of BU still has to be improved to stimulate research activities in the university, especially on their focal disciplines. As a first step, there is a need to improve the competency of the faculty members through scholarship and research opportunities. Additionally, Bicol University would need assistance in equipping their facilities with basic equipment for research and linkage with overseas universities which match the research topics in which they would like to venture.

Facilities and equipment

Due to the limited internal budget for capital outlay, most of the facilities and equipment are still limited in number and poorly developed. Some pieces of equipment are outdated while still being used for instruction. This limits the student's knowledge and produces a mismatch with the industry's requirements. One example would be in Figure 66, which shows an obsolete machine being used for instruction.

Figure 66 A lathe machine donated by UNESCO during the 1950s.

BU recently established a new building for R&D Center funded by CHED, this center equips some new analytical machines. The more equipment could be acquired if the department become active in conducting their R&D activities or through their linkages.

Figure 67 New equipment in their CHED-funded R&D Center for their project on regional food safety and quality control

A Japanese manufacturing company donated second-hand equipment to enhance their curriculum of college of engineering, however, faculty don't fully understand how to operate those machine, most of the machines are left unused (Figure 68).

Figure 68 Second-hand equipment donated by a private company

Fluctuating power in region V causes problems with their equipment. Recently, they were able to secure a Php 5 million budget for maintenance under CHED. BU is located disaster prone area, their facilities and equipment easily get damaged by typhoon. As the fact, the equipment of civil engineering was damaged by strong rain, it's no longer functioning (Figure 69).

Figure 69 Damaged equipment left unrepaired in their Hydraulics laboratory

The university houses the regional zonal center and the alternative energy center. The regional zonal center, funded by CHED, serves as a center for HEIs in the region who would like to develop the technical skills of their faculty members, especially in proposal preparation. They also have the alternative energy center, funded by the Department of Energy (DoE) as a support to areas which have no electricity yet.

Currently, a regional multi-technology facility is being constructed, proposed by the College of Industrial Technology. CHED and DOST provide funding for the facility and the equipment of the center. Other private companies have also pledged to donate equipment to the facility.

4.4.5.10. Visayas State University

Linkage

Linkage with overseas universities

VSU currently has collaborative research with the following overseas universities.

Japan

- Tokyo University of Agriculture and Technology
- Obihiro University of Agriculture and Veterinary
- Nagoya University
- Mie University
- Tokyo University
- Hiroshima University

Australia

- University of Queensland

Germany

- Wageningen School of Social Science
- CT De Wit Graduate School for Production Ecology and Resource Conservation
- University of Hohenheim

Linkage with industry

They have linkages with agricultural companies such as fruit processing company, and dryers for coconut mills. Currently, they don't have collaborative research with them.

Research activities

Salient features of management of research

VSU has a model that other SUCs should emulate, particularly their program for the university's priority for R&D as an integral part of university activity.

VSU has a good and effective model of management of research activities. Research is planned on a per-commodity basis, which means specific commodities have been identified for which faculty members may plan their research. The commodities are based on research needs gathered from national development plans, consultations with surrounding stakeholders, and corresponding plans of each college in VSU. The Office of the Vice-President for Research and Extension oversees planning and implementation of the research projects. Research proposals and their implementation are monitored by a team of experts that are grouped per-commodity.

The faculty members also mentor their own colleagues in proposal-writing. They follow an internal training system where researchers are walked-through the proposal by a more senior faculty member until the research proposal is fit for submission.

VSU has managed to facilitate procurement through the VISCA Foundation for Agricultural and Rural Development, Inc. (ViFARD), a non-stock, non-profit corporation on which VSU's President sits as a member of the board of directors. The foundation was established to facilitate procurement for VSU's research projects. Research grants that do not go through the university are coursed through ViFARD for faster procurement, since these purchases are not required to go through the Government's procurement process. Under the Government's procurement process, equipment can be obtained in about 3 months; whereas, under ViFARD, funds for the purchase of equipment can be disbursed in about a day. This timeline is important for scientific research equipment since there are few suppliers for such specialized equipment in the Philippines and so bidding is unnecessary. To

balance fraud, ViFARD has registered as a legal entity under the Securities and Exchange Commission, to which it annually submits an audited financial statement[25].

Issues on R&D

Issues on VSU include an aging faculty that poses a risk to research capabilities of the university, unstable electricity supply, lack of analytical equipment, difficulty in getting acceptance from relevant communities with research results, and costly delivery of research extension to relevant industries due to geographic inconvenience.

VSU's research capability is at risk due to an aging faculty. About 70 faculty with PhDs are expected to retire within the next 5 years. In agriculture alone, where the university is accredited with a Level 4 by the AACUP, 10 out of 54 faculty members are about to retire in the next 5 years. They have an urgent need to upgrade their faculty members' academic standing. To mitigate this, they have stopped hiring faculty members with only a BS degree.

Unstable electricity supply is also an issue for VSU, as intermittent and unpredictable power failures affect the durability of some equipment. This is a problem because repairing specialized research equipment is expensive and takes time, often contributing to the delay of research implementation.

Another problem is the acceptance of community with regards to research results. The university sometimes has difficulty convincing communities to adopt newly-developed technologies, such as those for soil management, due to the community's adherence to traditional ways of agriculture. An extreme case is the acceptance of BT corn, a genetically-modified organism (GMO), when in fact according to VSU BT corn has made the country self-sufficient in corn. GMO is a globally-controversial issue, and there are some international protests against BT Corn, so this is an issue that is difficult to overcome.

Research extension also encounters a problem. There is low industrial activity in the Baybay City area, and so industrial clientele may be far from the university. This geographic inconvenience will make it costly for companies, especially SMEs, to visit VSU and view the technologies developed in the university.

Future needs on R&D

VSU urgently needs to develop an existing faculty pool and hire PhD holders to replace aging faculty researchers, establish a more predictable power supply to minimize risks to research equipment, acquire analytical equipment, improve their communication of extension activities to relevant communities, and facilitate the demonstration of technologies to far-located industries.

Facilities and equipment

VSU has managed to house and acquire equipment for their research and instruction needs. An example is their Central Analytical Services Laboratory that was acquired through an institutional grant from DA-BAR (Figure 70), and which contains equipment purchased through the grant and other equipment that the university had previously owned (Figure 71). The laboratory is maintained by a full-time technician while use of the lab is assisted by 1-2 part time laboratory staff.

[25] Latest available financial statement of ViFARD in SEC's online registry is for the fiscal year 2008.

Figure 70. Central Analytical Services Laboratory equipment that was set up through an institutional grant from the DA-BAR

Figure 71 Other analytical laboratory equipment (not acquired through DA-BAR)

Aside from the analytical laboratory, which is mainly for agricultural-related laboratory work, the university also houses a renewable energy laboratory (Figure 72) which also serves as a showroom of technologies that were developed in the university. Such technologies include a plant oil stove, process demonstration of the production of biodiesel, and a generator powered by hydroxyl gas.

Figure 72 Renewable energy laboratory and resulting technologies

Top picture: Overview of the biofuels processing laboratory
Middle row (left to right): (1) Plant oil stove (2) Process demonstration for producing biodiesel
Bottom row: Generator powered by hydroxy gas

4.4.5.11. Mindanao University of Science and Technology

Linkage

Linkages with overseas universities

MUST has linkages with Nagoya University for biotechnology research, and the Netherlands for a biodiversity study for collaborative research. They also have linkages with the following overseas universities, however those linkages were established by faculty's personal contact.

- AIT (Asia Institute of Technology) , Singapore,
- University of Massachusetts, USA
- Kyoto institute of Technology (mechanical), Japan
- New South Wales, Australia
- Asia Institute of Technology, Thailand
- The university of Manchester, UK

Linkages with industry

Due to the location of the university in a highly commercialized area, research linkages have been formed with many major industry players, such as food manufacturers (i.e., Del Monte Philippines and Nestle), IT companies (i.e., Microsoft), a local telecoms company (PLDT[26]), hotel & restaurant groups, and power companies AMRECO[27] and CEPALCO[28], as well as government agencies such as the Bureau of Crime and the local government unit of Cagayan de Oro City.

A larger effort is the plan of the university to evolve into a university that strongly collaborates with industry through relocation in an industrial area and increasing involvement of industry players in its board of directors. The plan involves changing the charter of the university through legislation, and renaming the university as "University of Science and Technology of the Philippines". Legislation is currently proceeding in Congress as House Bill 4184 and in the Senate as Senate Bill 2468

Research activities

Issues on R&D

Institutional-level research linkages are weak. The university's research linkages are usually made through the efforts of the President of the university. The Research & Development Division and the faculty members have little connection or active activities for linkage of their own. Past and present funding agencies and companies usually approached their President, instead of approaching faculty members or the Research & Development Division.

R&D activity is hampered by teaching obligations. Faculty have instruction workload with 18 units per week in average, the faculty-student ratio of college of engineering is 83. R&D activity is done during overtime hours after teaching or during weekends. Because of a focus in teaching obligations, faculty members have little experience in participating in competitive research fund. Research engaged in by faculty members is usually commissioned, wherein the topic is already pre-determined and research teams are tapped directly instead of being bid out.

The university also lacks a research career that can encourage returning faculty member scholars or researchers to practice their research in the university. Faculty members often return to the school but are unable to secure research due to lack of a laboratory in the school. Some, on the other hand, get an administrative promotion upon return, which decreases the time that a faculty member can devote to research.

[26] Philippine Long Distance Telephone Company
[27] Association of Mindanao Rural Electric Cooperatives
[28] Cagayan Electric Power and Light Company, Inc.

Future needs on R&D

The university needs assistance in connecting with more industry players and overseas universities for collaborative research. For linkages with industry players, the College of Science, for example, would like to know which companies are open to collaborative research, and what these needs are. For links with overseas universities, they have plans for coordinating with universities in Japan, Australia, Thailand and the UK, but these are based on pre-existing linkages, so they would like to tie their faculty members to even more universities. To support these links and collaboration, faculty members' capabilities in writing research proposals and conducting research also need to be improved.

Facilities and equipment

MUST has acquired new equipment for its engineering program. Examples of these are shown below, for renewable energy (Figure 73), communications engineering (Figure 74), electrical engineering (Figure 75), and food processing (Figure 76). The College of Sciences has also acquired equipment for laboratories, an example of which is equipment for their microbiological testing laboratory (Figure 77). The university built new buildings since 2013 for the College of Engineering and College of Science, as well as other buildings for administrative department.

Figure 73 Renewable energy laboratory and related equipment

Figure 74 Communications and digital laboratory and related equipment (used for instruction)

Figure 75 Electrical engineering laboratory and newly acquired equipment

Figure 76 Food processing laboratory

Figure 77 Microbiological testing laboratory

Current equipment of the Colleges of Engineering and Arts and Sciences are used in instruction. There is little opportunity for their equipment to be used for research by faculty members. Examples of such equipment are old spectrophotometers and other equipment which was acquired by the College of Arts & Sciences from private companies such as Nestle and Pilipinas Kao.

4.4.6. Cases of linkage with Japanese University

Some SUCs have collaborative researches with Japanese universities. Their linkage was established by either personal connection of the faculty, an approach from Japanese university, or a project of Japan Society for the Promotion of Science (JSPS). The personal connection was established by the scholarship where the faculty obtained the Master or PhD degree, they kept communicating with the mentors in Japanese university after the scholarship.

Based on the interviews with Japanese universities which have experiences of collaborative research with SUCs in the Philippines, researchers from Japanese universities approached universities in the Philippines because of the resource for the research theme. The advantage of collaborating with SUCs in the Philippines is that Japanese researchers can obtain samples or data which are not available in Japan. Japanese researchers recognized the gap in knowledge and skills for research activities between Japanese researchers and the Philippine researchers, and lack of equipment and facilities for research, however they more valued the support and contribution from the faculty and research members from SUC as a team when they conducted a field survey.

The cases of collaboration between SUCs and Japanese Universities are as follows.

1. Case of Kagoshima University and UP Visayas and other SUCs
Salient feature of the linkage

- The linkage was originally funded by JSPS core university program (10 year program) since 1998 in fisheries research.
- Both Kagoshima University and UP Visayas functioned as "core universities (leader universities)."
- Totally 16 universities from Japan, 13 SUCs from the Philippines participated in the research program.

Accomplishment

- The research capability of SUCs has improved significantly after the 10 years of the program, through the collaboration with UP Visayas and Japanese universities.
- Philippine and Japan complimented each other (win-win relationship); Kagoshima Univ. offered the latest and necessary equipment for analysis whereas Philippines side offered research fields.

2. Case of Kochi University and Bicol University
Salient feature of the linkage

- Kochi Univ. and Bicol Univ. have continued collaborative research since 2006.
- They have similar marine environment in common as a research object.
- In 2008, they set up an International Collaboration Office in Bicol University in pursuit of establishment of "the Black Current Science".
- Kochi University selected Bicol University because there are many young researchers who will study at Kochi University and continue the study in a long term.

Accomplishment

- They have made significant progress in the marine environment study, biological study of fish and algae, and study on environmental protected areas.

3. Tokyo University of Agriculture and Technology (TUAT) with Visayas State University.
Salient feature of the linkage

- Based on the personal network of a professor, TUAT and Visayas State University concluded a memorandum of understanding in March of 2004.

Accomplishment

- VSU is a leading university in study of sago.
- An efficient grater machine jointly developed by TUAT and VSU.

- While only few studies have been conducted on sago, some initiatives have significantly contributed to the development of the industry.

The 10 year program of JSPS lead by Kagoshima University and UP Visayas is one of the successful cases of collaborative research. The respondent from Kagoshima University said that the project successfully built a good relationship among SUCs and Japanese universities, and was able to develop a good environment where researchers from both countries were trained through research.

The collaborative research between SUCs and Japanese Universities are mainly conducted in agriculture or fisheries disciplines where the resource for the research theme is abundant, or specific research theme can be defined in the Philippines. Environmental issues related to water infrastructure in urban area that Asian countries are facing are also conducted. The collaborative research sometimes tends to end up just providing data from the Philippine side to Japanese side, then the important process, such as analysis of data or writing a research paper is done by Japanese researchers. Respondents from Japanese universities also recognized this trend, and they understood the importance of training faculty through research to enhance the level of research activities in the Philippines. Collaborative researches shall set up the conditions where SUCs can take initiatives of the project to train faculty through research. When SUCs have collaborative research with overseas universities, research topics shall be selected based on the needs of the local region so that SUCs can lead the project.

4.4.7 Summary

The eleven state universities exhibited different levels of their advancement of *Institutional Support to R&D*, *Faculty Quality* and *Facilities & Equipment* in the respective focus disciplines into which inquiry in each SUC was made. The emphasis on R&D was a qualifier because this is identified by CHED[29] as an important role of universities and it is its main difference from colleges or professional institutions, as well as being identified in the present study to be a key factor for the improvement of delivering higher education.

Institutional Support to R&D is defined as having the ability to (1) balance priority of both instruction and R&D as a matter of policy and implementation, (2) allocate appropriate funds for instruction and R&D, (3) motivate faculty members to pursue both instruction and research work, and (4) establish institutional linkages for scholarships and research with industry, domestic and overseas universities, and domestic and international funding agencies in each SUC for the specific focus discipline under which they are classified in this study.

Faculty Quality is defined as (1) adequacy of quality and number of MS and PhD holders, (2) linkage with industry, (3) capability of writing research proposals for competitive research, and (4) conduct of mentorship among faculty members for research in each SUC for the specific focus discipline under which they are classified in this study.

Facilities & Equipment is evaluated based on the status of having basic and advanced equipment in each SUC for the specific focus discipline under which they are classified in this study.

Based on the abovementioned factors, SUCs can be grouped according to their comparative advantages and issues. The groupings according to the three factors above are shown below in Table 60.

[29] Handbook on Typology, Outcomes-Based Education, and Institutional Sustainability Assessment, 2014

Table 60 Summary of SUC groupings according to status and issues about their Institutional Support to R&D, Faculty Quality, and Facilities & Equipment

SUC groupings	Institutional support to R&D	Faculty quality	Facilities & equipment
Tier 1 · University of the Philippines Diliman (UPD) · University of the Philippines-Los Banos (UPLB) · University of the Philippines-Visayas (UPV)	◎	◎	○
Tier 2 · Benguet State University (BSU) · Central Luzon State University (CLSU) · Visayas State University (VSU)	○	○	△
Tier 3 · Mindanao University of Science and Technology (MUST) · Mindanao State University – Iligan Institute of Technology (MSU-IIT)	△	△	△
Tier 4 · Bicol University (BU)	△	X	X
Tier 5 · Mindanao State University-Main Campus (MSU-Main) · Mindanao State University-General Santos (MSU-Gensan)	X	X	X

Legend:
In Institutional support to R&D, given that the factors are:
(1) Ability to balance priority of both instruction and R&D as matter of policy and implementation,
(2) Ability to motivate faculty members to pursue both instruction and research work,
(3)Ability to allocate appropriate funds for instruction and R&D, and
(4) Establishment of institutional linkages for scholarship and research with industry, domestic and overseas universities, and domestic and international funding agencies
◎ = all 4 are present; ○= (1) and (4) are lacking; △ = (1) and (2) are lacking; X = all are lacking

In Faculty Quality, given that the factors are:
(1) Adequacy of quality and number of MS and PhD holders,
(2) Linkage with industry,
(3) Capability of writing research proposals for competitive research, and
(4) Conduct of mentorship among faculty members for research in each SUC for the specific focus discipline under which they are classified in this study.
◎ = all 4 are present; ○= lacks (2); △ = lacks (1), (2) and (4); X = all 4 are lacking

In Facilities & Equipment
◎ = all basic equipment and some advanced equipment is present, and needs just some advanced equipment;
○ = all basic equipment is present, but lacks advanced equipment
△ = basic equipment is present, but some is outdated or nonfunctioning
X = lacks even basic equipment

Tier 1: University of the Philippines (Diliman, Los Banos, and Visayas campuses)
Tier 1 is comprised of the UP campuses (UPD, UPLB and UPV) as they were found to exhibit in their respective focus disciplines good institutional support to R&D, good faculty quality, and having complete basic equipment and facilities and some advanced equipment, with a need to acquire more advanced equipment to enable them to perform higher-level research. These evaluations are applicable for UPD's disciplines of Civil Engineering, Manufacturing, Mining, and Renewable Energy, UPLB' disciplines of Agricultural Biotechnology and Agriculture/Agribusiness, and UPV's disciplines of Fishery and Renewable Energy.

Tier 1 universities have what it takes to start and sustain research programs, ensuring that faculty members are continuously updating their capabilities through research. Although Tier 1 universities

have this capability, it is notable that they still need closer coordination with industry in terms of updating the content of their curricula to make them more relevant to industry needs. Linkage might be currently established, but the translation of these linkages into updated curricula seems absent, hence the negative feedback of industry players as discussed in Chapter 4.

Tier 2: Benguet State University, Central Luzon State University, and Visayas State University
Tier 2 is comprised of BSU, CLSU and VSU. BSU and CLSU lack the ability to allocate appropriate funds for instruction and R&D and motivate faculty members to pursue both instruction and research work. All three universities' faculty quality lack linkages to industries and also lack advanced equipment for research, despite having adequate basic equipment. These are applicable to BSU's discipline of Agriculture, CLSU's disciplines of Agriculture, Renewable Energy and Fisheries, and VSU's discipline of Agriculture.

Tier 2 universities need to develop their linkages with industries so that they can calibrate their respective curricula to be updated with industry requirements. These universities also need to acquire advanced equipment so that they can perform higher-level research work. Also, BSU and CLSU need to ensure the appropriation of funds for R&D, specifically towards the maintenance of their equipment for their sustainability. VSU does currently already have this capability, and may take a role in educating other SUCs about it.

Tier 3: Mindanao University of Science and Technology and Mindanao State University-Iligan Institute of Technology
Tier 3 is comprised of MUST and MSU-IIT. In Institutional Support to R&D, these two universities lack the ability to allocate appropriate funds for both instruction and R&D and have not established institutional linkages for scholarship and research with industry, domestic and overseas universities, or domestic and international funding agencies. In Faculty Quality, these two universities lack the appropriate number and quality of PhD holders, linkages with industry, and mentorship among faculty members. In Facilities & Equipment, these two universities have basic equipment, but some is outdated or malfunctioning. These are applicable to MUST's focus discipline of manufacturing and MSU-IIT's focus disciplines of Manufacturing, and Renewable Energy. MSU-IIT's Pharmaceutical Biotechnology discipline has already acquired adequate basic equipment and is moving towards advanced research.

Tier 3 universities need to develop institutional support for R&D, particularly developing institutional linkages that are aside from personal ones that faculty members themselves have established. This is important for continuance of research programs in the absence of the faculty members who initially established it. These universities' management also need to increase allocation of internal funds for R&D to support faculty members who are not yet competent enough to vie for external research funds, given that mentorship activity in research needs to be developed more.

Faculty members in Tier 3 universities need to increase their links with industry, so that they can understand ways in which they can adjust the content of their instruction to meet industry's needs. The university also needs to increase the number of PhDs in the respective faculty roster and increase mentorship of faculty members to each other in terms of developing their research capabilities so that the level of specialization of faculty members will also increase.

Facilities & equipment, on the other hand, need to be fixed or upgraded so that students, particularly in fields related to manufacturing, may experience work situations that are close to industry settings.

Tier 4: Bicol University
Tier 4 is comprised of BU, applicable to the university's focus disciplines of Civil Engineering, Mining, Manufacturing and Renewable Energy. The university in terms of Institutional Support to R&D lacks the ability to motivate faculty members to pursue both instruction and research work, and the ability to balance priority of both as a matter of policy and implementation. The university's

priority is in its traditional strengths in the fields of Healthcare and Education, and its focus on Civil Engineering, Mining, Manufacturing and Renewable Energy are not as prioritized.

In terms of Faculty Quality of focus disciplines, the university lacks the adequate number and quality of MS and PhD holders, linkages with industry, capability in writing research proposals for competitive research calls, and mentorship among faculty members. In terms of Facilities & Equipment, BU lacks the basics. Faculty departments and corresponding facilities equipment in BU is at an early stage of development that the quality and number of faculty members and facilities & equipment still need to be increased for the university to be able to start a research program.

Tier 5: Mindanao State University (Main and General Santos campuses)
Tier 5 is comprised of MSU-Main and MSU-Gensan. These universities are lacking in all of the above criteria, making it extremely difficult to cultivate a research program in the respective universities. These are applicable to MSU-Main's focus discipline of Manufacturing and MSU-Gensan's focus discipline of Fishery.

MSU-Main, compared to the 11 SUCs, has a unique problem of peace and order, as it is located in a conflicted area, and has issues with internet connection, all of which hamper the institution's abilities and faculty members' motivation to engage in research work within the university. This, in turn, affects the arrival of any equipment to the university, as funding for research is also usually the source for funding for relative equipment. To improve or mitigate these situations they need to additionally work closely with the local government of Marawi City.

MSU-Gensan is moving towards acquiring some new research equipment, but the initiative may be short-lived if there is little institutional support to motivate the involvement of other faculty members in conducting research, and if management does not support the maintenance of new equipment.

Implications to further development of the higher education
Currently CHED and SUCs are already promoting higher education reform. However, based the present state of SUCs, quality and delivery of education, qualification of faculty and management ability are needed be improved to respond to the needs from industry and society.

With regards the quality and delivery of education, the essential issue is that faculty members are busy with transfer of knowledge, without considering how to utilize such knowledge in the real world after the graduation. In addition, mostly because of constraints of the budget, equipment and tools used in SUCs are obsolete and not practical in industry. HE graduates cannot operate the equipments actually used in the real world. It is important to review the contents of education and renew facilities and equipments with better understanding of the expectations on HE graduates in industry.

This survey finds that industry expects generic skills to be enhanced rather than expertise skills. One of the reasons may be rooted in the qualification and experience of faculty members. Those faculty members who do not hold graduate degree can only transfer knowledge gained from what they have learned from textbook. However, what is important in real world is an applied skill based on a deep understanding of one expertise. If those faculty members do not have such advanced expertise, then they may not have enough applied skills. If they do not have enough experience of research, then they may not know about the latest achievement of the discipline and it may be difficult for them to be innovative in the field. It is important for faculty members and their students to gain more opportunities for research and obtaining graduate degrees.

According to the interviews with SUCs, it depends on the consideration of the management. If a management board is making consideration on research, then they are successful to secure time and budget for research. It is also necessary to enlighten and change the mind of management board of SUCs.

5. Recommendations

5.1 Needs of Industry Players and Expectations for HEIs

The present study's results have led to the conclusion that the human resources which industry needs from graduates of HEIs should have (1) "Key Generic Skills" in order for them to be creative, responsible, and capable of problem-solving, which eventually equip them to become the core leaders/managers of organizations and to drive businesses, and (2) "High Expertise" of respective disciplines in order for them to contribute to the attainment of the medium to long-term national development goals of the Philippines. The former pertains to requirements from a micro-perspective at a per-company level, while the latter is required from a macro-perspective to increase the generation of value added of the Philippines as a country.

However, as discussed in Chapter 4, there are large gaps between industry needs and what SUCs produce. SUCs today are not able to fulfil the needs of the industry. In order for SUCs to be able to produce human resources with the above qualities required by industry, the following are needed:

a) **Education**: Strengthening of curriculum, focusing on key generic skills which are expected for graduates. The content of curriculum, facilities and equipment shall be relevant to industry in order for students to acquire practical and hands-on experience;

b) **Research**: Enhancement of faculty members' skills, capabilities and expertise is necessary to improve the research activities of the Philippines, eventually they can appropriately educate students and bring out their potential as future professionals; and

c) **Management**: Improvement of management structures and systems by each player of the higher educational sector for them to be able to acquire, allocate and manage necessary resources with a sense of responsibility to fulfill their mission in educating future professionals who can contribute to industry.

5.2 Recommended interventions

Based on the three (3) areas to enhance in HEIs, namely Education, Research and Management, recommended interventions to narrow the gap between industry needs and HEI outputs are a) promoting research activities in collaboration with industries and other local / foreign universities (Collaborative R&D); b) improving curriculum delivery to be more practical/problem solving oriented to reflect the industrial needs; c)improving the professional capacity of faculty by upgrading their qualification through scholarships; d)upgrading education and research equipment / facilities; e) strengthening Management of HEIs. This section discusses the direction of support measures for each of these agenda.

<u>a) Promoting research activities in collaboration with industries and other local / foreign universities (Collaborative R&D)</u>

Expertise, as well as the aforementioned skills, cannot be enhanced if faculty members dedicate most of their time to instruction. Rather, by conducting their own R&D in collaboration with the industry and other local and/or foreign universities, their expertise could be developed. The theme of R&D shall not be limited to the faculty's own area of interest. Rather, it should be of value to solve problems and challenges faced by their respective communities or the country as a whole, and it should contribute to create new value. By doing so, R&D becomes an initiative that involves not only the HEI, but also third parties such as industry and community, along with foreign universities for collaborative R&D on themes in which Philippines does not have knowledge. At present, many SUCs are passive about such initiatives. They only start a course action if they receive invitations from industry players or universities overseas. In the proposed collaborative R&D measure,

however, SUCs are encouraged to take initiatives and approach industry and other local and/or foreign universities. It is expected that the faculty members' communication skills, logical thinking and application capability will be improved through collaborative R&D activities with external parties. Overview of the proposed "Collaborative R&D with Industry and other local/foreign Universities" is as follows.

Collaborative R&D

[Theme of R&D]

R&D support shall be awarded in a competitive manner. Selection criteria will be developed by referring to existing ones that are implemented by CHED or DOST.

It will be required that the selection of the theme shall be done in collaboration with industry members and the output of the R&D should be usable by them. Result of R&D shall contribute to the enhancement of the specific discipline by being published in peer-reviewed journals and being presented in conferences.

[Proponents]

Proponents shall be on a scheme of industry-academe collaboration, participated in by SUCs, industry players and other local/ foreign universities.

SUC: A leading SUC of a certain discipline and another SUC which has the potential of becoming a focal point in their respective region shall form a partnership. The Leading SUC shall support the development of the other SUC. Such an approach should ultimately prevent the widening gap between the top universities and other universities.

Industry: Industry association of the relevant discipline. Consideration shall be made not to benefit specific companies. A guideline on the treatment of IP that may be developed as a result of the R&D shall be defined in advance.

Other local/ foreign University: SUC shall contact other local/ foreign university that has strong expertise in the specific field of R&D to be undertaken and secure their cooperation. If the SUC does not have any existing network, CHED shall support the SUC.

[Period]

Three (3) years will be the target of a collaborative R&D project. It could be extended to maximum of five (5) years if the need for a longer period of research is recognized as valid.

<u>b) Improving curriculum delivery to be more practical/ problem solving oriented to reflect the industrial needs</u>

Aside from improving faculty members' communication skills, logical thinking and application capabilities through collaborative R&D with industry and other local/ foreign universities, a more direct measure would be to add the development of key generic skills in the curriculum of all disciplines as mandatory subjects. Practicing and applying key generic skills will be developed by students in their specialization courses, but they should be formally educated about its basic concepts before going into specialization. Making that subject mandatory for all should eventually contribute to enhancing the quality of industry's human resources. The development of key generic skills has already been established in top HEIs, so it is clear that resources are already available in the Philippines. The next step would be to standardize curricula so it could be implemented nationwide. Even more effective implementation would be possible by collaborating with industry (e.g., inviting industry professionals to be instructors).

<u>c) Improving the professional capacity of faculty by upgrading their qualification through scholarships</u>

Qualifications of faculty members of HEIs have significant impact on the quality of their graduates from HEIs. However, almost half of the faculty members of HEIs are only undergraduate degree holders in the Philippines. As discussed in Chapter 2, only a total of 11% of faculty members of HEIs in the Philippines hold PhDs. Among the SUCs that were surveyed, the number of PhD holders is very limited, except for the University of the Philippines.

In order to address the current state of insufficient numbers of faculty members with a high level of expertise, scholarship for faculty to acquire master and/or doctor degree by straight program or twinning/sandwich program between Philippine and foreign universities is recommended. Through the course of upgrading their qualification, faculty members are expected to enhance their expertise in respective discipline. This can also contribute to a concern that HE sector is now facing wherein faculties with PhD degree who are near the retirement age have few qualified successors.

It is recommended that the scholarship program is offered to faculties with conditions such as (i) returning to his/her original university after the scholarship program, (ii) contributing to enhance the curricula contents/ instruction materials based on the learning through the scholarship program, (iii) coordinating with SUC management for replacement for instruction during his/ her absence, and so on.

d) Upgrading educational and research equipment

Lack of necessary facilities and equipment is the bottleneck of R&D at most SUCs today. There are SUCs that even lack basic equipment for scientific courses. In such situations, faculty members themselves can only learn theories from textbooks but cannot gain actual experience.

Even when there are facilities and equipment, they are generally too old, outdated or different compared with those actually used in the industry. Because of this, graduates hired by industry do not know how to use industrial equipment.

In order to address such situations, hard-infrastructure such as facilities and equipment shall be put in place. It is also notable that currently, the acquisition of vehicles is not allowed for R&D by the Philippine Government. This causes huge restrictions on physical scope in R&D projects. In the proposed support measure, acquiring vehicles as well as setting up facilities and equipment to support R&D shall be strongly considered with a condition that operation and maintenance budget need to be planned and secured by the SUC.

Progressive SUCs surveyed have strategic income generating activities aside from the domain educational function, which allows them to allocate certain budget for procurement/ upgrading and maintenance of facilities and equipment.

e) Strengthening Management of HEIs

Organizational support and management systems of each university are essential for the faculty members to implement the abovementioned interventions. The survey revealed that the extent of investment in capacity development of faculties, R&D, facilities for it, and efforts for creating and maintaining a source of funds for such investment are very different among universities, depending on the top leadership of the university. Even when there is a collaboration with industry or universities overseas, if that is limited to the level of individual faculty members and not institutionalized by the SUC, such collaboration cannot contribute to the long-term improvement of the overall higher education sector in the country. To produce human resources that meet industry's expectations, the capability and qualifications of the faculty members must be improved. To do so, it is important to establish and institutionalize a solid management.

Specific measures to strengthen the management of universities are discussed below:

- Leadership Development for University Management
  - Recognizing the roles and responsibilities of universities. Setting clear visions.

- Acquiring resources (including income-generating activities) for R&D, capital investment and allocating resources (including the assessment of appropriate number of faculty members)
- Strict implementation of faculty qualifications requirements (e.g., tightening of faculty evaluation)

・Strengthening R&D Functions
- Management system for R&D
- Support for improving proposal-writing skills
- Enhancing incentives for faculties in conducting R&D, among others

Furthermore, it is recommended that CHED strengthen the following support to SUCs.
- Support in building collaborations with the industry (networking, database, matching, etc.)
- Support in building collaborations with foreign universities (database, matching, etc.)
- Training for SUC management and faculty members (management, leadership, human skills, conceptual skills, proposal writing, etc.)

5.3 Priorities per Candidate Discipline to be supported

Human resources needed by the candidate seven (7) disciplines are presented in the table below. A corresponding matrix that outlines each SUCs' needs is provided in Appendix 3.

Discipline	Required Human Resource	Impact
Disaster Prevention	Expertise (Latest technology for disaster prevention in infrastructure design, disaster prevention knowledge in urban planning)	Contributes to economy and investment promotion by increasing disaster-resiliency
Renewable Energy (RE)	Expertise (Designing facilities and equipment, programming capability, product/process development and improvement, etc.)	Contributes to economy and investment promotion by improving energy infrastructure
Biotechnology	Agriculture: Application to the industry Pharmaceutical: R&D Capability	Contribute to agricultural development by combining agriculture with biotechnology. Small chance for the development of the biotechnology industry as an independent industry in the long-term
Manufacturing	Overall: Human Skills (communication) and Conceptual Skills (problem solving, analytical skill) Electronics and other high-technology manufacturing: Advanced technology and skills toward shifting to higher value added. Creativity, application capability.	Investment promotion, employment generation, increasing value added
Mining	Human Skills and Conceptual Skills	Contribute to the existing industry. Small contribution to future economic growth
Agriculture	Innovation for productivity improvement, Entrepreneurship	Contribute to expanding value added and poverty alleviation
Fisheries	Innovation for productivity improvement	Contribute to expanding value added and poverty alleviation

Of the seven (7) disciplines above, three (3) priority disciplines which have larger economic and social impact and in which Japan has particular strengths are (1) Disaster Prevention, (2) Manufacturing (including IT) and (3) Agriculture (including use of Biotechnology and Renewable Energy).

(1) Disaster Prevention (Architecture, Civil Engineering, Urban Planning)

This particular discipline has not been well established yet in the Philippines. Possible support could be provided to a pair of SUCs comprised of the University of the Philippines-Diliman as the leading SUC (as it is in a leading position for Architecture, Civil Engineering and Urban Planning among SUCs) and Bicol University which is in a highly prone area to natural disasters in the Philippines, by matching them with a university in Japan for collaboration.

Japan's contribution of its knowledge and experience in conducting R&D for disaster prevention that compares with the situation in the Philippines, can yield contributions that have a macro-level impact, such as development of national disaster prevention plans, defining and revising disaster prevention standards and application in relevant industries.

(2) Manufacturing (including IT)

The manufacturing sector is recognized as a priority sector in the Philippine Development Plan and the sector is trying to shift from simple assembly to higher value-added functions. However, the industry experiences insufficient human resources which makes it difficult to achieve such a shift because highly-skilled people tend to prefer to work outside the country. Although the Philippine Government has developed a roadmap for the Manufacturing Industry, it has not presented specific policies for priority segments, as Malaysia and Thailand have done. In order for the Philippines to strengthen its global competitiveness, it should focus on specific segments such as Electronics and IT, and then develop highly-skilled experts in these fields through collaboration with universities and industry players.

(3) Agriculture (including use of Biotechnology and Renewable Energy)

There has been collaboration between Philippine and Japanese Universities in the Agricultural sector. For the Philippines to be more competitive in the midst of trade liberalization trend in agricultural sector, it is necessary to improve efficiency of production and post-harvest processes, managing quality, and increasing value-added by processing the agricultural products. This is another area in which Japan can leverage its strengths. Possible support measures would be collaborative R&D with Japanese Universities, as well as incubation support for the utilization of R&D outcomes in agricultural businesses.

5.4 Recommended timeline of the implementation

Recommended interventions are aligned with the Roadmap of CHED for 2011-2016 and it would be more efficient if those interventions were integrated with CHED's own initiatives as follows. These interventions are recommended to be continuously implemented in the next administration in 2016 onwards. Recommended timeline for implementing the interventions are stated in the table below.

Recommended interventions		Programs and target in the Roadmap of CHED (2011-2016)	Recommended target of implementation of the intervention
a) Improving the Qualification of Faculty Members	i) Collaborative R&D with industry and local/ foreign universities	Grants-in-Aid for RDD (50 SUC RDE programs funded)	2015-2016: planning & preparation 2017: 2 projects 2018 onwards: 3 projects/year
	ii) Improvement of facilities & equipment	Upgrading and modernization of infrastructure facilities and equipment of leading SUCs (15RDE centers established)	Together with i) R&D
	iii) Upgrade of faculty qualification to PhD	Faculty Development Program (To upgrade qualifications of SUC faculty to Masters and PhD levels)	i) upgrade to Master level: 2015-2016 ii) upgrade to Doctor level: 2017-2020
b) Improving curriculum delivery; Developing standardized Generic Skills Program		Development of priority programs (8 programs in priority disciplines developed)	2015: planning 2016: development of curricula and contents, pilot-runs, training, etc. 2017: roll-out
c) Strengthening Management of HEIs		Strengthening public HEI management through an Executive Development Program (2,550 SUC managers trained)	2016: gap analysis 2017: planning 2018: implementation

Appendix

1. List of SUCs

2. List of Priority Disciplines

3. Matrix of Industry and SUC Needs

4. Signed Minutes of Discussion (TOR mission)

5. Signed Minutes of Discussion and Attached Document

1. List of SUCs

List of State Universities & Colleges per Industry									
No.	Region	Name of University/College	Industries						
			Civil Engineering	Natural Resources/Geology	Manufacturing	Renewable Energy	Biotechnology	Agriculture/ Agri-business	Fisheries/ Aquaculture
1	NCR	Eulogio 'Amang' Rodriguez Institute of Science and Technology	x	o	o	o	x	x	x
2	NCR	Marikina Polytechnic College (Marikina Institute of Science and Technology)	x	x	o	x	x	x	x
3	NCR	Philippine Normal University	x	x	x	x	x	x	x
4	NCR	Philippine State College of Aeronautics	x	x	x	x	x	x	x
5	NCR	Polytechnic University of the Philippines	o	o	o	o	o	o	x
6	NCR	Rizal Technological University	x	x	o	o	o	x	x
7	NCR	Technological University of the Philippines	o	o	o	o	o	o	x
8	NCR	University of the Philippines System	o	o	o	o	o	o	o
9	Region I	Don Mariano Marcos Memorial State University	x	o	o	o	o	o	o
10	Region I	Ilocos Sur Polytechnic State College	x	o	o	o	o	o	o
11	Region I	Mariano Marcos State University	o	o	o	o	o	o	o
12	Region I	North Luzon Philippines State College	x	x	x	x	x	x	x
13	Region I	Pangasinan State University	x	o	o	o	o	o	o
14	Region I	University of Northern Philippines	o	o	o	o	o	x	x
15	CAR	Abra State Institute of Science and Technology	o	o	o	o	o	o	x
16	CAR	Apayao State College							
17	CAR	Benguet State University	x	x	x	x	o	o	x
18	CAR	Ifugao State University (Ifugao State College of Agriculture and Forestry)	o	x	o	x	x	o	x
19	CAR	Kalinga-Apayao State College	o	x	x	x	x	o	x
20	CAR	Mountain Province State Polytechnic College	x	o	o	x	x	o	x
21	Region II	Batanes State College (Batanes Polytechnic College)	x	o	o	o	x	o	o
22	Region II	Cagayan State University	o	o	o	o	o	o	o
23	Region II	Isabela State University	o	o	o	o	o	o	o
24	Region II	Nueva Vizcaya State University (NVSIT AND NVSPC)	x	o	o	o	o	o	x
25	Region II	Quirino State University	x	x	x	x	o	o	x
26	Region III	Aurora State College of Technology	o	o	o	o	o	o	x
27	Region III	Bataan Peninsula State University	o	o	o	o	o	o	o
28	Region III	Bulacan Agricultural State College	x	o	x	x	o	o	x
29	Region III	Bulacan State University	o	o	o	o	x	x	x
30	Region III	Central Luzon State University	o	x	x	x	o	o	o
31	Region III	Don Honorio Ventura Technological State University (Don Honorio Ventura College of Arts and Trades)	x	x	x	x	x	x	x
32	Region III	Nueva Ecija University of Science and Technology	o	o	o	o	o	o	x
33	Region III	Pampanga State Agricultural University	x	x	x	x	o	o	o
34	Region III	Philippine Merchant Marine Academy	x	x	x	x	x	x	x
35	Region III	Ramon Magsaysay Technological University	o	o	o	o	o	o	o
36	Region III	Tarlac College of Agriculture	x	o	x	o	o	o	x
37	Region III	Tarlac State University	o	o	o	o	o	x	x
38	Region IV-A	Batangas State University	o	o	o	o	o	o	x
39	Region IV-A	Cavite State University	o	o	o	o	o	o	o
40	Region IV-A	Laguna State University							
41	Region IV-A	Laguna State Polytechnic University (Laguna State Polytechnic College)	o	o	o	o	o	o	o
42	Region IV-A	Southern Luzon State University (Southern Luzon Polytechnic College)	x	o	o	o	o	o	o
43	Region IV-A	University of Rizal System	o	o	o	o	o	o	o
44	Region IV-B	Marinduque State College	o	o	o	o	x	o	o
45	Region IV-B	Mindoro State College of Agriculture and Technology					o	o	o
46	Region IV-B	Occidental Mindoro State College (Occidental Mindoro National College)	x	x	x	x	x	o	x
47	Region IV-B	Palawan State University	o	o	o	o	o	o	o
48	Region IV-B	Romblon State University (Romblon State College)	o	o	o	o	o	o	x
49	Region IV-B	Western Philippines University	o	o	o	o	o	o	o
50	Region V	Bicol State College of Applied Sciences and Technology	x	o	o	o	x	x	x
51	Region V	Bicol University	o	o	o	o	o	o	o
52	Region V	Camarines Norte State College	x	o	o	o	x	o	o
53	Region V	Camarines Sur Polytechnic Colleges	x	o	o	o	x	x	x
54	Region V	Catanduanes State University	x	x	x	x	x	o	x

(Cont.)

No.	Region	Name of University/College	Industries						
			Civil Engineering	Natural Resources/Geology	Manufacturing	Renewable Energy	Biotechnology	Agriculture/ Agri-business	Fisheries/ Aquaculture
57	Region V	Central Bicol State University of Agriculture (Camarines Sur State Agricultural College)	x	x	o	o	o	o	x
58	Region V	Partido State University	o	o	o	o	o	x	o
59	Region V	Sorsogon State College	o	o	o	o	x	o	o
60	Region VI	Aklan State University	x	x	o	x	o	o	o
61	Region VI	Capiz State University	x	x	o	x	o	o	o
62	Region VI	Carlos C. Hilado Memorial State College	o	x	o	x	x	x	o
63	Region VI	Central Philippines State University	o	o	o	o	o	o	x
64	Region VI	Guimaras State College	x	x	o	x	x	x	x
65	Region VI	Iloilo State College of Fisheries	x	o	o	o	x	o	o
66	Region VI	Northern Iloilo Polytechnic State College	o	o	o	o	o	o	o
67	Region VI	Northern Negros State College of Science and Technology	x	x	o	x	o	o	o
68	Region VI	University of Antique (Polytechnic State College of Antique)	o	o	o	o	o	o	o
69	Region VI	Western Visayas College of Science and Technology	x	o	o	o	x	x	x
70	Region VI	West Visayas State University	x	x	o	x	o	o	x
71	Region VII	Bohol Island State University (Central Visayas State College of Agriculture, Forestry and Technology)	o	o	o	o	x	o	o
72	Region VII	Cebu Normal University	x	x	x	x	o	x	x
73	Region VII	Cebu Technological University (Cebu State College of Science and Technology)	o	o	o	o	x	o	o
74	Region VII	Negros Oriental State University (Central Visayas Polytechnic College)	x	o	o	o	o	o	o
75	Region VII	Siquijor State College	x	x	o	x	x	x	x
76	Region VIII	Eastern Samar State University	o	x	o	o	x	o	o
77	Region VIII	Eastern Visayas State University (Leyte Institute of Technology)	o	o	o	o	o	x	o
78	Region VIII	Leyte Normal University	x	x	x	o	o	x	x
79	Region VIII	Naval State University (Naval Institute of Technology)	o	o	o	o	x	o	o
80	Region VIII	Northwest Samar State University (TTMIST and SSCAF)	o	o	o	o	x	o	x
81	Region VIII	Palompon Institute of Technology	x	o	o	o	x	x	x
82	Region VIII	Samar State University (Samar State Polytechnic College)	o	o	o	o	x	o	o
83	Region VIII	Southern Leyte State University (Southern Leyte State College of Science and Technology and TONC)	o	o	o	o	o	o	o
84	Region VIII	University of Eastern Philippines	o	o	o	o	o	o	o
85	Region VIII	Visayas State University (Leyte State University)	x	o	o	o	o	o	o
86	Region IX	Basilan State College							
87	Region IX	J.H Cerilles State College	x	x	o	x	x	o	x
88	Region IX	Jose Rizal Memorial State University (Jose Rizal Memorial State College)	o	o	o	o	o	o	o
89	Region IX	Western Mindanao State University	o	x	o	x	x	o	x
90	Region IX	Zamboanga City State Polytechnic College	o	x	o	x	x	x	x
91	Region IX	Zamboanga State College of Marine Sciences and Technology	x	x	x	x	o	x	o
92	Region X	Bukidnon State University	x	x	x	x	o	x	x
93	Region X	Camiguin Polytechnic State College	x	x	x	x	x	o	x
94	Region X	Central Mindanao University	o	o	o	o	o	o	x
95	Region X	Mindanao University of Science and Technology	o	o	o	o	o	x	x
96	Region X	Misamis Oriental State College of Agriculture and Technology	x	x	x	x	o	o	x
97	Region X	Northwestern Mindanao State College of Science and Technology	x	x	o	x	o	x	x
98	Region XI	Compostela Valley State College							
99	Region XI	Davao del Norte State College	x	x	x	x	o	x	o
100	Region XI	Davao Oriental State College of Science and Technology	o	x	x	x	o	o	x
101	Region XI	Southern Philippines Agri-Business and Marine and Aquatic School of Technology	x	x	x	x	o	o	o
102	Region XI	University of Southeastern Philippines	o	o	o	o	o	o	x
103	Region XII	Cotabato City State Polytechnic College	x	x	x	x	x	o	o
104	Region XII	Cotabato Foundation College of Science and Technology	x	x	x	x	x	o	x

(Cont.)

No.	Region	Name of University/College	Industries						
			Civil Engineering	Natural Resources/Geology	Manufacturing	Renewable Energy	Biotechnology	Agriculture/ Agri-business	Fisheries/ Aquaculture
107	Region XII	Mindanao State University, Marawi	o	o	o	o	o	o	o
108	Region XII	Sultan Kudarat State University (Sultan Kudarat Polytechnic State College)	o	x	o	x	o	o	o
109	Region XII	University of Southern Mindanao	o	o	o	o	o	o	o
110	Region XIII	Agusan del Sur State College of Agriculture and Technology	x	x	x	x	o	o	x
111	Region XIII	Caraga State University (Northern Mindanao State Institute of Science and Technology)	o	o	o	o	o	o	x
112	Region XIII	Surigao del Sur State University (Surigao del Sur Polytechnic State College)	o	x	o	x	o	o	o
113	Region XIII	Surigao State College of Technology	o	o	o	o	o	o	x
114	ARMM	Adiong Memorial Polytechnic State College	x	x	x	x	x	o	x
115	ARMM	Sulu State College	x	x	x	x	x	o	x
116	ARMM	TAWI-TAWI Regional Agricultural College	x	x	x	x	x	o	x

Note: There are five (5) SUCs with no public information available.

Legend:
o = The university offer the following courses/Participating SUC
x = The university does not offer the following courses

Suggested SUCs by CHED
SUCs which have COE/COD in the 7 industries

Some SUCs listed here are under the same system.
e.g. Mindanao State University, Iligan Institute of Technology

2. List of Priority Disciplines

List of Priority Courses			
#	Student Financial Assistance Program (Undergraduate)	CHED-Faculty Development Program (CHED-FDP) Phase 2	Research Grants-in-Aid (CHED Research - GIA)
1	Agriculture & Related Fields	Engineering, Maritime and Architecture	Science and Mathematics
2	Engineering	Science and Mathematics	Education and Teacher training
3	Science and Math	Information and Communication	Health and health profession
4	Information Technology	Education and Teacher Training	Information and Communication Technology
5	Teacher Education	Health and health profession	Engineering, Maritime and Architecture
6	Health Sciences	Technology	Agriculture
7	Arts and Humanities	Environmental Science	Environmental Science
8	Social and Behavioral Sciences	Humanities	Humanities
9	Business administration and other related courses	Social Sciences	Social Sciences
10	Architecture	Other disciplines as identified by the Commission	Other disciplines as identified by the Commission
11	Others (to be determined per region)		
Purpose	Filling up the undersubscribed courses and meeting the manpower demands of the industries	Upgrading the academic qualifications and enhancing the faculty performance	Prioritizing researches which contribute to the national development
Period of Effectivity	5 years	Changes depending when the need arises	10 years
Source	CMO no. 1 series of 2014	CMO no. 26 series of 2009	National Higher Education Research Agenda 2

3. Matrix of Industry and SUC Needs

To meet with industry needs from HE, what kind of development (intervention) is necessary for HEI?

Lead University of the discipline
Partner University of the discipline

Category of interventions for University to meet needs from industry: Facility & Equipment
Faculty Degree
Research activities
Curriculum delivery improvement
Linkage with industry

	Industry	Relevant discipline	Industry's Challenges and Future Direction	Expectations on HEIs	Needs of HEIs	UP			MSU			BSU	Bicol Univ.	CLSU	VSU	MUST	Remarks
						Diliman	Los Banos	Visayas	IIT	Gen San	Marawi						
1-1	Disaster Prevention	Civil Engineering/ Architect/ Urban Planning	・Country needs disaster prevention measures for improvement of investment climate ・Need to learn practices and technologies from other countries ・R&D on disaster-ready infrastructure	Infrastructure (Hard): Knowledge of advanced technology	・Need to learn advanced technology for infrastructure-related disaster prevention	・Upgrade Facility&Equipment for simulation experiment ・Knowledge transfer from Japanese University							・Develop the curriculum and faculty ・Provide facilities and equipment					
1-2	Disaster management	Public administration Disaster risk management		Management (Soft): Establish the extension program on disaster prevention community									・Develop experts ・Standardization of process and share with other SUCs				
2	Renewable Energy (Wind,Solar, Hydro, Geothermal, Biofuel)	Mechanical/ Electrical Engineering	・ Widespread adoption of RE technologies in Philippine setting	•Installation, management/ after-sales support of RE technologies in power plant situation, communities and households ・ R&D on adoption of RE technologies in industry	・Upgrade facilities and equipment to conduct simulating experiments ・Linkage with industry to know the trend and practice of industry	・UPD has MS energy engineering course, but need to establish RE course ・Upgrade facility&equipment for simulation experiment Leading SUC for mechanical RE		Biofuel(Algae) ・Faculty development for PhD ・Upgrade facilities & equipment for simulation	Hydro, Biofuel ・Collaborative research with local private companies ・Establish laboratory Leading SUC for Biofuel				Micro hydro, bioethanol ・Faculty development for PhD ・Establish laboratory ・Promote the research outcome of micro hydro (linkage with industry)			
3	Biotechnology	Biology Chemical Engineering	・Enhancing R&D capability for local technological development Agri-biotechnology: Increase value and efficiency of output Pharmaceutical biotechnology: Improve R&D environment	Conduct basic experimentation & design Agri-biotechnology: ・Technology tranfer from university to agribusiness Pharmaceutical biotechnology: ・R&D skill specific on molecular biotechnology	Agri-biotechnology: ・Linkage with industry ・Facilities and equipment upgrade Pharmaceutical biotechnology: ・Enhance curriculum on molecular biology		Agri-biotechnology ・More linkages with agribusiness nationwide for research extension ・Develop scheme for distributing research outcomes		Pharmaceutical-biotech ・ Linkage with pharmaceutical companies ・ Faculty development for improving knowledge and skills on drug discovery research ・ Upgrade facilities & equipment for drug discovery research						・UP Manila will be the leading university for pharmaceutical biotech ・Need to establish a guideline for IP when SUC has a contract with industry

To meet with industry needs from HE, what kind of development (intervention) is necessary for HEI?

Lead University of the discipline
Partner University of the discipline

Category of interventions for University to meet needs from industry: Facility & Equipment
Faculty Degree
Research activities
Curriculum delivery improvement
Linkage with industry

4	Manufacturing	Mechanical/ Electrical/ Industrial Engineering	・Improve efficiency of processes and quality of output ・Offer higher-value products & services in the long-term	・Human skills (communication, application skills, etc.), Analytical skills, Leadership ・Develop experts in electronics designing&testing as long-term plan(SEIPI) ・Closer coordination for modification of curriculum according to industry needs	・Upgrade of facilities and equipment to catch up with the latest industry practice ・Linkage with industry to know the practices and needs of industry	・Faculty exposure to industry ・Update curriculum contents to include industry practice			・ Faculty exposure to industry ・ Update curriculum contents to include industry practice ・ Update facilities & equipment to align with industry practice		・ Faculty exposure to industry ・ Update curriculum contents to include industry practice ・ Upgrade facilities & equipment to align with industry practice ・ Installation of stable internet connection		・ Upgrade faculty to PhD ・ Faculty exposure to industry ・ Update curriculum contents to include industry practice ・ Upgrade facilities & equipment to align with industry practice			・ Faculty exposure to industry ・ Update curriculum contents to include industry practice ・ Update facilities & equipment to align with industry practice	
5	Mining	Mining engineering, Geological engineering, Geodetic, Mechanical/ Electrical Engineering	・Improve efficiency of processes and quality of output	・Supervisory role in mining operations ・Human skills (communication, application skills, etc.), Analytical skills, Leadership	Upgrade of facilities and equipment to catch up with the latest industry practice Linkage with industry to know the actual practice of industry	・Faculty exposure to industry ・Update curriculum to include industry practice								・Re-open the course ・Upgrade faculty to PhD ・Faculty exposure to the industry ・Provide facilities&equipmenent				
6	Agriculture/ Agri-business	Agriculture	・Improve post-harvest efficiency ・Produce higher-value output ・Mechanization of processes	・Management of machine operations and production ・Quality testing of crops and machine ・Innovation mindset and skills (productivity improvement) ・Entrepreneurship	・Upgrade of facilities and equipment to conduct basic and advanced research ・Linkage with industry and to know the trend and needs of industry		R&D ・Upgrade facilities & equipment ・Collaboration with Japanese university on basic research using advanced technology ・Enhance applied research for advanced agribusiness ・Linkages with industry Instruction ・Enhance curriculum for entrepreneurship					・Upgrade facilities & equipment ・Knowledge & technology transfer from Japanese university on highland vegetable production ・Enhance the curriculum for entrepreneurship ・Improve R&D&E management system		・ Upgrade facilities & equipment for instruction, R&D ・ Promote their research outputs in the industry(linkages with industry) ・ Enhance curriculum for entrepreneurship	・ Upgrade faculty to PhD ・ Upgrade facilities & equipment for R&D ・ Knowledge & technology transfer from Japanese university ・ Promote their research outputs in the industry(linkages with industry)		
7	Fisheries	Fisheries	Improve post-harvest efficiency	・Innovation mindset and skills (productivity improvement) ・Process improvement in aquaculture ・Management of the business ・Specialization in aquaculture ・Knowledge of business operations (e.g., marketing, financial, etc.)	・Upgrade of facilities and equipment to conduct research ・Linkage with industry to know the trend and needs of industry ・Need to add basic and advanced subjects for curriculum development ・Profiling of species for improvement of productivity			・Upgrade facilities & equipment for R&D ・Linkages with industry Leading SUC for marine aquaculture		・ Upgrade facilities & equipment for instructions, R&D ・ Upgrade faculty to PhD ・ Capacity building for proposal writing ・ Collaborative research with private companies ・ Collaborative research with leading SUC				・ Upgrade facilities & equipment for advanced research ・ Faculty development for advanced research for (DNA profiling) Leading SUC for fresh water aquaculture			

4. Signed Minutes of Discussion (TOR mission)

Minutes of Discussion
on
Data Collection Survey for Higher Education Sector
Between
Japan International Cooperation Agency
and
Commission on Higher Education

DATE: November 15, 2013

Japan International Cooperation Agency (hereinafter referred to as "JICA") had discussions on the Terms of Reference of JICA Data Collection Survey for Higher Education Sector, (hereinafter referred to as "the Survey") with the officials of The Commission on Higher Education (hereinafter referred to as "CHED").

JICA and CHED hereby agreed upon the draft TOR of the Survey for as per Annex-1. JICA and CHED also agreed to share the record of main points discussed as per Annex-2 and actions to be taken as per Annex-3.

For JICA

Daisuke Ueda
Advisor,
Technical and Higher Education Division,
Human Development Department

Haruko Kase
Deputy Director
Southeast Asia Division 5
Southeast Asia and Pacific Department

For CHED

Napoleon B. Imperial
Deputy Executive Director

Lily Freida Macabangun Milla
Director III
International Affairs Service

Witnessed by

Patricia B. Licuanan
Chairperson

Annex-1

Terms of Reference of the Data Collection Survey for Higher Education Sector

1. Background and rational of the Study

The Higher Education Reform Agenda (HERA) is underpinned by the two-hold summarizing thrusts/organizing themes:

1) Expanded and enhanced career and life chances and choices of students
2) Higher education and its institutions placed in the full service of national development

In this regards, the package will pursue the twin strategic roles of higher education in national development outlined in the Philippine Development Plan 2011-2016:

1) Instrument for poverty alleviation
2) Vehicle for technologically-driven national development and global competitiveness

In order to achieve the above mentioned goals, the HERA addresses nine working/ directional goals, such as amalgamation of public HEIs, strengthening policy making and quality assurance, leveling of playing fields, student financial assistance and promoting priority disciplines.

Among these goals, notable efforts have been done to promote amalgamation of public HEIs. In addition to that, further consideration is needed to improve quality of higher education which can contribute to industrial development and creating better job opportunities.

This survey mainly aims to contribute one of the HERA's important goals of "improving access to and promoting priority disciplines for the growth sector" which assist in developing the competitive edge in emerging and flourishing international markets primarily through systematic build-up of high level scientific and technologically-oriented professionals. It is mentioned in HERA that investment in the capacity building of identified institutions is necessary to attract and capacitate the best talents in strategic fields needed by the local economy and public services.

The Survey also pays attention to the HERA's goals of "optimizing HEI roles in poverty alleviation and social development " by selecting specific sectors/institutions which can contribute to job creation in countryside as well as by strengthening capacity of identified institutions in disaster preparedness and management.

In order to contribute the said goal, the Survey will identify needs of human resources development from specific disciplines/sectors proposed by CHED, and it will also analyze effective approaches to assist capacity building of identified institutions to draw plans for improvement, which will serve CHED as a base of discussions on appropriate funding modalities of selected plans with ODA donors, as proposed in HERA.

2. Objectives of the Study

(1) To collect and analyze information regarding the job-skills mismatch of human resources of the identified disciplines/sectors needed for national development and global competitiveness;

(2) To analyze problems/challenges of the Higher Education Sector in the Philippines, in order to identify sector/disciplines and the identified higher education institutions to be assisted; and

(3) To propose basic framework of the prospective project(s) to address the above challenges in a final report.

3. Counterpart Agency

- Commission on Higher Education (CHED)

4. Supporting Agencies of the Survey

- Department of Education (DepED)
- Department of Trade and Industry (DTI)
- Department of Science and Technology (DOST)
- Department of Labor and Employment (DOLE)

5. Scope of the Survey

(1) Phases of the Survey

The Survey will be conducted in two phases. The 1st Phase of the Survey will conduct overall review of higher education sector and higher education institutions as well as potential disciplines/sectors as a basis of determining the sector/disciplines and higher education institutions to be assisted. Consultation meeting will be held to select the target institution in each designated sectors to be surveyed in the next phase. The 2nd Phase will conduct detailed survey and formulate basic frameworks of the prospective projects.

(2) Disciplines/sectors to be focused in the Study:

- Civil engineering

  Especially for disaster management such as earthquake, flood, landslide, etc. In considering the target institutions of this sector, it is important to include national leading institutions such as University of the Philippines and other universities as a network, in order to facilitate the capacity development of universities nationwide.
- Additional one or two disciplines/sectors shall be selected based on discussion in consultation meeting during the Survey, in consideration to the following criteria:
  - (i) Disciplines/sectors which are conducive to poverty alleviation and creation of job opportunities in the countryside such as science and technology (especially agriculture and fisheries) and engineering
  - (ii) Disciplines/sectors which are closely related with the development of internationally competitive, high-value-added manufacturing sector in the Philippines.

(3) Higher education institutions to be studied:

- University of the Philippines
- Leading higher education institutions in the regions.

  Two or three universities will be selected as a result of the above mentioned overall

review and subsequent discussion in consultation meeting.

(4) Analysis of potential assistances
Basic frameworks of the several prospective project(s) in the higher education sector will be proposed based on detailed survey.

6. Contents of the Survey

(1) Analysis of the following items regarding education in the Philippines:

(A) Data collection of the Higher Education sector in the Philippines
1) Law, Policy, institutional framework, financial and budget system, monitoring and evaluation system of education institutions
2) Current policy issues and reform efforts (e.g. Higher Education Reform Agenda, K to 12, etc.)
3) Academic exchange with foreign universities, including joint researches, joint education programs, and study abroad program of students
4) Existing and planned projects relating to higher education institutions of other donors and local and international corporations

(B) Review of disciplines/sectors
1) Overall review
- Identification of industries' needs for and demand-supply gap as well as job-skills gap/mismatch of competent human resources in each disciplines/ sectors of science and technology

2) Detailed survey for selected disciplines/sectors
- Priority areas for industries in the Philippines (including Japanese firms), in consideration to the current trends and future prospects of industrial development

(C) Review of higher education institution
1) Overall review
- History, institution, policy, law and development plan
- Population forecast, access to higher education, scholarship system
- Overview and quality of study and research
- For each type of higher education institutions: number of institutions, departments/courses, number of faculty members and students, geological location, situation, etc.

2) Detailed survey for identified institutions
- Basic information of the identified institutions (including survey items mentioned above)
- Qualification and placement of faculty members, training programs, salary policy, management system
- Quality of study and research of identified institutions (curriculum, syllabus, teaching materials, accomplishment situation of study, study/research environment such as equipment, research fund, academic society activities)
- Network of identified institutions with other institutions in the Philippines or overseas (including Japan), exchange programs, international joint education programs
- Academic-industrial collaboration situation of target universities

- Employment situation of graduates of the identified institutions.

(D) Needs and issues of Japanese universities for collaboration with universities in the Philippines
   1) Current status of collaboration (including MOUs, joint researches, exchange of academic staff and students.)
   2) Possible areas (disciplines/sectors) of collaboration in which Japanese universities are interested in.
   3) Preconditions of Japanese universities in promoting collaboration
   4) Assessment of exchange students from the Philippines and needs and issues of accepting the Filipino students at major Japanese universities

(2) Formulation of basic framework of prospective project(s)
Basic frameworks of the several prospective project(s) in the higher education sector will be proposed based on detailed survey on the selected disciplines/sectors and identified universities.

END

Annex-2

Main Points Discussed

1. **Objective of the Survey**
   - With the CHED's new Official Development Assistance (ODA) Policies and Guidelines and its Public Investment List as main points of reference, both sides agreed upon the objective of the study articulated in the Annex 1

2. **Disciplines/Sectors to be focused**
   - Taking particular note of the importance of three priority programs/areas of public investments in Philippine higher education such as amalgamation, internationally competitive higher education institutions, and poverty alleviation/disaster management. both sides agreed that the cooperation on the academic and research disciplines that will arise from the Survey shall form generic parts or components of the three priority programs especially in the forms of faculty development, scholarship and training opportunities, academic exchange, research collaboration and other critical aspects of institutional development.
   - Both sides agreed on the importance of civil engineering in disaster management such as earthquake, flood, landslide, etc., and the necessity of upgrading the research as well as education capacity of the leading institution in the Philippines in this sector, with a close collaboration with Japanese universities.
   - Both sides further agreed that additional one or two target disciplines/sectors should be selected based on the following criteria proposed by the both sides: (i) to be conducive to poverty alleviation and creation of job opportunities in the countryside such as science and technology (especially agriculture and fisheries) and engineering, (ii) disciplines/sectors which are closely related with the development of internationally competitive, high-value-added manufacturing sector in the Philippines.
   - In addition to above, both sides acknowledged the importance to consider the disciplines/sectors in which Japanese universities are interested in and eager to collaborate.
   - As a result of discussion, both sides acknowledged the following as the initial set of sectors/disciplines for consideration
     -Civil engineering
     -Mining/geological engineering
     -Mechanical, Electrical-electronics, ICT, and Chemical engineering
     -Renewable energy
     -Biotechnology
     -Agriculture/Agribusiness
     -Fishery/Aquaculture
   - The selection of one or two additional disciplines/sectors will be discussed and agreed upon through close consultation between JICA and Philippines sides during the Survey, in consideration to the criteria mentioned above, as well as result of 1st phase Survey.

3. **Higher Education Institutions to be studied**
   - CHED emphasized the importance of addressing the restructuring of public higher

Table 1 Index Patterns

1. [illegible]
   - [illegible]

2. [illegible]
   - [illegible]
   - [illegible]
   -

education institutions by amalgamation along regional systems and specialized function, and a part of identified institutions of JICA's assistance to be selected from the candidate institutions for amalgamation.

- JICA stressed the importance of including University of the Philippines as the national leading higher education institutions of the Philippines in view of their vital role in the development of human resources necessary for developing high-value -added industry in the Philippines.
- Both sides agreed to consider other candidate universities taking into consideration CHED's amalgamation policy as identified institutions in the overall review of the survey.
- Cognizant of the comparative advantage of Japan in efficient disaster management and the immediate need of the Philippine Government and the CHED to address certain urgent needs and problems brought about by recent successive natural disasters, both sides stressed the need to include institutions in the regions that will be identified by the survey in designing program collaboration in the field of disaster management.

4. Output of the Survey

- Both sides agreed that the output of the Survey will be basic framework of the prospective project(s) in the higher education sector.
- The modality of cooperation will be decided during the course of or after the Survey, for instance loan scheme could be considered as an option in consideration to the scale and characteristics of the expected assistance.

5. Implementing Arrangement

- The Survey will be a joint study between CHED and JICA, and will be implemented with close consultation process.
- CHED will form a task force which is mainly comprised of CHED members but not limited to them depending on necessity of the smooth and effective implementation of the study.
- JICA will commission a consulting firm for the actual implementation of the Survey. JICA will be responsible for the consultation with the Philippines side, by utilizing the information and data collected in the Survey.
- CHED will coordinate with the identified institutions to have necessary support in implementation of the Survey.

6. Implementation schedule (tentative)

Both sides confirmed implementation schedule of the Survey as follows.

Items	Period	Organization in charge
Finalize the draft TOR of the Survey	on this mission	JICA and CHED
Internal approval in CHED	by early Dec.	CHED
Procurement of consultant firm (in Japan)	Dec 2013-Feb.2014	JICA
Commencement of the Survey	Feb, 2014	JICA
Phase I: overall review of HE sector and institutions, as well as potential disciplines/ sectors	Feb to Mar. 2014	Consultant
Consultation meeting 1	Apr. 2014	

Phase II: Detailed survey on basic frameworks of the prospected projects(identified institution in each designated sectors).	May–June 2014	Consultant
Submission of draft final report	July 2014	Consultant
Consultation meeting 2	July 2014	
Submission of final report	Aus. 2014	Consultant

7. Actions to be taken

Both sides confirmed actions to be taken as per Annex-3

END

Annex-3

Actions to be taken

Actions	Deadline	Organization in charge
(1) Provision of copy of finalized ODA Policies and Guidelines	by end Nov. 2013	CHED
(2) Official notice of approval of TOR within CHED	by early Dec.2013	CHED
(3) Send official communication to UP and other supporting institutions	by mid Dec. 2013	CHED

5. Signed Minutes of Discussion and Attached Document

Minutes of Discussion
on
Data Collection Survey for Higher Education Sector
in the Philippines
Between
Japan International Cooperation Agency
and
Commission on Higher Education

DATE: April 21, 2015

Japan International Cooperation Agency (hereinafter referred to as "JICA") had discussions on the findings of Data Collection Survey for Higher Education Sector in the Philippines, (hereinafter referred to as "the Survey") with the officials of The Commission on Higher Education (hereinafter referred to as "CHED").

JICA and CHED hereby agreed upon the findings and recommendations of the Survey as attached.

For JICA

Daisuke Ueda
Director
Technical and Higher Education Division,
Human Development Department
Japan International Cooperation Agency

For CHED

Alex B. Brillantes, Jr
Oversight Commissioner on ODA
Commission on Higher Education

Major Findings of
the Data Collection Survey for Higher Education Sector

1. Background of the Study

This survey mainly aims to contribute to attainment of one of the important goals of Higher Education Reform Agenda (HERA) i.e. "improving access to and promoting priority disciplines for the growth sector" (HERA directional goal No.8). This is also pursued in order to assist in developing the competitive edge in emerging and flourishing international markets primarily through systematic build-up of high level scientific and technologically- oriented professionals.

The Survey also pays attention to the HERA's goals of "optimizing HEI roles in poverty alleviation and social development " by selecting specific sectors / institutions which can contribute to job creation in the countryside, by strengthening capacities of identified institutions and improving the level of productivity of industry.

In order to contribute to the attainment of the said goals, the Survey identifies needs of human resources from specific disciplines / sectors proposed by CHED, and it also analyzes effective approaches to assist capacity building of identified institutions to draw plans for improvement. This will serve as a base of discussions on appropriate assistance modalities of selected plans with ODA donors, as proposed in the HERA.

2. Objectives of the Study

(1) To collect and analyze information regarding the job-skills mismatch of human resources of the identified disciplines / sectors,

(2) To analyze problems / challenges of the higher education sector and targeted State Universities and Colleges (SUCs) in the Philippines,

(3) To elaborate the findings of (1), (2), and recommend potential future intervention in a Final Report.

3. Framework of the Survey

(1) Phases of the Survey

The Survey was conducted in two phases. The 1st Phase of the Survey reviewed higher education sector and potential disciplines/sectors as a basis of determining the disciplines/sectors and higher education institutions that needs further improvement. . As a result of the initial phase of the survey and consultation meeting with CHED held in November 2014, 7 SUCs were identified by both sides, and all 7 disciplines were proposed to be the survey target. In the subsequent 2nd Phase, each of the 7 SUCs' in-depth survey was conducted.

(2) Disciplines/sectors studied in the Survey:

① Civil engineering
② Mining
③ Manufacturing
④ Renewable Energy
⑤ Biotechnology
⑥ Agriculture / Agri-business
⑦ Fisheries

(3) SUCs studied:

	SUCs		Disciplines
1	University of the Philippines (UP)	Diliman	Civil Engineering, Manufacturing, Mining, Renewable energy
		Los Banos	Biotechnology, Agriculture/Agribusiness
		Visayas	Fisheries, Renewable Energy
2	Mindanao State University	Main campus, Marawi city	Manufacturing
		Iligan Institute of Technology	Civil Engineering, Manufacturing, Renewable Energy, Biotechnology
		General Santos	Fisheries
3	Central Luzon State University		Agriculture, Renewable Energy, Fisheries
4	Benguet State University		Agriculture
5	Bicol University		Civil Engineering, Mining, Manufacturing, Renewable Energy
6	Visayas State University		Agriculture
7	Mindanao University of Science and Technology		Manufacturing

4. Major Findings of the Survey

This part is discussed in Attachment 1 ("The Third Consultation Meeting Material").

5. Recommendations

The study's results have led to the conclusion that the following competencies of human resources expected by industry from the graduates of SUCs are as follows:

(1) "Key Generic Skills" in order for the SUC graduates to be creative, responsible, and capable of problem-solving, which will eventually equip them to become the core leaders / managers of organizations, and

(2) "High Expertise" of respective disciplines in order for the graduates to contribute to the attainment of the mid- to long-term national development goals of the Philippines.

Some of the surveyed SUCs are facing difficulties in fulfilling the needs of the industry, given

among other things, the lack of resources (human and financial) and the rapid technological advancements of the industry. The following challenges were identified by the surveyed SUCs;

(1) Education: In some SUCs, curriculum / educational content was not relevant enough for students to acquire practical and hands-on experience. The interview results revealed that insufficient facilities and equipment of SUCs (especially those for experiments) seem to be a big constraint.

(2) Research: The intensity /frequency of research activities at SUCs vary. This is because in some SUCs, research activities were hindered by either (i) faculty's heavy work load (instruction and administrative), (ii) limited research capacity and research opportunities of the faculty, (iii) lack of network with industry, (iv) inadequate and outdated equipment / facilities. In some SUCs such as UP, continuous upgrading of their research capacity to international level (such as, publishing the research outputs in international journals and presenting in international conferences and academic societies) is necessary.

(3) Management: Stronger leadership and management capacities of the SUCs would enable efficient allocation and utilization of necessary resources.

Hence, possible future interventions for narrowing the present gap between industry needs and SUCs outputs can be summarized as follows:

a) Promoting research activities in collaboration with industries and other local / foreign universities

b) Improving curriculum delivery to be more practical/problem solving oriented to reflect the industrial needs

c) Improving the professional capacity of faculty (through scholarships) in terms of research and education

d) Upgrading education and research equipment / facilities

Furthermore, based on the findings of the Survey, both sides understand the importance of designing future interventions that are aligned with the HERA, CHED Roadmap, and initiatives of other institutions and agencies.

6. Ways forward

Both sides confirmed that contents of the Draft Final Report will be further refined and finalized into Final Report of the Survey by late-May.

END

Attachment 1: The Third Consultation Meeting Material
Attachment 2: Needs analysis matrix

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JICA and CHED Data Collection Survey for Higher Education Sector in the Philippines

The third consultation meeting material

April 21, 2015

Nomura Research Institute Ltd.

1-6-5 Marunouchi, Chiyoda-ku, Tokyo 100-0005

Goal of the meeting

Share the findings from the survey and mutually agree upon possible intervention areas in the future.

- Review the findings from the survey on 7 focus disciplines, current state of higher education sector and target SUCs (7 SUCs with11 campuses) .

- Discussion and agreement on main findings and recommendations.

Agenda

1. Project framework
2. Review of the survey results
3. Recommendations

1. Project framework

2. Review of the survey results

3. Recommendations

Progress of the project
The 3rd consultation meeting with CHED will be held on the 20th and 21st of April

Preparation Sep	1st Field survey 1st Mission Sep-Oct	2nd Field survey Nov-Mar	2nd Mission March	3rd Mission April	Output
• Information gathering (desk research) • Prepare questionnaire for mission 1 • Prepare/submit inception report	1.Industry's needs study • Interview association/companies 2.Study of actual status of HEIs through visiting/interview 3.Study of CHED through interviews	1.In-depth research on SUCs Conduct interviews to identify the current status and future plans on R&D 2.Discuss possible intervention program. 3.Draft Final Report containing the information collected in the 2nd mission	• Consultation with CHED/JICA on the interim report and information sharing of the results of 2nd field survey.	• **Consultation with CHED/JICA on the key findings of the survey (main points of Draft Final Report) and recommendations.**	• Final report

Scope of the field work

	Objective	Method	Respondents
1st field survey	■ To obtain the following information • General information about the SUC • Current status & issues encountered with the development of the 7 disciplines • Existing initiatives • Future plan ■ To understand the needs of industry/gov't agency (as an employer)	Questionnaire	• 52 respondents (46.4%) - distributed to 112 SUCs via mail and email. - previously 41 respondents (as of end of Feb 2015)
		Interview	• 7 SUCs - UP Diliman, UP Los Banos, MSU Marawi, MSU IIT, MUST, VSU, Bicol Univ. • Industry (association & companies) • Government agencies
2nd field survey	■ To understand the current status of the leading SUCs ■ To identify their needs on research, faculty development and equipment/facility.	Interview	• 11 SUC campuses - UP-Diliman, UP-Los Banos, UP-Visayas, MSU-Main, MSU-IIT, MSU-Gensan, CLSU, Benguet, Bicol Univ., MUST, VSU

1. Project framework

2. Review of the survey key results

3. Recommendations

Industry Needs

Major expectations on HEIs graduates from industry is to be ready to become practical managers or engineers.

- Readiness to become a manager / engineer in a real business.
  - HEIs students will, in general, become managers or engineers with subordinates when they enter to industries.

- They are expected to have:
  a. Key generic skills such as logical thinking, communication, conceptual and interpersonal skills etc.
  b. Updated knowledge of technologies relevant to the industry, and
  c. Knowledge and experience of facilities and equipments actually being used in industries.

- Innovators and entrepreneurs will be needed.
  - The number of HEIs graduates is perceived as adequate for the current operation of industries.
  - however, engineers and entrepreneurs who will lead the innovation will be needed to further develop the industries.

Producing more experts in disaster prevention will support the development of disaster-resilient infrastructure

	Industry situation	Expectations for HEIs
Direction of industry / government	• Disaster prevention measures are needed in strengthening the country's urban/rural infrastructure and improving investment climate.	
Roles of HE graduates	• Supervisory function in construction projects	
Linkage with HEIs	• Research on disaster vulnerability • Consultation on community organization during disasters	
Skills / competency		• Faculty / students need more exposure to the field and equipment used in the industry • Need general knowledge on safety, construction management and specialized knowledge on public infrastructure and environmental engineering • Preparedness of becoming supervisory function.
Linkage		• R&D on disaster-resilient infrastructure

Producing more experts in renewable energy (RE) will support adoption of RE technologies in power plants (large-scale), communities and households (small-scale)

	Industry situation	Expectations for HEIs
Direction of industry / government	Widespread adoption of RE technologies in Philippine setting	
Skills / competency		Develop experts in designing and optimization of devices, RE plant planning & installation, and innovation skill for production of RE products (e.g. biofuel)
Roles of HE graduates	• Installation, management/after-sales support of RE technologies in power plant situation, communities and households	
Linkage		• R&D on adoption of RE technologies in industry
Linkage with HEIs	• On-the-job training/internships • Research on application of RE technologies	

Producing more experts will contribute to country's agricultural output, as well as support the emergence of pharmaceutical biotechnology in the long term

	Industry situation	Expectations for HEIs
Direction of industry / government	• Enhancing R&D capability for local technological development • Agri-biotechnology: Increase value and efficiency of output • Pharmaceutical biotechnology: Going to R&D and testing.	
Skills / competency		• Agri-biotechnology: Technology transfer from university to agribusiness • Pharmaceutical biotechnology: R&D skill specific on molecular biotechnology
Roles of HE graduates	• Conduct basic experimentation & design	
Linkage		• Arrangement on IP concerns • R&D on agricultural biotechnology
Linkage with HEIs	• R&D on developing technologies for application on agriculture and fisheries sector	

Manufacturing industry requires from HEI graduates to improve their human, analytical, and leadership skills; and from HEIs to improved coordination in improving curriculum.

	Industry situation	Expectations for HEIs
Direction of industry / government	• Improve efficiency of processes and quality of output • Offer higher-value products & services in the long-term	
Skills / competency		• Human skills (communication, application skills, etc.), Analytical skills, Leadership • Develop experts in electronics designing & testing as long-term plan
Roles of HE graduates	• Supervisory role in manufacturing operations • Analysis and solution of problems	
Linkage		• Closer coordination for modification of curriculum according to industry needs
Linkage with HEIs	• On-the-job training/internships	

Industry needs 5) Mining

Improving efficiency of processes and quality of output in mining require improvement of human, analytical, and leadership skills.

	Industry situation	Expectations for HEIs	
Direction of industry / government	Improve efficiency of processes and quality of output	Skills / competency	Human skills (communication, application skills, etc.), Analytical skills, Leadership
Roles of HE graduates	• Supervisory role in mining operations	Linkage	• (None)
Linkage with HEIs	• On-the-job training/internships		

Improving post-harvest efficiency and producing higher-value output in agriculture and fisheries requires innovation and entrepreneurship mindset and skills

	Industry situation	Expectations for HEIs
Direction of industry / government	• Improve post-harvest efficiency • Produce higher-value output	
Roles of HE graduates	• Management of machine operations and production • Quality testing of crops and machine	
Linkage with HEIs	• On-the-job/internships • Consultations on product development (agribusiness) • R&D on crop productivity	
Skills / competency		• Innovation mindset and skills (productivity improvement) • Entrepreneurship mindset
Linkage		• (none)

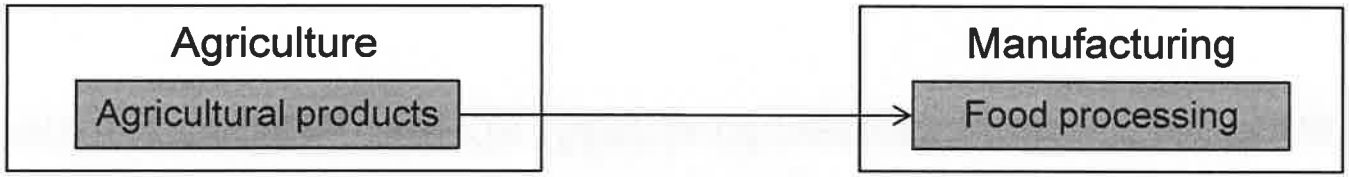
Improving post-harvest efficiency in fisheries requires mindset and skills in innovation and business management

	Industry situation	Expectations for HEIs
Direction of industry / government	• Improve post-harvest efficiency (aquaculture)	
Skills / competency		• Innovation mindset and skills (productivity improvement) • Specialization in aquaculture • Knowledge of business operations (e.g., marketing, financial, etc.)
Roles of HE graduates	• Process improvement in aquaculture • Management of the business	
Linkage		• Curriculum development: need to add basic and advanced subjects • Profiling of species for improvement of productivity
Linkage with HEIs	• On-the-job training/internships • Consultation on productivity and environmental issues	

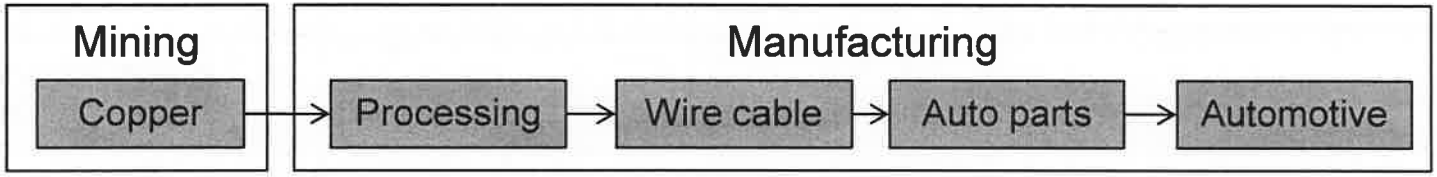
Government Plan

The goals of the PDP in terms of industry development are more inclusive growth, widening the value chain and shifting towards the higher value-added industry.

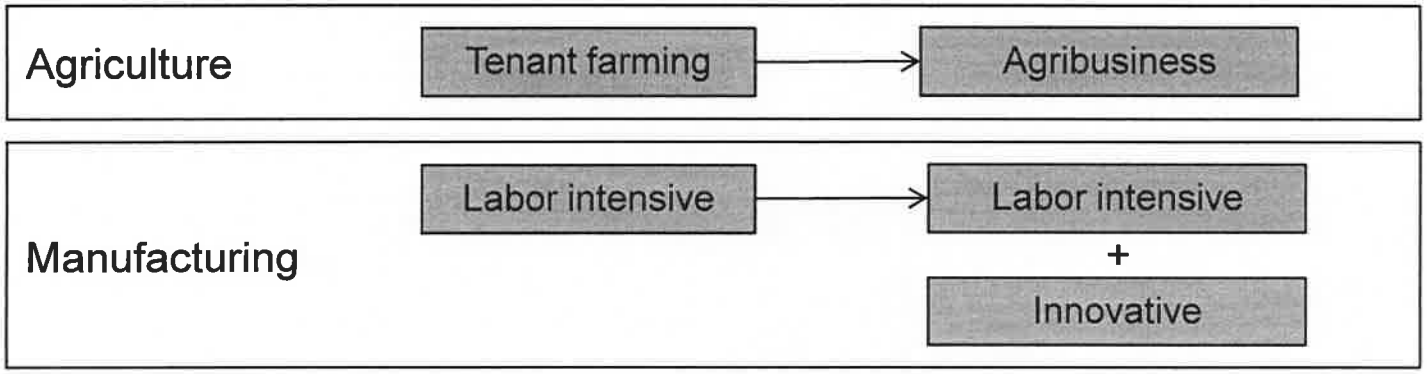
■ Inclusive growth:



■ Widening the value chain:



■ Higher value-added industry



Disaster prevention, renewable energy and biology are not mentioned in the PDP, since these are not categorized as "industry"

Also, these subjects are still new where as others have to change for further development.

Fishery may be fallen into the same category of Agriculture.

SUC Needs

1. Updates of the Questionnaire Survey
2. Summary of SUC Needs (Matrix of necessary interventions per level)

Needs from the SUCs were identified through questionnaire and interview survey.

【Questionnaire】

- Distribute questionnaire to 112 State Universities and Colleges via mail and email.
- Survey Collection rate:

No. of collected questionnaires	Collection rate
52	46.4%

【Interview】

- Conducted interviews with 7 SUCs (11 campuses) through 1st and 2nd field survey.
  - University of the Philippines, Diliman (2nd field survey)
  - University of the Philippines, Los Banos
  - University of the Philippines, Visayas (2nd field survey)
  - Mindanao State University, Marawi
  - Mindanao State University, Iligan Institute of Technology
  - Mindanao State University, General Santos (2nd field survey)
  - Central Luzon State University
  - Benguet State University
  - Bicol University
  - Visayas State University
  - Mindanao University of Science and Technology

Summary table
Surveyed SUCs and focus disciplines

	Surveyed SUCs (Campus)		Focus disciplines of each SUCs
1	University of the Philippines	Diliman	Civil Engineering, Manufacturing, Mining, Renewable energy
		Los Banos	Biotechnology, Agriculture/Agribusiness
		Visayas	Fisheries, Renewable Energy
2	Mindanao State University	Marawi	Manufacturing
		Illigan Institute of Technology	Civil Engineering, Manufacturing, Renewable Energy, Biotechnology
		General Santos	Fisheries
3	Central Luzon State University		Agriculture, Renewable Energy, Fisheries
4	Benguet State University		Agriculture
5	Bicol University		Civil Engineering, Mining, Manufacturing, Renewable Energy
6	Visayas State University		Agriculture
7	Mindanao University of Science and Technology		Manufacturing

Summary table
Focus disciplines and relevant SUCs

	Focus disciplines	SUCs
1	Civil Engineering	1. University of the Philippines, Diliman 2. Mindanao State University, Illigan Institute of Technology 3. Bicol University
2	Mining	1. University of the Philippines, Diliman 2. Bicol University
3	Manufacturing	1. University of the Philippines, Diliman 2. Mindanao State University, Marawi 3. Mindanao State University, Illigan Institute of Technology 4. Mindanao University of Science and Technology
4	Renewable energy	1. University of the Philippines, Diliman 2. University of the Philippines, Visayas 3. Mindanao State University, Illigan Institute of Technology 4. Central Luzon State University 5. Bicol University
5	Biotechnology	1. University of the Philippines, Los Banos 2. Mindanao State University, Illigan Institute of Technology
6	Agriculture / Agri-business	1. University of the Philippines, Los Banos 2. Central Luzon State University 3. Benguet State University 4. Visayas State University
7	Fisheries	5. University of the Philippines, Visayas 6. Mindanao State University, General Santos 7. Central Luzon State University

SUC Needs

1 University of the Philippines-Diliman [Civil Engineering, Manufacturing, Mining, Renewable energy]

- The most experienced university in research activity with the 4 focal disciplines.
- They have many track records, however some disciplines still need facilities and equipment.

Characteristics of the university

- Leading university of most focal disciplines with research experts
- Management of research and extension office is well organized to enhance research activities
- Have many linkages with Japanese universities and industry
- Renewable energy: No established course yet. On-going study in energy engineering program under the Dean.
- Engineering: Maintenance of equipment is relatively weak

Need for support

- Faculty development to increase the number of Ph.D and experts for research
- Faculty development if they start research in aeronautical engineering (no faculty yet)
- Facilities and equipment needed to conduct advanced technology research

2 University of the Philippines-Los Banos [Biotechnology, Agriculture/Agribusiness]

- Leading university for Agriculture/ Agribusiness
- They conduct the most advanced research in agri-biotechnology in the country.

Characteristics of the university

- Conduct 700 internally and externally funded research projects under UPLB a year
- Have 25 research projects collaborating with industry
- "National Institute of Molecular Biology and Biotechnology" (BIOTECH) the leading agri-biotechnology research in the country, is located in the campus.
- Further research needs: Nanotechnology using molecular biology

Need for support

- Faculty development for young faculty
- Facilities and equipment especially for food science cluster and molecular biology research
- Equipment to conduct research related to molecular biology
- Stable power supply for laboratory to prevent damage on preserved analytical samples

3 University of the Philippines - Visayas [Fisheries, Renewable Energy]

- Have a good fisheries research with little linkage with industry/int'l univ.
- They need basic equipment and linkage

Characteristics of the university

- Known to have a good fisheries program within Visayas region.
- Part of the Western Visayas Agriculture and Resources Research and Development Consortium (WESVARRDEC)
- Good Management on Research
  - Have an interdisciplinary R&D direction
  - Making use of the facilities and equipments from the surrounding research centers
  - Have capable faculty members who are competent to write research proposals
- Most faculty have good experience in R&D due to
  - High motivation of faculty to do research
  - High priority to allocate research funds

Need for support

- Basic equipment, facility and infrastructure for fisheries
- Linkage with domestic industry and foreign universities

4 Mindanao State University, Main Campus (Marawi City) [Manufacturing]

- Need development on science/technology research with little linkage with industry/int'l univ.
- They need basic capability development, equipment, linkage, and security

Characteristics of the university

- Dedicated faculty, Large campus
- Most faculty have little experience in R&D
  - Little time allocated by faculty to conduct research (focus on teaching),
  - Low priority for research funds
  - Problematic peace and order situation
- Recent research-related initiatives:
  - Organizing an International Linkages Office
  - Expansion of engineering and science buildings (first since 1964) and acquisition of new equipment for engineering

Need for support

- Basic equipment, facility and infrastructure
- Capability development on proposal making
- Linkage with domestic and foreign universities and industries.
- Increased security for research equipment and faculty members

5 Mindanao State University – Iligan Institute of Technology [Civil Engineering, Manufacturing, Renewable Energy, Biotechnology]

- Start-up stage for research with little linkage with industry/int'l univ, but gradually improving.
- They need basic and analytical equipment and linkages.

Characteristics of the university

- Active research in biotechnology (drug discovery)
- Most faculty members have little experience of R&D due to:
  - Lack of time (overloaded with instruction), Low network with funding agencies and industry, Low internal funding for research
- Recently, efforts to increase R&D network and capability via
  - AUN/SEEDNET
  - Visiting professor workshops of their Biological Sciences Department
  - Establishment of Science Research Complex
  - "Technovation" science & technology fair

Need for support

- Basic equipment in engineering, Analytical equipment in biotechnology
- Linkage with domestic and foreign universities and industries.

6 Mindanao State University -General Santos [Fisheries]

- Start-up stage for a research with little linkage with industry/int'l university yet.
- They need basic capability development, equipment and information.

Characteristics of the university

- The only fishery college in the region
- Plan to set up a Fishery & Analytical laboratory research center (aquaculture center)
    - Contribution to (1) regional development and (2) industry (processing plant, feed company, operator, etc.) to supply experienced graduates
- Little experience of R&D
    - low awareness of the importance of research, lack of time (overloaded with instruction) and low priority in allocating budget.

Need for support

- Capability development on Proposal making
    - Most faculties have no experience of making proposal to apply for funds.
- Basic equipment and facility including a car to be used for filed survey
    - Despite the industry requests for analysis, they don't have basic analytical equipments.
- Support for linkage with foreign universities and industries.
    - They have no information to contact yet.

SUC Needs

7 Central Luzon State University [Agriculture, Renewable Energy, Fisheries]

- Mostly applied R&D with many linkages with industry/int'l univ.
- They need basic, equipment, research assistance, capability development and linkage

Characteristics of the university

- Part of the Central Luzon Agriculture and Resources Research and Development Consortium (CLARRDEC)
- Good management of research
- Have relatively good linkages with the surrounding industries and int'l universities & organizations
- The R&D direction of agriculture, renewable energy & fisheries is heading towards biotechnology.
- The faculty members are proactive in conducting research but, they're currently facing these problems:
    - Lack of faculty members
    - Heavy teaching load per faculty
    - Difficulty to have linkage with private industries for research

Need for support

- Basic equipment, vehicle procurement, facility and infrastructure
- Joint Research Project seen as most effective solution
- Capability development on proposal making for young faculty members
- Linkage with industries and Japanese universities specifically for research

8 Benguet State University [Agriculture]

- Proactive in conducting research regionally but, little linkage w/ industry and int'l universities
- They need faculty development (i.e. scholarship, short-ter training), equipment and linkage

Characteristics of the university

- Currently have 63 on-going projects
  - Part of the Highland Agriculture and Resources Research and Development Consortium (HARRDEC)
  - For agriculture, they're specialized on highland crops and ornamental plants
- Have capable, highly specialized faculty members in the Agriculture discipline
- Efficiently used their farmland space for farming extension and business incubation activities
- Most faculty have good experience in R&D due to high priority in allocating budget and time for research & faculty development

Need for support

- Basic & highly advanced equipments for agriculture & biotechnology
- Exposure & Training for certain areas in agriculture and maintenance of equipments
- Establishing linkage with industry specifically for research
- Linkage with domestic and foreign universities
- Upgrade young faculty replacing the ageing faculty

9 Bicol University
[Civil Engineering, Mining, Manufacturing, Renewable Energy]

- Research and development center(RDC) monitors research activities and take responsibility as zonal research center
- Their research activities are not active in Civil Engg, Mining, Manufacturing, and Renewable Energy.

Characteristics of the university

- They are appointed as zonal research center by CHED, newly established food security and assurance laboratory in RDC with Php17 million budget
- Faculty immersion to industry is implemented to know the actual situation of industry
- Focus on disaster preparedness, disaster resilience, and good governance in the aspect of public health
- No research related to disaster management under civil engineering is conducted, however building resilient community for disaster project is conducted under extension service office
- Lectures are more focused on than research to achieve higher passing rate of license exam (RDC tries to change their culture to research oriented)

Need for support

- Faculty development for young faculty to earn MA and Ph.D
- Facilities and basic equipment for all department
    - Mechanical Engineering still use outdated equipment donated 60 years ago.

10 Visayas State University [Agriculture]

- Intermediate to advanced stage for research with existing linkages
- They need cutting-edge equipment, stability of electricity and faculty development

Characteristics of the university

- Good management support on research
  - Accelerates procurement through foundation (VFARD)
  - Organized and well-monitored research plan
  - Efficient procurement procedure
- Active in relating agriculture by-products to renewable energy
- Low industrial activity in the area

Need for support

- Analytical equipment
- Stabilizing electricity supply
- Upgrade young faculty to replace ageing faculty

SUC Needs

11 Mindanao University of Science and Technology [Manufacturing]

- Accelerating research activity with supportive management.
- They need basic equipment and more linkages.

Characteristics of the university

- Management is supportive to research
- Located in a highly commercialized & industrialized area in Mindanao
- R&D activity is hampered by teaching obligations
- Research trends/issue:
  - Organizes Public-Private Partnership forums
  - Plans increase of industry involvement via University of Science and Technology of the Philippines (USTP) plan

Need for support

- Basic analysis equipment for machine fabrication, simulation, chemical analysis and environment monitoring
- Linkage of faculty with more industry players and foreign universities

SUC needs concentrated in improving and upgrading facilities and equipments.

SUCs needs on facilities and equipment

Needs on facilities and equipment	Number of respondents	%
Establishment and/or improvement of general facilities (R&D facilities, classrooms etc.)	41	79%
Procurement and/or Upgrade of Equipment (e.g. disaster warning devices)	24	46%
Establishment and/or improvement of science laboratories	24	46%
Establishment of research centers (e.g. Mindanao Sustainable Minerals Research Center, Alternative Energy research center)	16	31%
Establishment of Training Facilities for faculty and students	6	12%

Source: Questionnaire survey

Engineering and Agriculture, among others, have more needs on improvement of facilities and equipments.

- Engineering disciplines, in general, need a heavy investment into facilities and equipments compared to other disciplines.

Discipline that SUCs need to establish and/or improve facilities and equipment

Facilities & Equipment needs by discipline	Number of respondents	%
Engineering (e.g. civil eng., sanitary eng.)	15	28%
Agriculture	14	26%
Fisheries	8	16%
Biotechnology	6	11%

Source: Questionnaire survey

Only 38% of surveyed SUCs have linkage with overseas universities. 67% of them have linkage with the industry.

- Even though 67% of respondent SUCs have already a linkage with industry, industries perceive that HEIs in the Philippines lack of exposure to industries, both for faculty members and students.

Status and needs of linkage with overseas university and industry

	Linkage	Number of respondents	%
Linkage with overseas universities	Already have	20	38%
	Plan to have or to expand	39	75%
Linkage with industry	Already have	35	67%
	Plan to have or to expand	39	75%

Source: Questionnaire survey

The number of linkage with overseas universities are concentrated in Agriculture and Fishery disciplines.

Number of SUCs with Linkages with overseas universities mentioned in the Survey by Discipline

Discipline	Student/Faculty Scholarship	Research/ Consultations	Student/Faculty Exchange	Others
Civil Engineering	1	8	0	0
Mining/Natural Resources	2	6	1	0
Manufacturing	2	1	0	1
Renewable Energy	2	0	0	0
Biotechnology	5	4	0	1
Agriculture/Agri-business	2	9	2	3
Fisheries	2	15	2	2

Source: Questionnaire survey

Needs of SUCs are categorized into three major dimensions, (a) Institutional support to R&D, (b) Faculty quality and (c) Facilities and equipment.

a. Institutional support to R&D	b. Faculty quality	c. Facilities & equipment
(1) Ability to allocate appropriate funds for instruction and R&D, (2) Establishment of institutional linkages for scholarship and research with industry, domestic and overseas universities, and domestic and international funding agencies (3) Ability to motivate faculty members to pursue both instruction and research work, and (4) Ability to balance priority of both instruction and R&D as matter of policy and implementation	(1) Capability of writing research proposals for competitive research, (2) Adequacy of quality and number of MS and PhD holders, (3) Conduct of mentorship among faculty members for research, and (4) Linkage with industry	(1) Availability and functionality of basic equipment (2) Availability of advanced equipment

Note: Pertains to the SUC's specific focus discipline under which they are classified in this study

Institutional development needs of SUCs

SUC groupings	Institutional support to R&D	Faculty quality	Facilities & equipment
• University of the Philippines Diliman • University of the Philippines-Los Banos • University of the Philippines-Visayas	◎	◎	○
• Benguet State University • Central Luzon State University • Visayas State University	○	○	△
• Mindanao University of Science and Technology • Mindanao State University – Iligan Institute of Technology	△	△	△
• Bicol University	△	X	X
• Mindanao State University-Main Campus • Mindanao State University-General Santos	X	X	X

Legend:

In **Institutional support to R&D**, given that the factors are:
(1) Ability to allocate appropriate funds for instruction and R&D,
(2) Establishment of institutional linkages for scholarship and research with industry, domestic and overseas universities, and domestic and international funding agencies,
(3) Ability to motivate faculty members to pursue both instruction and research work, and
(4) Ability to balance priority of both instruction and R&D as matter of policy and implementation;
◎ = all 4 are present; ○= (2) and (4) are lacking; △ = (3) and (4) are lacking; X = all are lacking

In **Faculty Quality**, given that the factors are:
(1) Capability of writing research proposals for competitive research
(2) Adequacy of quality and number of MS and PhD holders,
(3) Conduct of mentorship among faculty members for research in each SUC for the specific focus discipline under which they are classified in this study, and
(4) Linkage with industry;
◎ = all 4 are present; ○= lacks (4); △ = lacks (2), (3) and (4); X = all 4 are lacking

In **Facilities & Equipment**
◎ = all basic equipment and some advanced equipment are present, and needs just some advanced equipment;
○ = all basic equipment are present, but lacks advanced equipment
△ = basic equipment are present, but some are outdated or nonfunctioning
X = lacks even basic equipment

1. Project framework

2. Review of the survey results

3. Recommendations

3. Recommendations

(1) To respond to the needs of industry, key generic skills need to be developed and capacity building of school management is needed.

Needs of Industry and Society

- Key Generic Skills
  - Logical thinking, communication and conceptual and interpersonal skills etc.
- High expertise for further development of the industry
- Exposure to industry and machines and equipments currently used

Issues of SUCs

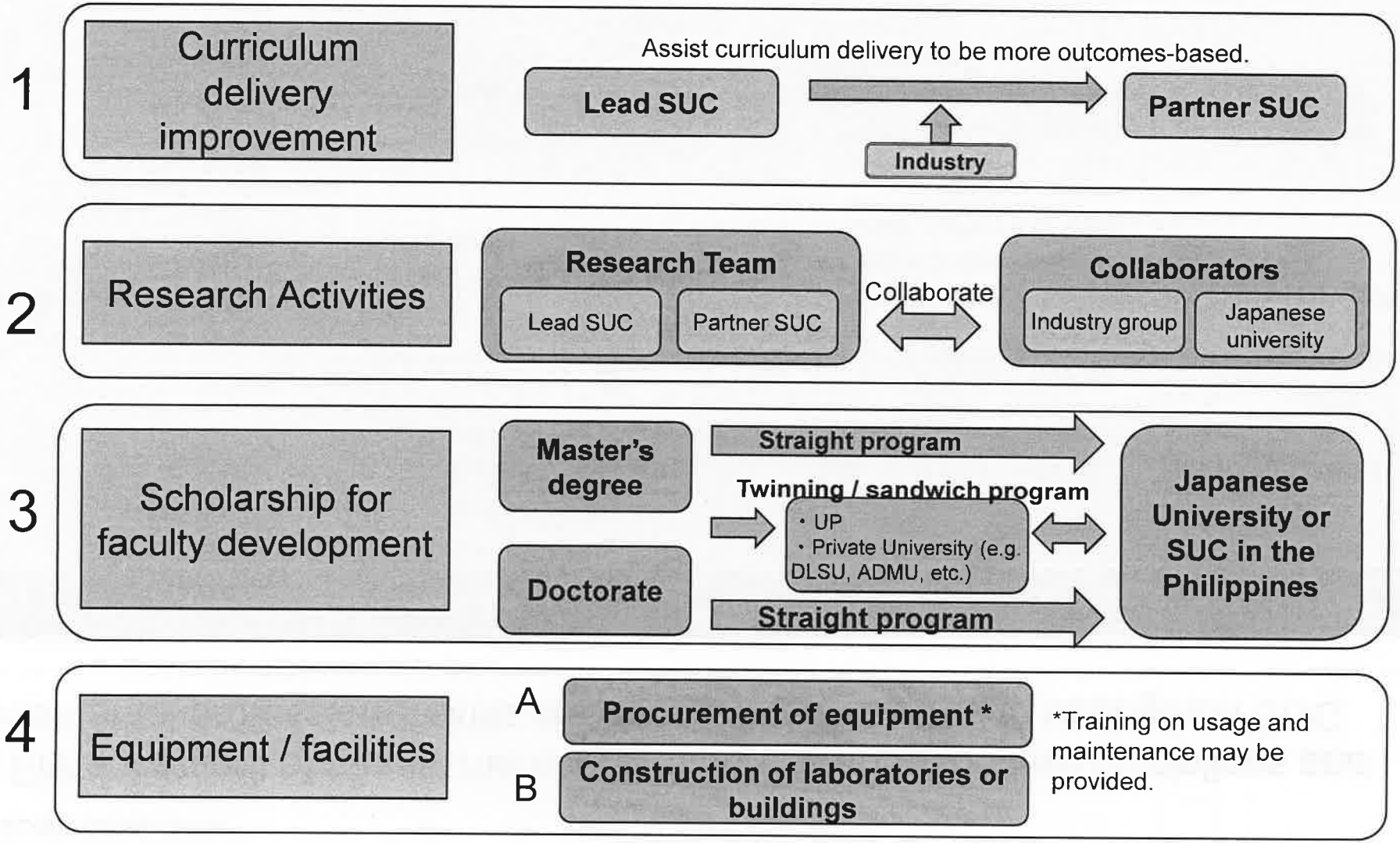
- Institutional support for R&D and quality upgrading
- Underqualified faculty members
  - Instruction oriented (not thinking skill)
  - Weak Research and Development
- Lack of exposure to industry
- Obsolete facility and equipments

- Enhancement of R&D experience where faculty members and students can nourish thinking skills and communication skills and gain the latest knowledge of the discipline.
- Supporting faculty members to gain graduate degrees through R&D.
- Updating facility and equipments.
- Supporting management capacity of SUCs to promote these measures.

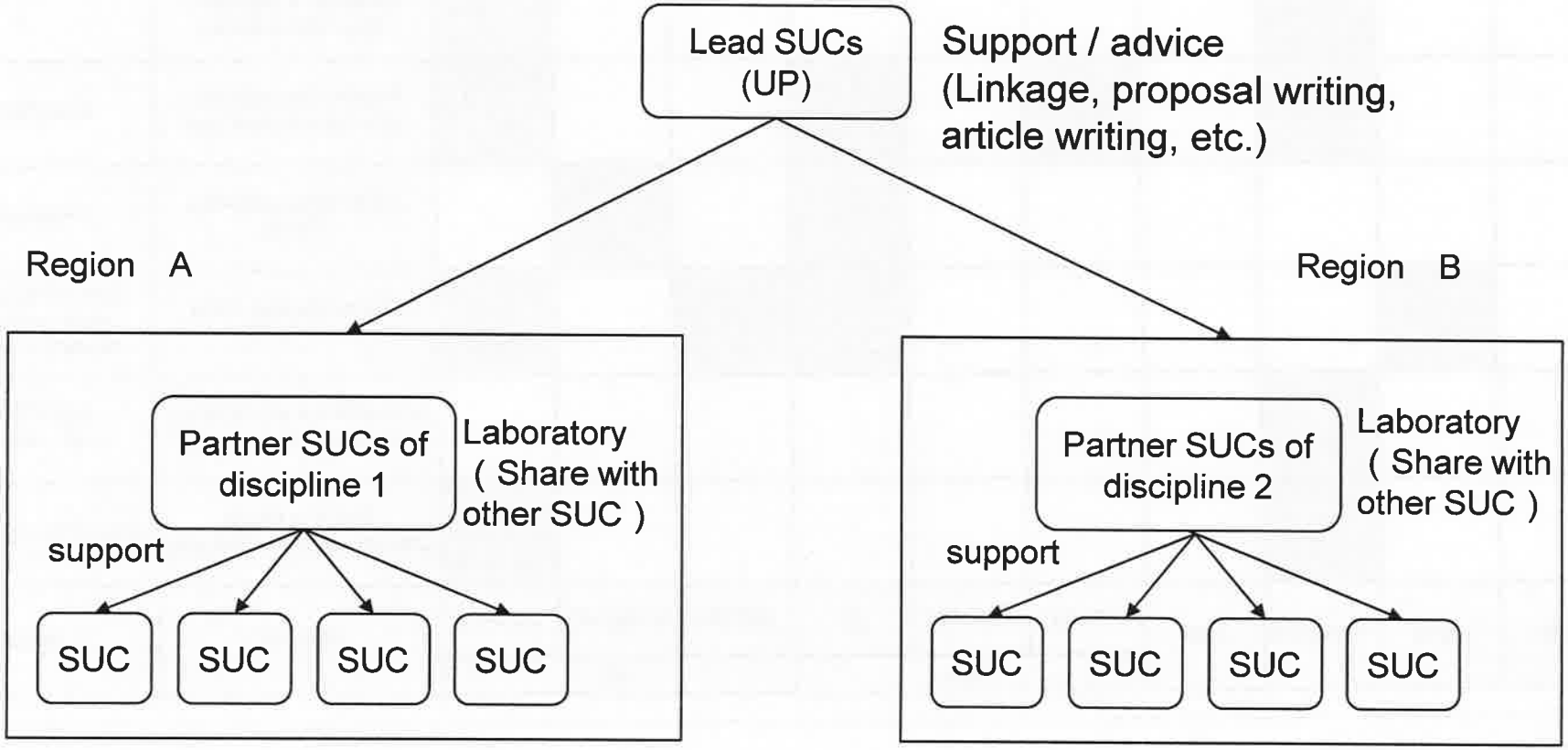
(2) Enhancement of faculty members' expertise on respective disciplines and fundamental professional skills are necessary measures to strengthen SUC.

Recommended interventions		Programs and target in the HERA
a) Improving the Capacity of Faculty Members	i) Collaborative R&D with industry and foreign universities	Grants-in-Aid for RDD (50 SUC RDE programs funded)
	ii) Improvement of facilities & equipment	Upgrading and modernization of infrastructure facilities and equipment of leading SUC (15RDE centers established)
	iii) Upgrade to Ph.D	Faculty Development Program (To upgrade qualification of SUC faculty to Masters and Ph.D levels)
b) Developing Key Generic Skills and High Expertise to be a Professional		Development of priority programs

The following interventions may produce human resources and technologies needed by the industry.



Some SUCs are front-running whereas others are lagging behind. Collaboration among SUCs will be recommended.



Disciplines and SUCs Matrix

Leading University

Partner University

Industry	Discipline	UP			MSU			BSU	Bicol Univ.	CLSU	VSU	MUST
		Diliman	Los Banos	Visayas	IIT	Gen San	Marawi					
Disaster risk reduction	Civil Engineering/ Architect/ Urban Planning											
Disaster risk management	Public administration Disaster risk management											
Renewable Energy (Wind,Solar,Hydro, Geothermal,Biofuel)	Mechanical/ ElectricalEngineering											
Biotechnology	Biology Chemical Engineering											
Manufacturing	Mechanical/ Electrical/ Industrial Engineering											
Mining	Mining engineering, Geological engineering, Geodetic,Mechanical/ Electrical Engineering											
Agriculture/ Agri-business	Agriculture											
Fisheries	Fisheries											

An idea for prospective intervention areas - Priority may be given to some disciplines.

Short term priority

Industries / disciplines	Evaluation based on the survey
Disaster prevention (Architecture, Civil engineering and Urban planning)	The Philippines have many disaster prone areas. Needs from the society are strong. Size of employment may not be large enough.
Manufacturing (including IT)	For upgrading the industry, HE level engineers are needed. Linkage with other universities and industry is strong. Size of employment is large. If the country failed to produces highly skilled engineers, growth of the sector will remain low.
Agriculture / Agri-business	The size of employment is large. Technology breakthrough for inclusive growth is needed.

Long term targets

Industries / disciplines	Evaluation based on the survey
Mining / Geological Eng.	Not much needs from industry. The industry needs more field worker than university graduates.
Renewable energy	Growth potential is high domestically, but not necessarily competitive in global market. Size of employment will be limited.
Biotechnology	Biotech can be related to several industrial sectors including energy, environment, food, medial / pharmaceutical etc. Needs from industry is strong.
Fisheries / Aquaculture	The needs from industry is not quite strong. The size of employment as a whole is large but not much for HE graduates.