

CENTER FOR PUBLIC HEALTH AND ECOSYSTEM RESEARCH (CENPHER)
AT THE HANOI SCHOOL OF PUBLIC HEALTH (HSPH)



CENPHER

TRUNG TÂM Y TẾ CÔNG CỘNG VÀ HỆ SINH THÁI
CENTER FOR PUBLIC HEALTH AND ECOSYSTEM RESEARCH



CENPHER Five Year Report 2009 - 2014

From a Research Project to a Research Center

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ABBREVIATIONS

ACIAR	Australian Centre for International Agricultural Research
CENPHER	Center for Public Health and Ecosystem Research
CGIAR	Consultative Group on International Agricultural Research
CRP A4NH	CGIAR Research Program on Agriculture for Nutrition and Health
DAH	Department of Animal Health
Eawag/Sandec	Department of Water and Sanitation in Developing Countries, Swiss Federal Institute of Aquatic Science and Technology
FBLI	Field Building Leadership Initiative: Advancing Ecohealth in South East Asia
FOOD-RISK	Strengthening the capacity of risk assessment application for managing food safety within a Food production-Environment-Health interaction context in Vietnam
GHLT	Global Health True Leader
HIA	Health Impact Assessment
HRIA	Health Risk and Impact Assessment
HSPH	Hanoi School of Public Health
IDRC	International Development Research Centre
ILRI	International Livestock Research Institute
MARD	Ministry of Agriculture and Rural Development
MOH	Ministry of Health
NCCR North-South	National Centre of Competence in Research North-South
PigRISK	Reducing disease risks and improving food safety in smallholder pig value chains in Vietnam
QMRA	Quantitative Microbial Risk Assessment
RRR	Resource, Recovery and Reuse
SDC	Swiss Development Cooperation
Swiss TPH	Swiss Tropical and Public Health Institute
USAID	US Agency for International Development
VOHUN	Vietnam One Health University Network
WHO	World Health Organization

A MESSAGE FROM THE FOUNDERS



Prof. Dr. Le Vu Anh



Dr. Pham Duc Phuc



Dr. Nguyen Viet Hung

Dear Readers,

It is our great pleasure to introduce this five-year report of the Center for Public Health and Ecosystem Research (CENPHER) of the Hanoi School of Public Health (HSPH). This report aims to summarize the activities conducted over the last 5 years by this research center, which has developed at a Vietnamese university.

We are the co-founders of the Center and have been involved from the start. It began with a single research partnership project between Swiss institutions and HSPH. With the support and commitment of HSPH, our partners, colleagues, mentors, supervisors, students, and donors, we have been able to institute diverse projects and generate research and training portfolios with a special focus on environmental health and food safety in Vietnam and in the Southeast Asian region. While the research group is still in its early stage, the following report documents our achievements thus far for our partners who have helped us pursue common goals.

We would like to take this opportunity to express our gratitude to HSPH leaders, colleagues, and students; to communities in Vietnam; and to regional and international partners for their support and collaboration. We particularly thank the Swiss Tropical and Public Health Institute (Swiss TPH), the International Livestock Research Institute (ILRI), and Eawag/Sandec for their support from the beginning and continued support as well as for accompanying CENPHER in its development. The Swiss Development Cooperation (SDC) and the International Development Research Centre (IDRC), the Australian Centre for International Agricultural Research (ACIAR), and the US Agency for International Development (USAID) and other donors are thanked for their great financial support. We are looking forward to future collaboration and support to further develop the research center.

We hope that you enjoy our report “from a research project to a research center”.

Le Vu Anh, Pham Duc Phuc & Nguyen Viet Hung

Co-founders of CENPHER

FOREWORD FROM THE DIRECTOR



Dear Colleagues,

It is my honor to introduce the five-year report of the Center for Public Health and Ecosystem Research (CENPHER) to you. This report captures the journey of CENPHER from 2009 to 2014 and discusses the wealth of achievements, as well as the challenges faced along the way.

Having been appointed as the director of the CENPHER in July 2014, I see lots of potential positive developments of the unit in the future. This model, with no doubt, will be one of the contributions to the success of the Hanoi School of Public Health in the future.

On this occasion, I would like to thank all CENPHER's members, the domestic and international organization and partners for making contribution to successful years of CENPHER. I want to emphasize that CENPHER, with what it has been achieved up to date, is built up by its great team including the co-founders, researchers, staff, volunteers, interns, and students. I believe that with the support from the HSPH and friends CENPHER will overcome any challenges facing it ahead.

We thank you for your interest and support.

Nguyen Luong Hien, MA.,

Director

Center for Public Health and Ecosystem Research (CENPHER)

Hanoi School of Public Health (HSPH)

CENPHER - FROM A RESEARCH PROJECT TO A RESEARCH CENTER



Health risk due to exposure to polluted waste water Hoang Tay commune, Kim Bang dist., Hanam province

Urgent need for more research at universities in Vietnam

Vietnamese universities are generally perceived to be teaching oriented-institutions. Research is not always prioritized and is often given limited resources. This leads to modest visibility in the international sphere, especially in regards to international publications, funding, and social impact compared to the research of national research institutes worldwide. Research centers at universities have been to strengthen research at the university level. Many research centers are established to implement specific projects that are usually supported by international funding. As a result, the sustainability of these centers beyond the lifespan of the funded research projects is questionable as they cannot function without funding. Moreover, postdocs have the potential to start new research groups, often bringing new fields of study to their institutions and the research centers. The intermixing of disciplines is an essential ingredient for integrated research. However, the concept of a research group nuclei comprised of postdocs appears to be rather new to Asian academic institutions, which largely operate with limited resources.

From a research project to a research group

Understanding the local context and having opportunities to develop international research partnerships, a group of researchers at the Hanoi School of Public Health (HSPH) got together to develop a research center at HSPH that would a new model, it would be donor-funded. We began in 2009 with a postdoc project working on environmental sanitation and health issues of the Swiss National Centers of Competence in Research North-South (NCCR North-South) program at HSPH. This project allowed the creation of a research group of “water, sanitation and health” within the Department of Environmental Health. The research group gradually established other projects and activities that have been both internationally and nationally funded. This was the basis for the upgrade of the research group to a research center in 2012.

And to the emergence of a research center

To assist individuals and groups of researchers, research for development requires developing institutional research capacities to ensure the sustainability of these efforts. Three years after forming a research group, HSPH founded the Centre for Public Health and Ecosystem Research (CENPHER) on June 1st, 2012, as a research Centre affiliated to HSPH. CENPHER's objective was to conduct and strengthen interdisciplinary research capacity at HSPH. The support of HSPH's leadership to embed CENPHER within the university shows their recognition of CENPHER's work and its relevance to the local context, as well as their understanding of the importance to develop institutional research capacity. The establishment of CENPHER at HSPH has brought HSPH the benefit of improved visibility nationally and internationally. This has been a win-win situation for both institutions. CENPHER functions as a donor-funded unit, and has the responsibility to raise its own financing. The partnership with HSPH has also allowed CENPHER to be recognized as a legal entity within the university.

Up to the present, a handful of research, training, service, and knowledge translation activities have been carried out by CENPHER. The next few sections provide a glimpse of what has been done over the last five years.



Prof. Marcel Tanner

Director of Swiss Tropical and Public Health (Swiss TPH).

The creation and the development of CENPHER reflects not only a result of North - South partnership in

research and public health action, but also how one can jointly tackle the great issues in national public health and global health. Effective health development is most effective when shared and compared across cultures and health and social and ecological systems. It is this process of mutual learning for change that will reveal the key determinants that will lead to new evidence and innovative solutions to improve health and well-being. SwissTPH is happy to be a partner of CENPHER and will continue to support its development.

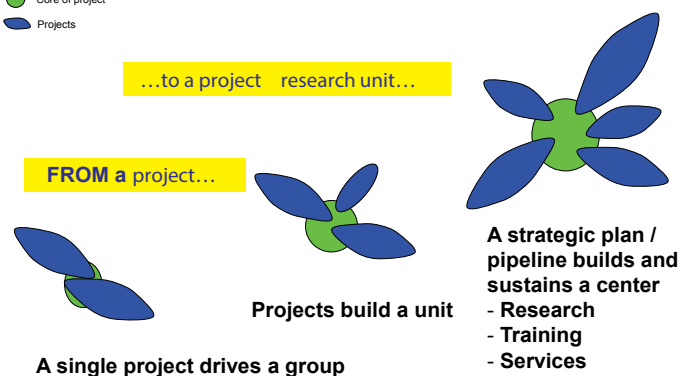
Capacity Building: Individuals and Institutions

● Core of project
● Projects

...TO a research center

...to a project research unit...

FROM a project...



The development of CENPHER from a research project to a research center. Adapted from Tanner (2012)

CENPHER Strategic Plan (2012-2020)

Our mission: To study the impact of environmental, ecological, cultural, socio-economic and demographic factors on health and well-being, using the integrative approaches of Ecohealth and One Health in Southeast Asia and similarly in Africa.

Our Goals are to become:

- A well-established nationally and regionally recognized center on environmental health that works with the Ecohealth/One Health approach
- A national reference center for health risk assessment
- A resource center for integrative research and training in environmental health
- A consultancy resource for policy makers and donors

Key activities:

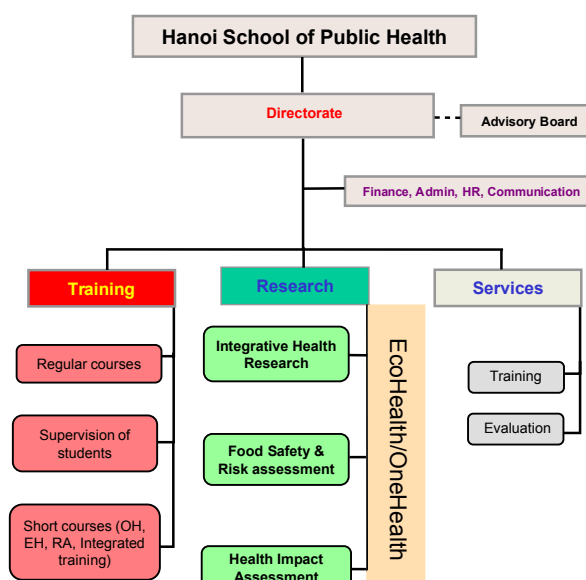
CENPHER conducts research and training, and provides services. The expected time allocation of the research is 80% and 20% for training and service provision.

Research Main themes:

1. Integrative health research: Ecohealth and One Health (InRe)
2. Food Safety (FS) and risk analysis
3. Health Risk and Health Impact Assessment (HRIA)

Training: We supervise BSc, MSc and PhD students at HSPH and at other universities in and outside Vietnam. We teach regular courses at HSPH and other universities in the region. We offer short courses on Ecohealth, One Health, Risk Assessment, Integrative Training, and Environmental Sanitation and Health.

Services: Our consultancy consists of research, training, and evaluation work related to the core competencies of CENPHER research.



Organizational structure of CENPHER

FUNDING 2009-2014

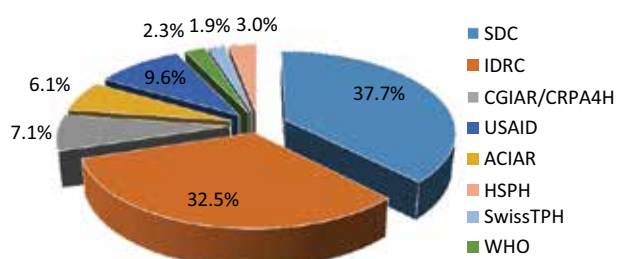
Since its founding, CENPHER has been supported by various donors. The funds have been managed by HSPH and several other partners.

Details of funding resource from Sep 2009 to Jul 2014

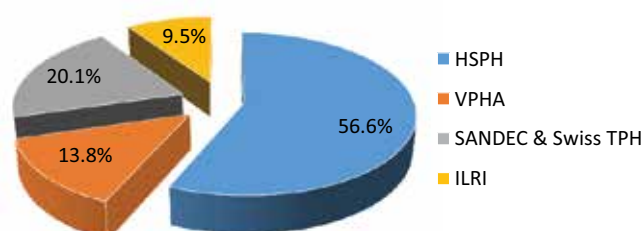
Project/Program	Project type	Expenses in USD	Donors	Managed by
IHR. EcoEID	Research	9,555	IDRC	HSPH
IHR. FBFI coordinating unit	Coordination and Management	111,059	IDRC	VPHA
IHR. FBFI Ecohealth	Research	227,242	IDRC	HSPH
IHR. Leptospirosis and Regional ecohealth course	Operational research	24,727	IDRC	ILRI
IHR. PAMS waste	Operational research	42,846	SDC	VPHA
IHR. RP8 - NCCR North-South	Research	144,062	SDC	Eawag/Sandec & Swiss TPH
IHR. Sanitation and Health - NCCR North-South	Research	117,690	SDC	HSPH
IHR. VOHUN-One Health	Coordination and Management	109,500	USAID	HSPH
FS. Book QMRA	Training	11,420	WHO	HSPH
FS. FOOD-RISK	Operational research	46,916	SDC	Eawag/Sandec & Swiss TPH
FS. PigRISK	Research	69,895	ACIAR	HSPH
FS. QMRA training	Training	14,431	WHO	HSPH
FS. Food Safety Risk Assessment taskforce	Operational research	81,052	CRP A4NH	ILRI
HRIA. Arsenic risk assessment	Research	6,000	SDC	Eawag/Sandec & Swiss TPH
HRIA. Dioxin risk assessment	Research	5,000	SDC	Eawag/Sandec & Swiss TPH
HRIA. PAMS QMRA	Research	54,372	SDC	HSPH
HRIA. RRR	Research	14,848	SDC	HSPH
Core: HSPH in-kind contribution (office and utilities)	Core funding contribution	34,230	HSPH	HSPH
Core: SwissTPH	Core funding contribution	21,511	SwissTPH	Swiss TPH
TOTAL		1,146,356		

IHR: Integrative Health Research (Ecohealth and One Health); **FS:** Food Safety and Risk Analysis; **HRIA:** Health Risk and Health Impact Assessment; **ACIAR:** Australian Centre for International Agricultural Research; **CGIAR:** Consultative Group on International Agricultural Research; **CRP A4NH:** CGIAR Research Program on Agriculture for Nutrition and Health; **Eawag/Sandec:** Department of Water and Sanitation in Developing Countries, Swiss Federal Institute of Aquatic Science and Technology; **FOOD-RISK:** Strengthening the capacity of risk assessment application for managing food safety within a Food production-Environment-Health interaction context in Vietnam; **HSPH:** Hanoi School of Public Health; **IDRC:** International Development Research Centre; **ILRI:** International Livestock Research Institute; **NCCR North-South:** National Centers of Competence in Research North-South; **PAMS:** Partnership Action for Mitigation of Syndromes (of NCCR North-South); **PigRISK:** Reducing disease risks and improving food safety in smallholder pig value chains in Vietnam; **QMRA:** Quantitative Microbial Risk Assessment; **RRR:** Resource, Recovery and Reuse; **SDC:** Swiss Development Cooperation; **Swiss TPH:** Swiss Tropical and Public Health Institute; **USAID:** US Agency for International Development

Funding sources (2009 - 2014)



Financial management (2009 - 2014)



ACHIEVEMENT HIGHLIGHTS

RESEARCH

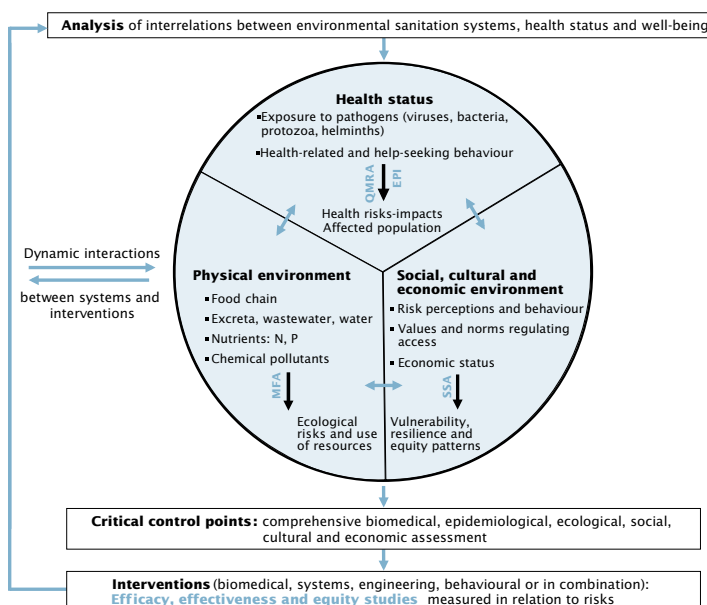
We focus on the link between health and agriculture, infectious and zoonotic diseases, chemical pollution, food safety and nutrition. Research is conducted at different levels (molecular, individual, and population) and from labs to the field. Our ultimate goal is to promote the understanding that health issues are related to ecosystems and to use research outputs to inform policy to change and improve the health of the most vulnerable populations. The main research themes:

Integrative health research (IHR): Ecohealth and One Health

We aim to understand how human health is determined by the inter-linkages between human, animal and environmental health in a socio-ecological context, using the Ecosystem approach to health (Ecohealth). The context we consider covers environmental pollution, agricultural intensification, urbanization, and environmental sanitation. The primary health issues we focus on are neglected tropical diseases, zoonoses, and chronic diseases.

Water, sanitation and health

Our past research has focused on water, sanitation and health issues in developing countries. We have developed a conceptual framework for integrated health and environmental assessments, combining health status with physical, socioeconomic, and cultural environments to improve health and minimize the environmental impact of environmental sanitation (Figure below). The assessments provide the basis for the understanding of the key issues important for the improvement of health and the environment in a given area or setting. We applied this framework as a case study in Hanam Province to assess the health and environmental impact of human and animal excreta and of waste water reuse in agriculture. Three components of the framework were implemented, namely environmental, health, and socioeconomic assessments, leading to the identification of critical control points.



Conceptual framework of the combination of Health and Environmental risk assessment for Health and Environmental Sanitation Planning (Nguyen-Viet et al. 2009)

Green characters refer to methodologies

used within the conceptual framework: EPI:

Epidemiology, QMRA: Quantitative Microbial Risk

Assessment, MFA: Material Flow Analysis, SSA:

Social Science Analysis.



Study of the NCCR program in Hoang Tay commune show that local people view black water and bad smell of waster water as threats to their health.



Dr. Le Van Tuan

Head of the health station of the Hoang Tay commune, Kim Bang district, Hanam province.

Hoang Tay commune is a poor province with lots of issues related to health and environment.

In 2009, the researchers from CENPHER carried out research activities on the use of human excreta in the area with new models of excreta treatment, which benefitted the local households' health and economy. In 2012 they continued the research on human and animal waste management with a new approach. We (the locals) have opportunities to be involved in the research and address our concerns; especially through the stakeholder. I think this model of collaboration between universities and communities should be widely promoted in the future.

The results revealed that the agricultural system was a significant source of nutrients (N and P) due to the overuse of chemical fertilizers, which affect the surrounding environment. 48% of the farmers were infected with at least one of the three helminth species in the rainy season and 46% in the dry season. Other protozoal intestinal infections were also diagnosed. The estimated annual risks of diarrhoea values were at least 3-fold greater than the upper threshold risk of 10^3 per person per year; and the annual burden of diarrhoeal disease was significantly higher than the health target of 10^6 disability-adjusted life years (DALYs) (≤ 1 DALY/million persons) recommended by the World Health Organization (WHO). The social assessment showed that people recognized the black colour and smell of wastewater, the smell of excreta, inappropriate practices of excreta management, and the suspected diseases associated with contact with excreta and wastewater as threats and that 63% of the households studied were willing to pay for the construction of flush toilets (US\$ 800). No statistically significant difference in the willingness-to-pay by socioeconomic status was observed. Further studies were conducted on the factors influencing the die-off of human fecal pathogens, the nutrient values of excreta, and on assessing the pathways, frequency, and intensity of human exposure to excreta due to handling it throughout the process of storage or composting, and use in agriculture.

In light of this assessment, we conducted a field intervention that examined how the combination of human and animal excreta composting influences helminth egg die-off in excreta, while maintaining its nutrient value. The intervention aimed to improve the current storage practices of human excreta and to identify the best option for the safe use of excreta in agriculture. Results showed that the variation of the helminth concentrations of the different sampling dates was influenced by the composting options and the composting time. The average number of helminth eggs was less than 1 egg per gram in all of the composting options after 84 days. This parasite egg reduction meets the WHO standard (≤ 1 egg/L or 1g total solid) for the safe use of wastewater, excreta, and greywater in agriculture and aquaculture. This implies a significant reduction in the estimated annual risk of infections. Therefore, the combined human and animal waste management strategy shows the benefit of financial savings and helps to reduce environmental and health risks. The model is currently being promoted in Hanam province. This research was conducted with NCCR North-South and funded by SDC.



Small-scale pig production is the majority activity in Hoang Tay, Le Ho and Chuyen Ngoai communes, in Hanam province

Agriculture intensification and health

Tackling the issue of health and agricultural intensification via Ecohealth approach, the research “Using the Ecohealth Approach for Better Human and Animal Waste Management in Hanam Province, Vietnam” aims to i) study the impacts of human and animal waste management on health, the environment, and on socio-economics; ii) develop and implement practical and innovative solutions for better livestock and human waste management to improve the health and well-being of people and the environment; and iii) disseminate research outputs to related ministries, local and national institutions, NGOs, communities, and wider audiences through publications and presentations. The research is conducted within the framework of the regional Ecohealth Field Building Leadership Initiative (FBLI) funded by the International Development Research Center (IDRC), Canada to advance Ecohealth in Southeast Asia (SEA) (2012-2017). The field work of FBLI was conducted in Hoang Tay and Duy Tien Districts, Hanam Province.

We have involved many stakeholders (preventive medicine staff at all levels, veterinary experts, livestock and agriculture experts, and farmers) in identifying the health and environmental issues of Hanam. The issues identified are: i) household waste management (organic and inorganic waste), ii) hormone and antibiotic residues from human and livestock, iii) misuse of plant protection chemicals and pesticides, iv) management of animal waste and solid waste, v) water quality (arsenic contamination), iv) livestock diseases and weak veterinary services, v) knowledge and behavior of the population in regard to various environmental and health issues. The survey showed that the process of agricultural intensification of farming households has changed for the period analyzed from 2008-2013. Pig production is still a major activity at the sites studied, accounting for 47% of the households. Most of the pig production remains small or medium scale with the pig populations varying from 36 to 56 pigs per farm. Animal feed is normally bought from industrial feed markets. The most important problems faced by the farmers are risks from the market and from production (diseases, water contamination), and financial and personal risks (the health of producers). Pig production was ranked as having the second largest impact on farmer’s health after rice cultivation.



Dr. Arlyne A. Beeche

Senior Program Officer,
Ecosystems and Human Health,
Agriculture and Environment
Program Area
International Development
Research Centre (IDRC), India

CENPHER successfully hosts the Coordinating Unit of the International Development Research Centre’s (IDRC) Field Building Leadership Initiative that involves formal partnerships with four countries: China PDR, Vietnam, Thailand and Indonesia. Its young and dynamic professional staff consistently present innovative ideas, strong leadership skills, and ability to coordinate regional actors. These working principles prove CENPHER’s ability to continue growing as a Centre of excellence in applying integrated approaches to research, in particular the Ecosystem Approach to Human Health (Ecohealth), to promote sustainable solutions for improving human health. IDRC is pleased to have the opportunity to work with CENPHER and highlights its positive regional outreach and networking potential for research and knowledge transfer across Asia and globally.



Understanding of transmission route of leptospirosis in the outbreak areas is one of the outcomes of the research in Thanh Hoa province

Disease transmission at the environment - human and animal interface

Leptospirosis is a zoonosis found worldwide; it causes major problems for human and animal health due to the complexity of its transmission pathway and the difficulties to diagnose it. This research aimed to estimate the seroprevalence of human leptospirosis and the risk factors associated with agricultural occupation in Thanh Hoa Province, Viet Nam in 2013. The research used the *Leptospira* immunoglobulin G enzyme-linked immunosorbent assay (IgG ELISA) method to diagnose Leptospirosis. An epidemiological survey was conducted in eight clusters, representing 300 randomly selected people 18-60 years of age. The findings demonstrate the high level of circulation of leptospire (49% positive with *Leptospira*) and the potential importance of leptospiral infections among the rural population in the area. They also identify groups of people and professions at high risk that should be prioritized for risk mitigation measures based on an integrated approach, such as One Health.



Vaccination for dogs and cats is one of the effective ways to tackle rabbies (Photo taken by Thai Nguyen University)

Rabies is an important zoonosis in Vietnam, killing approximately 50 -100 people per year. Thus, rabies has become a re-emerging public health issue in Vietnam, particularly in high prevalence areas like the Thai Nguyen province. Currently, there is no standardized curriculum for training medical or veterinary students on rabies prevention and control. Therefore, we brought research and teaching professionals from the MOH, the MARD and Institutes and Universities to Thai Nguyen province to discuss developing a rabies curriculum for medical and veterinary students, as well as creating a health education program for local human and animal health professionals. The purpose of the study was to understand the rabies situation in Thai Nguyen and Tuyen Quang provinces and propose an integrated rabies curriculum for medical and veterinary students at Thai Nguyen universities. Further, the study aimed to develop a case study on Rabies for use in One Health educational activities.



Dr. Delia Grace

Program Leader Food Safety and Zoonoses
Flagship Leader Agriculture Associated diseases A4NH
International Livestock Research Institute (ILRI), Nairobi, Kenya.

From our perspective of international agriculture research for development, it is very exciting to see the emergence and evolution of national centres that can work at the interface of human health and agriculture. CENPHER has been a key partner for ILRI and the CGIAR Research Program on Agriculture for Nutrition and Health in Vietnam. The explicitly integrative approach to human health and the strong grounding in ecohealth, one health and risk assessment make CENPHER an ideal health partner for us.



Ms. Nguyen Thi Thanh An, MSc

Assistant Country Manager, ACIAR Vietnam at Australian Embassy, Hanoi.

CENPHER is the first and the only one institution in the Health sector in Vietnam that the ACIAR has been collaborating with to tackle the health issues related to agriculture. The work conducted by CENPHER in collaboration with partners on food safety in smallholder pig value chains in Vietnam is an innovative research that helps improve participation and benefits of different stakeholders in smallholder pig value chains and pro-poor management of the risks to human and animal health. I am happy to see the development of this new research center and ACIAR is glad to support CENPHER and was pleased to have Dr Nguyen Viet Hung - co-founder of CENPHER - as our ACIAR John Dillon Fellowship awardee for a leadership training in 2014.

Food Safety and Risk Analysis

Our main food safety issues relate to microbial contamination and toxins, pesticide use, antibiotic resistance, and growth promoters. The risk-based approach to food safety management is still not-well known and is rarely applied in the developing world. We generated evidence of how risk assessments can be used for specific cases of food safety management and how they are important to assist policy makers in the use of this approach for food safety management.

Risk assessments for food safety: pork value chain

In a 2013 study of Salmonella contamination in four pig slaughterhouses in Hung Yen, samples were taken from pig carcasses, workers' hands, cutting boards, and belly skin material. The prevalence of Salmonella on pig carcasses was found to be 35% and the most common contamination point was workers' hands. This very high Salmonella prevalence likely presents real risks to human health. The study suggests that interventions emphasising good hygienic practices, especially hand washing, would reduce contamination risks.

In Hanoi we examined how people's household cooking and eating habits exposed them to Salmonella. Evidence of Salmonella contamination was found in 25% of the pork samples at markets where people shopped, and people's food preparation methods risked spreading the bacteria to other foods in their households. Given the difficulty of changing the food-handling practices of millions of people, the best interventions are likely those that control Salmonella in the value chain before it reaches consumers.

The five year (2012-2017) project "Reducing human disease risks and improving food safety in smallholder pig value chains in Vietnam" (PigRisk), funded by the Australian Centre for International Agricultural Research (ACIAR) through the International Livestock Research Institute (ILRI), and implemented by CENPHER and its partners, aims at assessing the impact of pork-borne diseases on human health and the livestock sector to identify critical points/opportunities for risk management, and develop and test incentive-based innovations to improve the management of human and animal health risks in smallholder pig value chains.



Fecal sampling in a slaughterhouse in Hung Yen province

Some of the early risk and economic assessment achievements of PigRisk were a series of literature reviews on foodborne hazards, pig zoonoses and pig diseases that showed biological hazards as the most serious cause of human diseases (salmonellosis, coliosis, staphylococcosis). Antibiotic residues and heavy metals are common in pork. *Streptococcus suis* is an important emerging disease, representing 40% of acute adult bacterial meningitis in cities. Several potentially important hazards have never been assessed. Most of the pig health burden is due to a small number of diseases (especially FMD and PPRS). An in-depth study of the pork value chain actors was conducted in Hung Yen and Nghe An Provinces (n=1,025). The results are being analysed, but pigs continue to be important source of income and diet, although disease, feed costs and the lack of value addition remain serious constraints.

The results of the first round of biological sampling showed that: 36% of the farm samples, 38% of the slaughter house samples and 40% of the pork sold were positive for *Salmonella*. A slaughterhouse study identified risk factors for *S. suis* exposure and measures needed to reduce these (especially bed/suspended carcass dressing, en bloc removal of viscera, protective clothing for workers, and biosecurity).



Group discussion at the first meeting of the Taskforce for Risk Assessment in Food Safety in Hanoi, September 2013

Building capacity for Risk assessment in Vietnam through Research

In Vietnam, the national Law of Food Safety (in effect since July 2011) mandates the application of risk assessments to high-risk food products intended both for domestic consumption and for export. In May 2013, the government of Vietnam announced its support for the development of a rapid food safety detection system. The MARD issued a circular on how to use risk assessments in food safety management. However, there is a lack of local capacity concerning the practical application of risk assessments. The situation is especially urgent in Vietnam's informal markets, where most domestically produced food is bought and sold; risk assessments are rarely applied in these settings. One important way by which risk assessment capacity

is being strengthened in Vietnam is through a Risk Assessment Task Force. It brings together representatives from the MOH and MARD of Vietnam and researchers involved in risk assessments and food safety from key universities and research institutes (20 experts). The Task Force is developing guidelines for the use of risk assessments on behalf of food safety management in informal markets that cater to local consumers. These guidelines will be used to train a wide range of decision-makers, including high-level policymakers. A technical course and case studies of food safety in informal markets are being used to increase risk assessment capacity among implementers. This is followed up by mentoring and on-the-job support. The support of international and regional research institutes is already in place for such activities, in particular, for conducting specific cases studies to apply risk assessment for food safety management. The latter are to: i) assess the health risks of vegetables and fish grown/caught in wastewater; ii) assess the health risks related to chemical hazards (antibiotic residues) in pork; and iii) interact with stakeholders, disseminate research results, and advocate for the use of risk assessments as a tool in food safety management.



Using participatory risk assessment to estimate health risks caused by fresh food from informal markets



Fish sampling at a dioxin hotspot at Da Nang airport for risk assessment related to dioxin exposure

Health Risk and Health Impact Assessments (HRIAs)

The risk-based approach to environmental health management is still not well known in. We conducted research to generate evidence of how risk assessments can be used for specific cases of environmental related issues such as dioxin contamination in the environment and Arsenic contaminated drinking water. In addition, there is a clear need for Health Impact Assessments (HIA) in South East Asia where many large infrastructure development projects, i.e., dam construction, mining industries, and agricultural production are taking place and where HIA capacity is lacking. Therefore, through research and training with partners we will build capacity and expertise in HIA in the region.

Risk assessment of chemical contaminants in the environment: Dioxin hot spots and Arsenic in drinking water

We applied the Australian Environmental Health Risk Assessment Framework to assess the risk of dioxin exposure through the foods of local residents living in dioxin hot spots, i.e., the seven wards surrounding the airbases in Bien Hoa and Da Nang cities. These wards served as bulk storage and supply facilities of Agent Orange and other herbicides during the Vietnam War and are currently considered as dioxin hot spots in Vietnam. Various stakeholders were involved in the risk assessment process and the related publications on dioxin characteristics, its toxicity, and its levels in local soil, mud, food, milk, and blood samples. A food frequency and knowledge-attitude-practice survey of 1000 randomly selected local households, together with food sampling and analysis for dioxin/furan concentrations, were undertaken to provide data for exposure assessment. Results showed that local residents who consumed local high risk foods, especially freshwater fish, snails, crabs, free range chicken meat and eggs, duck meat and eggs, beef and buffalo meat, pumpkin, and lotus caught/raised/harvested inside or in the surroundings of the airbases were at very high risk. Their dioxin daily intake levels exceeded the recommended tolerable daily intake level recommended by WHO (1-4 pg/kg/day). Following this risk assessment, a multi-approach risk reduction program was developed and implemented by the Vietnam Public Health Association and its provincial branches in Bien Hoa and Da Nang during 2007-2009 and 2009-2011 to reduce the risks of dioxin exposure to local residents. Risk communication activities should be integrated into local routine health promotion programs in order to continue reducing the risks to the local residents from dioxin in the upcoming years.



Prof. Dr. Phung Dac Cam

Vice Rector of Thanh Do University and Dean of School of Medicine.

Despite its being young unit, the CENPHER has proved that this kind of research center

with universities should be the one for future. With its excellent and dedicated team, especially those working in field of Ecohealth, One Health, risk assessment, food safety and health impact assessment, the CENPHER has been taking the role of the national and regional research center.

The issue of health impact due to arsenic (As) contamination of drinking water is a great public health challenge. According to UNICEF, there are approximately 10-15 million people in Vietnam at risk of arsenic poisoning due to consuming tube-well water. We applied an environmental health risk assessment approach to analyze the arsenic contamination in tube-well water and to assess the health risks of people in the Chuyen Ngoai Commune, Duy Tien District, Hanam Province. A total of 150 households were included in the study; water and hair samples were taken and drinking water consumption characteristics were surveyed. Cancer risks were calculated, using the Cancer Slope Factor (CFS) for arsenic and the estimated daily dose. Results showed that arsenic concentration in tube-well water ranged from 8-579 ppb (mean 301 ppb) before filtration and that the sand filters currently used by the households did not meet the standard for As removal. The arsenic daily consumption of 40% of the adults exceeded the TDI level (Tolerable Daily Intake) of 1 ug/kg/day. The average skin cancer risk in adults due to consuming filtered tube-well water for drinking purposes was 25.3×10^{-5} (using only well water) and 7.6×10^{-5} (using both well and rain water). The skin cancer risk would be 11.5 times higher if the water was not filtered. Improving filtration measures or replacing the current drinking water sources is urgently needed to minimize the health risks to the local population.

Health Impact Assessment

CENPHERs first experience in HIA was its participation in a collaborative project entitled: “Resource Recovery Reuse (RRR)” with Swiss TPH. Swiss TPH and CENPHER jointly conducted health risk and impact assessments (HRIAs) along the waste management and wastewater chains in Hanoi. The research consists of four parts: 1) a cross-sectional study with 1000 participants to assess the existing exposure risks due to wastewater in different exposure groups with a specific focus on parasitic infections, skin diseases, eye diseases, and diarrhoeal episodes. The survey comprises of two components: (i) a questionnaire study; and (ii) the collection of stool samples to determine the prevalence and the intensity of helminth and of intestinal protozoa infections; 2) a pathogen flow analysis to observe the variance of pathogen contamination at critical control points over two months. Over a two month period, we will analyze wastewater for microbial contamination from bacteria (total faecal coliform, E. Coli, Salmonella spp., including antibiotic resistance testing of the 10 most commonly used antibiotics in Vietnam), helminth eggs and physiochemical factors (pH, rainfall); 3) quantitative microbial risk (QMRA) assessment interlinked to pathogen flow analysis to estimate diarrhoeal and parasitic infection risks of exposure groups and validate the results with the findings obtained under objective 1.



Collecting stool samples in Thanh Tri district, Hanoi for RRR project

TRAINING ACTIVITIES

The training activities focus on providing regular courses at academic institutions, short courses and certificate trainings, as well as seminars for students. Regular courses for undergraduates and postgraduates are conducted at HSPH and at other universities both at national and international levels. Short courses and certificate trainings are part of the research program's activities and cover almost all of CENPHER's research themes. CENPHER Seminar Series for Students (C3S) is an extracurricular program that is an initiative of CENPHER and co-organized by CENPHER and the HSPH Youth Union. The Table below summarizes the training activities at CENPHER in the five year period from 2009 to 2014:

Training course types	Name of the course	Time & Place	Partner/funder
Regular courses conducted at academic institutions	Introduction to Ecohealth for Specialist I, master, and bachelor programs	Currently run, Hanoi	Department of Environmental and Occupational Health, HSPH
	Introduction to Risk Assessment concept in Food Safety	Currently run, Hanoi	Department of Food Safety, HSPH
	Risk Assessment basic concepts and examples in health impact assessments related to environmental health and sanitation.		Asian Institute of Technology (AIT)
	One Health integrated module		Hanoi Medical University (HMU)
Short courses and Certificate trainings	Quantitative Microbial Risk Assessment (QMRA)	August 2010 and January 2011, Hanoi	
	One Health Risk Assessment Short course	3rd June to 7th June 2013, Hanoi	University of Minnesota, USA and funded by the RESPOND/EPT program of USAID
	Advanced course of Food Safety Risk Assessment for Informal Value Chains	Hanoi from 26 th August to 28 th August 2013	Rakuno Gakuen University of Japan, funded by CGIAR/ILRI
	Risk Assessment course for food safety	December 5 and 7, 2013 respectively, Hanoi and Ho Chi Minh city	DAH/MARD
	The first Ecohealth-One Health short-course in Vietnam	27 May to 30 May 2013	ILRI/EcoZD project, funded by the IDRC
	The Global Health True Leader (GHTL) Training	Ninh Binh, Vietnam from 25th April to 29th April 2014	University of Indonesia/ funded by the IDRC
	Short-course on "Environmental Health"	Republic Democratic of Congo from 17 September to 21 September 2012.	University of Kinshasa/ funded by USAID
Soft Skill Seminar	C3S	Currently run	HSPH



Dr. Nguyen Cong Khuong

Hanam Medical Provincial Department of Health, former NCCR MSc student from 2008-2010.

As a previous MSc student working in the NCCR research group (now known as CENPHER) at the HSPH from 2008-2010, I was among the first group of students to apply the new research approach of QMRA. Through the guidance of senior supervisors I successfully defended my master thesis in 2010. What I have learned from my time with NCCR has become an asset for my professional career. I strongly believe in the positive development of the CENPHER in the future.

First session of C3S in February 2014



One Health course conducted in Kinshasa School of Public Health, Kinshasa, Congo DRC on request of the Tufts University and the RESPOND program, September 2012



NETWORK COORDINATION AND MANAGEMENT

The Center has been actively involved in coordinating different regional and national networks. The Coordinating Unit of the FBLI Program and the Vietnam One Health University Network (VOHUN) are currently operated by CENPHER.



The Coordinating Unit of the FBLI Program, managed by CENPHER's team, serves as the administrative hub for the whole regional FBLI Program. The Unit has been actively involved in keeping track of the Program's activities and in informing its partners and donors on any and all developments. Thus far, the Unit has done two main groups of activities: communication and networking. The website of the regional program (<http://ecohealthasia.net/>) was launched to better promote the image of FBLI, as well as the concept of the Ecohealth to the world. In December 2013, the Unit facilitated and coordinated the signing of the Consortium Agreement among eight institutions of the Program to affirm their commitment to foster collaboration.



The VOHUN was established with the aim at promoting the One Health (OH) approach in Vietnam through training, research at universities and partnerships with stakeholders. Its objective is to train a new generation of graduates in the broad understanding and practice of One Health. The Coordination Office, run by CENPHER, provides logistical support for the network, and trainings on such issues as: One Health concepts, rabies, infectious diseases, zoonoses, etc.

Participants at the MOU signing ceremony of the Consortium Agreement among 8 partner institutions of the regional FBLI program in Jakarta, Indonesia in December 2013





Prof. Dr Hans Hurni

Director NCCR North-South (2001-2013), University of Bern, Switzerland.

The Swiss National Centre of Competence in Research (NCCR) North-South is very proud that

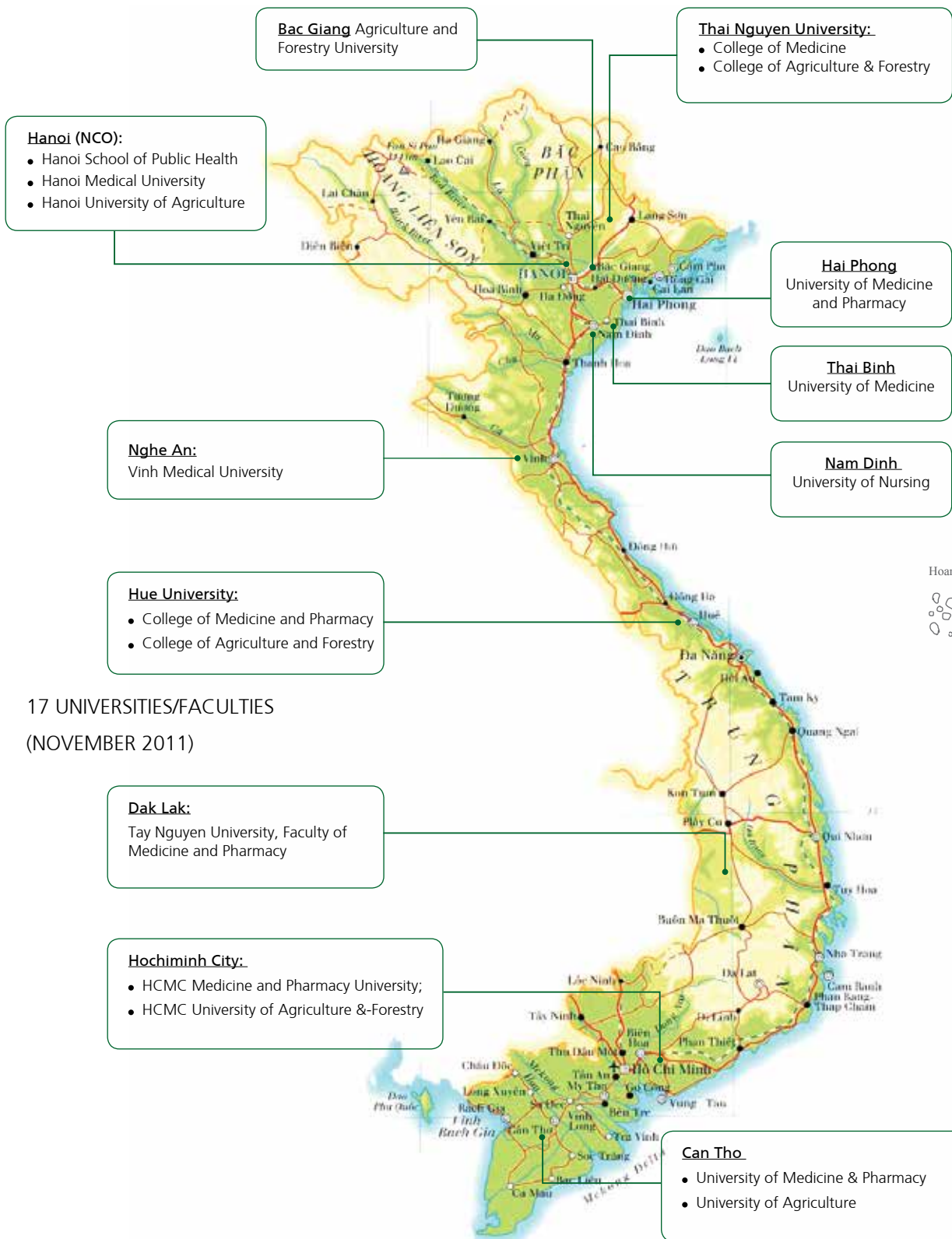
its research project on environmental sanitation and health under the leadership of Dr Hung Nguyen was one of few among its numerous post-doctoral projects which were able to grow into a self-sustaining institution: CENPHER. To create such spin-offs for research on sustainable development was one of the goals of the programme, which in its 12-year duration involved over 1200 persons in 40 countries world-wide.

PARTNERSHIPS

The Center has been a bridge connecting new international donors and HSPH. Through its research activities, CENPHER has played an instrumental role in establishing HSPH partnerships with other international organizations and institutions. The long term relationship of CENPHER with Swiss TPH led to a signing of a MOU by Swiss TPH and HSPH. In addition, the development of the Center was also noticed by the Swiss Embassy in Vietnam and the State Secretariat of Education, Research, and Innovation (SERI) of Switzerland. The two visits of the Swiss Ambassador to Vietnam and the Head of SERI to HSPH in 2013 and June 2014 opened more opportunities for collaboration in research and student exchanges. In fact, some lecturers at the HSPH Epidemiology Department have been trained at Swiss TPH thanks to the connection of CENPHER with its Swiss counterpart. CENPHER also played a key role in the signing of different MOUs between HSPH and international and regional institutions, such as the Rakuno Gakuen University in Japan, the Mahidol University and Health System Research Institute in Thailand, Kunming Medical University and Kunming Institute of Botany in China, Universitas Indonesia in Indonesia, and the Veterinary Without Border organization in Canada. In addition, the visits of high-ranking officials from the IDRC, Canada - one of the donors of several research projects at HSPH, indicates the work of CENPHER to connect international donors with HSPH.

A/Prof. Bui Thi Thu Ha (Dean of HSPH) and Prof Marcel Tanner (Director of Swiss TPH) signing an MoU with witness of Dr. Mauro Dell'Ambrogio (State Secretary for Education, Research and Innovation of Switzerland), Mr. Andrej Motyl (Ambassador of Switzerland to Vietnam), Prof. Nguyen Cong Khan (Director General of the Administration of Science, Technology, and Training - Ministry of Health), Prof. Le Vu Anh (Former Dean of HSPH and President of VPHA), A/Prof. Nguyen Thanh Huong and Tran Huu Bich (Vice-Dean of HSPH), Hanoi, June 12th 2014





17 UNIVERSITIES/FACULTIES
(NOVEMBER 2011)

**VIETNAM ONE HEALTH
UNIVERSITY NETWORK
(VOHUN)**

NATIONAL PARTNERS



Vietnam Public Health Association
(VPHA)



National Institute of Nutrition
(NIN)



Hanoi Medical University
(HMU)



Vietnam National University of Agriculture
(VNUA)



National Institute
of Hygiene and Epidemiology (NIHE)



National Institute Veterinary Research
(NIVR)



Ministry of Agriculture and Rural Development
(MARD)



Ministry of Health
(MOH)



Vietnam One Health University Network
(VOHUN)

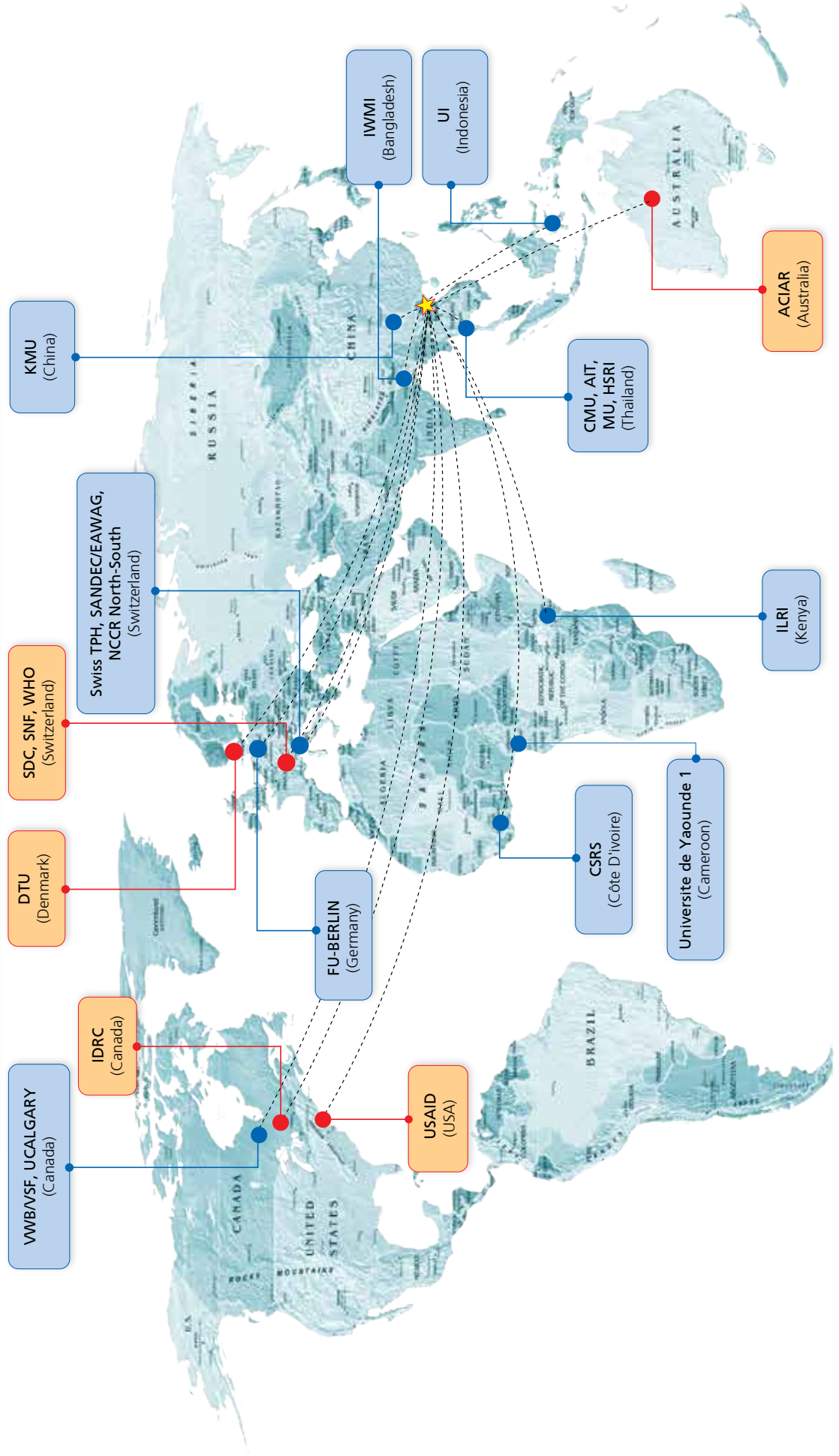


Vietnam Food Administration
(MOH)



Department of Animal Health
(MARD)

MAIN INTERNATIONAL PARTNERS AND DONORS



Partner Donor

KEY INTERNATIONAL PARTNERS



KEY DONORS



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sc | nat

Science and Policy
Platform of the Swiss Academy of Sciences
KFPE – Commission for Research Partnerships
with Developing Countries

Swiss TPH



USAID
FROM THE AMERICAN PEOPLE



Series of policy briefs rooted from research evidences for informed policy

KNOWLEDGE TRANSLATION

One of CENPHER's principles is to translate research outputs (evidence) into practice and into publications that would inform policy. Therefore, the Centre actively builds bridges for knowledge exchange between researchers, practitioners, and policy makers in many shapes and forms.

The research team has worked to convey their first results to policy makers through a number of policy briefs and outcome highlights on issues that need to be tackled in the short-term. Issues derived from the risks and benefits of using double-vault composting latrines to risk assessments of food safety in Vietnam have been produced, targeting at officials of the MOH and MARD.

The Task Force program aims at developing guidelines for the use of risk assessments on behalf of food safety management in informal markets that cater to local consumers. These guidelines will be used to train a wide range of decision-makers, including high-level policymakers. At the request of Department of Animal Health/MARD, the CENPHER team ran two workshops on Risk Assessment for Food Safety for more than 120 veterinary staff in Hanoi and Ho Chi Minh City in 2013. This is the model that CENPHER uses to inform policy based on our areas of expertise, i.e., environmental sanitation and waste reuse.

Lastly, apart from influencing policy makers, we have worked with farmers to implement a field intervention that will examine how the combination of human and animal excreta composting influences helminth egg die-off in excreta, while maintaining its nutrient value. This intervention aims to improve the current storage practices of human excreta and to identify the best options for the safe use of excreta in agriculture.



Prof. Nguyen Cong Khan

Director General of the Administration of Science, Technology, and Training - Ministry of Health (MOH), Vietnam.

It is great to see this new model of a research center at universities. We from MOH, through Vietnam Food Administration and Vietnam Health Environmental Agency, have collaborated closely with CENPHER on risk analysis for food safety, One Health, and water, sanitation and health. Translational research conducted at CENPHER is a great action for public health improvement.



Mr. Vu Van Minh

Deputy Director General of the International Cooperation Department, Ministry of Agriculture and Rural Development (MARD), Vietnam.

CENPHER is an outstanding research model that needs to be multiplied in Vietnam. During 5 years of operation, CENPHER has provided a significant contribution to a wide range of areas including food safety, water, sanitation, etc., and especially One Health. We from the Partnership Secretariat for Avian and Human Influenza always consider CENPHER as one of our strategic partners to support the Vietnamese Government to promote One Health approach in Vietnam.

FURTHER ACTIVITIES

International and regional levels

- International Livestock Research Institute: Nguyen Viet Hung, Senior Researcher
- Swiss Tropical and Public Health: Nguyen Viet Hung, Scientific Collaborator
- South East Asia One Health University Network (SEAOHUN): Le Vu Anh, Board of Directors; Pham Duc Phuc and Nguyen Viet Hung, Members of Strategic Planning Committee
- Regional Core Group of the Field Building Leadership Initiative (FBLI) program: Nguyen Viet Hung, Regional Program Coordinator
- Ecohealth 2014 Conference in Montreal, Canada: Nguyen Viet Hung, members of program committee; Tran Thi Tuyet Hanh, panelist
- The 4th Asia Pacific Conference on Public Health in Nha Trang, Vietnam: Le Vu Anh, Chairman; Nguyen Viet Hung, members of the program committee
- Global Livestock Dialogue: Nguyen Viet Hung (member of Waste to Worth group)
- UNESCO-Global Waterborne Pathogens (UNESCO-GWPP): Nguyen Viet Hung
- Journal reviewers: Nguyen Viet Hung (Acta Protozoologica, Ecotoxicology and Environmental Safety, Microbial Ecology, Environmental Monitoring and Assessment, Toxicology (USA), Bulletin of World Health Organization, Risk Analysis, Bill & Melinda Gates Foundation, Infectious Diseases and Poverty), Tran Thi Tuyet Hanh (Journal of Health, Population and Nutrition, Bangladesh, The International Health Journal, Transactions of the Royal Society of Tropical Medicine and Hygiene)
- International Association of Ecology and Health (IAEH): Nguyen Viet Hung
- Society for Risk Analysis (SRA): Nguyen Viet Hung, member
- Society of Environmental Toxicology And Chemistry (SETAC): Nguyen Viet Hung, member

National level

- Vietnam One Health University Network (VOHUN): Pham Duc Phuc, National Coordinator & Luu Quoc Toan, officer
- Vietnam Public Health Association: Le Vu Anh, President ; Nguyen Viet Hung, Pham Duc Phuc and Tran Thi Tuyet Hanh, members
- Water Supply, Sanitation and Hygiene (WASH) Working group, NGO Vietnam Union of Friendship Organization (VUFO): Pham Duc Phuc & Nguyen Viet Hung, member
- National Rural Water and Sanitation Task Force: Pham Duc Phuc, member

AWARDS

- John Dillon Memorial Fellowships, Australian Centre for International Agricultural Research (ACIAR): Nguyen Viet Hung, February 2014
- Travel grant Ecohealth conference in Montreal, Canada 2014: Dang Xuan Sinh, August 2014
- Emerging Scholars and Young Practitioners Panel Ecohealth 2014 in Montreal : Tran Thi Tuyet Hanh, August 2014
- The 17th Youth Science and Technology Conference, HSPH: Nguyen Mai Huong, Nguyen Thi Nhu, Phi Thi Thuy Ngan, fourth place, 2014
- Special Recognition for Contribution in Promoting the Visibility of the HSPH in Academic Year of 2013-2014 : Nguyen Viet Hung, 2014
- Ministry of Health: Luu Quoc Toan, Outstanding Prize for Young Scholar, Hanoi, 2013; Nguyen Viet Hung, Outstanding Prize for Promotor, Hanoi, 2012



Australian Minister of Foreign Affairs Julie Bishop received Dr. Nguyen Viet Hung - awardee of John Dillion Fellowship, Canberra, March 2014



Mr. Luu Quoc Toan received award for young scientists from the Ministry of Health, May 2012



Morning glory sampling in Nhue River, Hanam Province

CENPHER TEAM 2009-2014



The CENPHER team as of 2014

From left to right, front row first: Phi Thi Thuy Ngan, Nguyen Mai Huong, Nguyen Thi Bich Thao, Nguyen Luong Hien, Pham Duc Phuc, Le Vu Anh, Nguyen Viet Hung, Lam Thi Binh, Nguyen Hai Nam, Le Thi Huyen Trang, Siobhan Doria, Pham Thi Huong Giang, Trinh Thu Hang, Vu Van Tu, Dang Xuan Sinh

CURRENT STAFF

DIRECTORATE

Nguyen Luong Hien, MA., Director since July 2014

Pham Duc Phuc, Ph.D., Coordinator from January 2012 to April 2014, CEO from July 2014

Nguyen Viet Hung, Ph.D., Research group leader since September 2009, Vice director from June 2012 and Senior Researcher since July 2014

RESEARCH

Tran Thi Tuyet Hanh, MPH., Associate Researcher since September 2009

Vu Van Tu, MD, MPH., Master student from 2009, then associate researcher since September 2010

Nguyen Bich Thao, MSc., Research Assistant since October 2010

Luu Quoc Toan, MPH., Master student from 2010, Associate Researcher from September 2012, and PhD candidate since July 2014

Dang Xuan Sinh, MVPH., Master student from September 2011, and present PhD candidate

Nguyen Mai Huong, BPH, Research Assistant since July 2012

Pham Thi Huong Giang, MSc., Program Assistant & Communication Officer since August 2012

Nguyen Hai Nam, MPH., Research Assistant since May 2014

ADMINISTRATION

Lam Thi Binh, BA, Admin, Finance & HR Officer since May 2013

Trinh Thu Hang, BA, Support staff since September 2012

FORMER STAFF

Le Vu Anh, Ph.D, Director from June 2012 to August 2013
 Nguyen Hong Nhung, MSc., Research Assistant since October 2009 to August 2012
 Nguyen Duy Tien, BA, Field Research Assistant since August 2012 to May 2014
 Nguyen Phuong Hong, MSc, Researcher from July 2013 to January 2014
 Phi Thi Thuy Ngan, BPH, Research Assistant since October 2013 to July 2014
 Do Thu Nga, PhD, from April to August 2013
 Nguyen Tien Thanh, DMV., MSc., Researcher, from to December 2013

INTERNS & VOLUNTEERS

Le Thi Phuong Quyen, from August 12 to December 2013
 Nguyen Duy Tien, NCCR/FBLI/PigRisk/ RRR, since July 2012
 Ly Trung Sinh, PigRisk, from October 2012 to March 2013
 Dang Van Chinh, PigRisk, from November 2012 to April 2013
 Nguyen Thi Nhu, FBLI, from November 2013 to March 2014
 Nghiem Thi Ngoc Thuan, FBLI, since August 2012
 Kieu Thanh Truc, FBLI, since January 2014
 Tran Thi Kim Tuyen, from April 13 to February 2014

INTERNATIONAL EXCHANGE STUDENTS

Vi Nguyen, University of Guelph, Ontario, Canada, 2009 - 2010
 Raaka Kumbhaka, University of Pittsburg, PA, USA, 2012
 Nancy Ting, University of Pennsylvania, PA, USA, 2012
 Parfait Kouame, Université Félix Houphout-Boigny, Abidjan, Côte d'Ivoire, 2012
 Benoit Randuineau, University of Paris, France, 2012
 Laura Bates, University of Leeds, England, 2012
 Seth de Vlieger, Windesheim Honours College, Zwolle, the Netherland, 2013
 Samuel Fuhrmann, SwissTPH and University of Basel, Switzerland, 2013- 2014
 Pierre Schneeberger, SwissTPH and University of Basel, Switzerland, 2014
 Terumi Yokozawa, Rakuno Gaukuen University Japan, 2014
 Siobhan Doria, Simon Fraser University, British Colombia, Canada, 2014



Parfait Kouame, Dongo Kouassi, Rachelle Yapo and Nguyen Viet Hung working at CSRS, Abidjan, Cote d'Ivoire in 2009



Samuel Fuhrmann (standing), PhD student of SwissTPH, in the field for sampling in Hanam, May 2014

PUBLICATION 2009-2014

ARTICLES

INTERNATIONAL PEER-REVIEWED JOURNALS

- Kengne, E. S., I. M. Kengne, L. N. W. Arsene, A. Akoa, H. Nguyen-Viet and L. Strande (2014). Performance of Vertical Flow Constructed Wetlands for Faecal Sludge Drying Bed Leachate: Effect of Hydraulic Loading. *Ecological Engineering*. <http://dx.doi.org/10.1016/j.ecoleng.2014.07.041>
- Bui Huy, T., Tuyet-Hanh, T. T., Johnston, R., & Nguyen-Viet, H. (2014). Assessing Health Risk due to Exposure to Arsenic in Drinking Water in Hanam Province, Vietnam. *International Journal of Environmental Research and Public Health*, 11, 7575-7591. doi:10.3390/ijerph110807575
- Nguyen, V., Nguyen-Viet, H., Pham-Duc, P., & Wiese, M. (2014). Scenario Planning for Community Development in Vietnam: A New Tool for Integrated Health Approaches? *Global Health Action*, 7(24482). <http://dx.doi.org/10.3402/gha.v7.24482>.
- Saint-Charles, J., Webb, J., Sanchez, A., Mallee, H., van Wendel de Joode, B., & Nguyen-Viet, H. (2014). Ecohealth as a Field: Looking Forward. *Ecohealth*. doi: 10.1007/s10393-014-0930-2
- Rachelle, Y., Koné, B., Bassirou, B., Gueladio, C., Zinsstag, J., & Nguyen-Viet, H. (2014). Quantitative Microbial Risk Assessment Related to Urban Wastewater and Lagoon Water Reuse in Abidjan, Côte d'Ivoire. *Journal of Water and Health*, 12(2), 301-309.
- Hall, D., Nguyen-Viet, H., Wilyanto, I., Tung, D. X., & Chotinun, S. (2013). Improving Food Safety in Asia through Increased Capacity in Ecohealth. *Journal of Public Health and Epidemiology*, 5(8), 336-340.
- Pham-Duc, P., Nguyen-Viet, H., Hattendorf, J., Zinsstag, J., Phung-Dac, C., Zurbrugg, C., & Odermatt, P. (2013). *Ascaris lumbricoides* and *Trichuris trichiura* Infections Associated with Wastewater and Human Excreta Use in Agriculture in Vietnam. *Parasitology International*, 62(2), 172-180. doi: 10.1016/j.parint.2012.12.007
- Van Minh, H., Nguyen-Viet, H., Thanh, N. H., & Yang, J. C. (2013). Assessing Willingness to Pay for Improved Sanitation in Rural Vietnam. *Environmental Health and Preventive Medicine*, 18(4), 275-284. doi: 10.1007/s12199-012-0317-3
- Ferrer, A., Nguyen-Viet, H., & Zinsstag, J. (2012). Quantification of diarrhea risk related to wastewater contact in Thailand. *Ecohealth*, 9(1), 49-59. doi: 10.1007/s10393-012-0746-x
- Keserue, H. A., Fuchslin, H. P., Wittwer, M., Nguyen-Viet, H., Nguyen, T. T., Surinkul, N., . . . Egli, T. (2012). Comparison of Rapid Methods for Detection of *Giardia spp.* and *Cryptosporidium spp.* (oo)cysts Using Transportable Instrumentation in a Field Deployment. *Environmental Science and Technology*, 46(16), 8952-8959. doi: 10.1021/es301974m
- Payne, R., Mitchell, E. A. D., Nguyen-Viet, H., & Gilbert, D. (2012). Can Pollution Bias Peatland Palaeoclimate Reconstruction? *Quaternary Research*, 78, 170-173.
- Grace, D., Gilbert, J., Lapar, M. L., Unger, F., Fevre, S., Nguyen-Viet, H., & Schelling, E. (2011). Zoonotic Emerging Infectious Disease in Selected Countries in Southeast Asia: Insights from Ecohealth. *Ecohealth*, 8(1), 55-62. doi: 10.1007/s10393-010-0357-3
- Nga, D. T., Morel, A., Nguyen-Viet, H., Pham-Duc, P., Nishida, K., & Kootattep, T. (2011). Assessing nutrient fluxes in a Vietnamese rural area despite limited and highly uncertain data. *Resources Conservation and Recycling*, 55(9-10), 849-856. doi: 10.1016/j.resconrec.2011.04.008
- Pham-Duc, P., Nguyen-Viet, H., Hattendorf, J., Zinsstag, J., Dac Cam, P., & Odermatt, P. (2011). Risk Factors for *Entamoeba histolytica* Infection in an Agricultural Community in Hanam Province, Vietnam. *Parasit Vectors*, 4, 102. doi: 10.1186/1756-3305-4-102
- Van Minh, H., & Nguyen-Viet, H. (2011). Economic Aspects of Sanitation in Developing Countries. *Environmental health insights*, 5, 63-70. doi: 10.4137/ehi.s8199
- Jensen, P. K., Pham-Duc, P., & West, L. G. (2010). How do we sell the hygiene message? With dollars, dong or excreta? *Environ Health*, 9, 27. doi: 10.1186/1476-069x-9-27
- Meyer, C., Gilbert, D., Gaudry, A., Franchi, M., Nguyen-Viet, H., Fabure, J., & Bernard, N. (2010). Relationship of Atmospheric Pollution Characterized by Gas (NO2) and Particles (PM10) to Microbial Communities Living in Bryophytes at Three Differently Polluted Sites (rural, urban, and industrial). *Microbial Ecology*, 59(2), 324-334. doi: 10.1007/s00248-009-9580-2
- Nguyen-Viet, H., Frontasyeva, M. V., Thi, T. M., Gilbert, D., & Bernard, N. (2010). Atmospheric Heavy Metal Deposition in Northern Vietnam: Hanoi and Thai Nguyen Case Study Using the Moss Biomonitoring Technique, INAA and AAS. *Environ Sci Pollut Res Int*, 17(5), 1045-1052. doi: 10.1007/s11356-009-0258-6
- Cole, B., Pham-Duc, P., & Collett, J. (2009). A qualitative and physical investigation of a double-vault composting latrine programme in northern Vietnam. *Waterlines*, 28, 333-342.
- Jensen, P. K., Pham-Duc, P., Konradsen, F., Klank, L. T., & Dalsgaard, A. (2009). Survival of *Ascaris* eggs and hygienic quality of human excreta in Vietnamese composting latrines. *Environmental Health*, 8, 57. doi: 10.1186/1476-069x-8-57
- Nguyen-Viet, H., Zinsstag, J., Schertenleib, R., Zurbrugg, C., Obrist, B., Montangero, A., . . . Tanner, M. (2009). Improving Environmental Sanitation, Health, and Well-being: a Conceptual Framework for Integral Interventions. *Ecohealth*, 6(2), 180-191. doi: 10.1007/s10393-009-0249-6

NATIONAL PEER-REVIEWED JOURNALS

- Nguyen-Viet, H., Phuc, P. D., Anh, L. V., Cam, P. D., & Zinsstag, J. (2014). One Health: Integrated approach for research and intervention to improve the health of human, animal and the environment. *Vietnam Science and Technology Review of the Ministry of Science and Technology*, 1(2014), 44-48
- Dung, T. P., Nguyen-Viet, H., & Tuyet-Hanh, T. T. (2013). Health risk due to exposure to *Chlorpyrifos* for farmers in Thai Binh. *Journal of Preventive Medicine*, 23(4), 26 - 35.
- Ngan, N. K., Bich, N. N., Pham-Duc, P., Vu-van, T., Schelling, E., & Nguyen-Viet, H. (2013). Towards an integrated management of human and animal waste in Viet Nam: Regulation and health and environmental impacts. *Vietnam Journal of Public Health* 28, 4 - 12.
- Nguyen-Viet, H. (2013a). Taskforce of Risk Assessment for food safety in Vietnam: linking science to policy to increase food safety and livelihood generation of the poor farmers. *Journal of Preventive Medicine*, 23(4), 90 - 93.
- Nguyen-Viet, H. (2013b). What have we learned from Dr. Alexandre Yersin?. *Vietnam Journal of Public Health*, 28, 79 - 82.
- Nguyen-Viet, H., Giang, H. P., & Tung, D. X. (2013, 2-6 July 2013). *Field Building Leadership Initiative: Advancing Ecohealth in Southeast Asia - The first year journey*. Paper presented at the 10th Year Anniversary of Veterinary Public Health Centre for Asia Pacific, Chiangmai, Thailand.
- Nguyen-Viet, H., & Huong, L. T. T. (2013). Air pollution as a health issue on Hanoi: an opportunity for intensified research to inform public policy. *Journal of Preventive Medicine*, 23(4), 67 - 76.
- Nguyen-Viet, H., & Tuyet-Hanh, T. T. (2013). Research projects on health risk assessment implemented by the Hanoi School of Public Health. *Journal of Preventive Medicine*, 23(4), 94 - 99.
- Pham-Thi, N., Nguyen, T. T., Tuyet-Hanh, T. T., & Nguyen-Viet, H. (2013). Prevalence of *Salmonella* contamination in pig and pork at farm and slaughterhouse in the Northern provinces of Vietnam. *Journal of Preventive Medicine*, 23(4), 59 - 66.
- Phuc, P. D., Hanh, T. T. T., & Hung, N. V. (2013). Training and research programmes in health risk assessment in Vietnam. *Journal of Preventive Medicine*, 23(4), 83 - 87.
- Sinh, D. X., Nguyen-Viet, H., Meeyam, T., & Fries, R. (2013, 2-6 July 2013). *Quantifying Salmonella Contamination in Pig Slaughterhouses in Hung Yen, Vietnam*. Paper presented at the 10th Year Anniversary of Veterinary Public Health Centre for Asia Pacific, Chiangmai, Thailand.
- Toan, L. Q., Nguyen-Viet, H., & Huong, B. M. (2013). Risk assessment of *Salmonella* in pork in Hanoi, Vietnam. *Journal of Preventive Medicine*, 24(4), 10 - 17.
- Tung, B. H., Hanh, T. T. T., & Nguyen-Viet, H. (2013). Risk assessment of arsenic contamination in tube-well drinking water in Hanam province. *Journal of Preventive Medicine*, 23(4), 10 - 17.
- Tuyet-Hanh, T. T., Le-Vu, A., Nguyen-Ngoc, B., & Nguyen-Viet, H. (2013). Environmental health risk assessment of dioxin in food in Da Nang dioxin hot spot. *Journal of Preventive Medicine*, 23(4), 48 -58.
- Tuyet-Hanh, T. T., & Nguyen-Viet, H. (2013). Environmental health risk communication: concept, principles, and challenges. *Journal of Preventive Medicine*, 23(4), 77 - 82.
- Khong, N. V., Ngoc, P. T., Tung, D. X., Lucila, L. M., Unger, F., Nguyen-Viet, H., . . . Jeffrey, G. (2012). Hygienic practices and microbial contamination of small-scale poultry slaughterhouses at peri-urban areas of Hanoi, Vietnam. *Agriculture and Rural Development*, 12(2), 60 - 67.
- Thanh, N., Minh, H. V., & Hung, N. V. (2012). Using CVM to assess willingness to pay for constructed sewer system in a rural area of Vietnam. *Medical Research Journal*, 79(2), 151 - 157.
- Dam L, Nguyen-Viet, H., Cam, P. D., & R, M. (2011). The spread and antibiotic resistance of *Escherichia coli* from wastewater in Hanam. *Vietnam Journal of Public Health*, 22, 46 - 52.
- Hoang-Van, M., Thanh, N., & Nguyen-Viet, H. (2011). Economic benefits associated with diarrhea cases prevented as a result of improvement in access to clean water and hygienic sanitation in Nhat Tan commune, Kim Bang, Ha Nam. *Vietnam Journal of Public Health*, 22(61 - 65).
- Nguyen-Cong, K., Bich, T., Pham-Duc, P., & Nguyen-Viet, H. (2011). Assessment of diarrhea risk by microorganisms in wastewater and excreta used in agriculture in Hanam. *Vietnam Journal of Public Health*, 22, 14 - 20.
- Nguyen-Viet, H., & Anh, L. V. (2011). One Health : concept and action plan for public health. *Vietnam Journal of Public Health*, 21, 1 - 8.
- Thanh, N., Minh, H. V., & Nguyen-Viet, H. (2011). Relationship between self-reported health status and the condition of water and sanitation in Hoang Tay and Nhat Tan communes, Kim Bang district, Ha Nam province. *Vietnam Journal of Public Health*, 22, 46 - 52.
- Tuyet-Hanh, T. T., & Nguyen-Viet, H. (2011). Quantitative microbial risk assessment for water, sanitation and food: experience from a training and research development. *Vietnam Journal of Public Health*, 22, 73 - 78.
- Vu-Van, T., Huong, L. T. T., Pham-Duc, P., Thao, N. B., & Nguyen-Viet, H. (2011). Managing, using human excreta and community health in Vietnam. *Vietnam Journal of Public Health*, 22, 4 - 13.
- Vu-van, T., Huong, N., Pham-Duc, P., Nguyen-Viet, H., & Zurbrugg C. (2011). Developing a questionnaire to measure awareness and behaviours of people in relation to wastewater use in agriculture at Hoang Tay commune and Nhat Tan commune. *Vietnam Journal of Public Health*, 22, 14 - 20.

BOOKS & BOOK CHAPTERS

BOOKS

- Basuno, E., Nguyen-Viet, H., Tuyet-Hanh, T. T., Tung, D. X., Borin, K., Crocetti, E. M., . . . Willyanto, I. (2013). *Ecohealth Trainer Manual*. Nguyen-Viet, H. (2013). *Glossary of Terms in Water Supply and Sanitation*: Science and Technique Publishing House.
- Tuyet-Hanh, T. T., & Nguyen-Viet, H. (2012). *Environmental and Occupational Health Risk Assessment*. Hanoi: Labor Publishing House.
- Khan, N. C., & Nguyen-Viet, H. (2011). *Microbial Risk Assessment for food safety*. Hanoi: Medical Publishing House.
- Nguyen-Viet, H., Minh, H. V., Anh, V. T., Tuyet-Hanh, T. T., Vu-Van, T., Pham-Duc, P., . . . Thao, N. T. B. (2011). *Glossary of Terms in Water Supply and Sanitation. NCCR North-South Dialogue 37*. Bern, Switzerland.

BOOK CHAPTERS

- Hung Nguyen-Viet, Vi Nguyen, Pham Duc Phuc, Le Vu Anh, Phung Dac Cam, Marcel Tanner, Peter Odermatt, Delia Grace, Christian Zurbrüg, Tran Thi Tuyet Hanh, Vu Van Tu, Luu Quoc Toan, Dang Xuan Sinh, Pham Thi Huong Giang, Jakob Zinsstag (*in press*). Institutional research capacity development for integrated approaches in developing countries: an example from Vietnam. In J. Zinsstag, E. Schelling, D. Waltner-Toews, M. Whittaker & M. Tanner (Eds.), *One Health: The Theory and Practice of Integrated Health Approaches*. CAB International, Wallingford, UK.
- Hung Nguyen-Viet, Phuc Pham-Duc, Vi Nguyen, Marcel Tanner, Peter Odermatt, Tu Vu-Van, Minh V. Hoang, Christian Zurbrüg, Esther Schelling, Jakob Zinsstag (*in press*). A One Health perspective for integrated human and animal sanitation and nutrient recycling. In J. Zinsstag, E. Schelling, D. Waltner-Toews, M. Whittaker & M. Tanner (Eds.), *One Health: The Theory and Practice of Integrated Health Approaches*. CAB International, Wallingford, UK.
- Zinsstag J, Tanner M, Nguyen Viet H, Obrist B, Cissé G, Bonfoh B, Schertenleib R, Zurbrüg C, Birru Yitafaru, Amare Bantider, Hurni H. 2011. Interdisciplinary approaches in research for sustainable development. In: Wiesmann U, Hurni H, editors; with an international group of co-editors. *Research for Sustainable Development: Foundations, Experiences, and Perspectives*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 6. Bern, Switzerland: Geographica Bernensia, pp 207–228.
- Zinsstag J, Bonfoh B, Cissé G, Nguyen Viet H, Silué B, N'Guessan TS, Weibel D, Schertenleib R, Obrist B, Tanner M. 2011. Towards equity effectiveness in health interventions. In: Wiesmann U, Hurni H, editors; with an international group of co-editors. *Research for Sustainable Development: Foundations, Experiences, and Perspectives*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 6. Bern, Switzerland: Geographica Bernensia, pp 623–640.
- Kengne IM, Koanda H, Koné B, Kenfack S, Koné B, Nguyen-Viet H, Mahamat B, Silué B, Nguessan S, Zinsstag J, Bonfoh B, Cissé G. 2009. From risk management to equity effectiveness in environmental sanitation and health in Africa. *Global Change and Sustainable Development: A Synthesis of Regional Experiences from Research Partnerships*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 5. Bern: Geographica Bernensia, pp 47–59.
- Montangero A, Schaffner M, Surinkul N, Nguyen Viet H, Koottatep T, Morel A, Lüthi C, Schertenleib R. 2009. Innovative tools for environmental sanitation planning and river basin management in Southeast Asia. *Global Change and Sustainable Development: A Synthesis of Regional Experiences from Research Partnerships*. Perspectives of the Swiss National Centre of Competence in Research (NCCR) North-South, University of Bern, Vol. 5. Bern: Geographica Bernensia, pp 343–356.



Highlights of some books published in Vietnamese: i) *Microbial Risk Assessment for food safety* (2012), ii) *Environmental and Occupational Health Risk Assessment* (2013) iii) *Glossary of Terms in Water Supply and Sanitation* (2013), and iv) Special edition on Risk assessment for Health Research in Vietnam on the journal of Preventive Medicine (2013).

OTHERS

POLICY BRIEFS

Nguyen-Viet, H., Tuyet-Hanh, T. T., Pham-Duc, P., & Grace, D. (2013). Using risk assessment tools for food safety management in Vietnam. In ThammaratKooattatep.Pathumthani (Ed.), *Evidence for Policy Series, Regional edition Southeast Asia, No. 5*. Thailand: NCCR North-South.

Pham-Duc, P., Nguyen-Viet, H., Vu-Van, T., Zübrugg, C., & Zinsstag, J. (2013). The Vietnamese double-vault composting latrine: Fertilizer source or health risk? In ThammaratKooattatep.Pathumthani (Ed.), *Evidence for Policy Series, Regional edition Southeast Asia, No. 4*. Thailand: NCCR North-South.

Nguyen-Viet, H., Tuan-Anh, V., Pham-Duc, P., & Vu-Van, T. (2011). Safe use of wastewater in agriculture and aquaculture. In ThammaratKooattatep.Pathumthani (Ed.), *Evidence for Policy Series, Regional edition Southeast Asia, No. 2*. Thailand: NCCR North-South.

Nguyen-Viet, H., Tuyet-Hanh, T. T., Pham-Duc, P., Bich, N. N., & Huong, B. T. M. (2011). Microbial risk assessment in Vietnam: from training to policy. In T. Hirschbuehl & AnuLannen (Eds.), *Outcome Highlight Series*. NCCR North-South.

NEWSLETTERS

- Vietnam One Health and Ecohealth: <http://cenpher.hsph.edu.vn/english/content/one-health-ecohealth-vietnam>
- VOHUN: <http://cenpher.hsph.edu.vn/english/content/vietnam-one-health-university-network-newsletter>
- FBI 6 month newsletter: <http://cenpher.hsph.edu.vn/english/content/fbli-bulletin-0>

THESES OF STUDENTS TRAINED AT CENPHER

PhD students

1. Pham-Duc P. Waste and excreta use in agriculture in northern Vietnam: health risks and environmental impacts. 2012. PhD thesis. University of Basel, Swiss Tropical and Public Health Institute, Switzerland. 203pp.

MSc students

1. Nguyen Cong Khuong. Health risks related to excreta and wastewater reuse in agriculture using quantitative microbial risk assessment (QMRA) in Hanam, Vietnam. MSc thesis, Hanoi School of Public Health. 2009.
2. Vu Van Tu. Developing a tool to assess the behaviors of wastewater and excreta and reuse in agriculture based on Protection Motivation Theory (PMT) framework. MSc thesis, Hanoi School of Public Health. 2009.
3. Bui Huy Tung. Health Risk Assessment of Ground Water contaminated with Arsenic in Hanam. MSc thesis, Hanoi, Hanoi School of Public Health. 2011
4. Luu Quoc Toan. Quantitative Microbial Risk Assessment of Salmonella in Pork in Long Bien District, Hanoi, MSc thesis. Hanoi, Hanoi School of Public Health. 2011
5. Ho Thi Thanh Tam. Assessing carbon flow in environmental sanitation systems in two communes, Vietnam. MSc thesis, Asian Institute of Technology. 2011.
6. Vu Van Nam. Sanitation use and human faeces treatment and other factors in Mo Dao commune, QueVo District, BacNinh Province. Specialty I thesis, Hanoi, Hanoi School of Public Health. 2012.
7. Ho Thi Nga. Medical solid waste management and other factors in GiaLoc Hospital. MSc thesis, Hanoi, Hanoi School of Public Health. 2013.
8. Cong Ngoc Long. Leptospirasero prevalence in human and associated factors in Yen Dinh district and Nhu Thanh district, Thanh Hoa province, Vietnam. MSc thesis. Hanoi, Hanoi School of Public Health. 2014.
9. Dinh Phuong Hoa. Knowledge and Practice in using pesticide of famers in Le Ho and Hoang Tay communes Kim Bang district, Hanam province. MSc thesis, Hanoi, Hanoi School of Public Health. 2014.
10. Kieu Thanh Truc. Diarrhea risk assessment due to consumption of raw spinach grow on Nhue river in NhatTuu and Hoang Tay communes, Kim Bang district, Hanam province. MSc thesis, Hanoi, Hanoi School of Public Health. 2014.
11. Le Thi Thu. Assessment of the health risks from the exposure to wastewater in biogas systems in three communes of Hanam province. MSc thesis, Hanoi, Hanoi School of Public Health. 2014.



The way forward



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