

Building Interdisciplinary Graduate Programs for Sustainable Development in the Context of Climate Change at Vietnam National University, Hanoi

Trương Quang Học*

Vietnam National University, Hanoi, 144 Xuân Thủy, Cầu Giấy, Hanoi, Vietnam

Received 10 April 2015

Revised 20 October 2015; Accepted 20 December 2015

Abstract: Based on the analysis of the integration and globalization in the context of socio-economic, environmental crisis and current sustainable development orientations in the world, of the current status and tendencies of Vietnam's deep and comprehensive reform in education and science-technology, the author introduce interdisciplinary graduate programmes concerning sustainable development and climate change at Vietnam National University, Hanoi, analyzing opportunities, advantages and challenges in organization of these training programmes. The author also recommends some solutions for improving training and research quality in interdisciplinary graduate programs at Vietnam National University, Hanoi by more closely linking with social developmental practice, strengthening research activities, training via research and for research, development of strong scientific working groups, centers of excellence, and strengthening international integration.

Keywords: Sustainable development, climate change, interdisciplinary graduate programs, climate change, sustainability sciences, Vietnamese studies/area studies, environment and sustainable development.

1. Introduction

Over the last 20 years of sustainable development, the development model of the world economy remains “brown”, heavily dependent on natural resources, fossil fuels, causing environmental pollution, resource degradation and ecological imbalances. Recently, on a global scale, the new global crisis has continuously occurred, among which

climate change (CC) is said to be the biggest challenge of the humanity in the 21st century.

In this context, in the developed countries, the industrial economy is shifting to a post-industrial economy and gradually moving to a knowledge economy. The format of the world economy also tends to shift from “brown” economy to a “green” one. Green Economy Development (GED)/ Green Growth (GG) is becoming the advanced model for more countries moving towards to climate change response, sustainable development and social

* Email: truongquanghoc@gmail.com

justice (RIO+20 outcome Documents, 2012). Green growth "is to promote growth and economic development while ensuring that natural assets continue to provide the resources and essential environment services for life ", and is also considered to be a pathway to sustainable development.

Consequently, in several countries, frontier and periphery sciences appear to meet requirements of the developmental practice.

Accordingly, Vietnam National University, Hanoi (VNU) has recently offered interdisciplinary graduate programs such as Climate Change, Sustainability Science etc. This paper aims to discuss opportunities, advantages and challenges in conducting these training programs at VNU.

2. Global context

Sustainable development

After the UN Earth Summit on Environment and Development organized in June 1992 in Rio de Janeiro – Rio-92 and UN World Summit on Sustainable Development - Johannesburg-02 (Rio+10), Agenda 21, sustainable development has become the world community's development strategy.

For more than 20 years of sustainable development, the development model of the world economy still remains "brown", heavily dependent on natural resources, fossil fuels, causing environmental pollution, resource degradation and ecological imbalances. Recently, on a global scale, the new global crisis has continuously occurred, among which climate change (CC) is said to be the biggest challenge of humanity in the 21st century.

In this context, in the developed countries, the industrial economy is shifting to a post-industrial economy and gradually moving to a knowledge economy with 4 high-technological evolutions (GRIN: G – Genomics, R – Robotics, I – Informatics; N - Nano technology); and Knowledge Society. The format of the world economy also tends to shift

from "brown" economy to a "green" one. Green Economy Development (GED)/ Green Growth (GG) has become the advanced model for more countries moving towards to climate change response, sustainable development and social justice.

Accordingly, in producing highly qualified human resource, several frontiers, periphery sciences appear to meet requirements of developmental practice.

Approach for interdisciplinary research and training programs is interdisciplinary/transdisciplinary one (Fig. 1)

Sustainable development is the harmonious development of three fields: Economy - Society - Environment on the cultural background (UN, 1992, UNESCO) (Fig. 1A). Climate change knowledge structure consists of 7 phases, relating to each other (IPCC, 2007; Sumi, 2011)(Fig. 1C). Green growth is a pathway to sustainable development in the context of global climate change (Figure 1C). Sustainability Science - a new science indicates the path to sustainable development (Fig. 1D). All 4 contents are interdisciplinary issues.

Systemic approach and interdisciplinary/ecosystem - based approach is key for studies on integrated management of natural resources, sustainable development and climate change at present.

In sustainable development, ecosystem-based approach is widely adopted on a global scale for most ecosystems and natural areas, socio-economic, for integrated environmental management and for sustainable development. In broad terms, sustainable development aims to maintain or improve the health of the ecosystems and livelihoods/ prosperity of people including many factors (education, the basic needs such as clean water, food real, housing are improved). The ecosystem is the basic support system for life. Therefore, the basic principle is" functional and integrity conservation of the ecosystem will either need to be a basic means of sustainable development. "Development of natural capital is an important content of green growth.

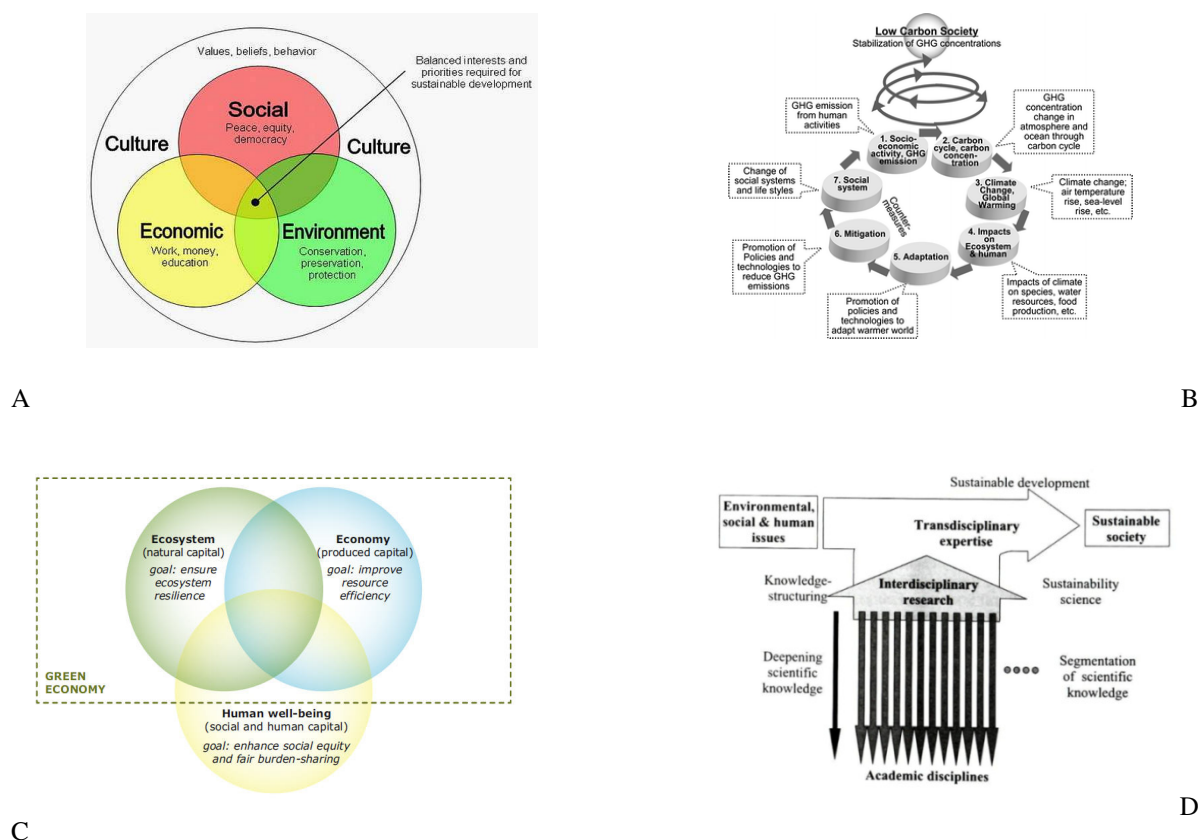


Figure 1. Schemes on interdisciplinary structure of sustainable development (A); knowledge of climate change (B); Green economy (C) and Sustainability science (D)

In recent years, the ecosystem-based approach has been studied and applied more in mitigation and adaptation to climate change in order to apply these solutions to cope with sustainability appropriate for each region, each country. For climate change mitigation, natural habitats, particularly forest ecosystems are carbon sinks. Therefore, planting and forest protection are solutions feasible to mitigate climate change. The conservation and restoration of degraded terrestrial ecosystems, marine and wetlands are needed to achieve the common goals of the Biodiversity Convention and the Framework Convention on Climate Change of the United Nations, because the ecosystem plays a very important role in the global carbon cycle and in adapting to climate

change. Besides, the ecosystem also provides essential services for human beings.

Ecosystem-based Adaptation (EBA) is to use natural systems and ecosystem services as an important component in the overall strategy for the integrated management of natural resources, help people adapt to the adverse effects of climate change. The aim of the EBA is to strengthen resilience of communities and ecosystems through concrete activities such as the management and conservation of natural resources, the integrated management of watersheds ...to maintain and restore the integrity of ecosystems and the benefits of ecosystems.

In green growth, natural capital (ecosystems) plays an important role in the

capital (economic capital, social ...), and is the resources for social development.

Impacts of climate change are the impacts on the composition of the ecosystem and on the entire ecosystem in general; and coping with climate change in principle is also the solution to restore, maintain the equilibrium of the ecosystem. Accordingly, systems, interdisciplinary/ ecosystem based approach are selected as a key approach in responding to climate change under the principle of responding to climate change which maintains and enhances resilience, adaptability and reduces climate vulnerability/ risks in order to limit the damage caused by climate change for ecosystems - social (IPCC, 2007; IUCN, 2008; World Bank, 2007, 2010, Truong Quang Học, 2010; Sumi *et al.*, 2011).

In higher education

In this context, producing highly qualified human resources for globalization and sustainable development should be the strategy of the 21st Century's higher education development, and has become the strategy for development and competition of countries.

Accordingly, general education guidelines are learning to know, learning to do, learning to be and learning to live together, instead of previously traditional "job-ready" graduates. The highly qualified human resources of the 21 century are of three manpowers: i) Creative thinking manpower; ii) Entrepreneurial manpower and iii) long-life/self-study manpower. It is, therefore, education institutions are not only obliged to imbue the younger generations with knowledge, but also to educate and develop their ability to adapt to the rapid changes and current unpredictable situations in the global scale.

Consequently, the guideline of the modern higher education reform is the combination of learning process with solving practical problems via science-technology R&D activities. In other words, we can say that scientific research is considered an important

function of higher education: Learning should be via research and for research.

Many new different university models such as research university, flag universities appear. Many frontier and periphery fields and training programs come into being (Douglass, 2009, 2013) (International Information on higher education, 2012-2014).

In the Vietnamese context

Vietnam has over 100 years' higher education development from the beginning of 20 century. The significant development is after the first Indochina war (1954). Presently, the total number of higher institutions is 433 including 214 colleges, 219 universities (3 regional universities and 2 national universities). Despite a lot of development, higher education quality and organization are still backward for different reasons. Presently, the Vietnamese government is carrying out a comprehensive and deep education reform.

As a result of this reform, Vietnam National University, Hanoi (VNU) was established in 1993 and then Vietnam National University, Ho Chi Minh City was established in 1995 aiming at strengthening education development as the two leading universities in the country (Truong Quang Học, 2004, 2005).

Vietnam National University, Hanoi is known for its tradition and prestige in high quality education and training. Every year, VNU produces more than 5,000 bachelors, 2,400 masters and 200 doctors graduating from 108 undergraduate programs, 121 Master's programs and 112 doctoral programs in natural sciences, technology, economics, social sciences and humanities, education and foreign studies, etc. In its process of development, VNU has step by step confirmed its status in training highly qualified human resources of international standards so as to meet the demands of the country's socio-economic development and foster more and more talents for the nation (VNU, 2014).

Apart from traditional majors, VNU is the first university in Vietnam to build up new

training programs of interdisciplinary nature like Environmental Sciences, Math-Information Technology, Natural Resources Management, Chemico-Pharmacy, Materials and Nano Devices and etc.

Regarding to sustainable development and climate change, VNU has recently offered new interdisciplinary graduate programs such as Environment and Sustainable Development (from 2004 in the Center for Natural Resources and Environmental Studies), Vietnamese Study (a discipline of Area Studies (from 2002 in the Institute of Vietnamese Studies and

Development Sciences), Climate Change (from 2011), Sustainability Science (from 2014) in Graduate School, etc.

These programs curriculum have been developed based on referring other countries curriculum (mainly developed countries as USA and Japan universities) and concrete situations (socio-economic, human resources, equipment) of Vietnam, and of the University (Table 1). Faculty are from different appropriate unites of the university. Field works have been conducted in different locations according to integrated plans.

Table 1. Curricula of the graduate programme on Climate change

No.	Subject code	Subject title	Credit number	Credit hours			Prerequisite credit code
				Theory	Practical	Self-study	
I	General knowledge block		7				
1	PHI 5001	Triết học (<i>Philosophy</i>)	3	45	0	0	
2	ENG 5001	Ngoại ngữ cơ bản (<i>Foreign Language for General Purposes</i>)	4	30	30	0	
II	Basis and major knowledge group		39				
II.1	<i>Compulsory subjects</i>		19				
3	HMO 6200	Cơ sở khoa học của biến đổi khí hậu (<i>Fundamentals of Climate Change</i>)	4	40	20	0	
4	GLO 6201	Phát triển bền vững (<i>Sustainable Development</i>)	3	25	15	5	
5	CRE 6426	Giảm nhẹ và thích ứng với Biến đổi khí hậu: Lý luận và thực tiễn (<i>Climate Change Mitigation and Adaptation: Theory and Practice</i>)	3	25	15	5	HMO 6200
6	HMO 6201	Đánh giá biến đổi khí hậu (<i>Assessment of Climate Change</i>)	3	30	15	0	HMO 6200
7	BIO 6200	Tác động của biến đổi khí hậu tới tự nhiên, xã hội và hệ sinh thái (<i>Climate Change Impacts on Society, Nature and Ecosystem</i>)	3	25	15	5	HMO 6200
8	GLO 6200	Đánh giá tính dễ bị tổn thương do biến đổi khí hậu (<i>Vulnerability Assessment of Climate Change</i>)	3	25	15	5	HMO 6200

No.	Subject code	Subject title	Credit number	Credit hours			Prerequisite credit code
				Theory	Practical	Self-study	
II.2		<i>Selective subjects</i>	20/55				
9	CRE 6428	Truyền thông về biến đổi khí hậu (<i>Communication of Climate Change</i>)	3	15	15	15	HMO 6200
10	SOC 6227	Thích ứng với biến đổi khí hậu dựa trên cộng đồng (<i>Community-based Adaptation to Climate Change</i>)	3	15	15	15	HMO 6200
11	HMO 6207	Dự tính khí hậu: Tính bất định và hoạch định chính sách (<i>Climate Projection: Uncertainty and Decision Making</i>)	2	25	5	0	HMO 6200
12	HMO 6204	Biến động khí hậu và các hiện tượng cực đoan (<i>Climate Variability and Extremes</i>)	2	25	5	0	HMO 6200 HMO 6201
13	CRE 6006	Phương pháp luận và phương pháp trong nghiên cứu môi trường và phát triển bền vững (<i>Methodology and Methods in Environmental Studies and Sustainable Development</i>)	3	15	15	15	HMO 6200
14	SGS 6002	Thống kê ứng dụng (<i>Applied Statistics</i>)	2	25	5	0	HMO 6200
15	SGS 6003	Thực địa liên ngành (<i>Interdisciplinary field work</i>)	4	10	25	25	HMO 6200
16	HMO 6202	Khí tượng nhiệt đới và gió mùa châu Á (<i>Tropical Meteorology and Asian Monsoon</i>)	2	25	5	0	HMO 6200
17	HMO 6203	Thiên tai và các hiện tượng thời tiết khí hậu cực đoan (<i>Natural Disaster and Extreme Weather and Climate Events</i>)	2	25	5	0	HMO 6201
18	HMO 6205	Động lực học khí hậu nhiệt đới (<i>Dynamics of Tropical Climatology</i>)	2	25	5	0	HMO 6202
19	HMO 6206	Mô hình hóa khí hậu khu vực (<i>Regional Climate Modeling</i>)	2	25	5	0	HMO 6204
20	SOC 6226	Con người, xã hội và biến đổi khí hậu (<i>People, Society and Climate Change</i>)	2	25	5	0	HMO 6200
21	COE 6301	Kinh tế học của biến đổi khí hậu (<i>The Economics of Climate Change</i>)	3	15	15	15	HMO 6200
22	BIO 6201	Bảo tồn đa dạng sinh học trong bối cảnh của biến đổi khí hậu	2	25	5	0	HMO 6200

No.	Subject code	Subject title	Credit number	Credit hours			Prerequisite credit code
				Theory	Practical	Self-study	
<i>(Biodiversity Conservation in the Context of Climate Change)</i>							
23	EVS 6200	Đánh giá tác động môi trường và đánh giá môi trường chiến lược (Strategic Environmental Assessment and Environmental Impact Assessment)	2	25	5	0	HMO 6200
24	GLO 6202	Đánh giá rủi ro tai biến khí hậu (Climate Hazards Risk Assessment)	2	25	5	0	HMO 6200
25	EVS 6201	Công cụ và quá trình quản lý tài nguyên và môi trường (Tools and Processes for Environmental and Resource Management)	2	25	5	0	HMO 6200
26	CRE 6427	Chính sách về biến đổi khí hậu phục vụ cho phát triển (Climate Change Policy for Development)	3	15	15	15	HMO 6200
27	GEO 6200	Phân tích không gian ứng dụng vào thích ứng biến đổi khí hậu (Spatial Analysis Applied to Climate Change Adaptation)	3	15	15	15	HMO 6200
28	GEO 6201	Quy hoạch lãnh thổ để thích ứng với biến đổi khí hậu (Territorial Planning for Climate Change Adaptation)	2	25	5	0	HMO 6200
29	EVS 6202	Tài nguyên năng lượng thế giới và công nghệ năng lượng tái tạo (World Energy Resource & Renewable Technologies)	3	15	15	15	HMO 6200
30	SGS 6001	Tiểu luận (Team Project)	2	5	10	15	CRE 6426 BIO 6200
IV	SGS 7001	MSc thesis	18				
	Total		64				

The author has participated in training activities of four interdisciplinary graduate programs (giving lectures, practice, field works, seminars).

From teaching practices, remarks could be discussed as follows:

Advantages:

Availability of abundant conditions (human resource and infrastructure/equipment) in VNU - a comprehensive university offering different programs of single disciplinary, multidisciplinary of low interdisciplinary sciences;

Training highly qualified human resources to supply timely for implementing current

state strategies (on Sustainable Development, Climate Change, Green Growth...);

Taking advantages on international cooperation in the present context of integration and globalization.

Weakpoints and challenges

General backward context of Vietnam's education, especially higher education

Most of lecturers of the new interdisciplinary programs normally are of single disciplinary;

Besides, conditions, especially budgets for research activities organization

Are limited (to organize scientific working groups where students mainly carry out research activities, especially for writing graduate theses;

Problems in training organization. Lecturers from different unites of the VNU, meanwhile, cooperation among the graduate school within the programs is so weak. These influence badly on the application of interdisciplinary approach in training and research process, and quality of the training programs;

Students are originally from different sectors/disciplines. Therefore, they have different backgrounds to perceive knowledge of new interdisciplinary sciences;

There is not any official international cooperation in training and research of the graduate programs.

Recommendations

VNU should have appropriate priorities to develop interdisciplinary programs in training lecturers, supplying infrastructure/equipment, development of curricula, syllabi, active teaching-learning methods.

Programs should be more closely linked with the country's real development according to the following orientation: Think globally and act locally. The basic and most important problems would be: (i) sustainable development and ways of sustainable development – green growth (green energy, green way of life, natural capital...); (ii)

resilience to climate change, poverty reduction, and at the same time, there should be closer linkage with other related sciences like Earth Science, some social sciences. These contents should be updated and integrated into different programs and subjects in an appropriate way;

Strengthening both lecturers' and students' research activities. Research in universities should be two-fold: producing scientific and technological products as well as training products (Truong Quang Học, 2008);

Quickly setting strong research groups, centers of excellence (they are the machines to produce scientific and technological products and the places where highly qualified human resources especially those with Master's and PhD degrees are produced) (Truong Quang Học 2008, 2014; Nguyen Van Hieu, 2012; Phạm Thị Ly, 2014);

Allocating more time for practice and field works; and allocating more time for seminars, field projects especially groups';

Applying suitable teaching/ learning methods for each subject.

References

- [1] Douglass, J.A. (2009). "The Race for Human Capital" in J. A. Douglass, C.J King and I. Feller (ed.), *Globalization's Muse: Universities and Higher Education Systems in a Changing World* (Berkeley Public Policy Press 2009).
- [2] Douglass, J.A. (2012). "China Futurisms: Research Universities and Leaders or Followers?" *Social Research: An International Quarterly*, vol.79, no. 3, pp. 639-688.
- [3] Nguyễn Văn Hiệu, 2012. Kiến nghị về đề án xây dựng các trung tâm xuất sắc tại Đại học Quốc gia thành phố Hồ Chí Minh.
- [4] Trương Quang Học, 2004a. Mô hình đại học nghiên cứu ở một số nước trên thế giới. Kỷ yếu Hội nghị Nghiên cứu khoa học - công nghệ và đào tạo định hướng xây dựng đại học nghiên cứu tiên tiến. Hà Nội-01/2004:101-122.
- [5] Trương Quang Học, 2004b. Đẩy mạnh hoạt động nghiên cứu khoa học và sự tích hợp với hoạt động đào tạo góp phần nâng cao chất lượng đào tạo trong các trường đại học. Kỷ yếu Toạ đàm khoa

- học quốc tế: Chính sách Nghiên cứu và đào tạo trong quá trình chuyển đổi ở Việt nam: 68-76.
- [6] Trương Quang Học, 2005. Suy nghĩ về xây dựng Đại học Quốc gia Hà Nội theo mô hình một đại học nghiên cứu hiện đại. Toạ đàm khoa học quốc tế: Chính sách Nghiên cứu và đào tạo trong quá trình chuyển đổi ở Việt nam, Hà Nội, 8-9/12/2005: 206-222.
- [7] Trương Quang Học, 2008. Nhóm Nghiên cứu - Yếu tố quyết định chất lượng nghiên cứu khoa học và đào tạo sau đại học. Hoạt động Khoa học. Bộ KH & CN, Số 10.2008: 21-24.
- [8] Trương Quang Học, 2010. Biến đổi khí hậu toàn cầu: Cơ hội và Thách thức cho Nghiên cứu và Đào tạo. Trung tâm Nghiên cứu Tài nguyên và Môi trường: 25 năm xây dựng và phát triển. NXB Khoa học và Công nghệ. Hà Nội.
- [9] Trương Quang Học, 2014. Development of scientific working Group: International experiences and Vietnam practice. VNU Conference on Development of Strong Scientific Groups.
- [10] Phạm Thi Ly, 2014. Trung tâm xuất sắc, một mô hình cần thiết cho thực tiễn Việt Nam. Báo cáo tại Hội thảo "Hoạt động Nghiên cứu trong các trường Đại học". Hà Nội, ngày 25.04.2014.
- [11] Sumi, A; Mimura, N; Masui, T., 2011. Climate change and Global Sustainability: A Holistic Approach. UN University Press. Tokyo-New York-Paris.
- [12] WB, 2010. Development and Climate Change. World Development Report. The World Bank.
- [13] The future we want: RIO+20 outcome Documents, 2012. (www.uncsd2012.org/.../documents/)
- [14] THÔNG TIN QUỐC TẾ VỀ GDĐH số 1, 2, 3-2012; số 7, 8 – 2013.