

State of Play Reports on Health, Food Security and Safety, and Water Management

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1 Executive Summary

This report contains an analysis of the current state of play in science and technology collaboration between researchers and organisation in the EU and ASEAN member states, and makes recommendations for future collaboration topics.

There is extensive research collaboration between EU and ASEAN researchers, with 2,254 scientific publications in health research with at least one author from the EU and ASEAN. The UK is the leading European partner, with Thailand and Singapore the most prolific in Southeast Asia. There are 21 projects funded under FP7 with ASEAN partners, which primarily focus on infectious disease and health policy.

Priorities for future EU-ASEAN collaboration are identified as (re)emerging infectious diseases, including conditions such as dengue and chikungunya which are increasingly threatening Europe as a result of climate change, and new diseases like H5N1. Antimicrobial resistance should be another focus – the emergence of artemisinin-resistant malaria threatens efforts to control the condition. There are also opportunities for collaboration in non-communicable diseases and social determinants of health, and the linked area of health policy.

There were 2,170 co-publications in 2012 food research, with organisations from the Netherlands, France, Thailand, Singapore and Malaysia contributing to most collaboration. These have primarily addressed rice, forestry and aquaculture. 21 FP7 projects have included ASEAN partners, with Thailand the leading Southeast

Asian nation (albeit ranked only 17th amongst third countries).

The food and agricultural systems of EU and ASEAN are heavily interlinked, with ASEAN a major exporter of food to the EU. Opportunities for mutually beneficial co-operation could be found in helping to develop ecologically intensive agriculture to feed Europe and Southeast Asia, particularly diversified, adaptable plant breeding with rice as a crop model, and designing ecologically intensive aquaculture systems. Other opportunities include innovating, to make food accessible, varied and safe, foreseeing and managing infectious disease risks linked to wildlife and domestic animals, and supporting public policies aimed at reducing structural inequality and poverty.

There have been 390 co-publications between the EU and ASEAN since 2000, with the highest proportion related to policies and management. These feature a diverse range of countries and organisations, led by Wageningen University and the International Rice Research Institute. There have been 14 water-focused projects in FP6 and FP7 with ASEAN partners.

Topics of future cooperation could include flood and drought preparedness and mitigation programmes, developing knowledge and monitoring water resources for better water management including water conservation and efficiency, urbanization, sustainable regional water infrastructure, transboundary river basin management, and water governance and policy issues.

2 Introduction

The first phase of the SEA-EU-NET project did much to establish science, technology and innovation cooperation between the EU and ASEAN. One of the primary aims of the second phase of the project, running until September 2016, is to stimulate deeper and more productive cooperation in three global societal challenges; health, food and water. This report serves to identify the specific topics within each challenge that hold the greatest potential for collaboration, based on the extent of the need, the existence of research capabilities and existing links, and the level of commitment from each region.

2.1 Societal Challenges

The rationale for the selection of the three societal challenges was recognition that these are areas in which the EU and Southeast Asia have strong and complementary interests. In Health, Southeast Asia is increasingly coming to resemble Europe, with non-communicable diseases burdening health systems and taking over from infectious disease as the leading cause of death. Yet the region still suffers from high incidences of infectious diseases which Europe – though climate change and global connectedness – is also exposed to. Southeast Asia is a major exporter of food to Europe, providing a strong rationale to work with the region to ensure the security and safety of Europe's food supply. Disruption caused by flooding in Southeast Asia affects the production

facilities of European companies and disrupts the plans of holidaymakers, and tensions over transboundary water resources threatens the stability of the region. These challenges are also interlinked; extreme weather events could threaten food supplies whilst also spreading waterborne diseases.

These societal challenges also reflect the areas in which much EU-ASEAN collaboration already takes place. Analysis produced in the earlier phase of the SEA-EU-NET project also shows that health, food and the environment account for the lion's share of EU-ASEAN co-publications. 40% of all co-publications are in health, 24% in agrifood, and 21% in environmental topics.¹

The societal challenges of health, food and water largely match the FP7 thematic areas of Health, the Knowledge-Based Bioeconomy (KBBE), and Environment. Much of the EU-Southeast Asia collaboration in Framework Programme 7 has taken place in these areas. There have been 103 projects with Southeast Asian participants in FP7 and 212 participations (a single project may have multiple Southeast Asian partners), with a total EC contribution of € 353.3 million, € 27.4 million of which has gone to ASEAN partners. Table 1 shows that 57 projects and 106 participations have been in Health, KBBE or Environment, and these areas have received 65% of the total EC contribution to Southeast Asian partners.

¹ 2000-2010, EU-Southeast Asia co-publications: dimensions, patterns, trends

	Projects	Participations	EC contribution to Southeast Asian partners
Health	22	35 (17%)	€ 9,518,857
KBBE	21	40 (19%)	€ 5,096,868
Environment	14	31 (15%)	€ 2,990,671
Total (including other topics)	103	212	€ 27.4 million

Table 1: Southeast Asia participation in FP7 Health, KBBE and Environment projects

2.2 About this report

The aim of this report is to identify the specific topics with the greatest potential for successful EU-ASEAN research collaboration within each societal challenge. The terms EU and ASEAN should be taken to refer to both the political entities and the member states of both regions (including the participants in the European Research Area).

In order to identify these areas, the authors of each chapter have sought to identify the thematic areas in which collaboration is already taking place using bibliographic data about co-publications; articles in scientific journals which have at least one author from Europe and Southeast Asia. Bibliographic analysis has proven to be a useful tool in the earlier phase of the SEA-EU-NET project. The analysis in this report has been produced by project partners at the Center for Social Innovation (ZSI), using a more up-to-date dataset and involving more in-depth analysis of specific topics and keywords. This helps to identify existing collaborations, and also provides some information as to the individual organisations and bi- or multilateral relationships that have been most productive.

This is supplemented with an analysis of existing EU-ASEAN cooperation under Framework Programme 7 (FP7) projects. This data was extracted from Cordis in early 2013, and includes all projects with a partner from Southeast Asia whose grant agreements were signed before the end of 2012. This analysis provides an additional benchmark as to where and in which topics cooperation is currently taking place.

The research needs of both regions are identified, as defined by the EU, ASEAN and other international organisations, including the UN. Where possible, the authors have sought to identify evidence of interest, either funding targeted to particular priorities, or the creation of new structures to address specific challenges.

Existing collaborations and future needs are then compared, to identify high potential areas for future work. In this synthesis, the authors have sought to identify topics where there is a clear mutual benefit for both regions, and a clear rationale for regional – rather than bilateral – collaboration.

2.2.1 Next Steps

The report will be used to guide the work of the project over the next three and a half years. The partners responsible for work in each societal challenge will organise workshops to better define research topics, and to promote an understanding of the research needs and capabilities of both regions. The project will then work to identify funding sources for that research, including Horizon 2020, and then organise matchmaking events when specific calls are published, to encourage the creation of EU-Southeast Asia research consortia.

3 Health

Tom Crawley, British High Commission Singapore

3.1 EU-ASEAN Collaboration in Health Research

3.1.1 EU-Southeast Asia Co-publication

EU-ASEAN collaboration in health research has a long history, arguably dating back to Christiaan Eijkman's beri-beri research in Indonesia in the 1880s which resulted in the discovery of vitamins. Research in tropical medicine has been continued by the Institutes Pasteur in Cambodia – which celebrated its 60th anniversary in March 2013 – Vietnam and Laos. The Mahidol Oxford Tropical Medicine Research Unit opened in 1979, and in the intervening years has conducting pioneering work, particularly in malaria.

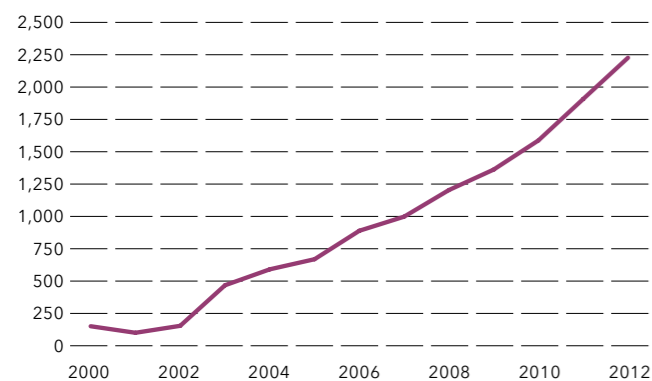


Figure 1: Number of EU-ASEAN co-publications in Health
Source: SCOPUS – retrieved by ZSI in February 2013

The number of publications in health and medicine journals which include an author from both the EU and Southeast Asia has steadily increased from 367 in 2000 to 2,254 in 2012 (see Figure 1).

Table 2 and Table 3 show the organisations from Europe and Southeast Asia that generate most co-publications with the other region. UK-based organisations account for six of the top ten, although there is a wider distribution of organisations, with the most

productive – the World Health Organisation – accounting for only 3.7% of the total. In Southeast Asia, four Thai organisations account for just less than 20% of co-publications, with Mahidol University the most productive from either region. Only three countries; Thailand, Singapore and Malaysia are in the top ten.

European organisations	Country	Records	%
WHO	CH	589	3.7%
University College London	GB	539	3.4%
London School of Hygiene & Tropical Medicine	GB	445	2.8%
University of Oxford	GB	443	2.8%
Nuffield Department of Clinical Medicine	GB	421	2.6%
Karolinska Institutet	SE	388	2.4%
Academic Medical Centre, University of Amsterdam	NL	345	2.2%
Imperial College London	GB	300	1.9%
John Radcliffe Hospital	GB	283	1.8%
Radboud University Nijmegen Medical Centre	NL	239	1.5%

Table 2: European organisations generating most co-publications with Southeast Asian partners. Source: SCOPUS – retrieved by ZSI in February 2013

Southeast Asian organisations	Country	Records	%
Mahidol University	TH	1,882	11.7%
National University of Singapore	SG	1,271	7.9%
Chulalongkorn University	TH	533	3.3%
University of Malaya	MY	519	3.2%
Yong Loo Lin School of Medicine	SG	493	3.1%
Chiang Mai University	TH	462	2.9%
National University Hospital, Singapore	SG	423	2.6%
Singapore General Hospital	SG	394	2.5%
Khon Kaen University	TH	325	2.0%
Nanyang Technological University	SG	291	1.8%

Table 3: Southeast Asia organisations generating most co-publications with European partners. Source: SCOPUS – retrieved by ZSI in February 2013

Figure 2 shows the countries which generate most co-publications. As is to be expected from the analysis of individual organisations, this list is dominated by the United Kingdom, Thailand, and Singapore, with a second tier occupied by Germany, France, the Netherlands, Malaysia and Vietnam.



Figure 2: Countries producing most Europe-Southeast Asia co-publications

Table 4 and Table 5 show the most prolific authors of EU-Southeast Asia co-publications from both regions. The list of EU-based researchers is dominated by those from the University of Oxford working on tropical infectious diseases at the Wellcome Trust Major Overseas Programmes in Thailand and Vietnam.

Rank	Name	Country	Topic
1	White, Nicholas J.	GB	Malaria
2	Day, Nicholas P. J.	GB	Malaria, melioidosis, leptospirosis
3	Farrar, Jeremy James	GB	Malaria
4	Nosten, Francois	GB	Malaria
5	Hien, Tran Tinh	GB	Malaria, typhoid, avian influenza
6	Peacock, Sharon J.	GB	Infectious diseases, esp. MRSA
7	Newton, Paul	GB	Clinical epidemiology
8	McGready, Rose	NL	Malaria epidemiology in pregnancy
9	Saw, Seang Mei	FI	Epidemiology, esp. of eye disease
10	Dondorp, Arjen M.	GB	Malaria

Table 4: EU authors listed in most EU-Southeast Asia co-publications

Southeast Asian researchers are mainly drawn from the Mahidol University side of this partnership, with a strong focus on tropical infectious diseases. There is also a strong collaboration involving ophthalmology research at the National University of Singapore.

Rank	Name	Country	Topic
1	Looareesuwan, Sornchai*	TH	Malaria
2	Wuthiekanun, Vanaporn R.	TH	Infectious Diseases
3	Wong, Tien Yin	SG	Ophthalmology
4	Ruxrungtham, Kiat	TH	HIV/AIDS
5	Singhasivanon, Pratap	TH	Infectious Diseases
6	Aung, Tin	SG	Ophthalmology
7	Pukrittayakamee, Sasithon	TH	Malaria
8	Chierakul, Wirongrong	TH	Melioidosis, Leptospirosis and Rickettsiosis
9	Limmathurotsakul, Direk	TH	Melioidosis, Leptospirosis and Rickettsiosis
10	Phanuphak, Praphan	TH	Allergy, Clinical Immunology, HIV/AIDS

Table 5: EU authors listed in most EU-Southeast Asia co-publications
*Professor Sornchai Looareesuwan passed away in 2007.

The list of keywords which occur in these co-publications reveal a strong focus on malaria and related keywords (p. Falciparum, antimalarials). HIV is referred to in over 1,000 co-publications, and TB in 355.

Specific conditions	No. of publications
Malaria	833
Plasmodium falciparum	785
HIV Infection	640
Antimalarials	563
Malaria, Falciparum	536
Malaria falciparum	492
HIV Infections	442
Diarrhea	419
Fever	406
Tuberculosis	355

Table 6: Commonly occurring keywords in Europe-Southeast Asia co-publications

3.1.2 Collaboration in FP7

Data on third country participation in the health theme of FP7 is given in Figure 3. This shows the top 25 countries with shortlisted participations in EU projects, as of May 2012. The list is dominated by the United States and India, who between them account for 31% of the shortlisted participations. Another 32% of shortlisted participations are from African countries, presumably in many cases via the European and Developing Countries Clinical Trials Partnership (EDCTP). Only two Southeast Asian countries feature in this list; Vietnam, with eight shortlisted participations, and Thailand (six).

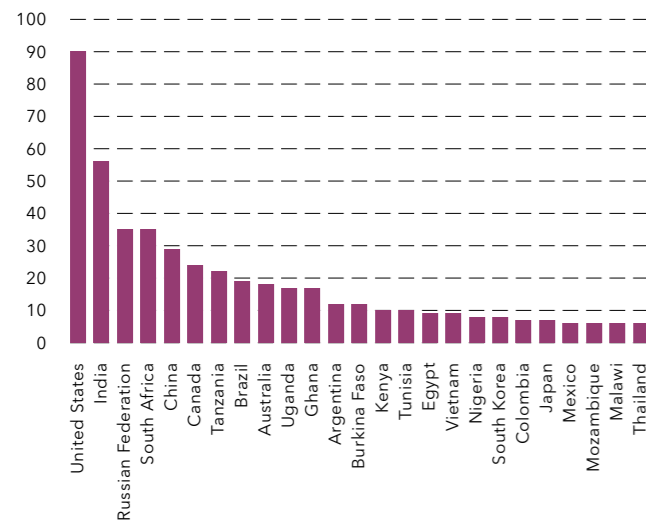


Figure 3: Top 25 countries with shortlisted participations in FP7 Health projects²

As of March 2013, the health theme has supported 21 projects involving Southeast Asian partners from seven countries, for a total of 34 participations (a project may have multiple Southeast Asian participants). This information is more up to date than the overall statistics for third country participation, accounting for the minor discrepancy in numbers.

The breakdown of countries and participations is shown in Table 7, and the full list of projects can be found in Annex I – FP7 Health Projects with ASEAN Partners. Vietnam has the largest number of participations and participants, with no organisations in multiple health projects. Thailand’s Mahidol University is participating in the largest number of projects (four), followed by Indonesia’s Gadjah Mada University with three.

Country	No. of participations	Institutions with multiple participations
VN	9	
TH	7	Mahidol University (4), International Health Policy Programme (2)
ID	6	Gadjah Mada University (3)
SG	4	National University of Singapore (2)
MY	3	University of Malaya (2)
PH	3	
KH	2	

Table 7: Southeast Asian participation in FP7 Health projects

The total value of the EC contribution to these projects has been €80.2 million. The projects can be broadly divided into those focusing on health policy, infectious diseases, and non-communicable diseases, and Table 8

shows the specific topics and budgets. The 10 infectious disease projects attracted an EC contribution of almost €50 million; including €17.6 million for three projects addressing dengue fever (dengue was the focus of a Specific International Cooperation Action call in 2011/12).

The health policy projects have tended to be smaller – around €3 million – possibly because of a reduced requirement for laboratory work. These projects have addresses a wide range of topics, from evaluating the effectiveness of EU aid interventions in developing countries, to developing sustainable financial models for universal health care systems.

Theme	No. of projects	Specific topics	EC contribution
Infectious Diseases	10	Influenza (3), Dengue (3), HIV/AIDS, Meningitidis, Neglected Infectious Diseases, Chikungunya	€48.9 million
Health Policy	7	Indicators (2), Health Economics, Health Management (2), Mobility, Drug Safety	€21.6 million
Non-Communicable Diseases	3	Social Determinants of Health (2), Diabetes	€6.99 million
Other	1	Drug development	€2.7 million

Table 8: Focus areas of EU FP7 Health projects with Southeast Asian participants

3.1.3 Summary

EU-Southeast Asia research collaboration has been productive – generating over 2,000 co-publications per year – and has been strongly focused on infectious diseases, particularly malaria. The focus areas of FP7 projects with Southeast Asian partners have been more diverse, with 7 of 21 projects addressing health policy and three NCDs. Projects have addressed infectious disease, but covering a wider range of conditions, including influenza and dengue. There is relatively little overlap between the productive co-publishers and the Southeast Asian project participants, with the exception of Thailand’s Mahidol University, which features heavily in both groups.

3.2 EU and ASEAN Health Research Priorities

3.2.1 World Health Organisation

The United Nations agency for international public health, the World Health Organisation (WHO), is the key international actor in global public health. The organisation publishes global health statistics and produces strategies for individual diseases, which are influential in setting the health policies of individual countries

and other international organisations. Coverage of ASEAN is split between two WHO regions, Southeast Asia (Myanmar, Vietnam and Indonesia) and Western Pacific (Thailand, Vietnam, Laos, Cambodia, Malaysia, the Philippines and Singapore).

WHO statistics on burden of disease illustrate changing patterns in Southeast Asia. A well observed trend affecting low and middle income countries in general and Southeast Asia in particular is a shift in the disease burden away from infectious diseases towards Non Communicable Diseases (NCDs); primarily cardiovascular disease (CVD), cancer, diabetes, and respiratory illnesses. Figures from the World Health Organisation on causes of death show that there are now no countries in Southeast Asia in which communicable conditions cause a majority of deaths.

NCDs account for 80% of deaths in Southeast Asia’s wealthiest countries; Singapore and Brunei. Figure 4 ranks countries in order of GDP per capita³, and shows that the prevalence of NCDs is closely linked to the level of economic development (with the notable exception of Vietnam, which has the third lowest rate of deaths due to communicable diseases, but the fourth lowest GDP per capita). It should also be noted that injuries – particularly resulting from traffic accidents – still account for a significant proportion of deaths.

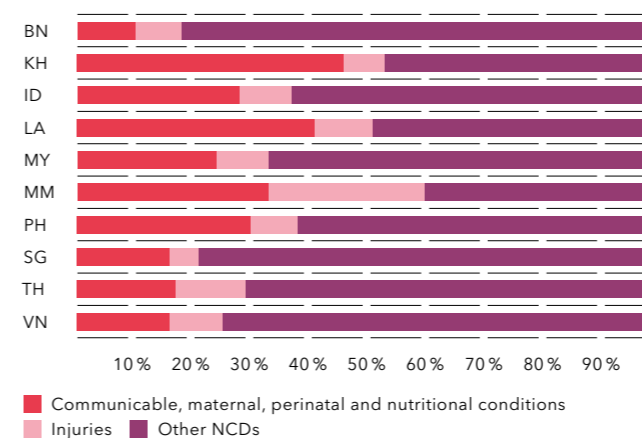


Figure 4: Causes of death

Non-Communicable Diseases

The WHO’s Moscow Declaration and a 2011 report from the World Economic Forum have highlighted the fact that the major public health challenge in low and middle income countries is now NCDs. 36 million deaths, or 63% of the 57 million deaths that occurred globally in 2008, were due to NCDs, comprising mainly cardiovascular diseases (48%), cancers (21%), chronic respiratory diseases (12%) and diabetes (3.5%).⁴

This pattern is replicated in Southeast Asia where cardiovascular diseases account for between 37% and 52% of total deaths from NCDs, and cancers between 15% and 40% of deaths (Figure 5). It should be noted that Singapore, the country with the best developed healthcare system, has the highest proportion of deaths from cancer, indicating the intractability of this particular cause of death.

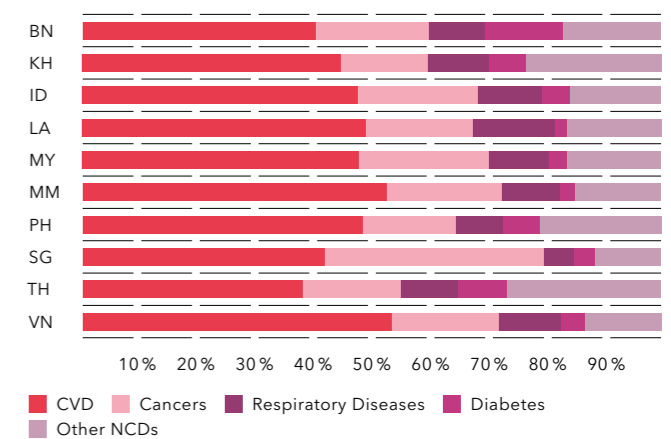


Figure 5: Proportion of deaths in Southeast Asian countries due to major noncommunicable diseases⁵

In 2011 the WHO published a strategic research agenda for NCDs⁶, and in subsequent political statements has urged that members states support and fund work in line with this agenda. The four priority areas for research are shown below:

1. Placing NCDs on global development agenda
2. Understand determinants of NCDs and risk factors, taking a multi-sector, macroeconomic and social perspective
3. Translational and health systems research for cost-effective and proven strategies
4. Enabling costly interventions to be used in resource constrained settings

Infectious Diseases

WHO statistics on infectious diseases – particularly the ‘big three’ Poverty-Related Infectious Diseases (PRIDs) of Malaria, HIV/AIDS and TB – portray a generally improving situation, albeit with particular areas of concern.

The level of attention given to malaria has substantially increased in recent years, with a commensurate increase in funding – from US\$100 million in 2000 to US\$1.84 billion in 2012, according to the World Malaria Report 2012.⁷ However, the WHO points that significant

² International cooperation in health research, Dr Indridi Benediktsson, Open Information Day (Brussels, 29 May 2012) http://ec.europa.eu/research/health/pdf/event14/indridi-benediktsson_en.pdf

⁵ Noncommunicable diseases country profiles, 2011 WHO global report
⁶ A prioritized research agenda for the prevention and control of noncommunicable diseases. Geneva, World Health Organization, 2011, http://whqlibdoc.who.int/publications/2011/9789241564205_eng.pdf
⁷ WHO World Malaria Report 2012, http://who.int/malaria/publications/world_malaria_report_2012/wmr2012_summary_and_keypoint.pdf

³ <http://data.worldbank.org/indicator/NY.GDP.PCAP.CD/countries>
⁴ WHO NCD Action Plan 2012, http://www.who.int/cardiovascular_diseases/15March2013UpdatedRevisedDraftActionPlan.pdf

work is still required to attain the goal of universal access to preventative interventions, diagnostics and treatments.

Malaria is endemic to all countries in ASEAN except Singapore and Brunei, but significant progress has been made in rolling back the spread of the disease. Cambodia, Laos, Vietnam, Thailand and the Philippines have all seen a 75% or greater reduction in case incidence during the period 2000–2011, and Malaysia has reduced cases to such an extent that is now considered to be at the pre-elimination stage. However, Indonesia and Myanmar are still thought to have over 30% of their populations living in high transmission areas (with >1 case per 1,000 population).

Despite the encouraging picture in the region as whole, there is a concerning increase in resistance to Artemisinin Combination Therapies (ACTs) in the Greater Mekong sub-region. Cambodia, Myanmar, Thailand and Vietnam have recorded cases of resistance to artemisinin, although the partner drug in the combination continues to be effective. Resistance to both components of ACTs has been detected in Pailin province in Cambodia.

The global status of the fight against TB is positive, and the Millennium Development Goal (MDG) target to halt and reverse the spread of the disease by 2015 has been achieved with the number of new cases falling 2.2% between 2011 and 2012. However, the disease still has a significant impact in Southeast Asia.

The World Health Organisation identifies 22 countries with a high tuberculosis burden, including six from Southeast Asia; Cambodia, Myanmar, the Philippines, Vietnam, Indonesia and Thailand. Cambodia has the world's highest mortality rate and prevalence rate for TB, with 63 deaths and 817 cases per 100,000 people. The burden of multi drug-resistant TB (MDR-TB) is heavily concentrated in the states of the former Soviet Union, but a number of cases have also been identified in Southeast Asia—in Myanmar and the Philippines, approximately 4% of total TB cases are MDR-TB.

The incidence of HIV and Aids in Southeast Asia reflects a mixed picture. The number of new infections has decreased by over 50% in Cambodia, Myanmar and Thailand, and by between 26–49% in Malaysia. Deaths have reduced by 25–49% in Thailand, and by over 50% in Cambodia.⁸

3.2.2 The World Bank

The World Bank has an interest in the economic implications of public health. It argues that the increase in NCDs presents significant economic challenges for low

and middle income countries⁹. Those which still experience relatively high rates of infectious disease face the double burden of dealing with these whilst also addressing NCDs. Countries are also dealing with NCDs at an earlier stage of development and with fewer resources than high income countries. NCDs are affecting populations of low and middle income countries at a younger age—the average age of a cardiac arrest sufferer is 53 in these countries, compared to 59 in the rest of the world. The impact of this is that chronic diseases reduce the productivity of the working age population, stifling economic growth.

As the countries of ASEAN progress towards universal healthcare, spending on health as a percentage of GDP is gradually trending upwards, albeit still well below European Union levels. Vietnam recorded the highest healthcare expenditure as a proportion of GDP amongst ASEAN nations of 6.84% in 2010, as compared to 10.4% for the European Union. Differences in levels of GDP lead to substantial differences when these figures are converted to expenditure per capita; the European Union spends US\$ 3,368 per person, compared to a Southeast Asian high of US\$ 1,733 in Singapore, and an average of US\$ 350.

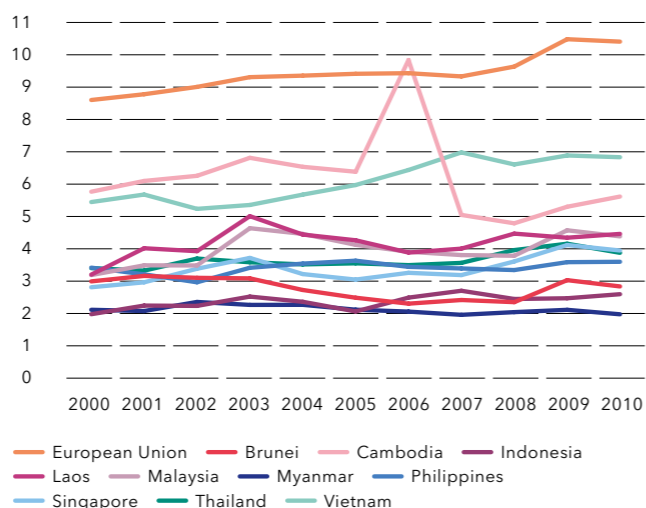


Figure 6: Health Spending as a Proportion of GDP, World Bank¹⁰

3.2.3 Association of Southeast Asian Nations (ASEAN)

ASEAN Health Ministers meet biannually to establish shared priorities. Tracking the development of the outputs from these meeting indicates an evolving interest in broader health issues beyond basic medical care and prevention of infectious diseases. The fifth Health Ministers meeting, held in Indonesia in 2000, set out the

Healthy ASEAN 2020 declaration. This stated that ASEAN leaders should “make sure that our people are assured of adequate medical care and access to essential medicines and that cooperation shall be stepped up in the control and prevention of communicable diseases, including HIV/AIDS¹¹.”

This led in turn to the ASEAN Strategic Framework on Health Development (2010–2015)¹², which focuses on four major areas; food safety, access to healthcare services, healthy lifestyles to reduce risk factors for NCDs and improve mental health, and pandemic preparedness and response. ‘Access’ is defined to include maternal and child health, migrants health, and traditional medicines as well as pharmaceuticals.

Whilst recognising the continuing importance of Healthy ASEAN 2020, the 11th Health Ministers Meeting in Thailand in July 2012 set five more specific priorities for concerted action; “tackling the increasing burden from Non Communicable Diseases”—including social determinants of health, detection and effective treatment; reducing tobacco consumption; achieving universal health coverage (UHC); getting to zero new HIV infections; and coordinating effective responses to public health emergencies—specifically Emerging Infectious Diseases (EIDs), artemisinin-resistant malaria and dengue.¹³

ASEAN Ministers of Science and Technology developed a Plan of Action on Science, Technology and Innovation (APASTI). One of the flagship programmes is intended to support R&D collaboration on infectious diseases across ASEAN, with a view to eventually developing new diagnostics and vaccines. This programme is led by A*STAR in Singapore and supported by the Ministry of Health. The Krabi Initiative 2010 also includes a thematic track on Biodiversity for Health and Wealth, which includes finding health applications for Asia's biodiversity.

Identifying a need to address diseases endemic in ASEAN through the advancement in health research and development whilst also strengthening regional cooperation (consistent with both ASEAN Harmonization towards 2015 and the Global Strategy and Plan of Action approved through the World Health Resolution WHA61.21), an ASEAN Network for Drugs, Diagnostics, Vaccines, and Traditional Medicine Innovation (ASEAN-NDI) has been initiated.

¹¹ Declaration of the 5th ASEAN Health Ministers Meeting on Healthy ASEAN 2020, 28–29 April 2000, Yogyakarta, Indonesia, <http://www.asean.org/communities/asean-socio-cultural-community/item/declaration-of-the-5th-asean-health-ministers-meeting-on-healthy-asean-2020-28-29-april-2000-yogyakarta-indonesia>

¹² Joint Statement of the 10th ASEAN Health Ministers Meeting Singapore, 22 July 2010, <http://www.asean.org/communities/asean-socio-cultural-community/item/joint-statement-of-the-10th-asean-health-ministers>

¹³ Joint Statement 11th ASEAN Health Minister Meeting, 5 July 2012, Phuket, Thailand <http://www.asean.org/images/2012/Economic/AHMM/11th%20AHMM%20Joint%20Statement%20Final.pdf>

The concept was first discussed during the 40th Meeting of the ASEAN Sub-Committee on Biotechnology (SCB) in Bali in May 2009. To lay the groundwork for this initiative, the Sub-Committee endorsed the conduct of a mapping activity to assess the product R&D landscape in the region; to know the capabilities of the ASEAN member countries on drugs, diagnostics, traditional medicine, and vaccines innovation on infectious tropical diseases; to identify gaps and opportunities in the ASEAN; to create a database of institutions, networks, and initiatives with capacities for innovation; and to provide the template for the establishment of an Asian regional network for innovation in product R&D.

With funding support from the World Health Organization Special Programme for Research and Training in Tropical Diseases (WHO-TDR), the activities of the Network were started. The mapping activity began in December 2009, and its methodology (survey, key informant interviews, and a review of the Elsevier's Scopus database), outputs and deliverables were finalized based on the agreement at the 1st ASEAN-NDI Coordinator's meeting in Manila on 21 October 2009. The results of the mapping activity were presented and discussed during a 2nd organisational meeting in the Philippines on 6 December 2010.

The results of the mapping activity showed that:

- Initiatives of most ASEAN Member States are mostly similar, thus, encouraging collaboration among countries, and coordination between the public and private sectors to address common health needs.
- Though ASEAN member states are in different stages of economic and health development with inadequate investment for product R&D and minimal research output, ASEAN has substantial human resource and institutions that can support the pursuit of R&D products.
- The ASEAN region holds a lot of potential in terms of resources for drugs, vaccines, diagnostics and traditional medicine research development.

These conclusions triggered the call for the preparation of a Strategic Business Plan (SBP) which serves as the guiding document for the operations of the Network, and tool for leveraging funds, as well as for advocating support for the ASEAN-NDI. A Task Force composed of representatives from the ASEAN member states was created as the ad hoc group who guided the development of the SBP. After several Task Force meetings including the 1st ASEAN-NDI Task Force meeting in Manila on 20 October 2013 and videoconferences relevant to the drafting and finalization of the SBP, it was finally presented during the ASEAN-NDI Stakeholders Meeting in Manila on 5 June 2013. All meetings were attended by representatives of the ASEAN member states and stakeholders. In the recently concluded ASEAN COST 65th meeting in Tagaytay, Philippines, COST-65 approved the ASEAN-NDI SBP.

⁸ UNAIDS, http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/gr2012/2012_FS_regional_asia_pacific_en.pdf

⁹ <http://siteresources.worldbank.org/HEALTHNUTRITIONANDPOPULATION/Resources/Peer-Reviewed-Publications/WBDeepeningCrisis.pdf>

¹⁰ Health Expenditure, Total (% of GDP), <http://data.worldbank.org/indicator/SH.XPD.TOTL.ZS>

3.2.4 European Union

The Directorate General for Health and Consumers has responsibility for protecting and improving public health. In the Commission White Paper 'Together for Health: A Strategic Approach for the EU 2008-2013' published in 2007, three growing challenges to European health systems were identified¹⁴.

The first of these was the challenge of demographic change – particularly aging populations and their effect on dependency ratios, with higher proportions of retired to working age citizens. This was seen to necessitate a focus on healthy aging, including promoting health throughout life. The next challenges was that of pandemics, physical and biological incidents and bioterrorism, which was accompanied with a recognition that climate change is affecting patterns of communicable disease (as can now be seen in the increasing prevalence of dengue in Europe, for example). Finally, the paper identified the opportunities offered by technological development, to improve ways in which health is promoted and illness is diagnosed, treated or prevented – although with a recognition of the challenging economic impact of new and potentially more costly treatments on public health systems. The paper also acknowledges the importance of working across sectors to address diverse causes and implications of health issues, and of global cooperation as health problems and solutions cross borders.

The agenda for European health research in Horizon 2020 is likely to reflect this, with a focus on

- understanding the determinants of health, including health promotion, surveillance and screening
- understanding disease, improving vaccines, diagnostics, treatments, and increasing use of in-silico medicine
- translating knowledge to practice on a scalable basis, with better use of data, improvements to policies, supporting individual empowerment and active aging, optimising healthcare systems and reducing inequalities.

Non-Communicable Diseases

The main health challenge for Europe is to address 'the increasing disease and disability burden in the context of an aging population', and this is likely to be reflected in Horizon 2020 with a major focus on 'Understanding the determinants of health, improving health promotion and disease prevention'.

The European Commission has made substantial investments in NCD research during FP7, largely under the Medical Research priority. 25 CVD research projects were funded during the first five years of FP7 with an

EU contribution of €163 million¹⁵. These projects include studies to improve risk assessment, diagnostic tools and therapeutic approaches for acute and chronic cases. In diabetes, €123 million has been committed to support 27 projects, covering genetics, lifestyle, links between diabetes and juvenile diseases, and the interactions between genetic factors, diet and overall health.¹⁶

Cancer research has received the largest share of NCD funding going to a single disease, with 58 projects and an EU contribution of €240 million. Funded projects look at "disease aetiology, new medicines and therapies; identifying and validating drug targets and biological markers that aid in the prevention, early diagnosis and treatment; and assessing the effectiveness of preventive prognostic, diagnostic and therapeutic interventions."¹⁷ Cancer research also features in other research areas of the framework programme, including ICT and nanotechnology, taking total investment to an estimated €500 million.

Infectious Diseases

The EC and member states have made a significant financial contribution towards addressing the challenges of Poverty Related Neglected Diseases¹⁸. Annual spending has averaged €341 million over the last four years, 27% of which comes from the European Commission¹⁹. Initiatives have included the European and Developing Countries Clinical Trials Partnership (EDCTP) which focuses on clinical research and capacity building in sub-Saharan Africa, and Product Development Partnerships (PDPs) bringing together research, industry and governments. The majority of EU investment has focused on the 'big-three' of HIV/AIDS, Malaria and TB, though the proportion of this spent on the latter two diseases is greater compared to US investment.

The European Commission has been a significant contributor to malaria research. Data from Policy Cures' G-Finder tool²⁰ indicates that the EC has spent US\$118 million over the period 2007-2011, the largest share of funding allocated to a single poverty-related infectious disease. This includes US\$50 million for basic research into malaria, and US\$30 million for the development of vaccines. Some of this work has been carried out via the European Vaccines Initiative, which has advanced 15 candidates into Phase 1a clinical trials, and has a candidate in Phase II trials in Africa.²¹ Other relevant organisations

¹⁵ http://ec.europa.eu/research/health/medical-research/cardiovascular-diseases/index_en.html

¹⁶ http://ec.europa.eu/research/health/medical-research/diabetes-and-obesity/index_en.html

¹⁷ http://ec.europa.eu/research/health/medical-research/cancer/index_en.html

¹⁸ The term Poverty Related Neglected Diseases includes HIV/AIDS, TB and Malaria, and the group of Neglected Tropical Diseases identified by the WHO; dengue, leishmaniasis, lymphatic filariasis, and 14 other diseases

¹⁹ Saving Lives, Creating Impact, DSW-PC Report

²⁰ http://g-finder.policycures.org/gfinder_report/registered/report_type1.jsp#

²¹ <http://www.euvaccine.eu/about-us-1>

¹⁴ Together for Health: A Strategic Approach for the EU 2008-2013, http://ec.europa.eu/health-eu/doc/whitepaper_en.pdf

Joint priority	Main concerns for international organisations/agencies			Covered in FP7 with ASEAN participation	Synergy with Horizon 2020 Societal Challenge 1
	EU	ASEAN	WHO		
Poverty Related Infectious Diseases	<ul style="list-style-type: none"> • Major funder of PRID research, including malaria (basic research, vaccines), HIV (microbicides, vaccines), and TB (vaccines, diagnostics, drugs) 	<ul style="list-style-type: none"> • Stepped up cooperation in control and prevention • Getting to zero new HIV infections • Flagship supporting R&D collaboration on infectious diseases 	<ul style="list-style-type: none"> • Research required on malaria vector control, vaccines, diagnostics and treatments, policy research on optimal interventions, operation research on delivery and treatment 	One FP7 HIV project with ASEAN partner (but extensive contribution from EC to PRIDs)	<ul style="list-style-type: none"> • Understanding disease • Developing better preventive vaccines • Improving diagnosis
Antimicrobial Resistance	<ul style="list-style-type: none"> • Antimicrobial resistance is a global public health concern²² • Actions include appropriate use of antimicrobials, join forces with international partners, reinforcing research 	<ul style="list-style-type: none"> • Coordinating effective responses to public health emergencies, including artemisinin-resistant malaria 	<ul style="list-style-type: none"> • Emergence of artemisinin-resistant malaria in Greater Mekong sub-region is major public health concern • High incidence of MDR and XDR TB in some ASEAN countries 	No projects	
(Re-)Emerging Infectious Diseases	<ul style="list-style-type: none"> • Improve surveillance and preparedness • Climate change affecting patterns of communicable diseases 	<ul style="list-style-type: none"> • Pandemic preparedness and response • Coordinating response to emergencies, specifically emerging infectious diseases (EIDs) and dengue 	<ul style="list-style-type: none"> • Encouraging pandemic preparedness, global vaccine supply 	Ten projects in this area, including dengue (3), influenza (3), and chikungunya	<ul style="list-style-type: none"> • Improving surveillance and preparedness • Developing better preventive vaccines • Improving diagnosis
Social Determinants of Health	<ul style="list-style-type: none"> • Understanding determinants of health, including health promotion, surveillance and screening 	<ul style="list-style-type: none"> • Healthy lifestyles to reduce risk factors for NCDs, detection and effective treatment, reducing tobacco consumption 	<ul style="list-style-type: none"> • Understand determinants of NCDs and risk factors 	Two projects specifically addressing this topic	<ul style="list-style-type: none"> • Individual empowerment for self-management of health
Optimising Healthcare Systems	<ul style="list-style-type: none"> • Translate knowledge to practice on a scalable basis • Optimising healthcare systems and reducing inequalities 	<ul style="list-style-type: none"> • Achieving universal health coverage 	<ul style="list-style-type: none"> • Translational and health systems research for cost-effective and proven strategies • Enable costly interventions in resource constrained settings 	Strong representation with seven projects	<ul style="list-style-type: none"> • Optimising the efficiency and effectiveness of healthcare systems and reducing inequalities

Table 9: Synthesis of EU and ASEAN research needs, current activities

include the Medicines for Malaria Vaccine initiative, and the Global Fund to Fight AIDs, TB and Malaria.

The European Commission has committed funding of €56 million from FP7 to 14 TB-focused projects by 2010. In the period 2007-2011 the EC spent US\$117 million on TB research, spread between vaccines, diagnostics and drugs. Approximately US\$8 million was directed to the TB vaccine initiative (TBVI), a network of 40 primarily European research centres and companies.

The European Commission has spent US\$115 million on HIV/AIDS research between 2007 and 2011. US\$70 million of this has been used to support the development of HIV vaccines, and US\$31 million to support the development of microbicides. The EC has been a major support of the International Programme for Microbicides (IPM) Product Development Partnership.

Diseases which were once thought to have been eliminated from Europe are re-emerging as public health threats, driven by increased travel and the return of disease vectors such as mosquitoes, in part because of the changing climate. These include diseases such as

dengue, a mosquito-borne virus which normally causes a flu-like illness but which can progress to a lethal haemorrhagic fever in some patients, and chikungunya. The primary vector for dengue, the *Aedes aegypti* mosquito, is well established in Italy and SE Europe, and 2,164 cases have been reported in Madeira between October 2012 and February 2013. Millions of people in ASEAN were infected with dengue fever, resulting in 6,000 deaths in 2008, and measures to prevent the spread of dengue drive significant public expenditure.

3.3 Future Research Directions

Table 9 compares the research priorities of the EU, ASEAN and World Health Organisation with the current extent of cooperation under FP7, and suggests five areas for future research collaboration. These areas are examined in more detail below.

3.3.1 Poverty Related Infectious Diseases

The Horizon 2020 proposal describes two areas with high potential for EU-ASEAN collaboration in infectious diseases: Developing Better Preventative Vaccines, and Improving Diagnosis. The EC has already invested

²² Communication from the Commission to the European Parliament and the Council Action plan against the rising threats from Antimicrobial Resistance, http://ec.europa.eu/dgs/health_consumer/docs/communication_amr_2011_748_en.pdf

heavily in these areas under Horizon 2020, particularly within the EDCTP with Sub-Saharan Africa. However, the conditions and capabilities which exist within Southeast Asia suggest that EU-ASEAN or even tripartite EU-ASEAN-Africa collaborations would be beneficial in specific areas:

- Exploring the biodiversity of Southeast Asia to discover and develop new treatments based on natural products. Develop commercialisation strategies for these which respect the rights of the communities from in which these products are located.
- There continues to be a need for research to improve anti-malaria infections (including vector control, vaccines, diagnostics and treatments), policy research to determine optimal interventions, and operational research to improve delivery and treatment.
- An important priority shared by the EU and ASEAN, and supported by activities under the EuropeAid programme, is OneHealth. This aims to link work on ecosystems, environment and human and animal health to protect the well-being of fragile populations.

3.3.2 Antimicrobial Resistance

Local conditions – including frequent and relatively uncontrolled prescribing of antibiotics and the presence of counterfeit medicines – encourage the emergence of antimicrobial resistance in Southeast Asia. In the case of artemisinin-resistant malaria, this poses a global public health risk as Artemisinin Combination Therapies (ACTs) are the primary treatment for *Plasmodium falciparum* malaria. Antimicrobial Resistance has been identified as a major risk by the European Union and member states, and there are several areas where EU-ASEAN collaboration could be productive:

- The WHO's Global Plan for Artemisinin Resistance Containment (GPARC) has four thrusts:
 1. stop the spread of drug-resistant parasites
 2. increase monitoring and surveillance of antimalarial drug resistance
 3. improve access to malaria diagnostic testing and rational treatment with ACTs
 4. invest in artemisinin-related research
- Specific research needs include "conducting in vivo parasite clearance rate studies, developing new ex vivo and in vitro antimalarial drug response assays, discovering molecular markers for resistance, creating rapid tests to measure drug quality, and discovering treatments that kill artemisinin-resistant parasites and block their transmission to mosquitoes"²³

²³ Artemisinin-Resistant Malaria: Research Challenges, Opportunities, and Public Health Implications, *Am J Trop Med Hyg.* 2012 August 1; 87(2): 231–241, Rick M. Fairhurst,* Gaurvika M. L. Nayyar, Joel G. Breman, Rachel Hallett, Jonathan L. Venerstrom, Socheat Duong, Pascal Ringwald, Thomas E. Wellems, Christopher V. Plowe, and Arjen M. Dondorp, <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3414557/>

3.3.3 (Re-)Emerging Infectious Diseases

Increasing global interconnectedness, plus the biodiversity of Southeast Asia also make the region an important partner in both the study and prevention of new and emerging infectious diseases. The EC has funded over 30 projects dealing with the threat of (re)emerging infectious diseases, including four with ASEAN partners. These projects have focused on dengue risk assessment, mapping and surveillance (IDAMS), a research framework for resisting epidemics in Europe (DENFREE), tools and strategies for the surveillance and control of dengue (DENGUETOOLS) and integration of chikungunya research (ICRES). Dispersed impacts amongst multiple European states make this a strong candidate for pan-European action.

Europe and Southeast Asia possess complementary capabilities. Europe has experience in virology and antibody development (Institutes Pasteur, CNRS, Bernhard Nocht Institute), biological vector control (Imperial College), and ecological research (CNRS). Southeast Asia has experienced research groups, public health expertise in vector control and treatments, and greater access to disease samples.

Research needs for vector borne infectious diseases include:

- Vector control – development of new, cost-effective and community based methods to reduce populations of *A. Aegypti* mosquitoes, to replace manual spraying
- Development of a vaccine candidate for dengue is complicated by the four strains of the disease. Whilst a vaccine candidate is currently in Phase III clinical trials, continued work to develop and test alternative vaccine candidates is required
- Cost-effective and rapid diagnostics for to enable diagnosis at an earlier stage, particularly in high-risk populations
- Effective antiviral treatments for infected patients

3.3.4 Social Determinants of Health

Shared research on risk factors and how to reduce them could benefit both regions. Particular attention should be paid to developing interventions that work in diverse cultural settings, plus:

- developing policies linking dietary quality to food security and research into determinants of levels of physical activity and obesity
- optimal community-based prevention models
- Special attention should also be given to tobacco control mechanisms (an area which ASEAN health ministers acknowledge is of particular importance).

3.3.5 Optimising Healthcare Systems

Southeast Asia spends a lower proportion of GDP on health, yet governments are increasingly aiming to provide universal coverage and address chronic diseases. The regions could collaborate on developing and deploying cost-effective interventions and treatments. Translational research should identify cost-effective screening strategies, cancer prevention approaches, training models for primary care workers, and strategies to improve access to critical medicines. Enabling the use of costly interventions could include developing cost-effective approaches to radiotherapy and cardiovascular surgery.

4 Food Security and Safety

Claire Khoury and Sloan Salètes, CIRAD

4.1 Introduction

Food demand will increase by 50% in the next twenty years owing to the growing global population, rising affluence and accompanying changes in dietary preferences (World Bank, 2008). The agricultural sector plays a key part in addressing the challenge to feed some eight billion humans in 2030, while preserving the environment and natural resources. Meanwhile, the World Bank pinpoints agriculture as the most credible way of significantly alleviating poverty, ensuring political stability and avoiding conflict (World Bank, 2007).

The Asia Pacific region is home to 57% of the world's population and 73% of the world's agricultural population in only a third of the world's farmland. However, the region is responsible for 90% of world rice production, 40% of cereal production, 40% of meat production, and accounts for 70% of global market vegetables and 80% of aquaculture. Despite this, 63% of the world's population living below the poverty line and suffering from famine lives in the region (Hoste, 2012).

In ASEAN, regional food preferences, export traditions, and geographical conditions combine to make food security a particularly pressing issue. About 35% of the region's GDP comes directly from agriculture, but beyond economic productivity, farming is part of daily life in the region and remains a strong part of cultural identity.

ASEAN countries also export large quantities of staple food products to Europe. Rice is a principle crop and a major export commodity from many ASEAN countries. Thailand is the world's largest exporter of rice, contributing 10 million of the 30 million tons of rice traded annually. For both Southeast Asia and Europe, a clear benefit would therefore arise from providing high quality and affordable food along the whole agrifood chain (production, harvesting, processing and distribution).

In this context, joint EU-ASEAN agricultural and food research is one of the best ways to assist in solving key problems such as eradicating poverty and hunger, preventing conflict and making food accessible, varied, safe and affordable. Issues coming up in Southeast Asia may also apply to Europe and solutions to problems in

Europe may be found in Southeast Asia. Additionally, innovative food research will remain a key factor for competitiveness, jobs, sustainable growth and social progress both in Europe and Southeast Asia.

For Europe, building S&T collaboration with Southeast Asia to jointly improve food security could be driven by two factors:

- A good dynamic on S&T EU-ASEAN co-publication in agriculture and food research
- A relatively low rate of ASEAN countries participation in the Framework Programmes launched by the DG RTD of the EU compared to other Third Countries

4.2 EU-ASEAN collaboration in food and agriculture research

The number of publications in food, agriculture and biotechnology journals which include an author from both the EU and ASEAN has increased from 372 in 2000 to 2,170 in 2012 (Figure 7).

Publications related to food, agriculture and biotechnology topics amount to 1/3 of the total publications published within this period (proportion similar to the thematic "health").

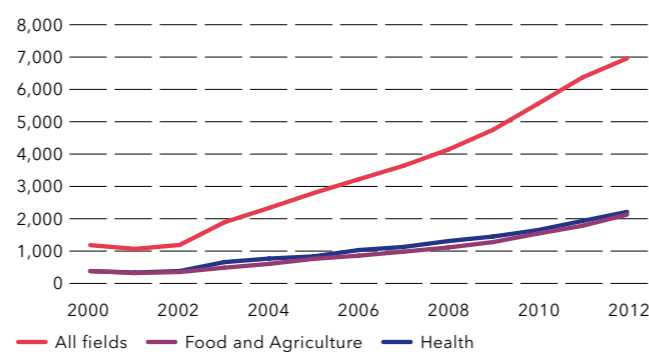


Figure 7: Number of EU-ASEAN co-publications from 2000 to 2012
Source: Scopus – retrieved by ZSI in February 2013
Definition: EU=EU27+NO, CH, TR. ASEAN=10 ASEAN Member States

European organisations				Southeast Asian organisations			
Country	Records	%	Country	Records	%		
Wageningen University and Research Centre	NL	656	4.6%	National University of Singapore	SG	1,109	7.7%
CIRAD	FR	322	2.2%	Mahidol University	TH	690	4.8%
Imperial College London	GB	290	2.0%	International Rice Research Institute	Int'l	539	3.8%
University of Oxford	GB	286	2.0%	Chiang Mai University	TH	484	3.4%
Sveriges Lantbruksuniversitet	SE	280	2.0%	Kasetsart University	TH	447	3.1%
University of Cambridge	GB	270	1.9%	Universiti Putra Malaysia	MY	418	2.9%
Universiteit Gent	BE	225	1.6%	Chulalongkorn University	TH	400	2.8%
Universität Hohenheim	DE	219	1.5%	Nanyang Technological University	SG	364	2.5%
Karolinska Institutet	SE	210	1.5%	University of Malaya	MY	339	2.4%
Utrecht University	NL	207	1.4%	Khon Kaen University	TH	287	2.0%
WHO	Int'l	199	1.4%	Prince of Songkla University	TH	254	1.8%
University of Nottingham	GB	192	1.3%	Universiti Sains Malaysia	MY	236	1.6%
Universität Göttingen	DE	181	1.3%	CIFOR	Int'l	229	1.6%
London School of Hygiene & Tropical Medicine	GB	176	1.2%	Can Tho University	VN	217	1.5%
University College London	GB	175	1.2%	Yong Loo Lin School of Medicine	SG	202	1.4%

Table 10: Top 15 organisations involved in EU-ASEAN co-publications

The Netherlands and France host two of the most productive organizations in term of co-publications with Southeast Asian partners: Wageningen University and Research Center and CIRAD. Both have a long tradition of S&T cooperation with tropical and sub-tropical countries with research focusing on life, social and engineering sciences applied to agriculture, food and rural areas (Table 10). British, German and Swedish universities are also rather productive and active in Southeast Asia. The list of Southeast Asian organisations is dominated by Singapore, Thailand and Malaysia. Two centers of the CGIAR (formerly the Consultative Group on International Agricultural Research) – the International Rice Research Institute in the Philippines and CIFOR in Indonesia – are also among the most productive organizations in terms of co-publications with Southeast Asian countries.

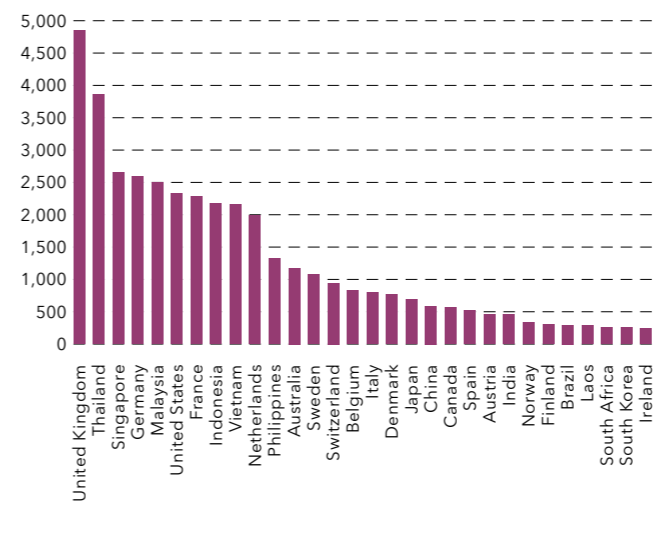


Figure 8: Top 30 involved countries in EU-ASEAN co-publications
Source: Scopus – retrieved by ZSI in February 2013
Definition: EU=EU27+NO, CH, TR. ASEAN=10 ASEAN Member States

The United Kingdom and Thailand are the leading countries in Europe and Southeast Asia respectively in terms of the volume of EU-ASEAN co-publications. The USA, Australia, Japan and China are the leading non-EU-ASEAN countries authoring EU-ASEAN co-publications.

The peer-reviewed open access Journal "Plos One" is the most heavily used to disseminate joint EU-ASEAN research results. Publications rates related to aquaculture concerns (in journals like "Aquaculture" or "Aquaculture Research") show a good scientific dynamic in this area.

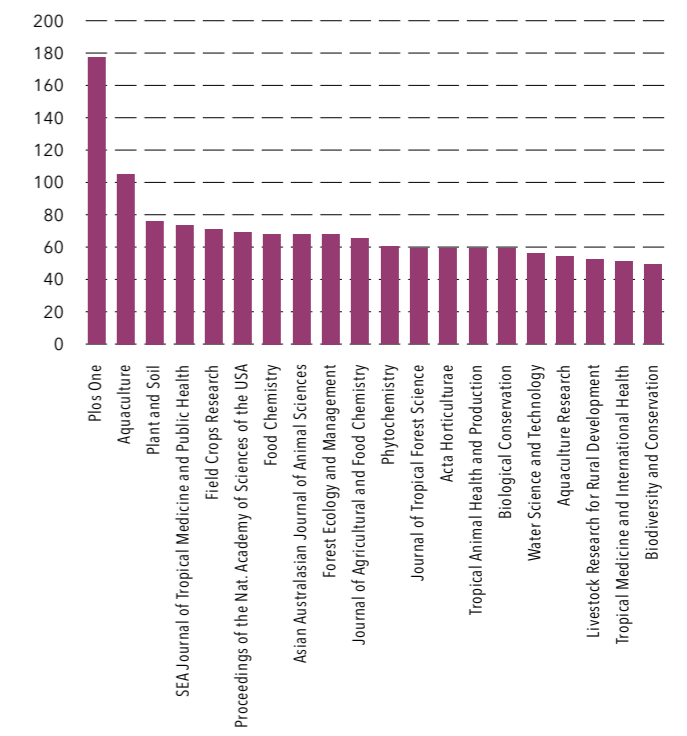


Figure 9: Most commonly used journals for EU-ASEAN co-publications
Source: Scopus – retrieved by ZSI in February 2013
Definition: EU=EU27+NO, CH, TR. ASEAN=10 ASEAN Member States

The most studied commodities in joint EU-ASEAN research are rice, timber, fish/aquaculture, swine, cattle, maize and oil palm (Table 11).

Rice	436
Forestry/Tropical forest	376
Fish/Aquaculture	345
Swine	191
Cattle	197
Maize	155
Oil palm	55

Table 11: Top 7 commodity value chains cited as keywords in EU-ASEAN co-publications. Source: Scopus – retrieved by ZSI in February 2013
Definition: EU=EU27+NO, CH, TR. ASEAN=10 ASEAN Member States

4.2.1 Participation of ASEAN countries in FP7

International cooperation in the FP7 Food Agriculture, Fisheries and Biotechnology theme has mainly been carried out with industrialized third countries (USA, Canada, Australia, New Zealand), Eastern European and Central Asian Countries (Russia, Ukraine), Africa (South Africa, Kenya, Ghana...), the Mediterranean (Morocco, Tunisia, Egypt...), Latin American countries (Brazil, Argentina, Mexico...) and China and India. ASEAN ranks below these partner countries (Figure 10).

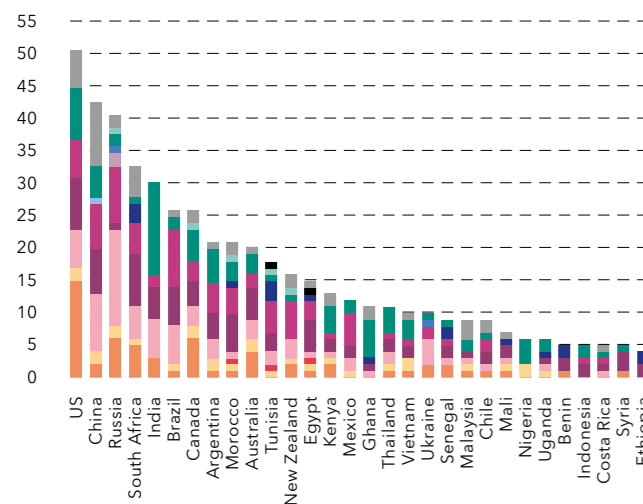


Figure 10: Top 30 participation of Third Countries in ranked proposals (main list for selection for funding) under the FP7 KBBE 2007-2012 main and related calls. Source: European Commission - DG RTD - Directorate D - International Cooperation - March 2013

The leading ASEAN country is Thailand, ranked 17th of third countries in shortlisted proposals under FP7 KBBE calls. Taking into account all thematic areas, Thailand ranks 25th in the number of participations and 22nd in budget share among third countries in all FP7 signed grant agreements (as of February 2013). The 218 applicants from Thailand amount to only 0.75% of third countries, and the requested EC financial contribution was 1.07% of the total budget requested by Third Countries. Other ASEAN member states are even lower ranked.

In Asia, International Cooperation with FP7 is mainly focused on China and India which gather more than 60% of the total participation of Asian countries in ranked proposals under the 2007-2012 KBBE calls (Figure 11).

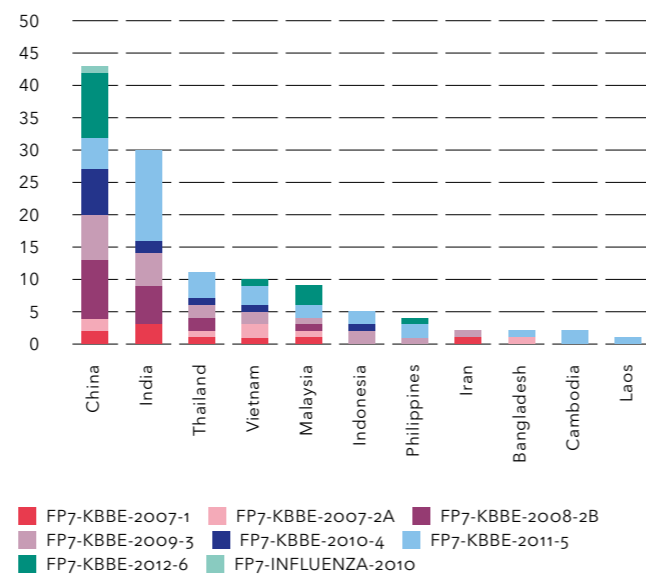


Figure 11: Participation of Asian countries in ranked proposals under the 2007-2012 KBBE calls. Source: European Commission - DG RTD - Directorate D - International Cooperation - March 2013

ASEAN participation amounts to only 5% of total participation by third countries in ranked proposals under the 2007-2012 KBBE calls (Figure 12).

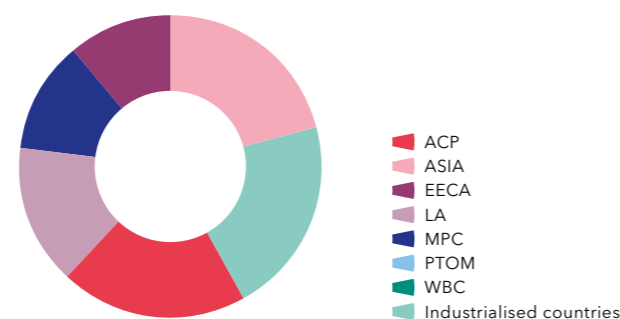


Figure 12: Third Countries Participations in ranked proposals under the 2007-2012 KBBA calls. Source: European Commission - DG RTD - Directorate D - International Cooperation - March 2013

Concern/Area	No. of funded projects	Challenge/Scientific topics
Aquaculture	4	Consolidated alliances in aquaculture
		Aquaculture and food security
		Sustainable trade in ethical aquaculture
Food safety and quality	3	Impact of climate change on food safety
		Strengthening cooperation in food safety research
		Food safety and quality related to parasites in seafood
Biorefinery	3	Sustainable certification and socioeconomic implications
		Biowaste management
		Plant photosynthetic efficiency
Functional food	2	Fishery products and functional food
		New sources of food additives and novel functional foods
Nutrition and global health	2	Sustainable micronutrient interventions to control deficiencies
		Natural products from marine fungi for the treatment of cancer
Food processing	2	Reduction of post-harvest losses
Optimised animal health & production	2	Porcine Reproductive and Respiratory Syndrome (PRRS)
		Precision livestock farming
Forestry	1	Valuing and marketing forest externalities
Non thematic	2	BIO NCP networks

Table 12: Number of funded projects with successful Southeast Asian participants under the FP7 KBBE 2007-2013 main and related calls

Despite a long tradition of developing joint research, good dynamics in EU-ASEAN co-publication in food and agriculture research and numerous universities and research centers performing excellent science in the food sector, the 2007-2012 KBBE calls of the FP7 have provided relatively few opportunities for a significant ASEAN participation compared to other regions in the world.

4.2.2 Scientific topics already covered by an EU funding through EU-ASEAN research project

The analysis of the topics dedicated to Southeast Asia and/or with successful Southeast Asian participants (calls KBBE 2007-2013 and corresponding funded projects 2007-2012 plus other funded projects with successful Southeast Asian participants 2007-2012) given in Annex III – KBBE Projects shows that eight scientific areas are tackled by joint EU-ASEAN projects funded by the European Commission (Table 12).

- 7 projects were funded under the activity “Sustainable production and management of biological resources from land, forest and aquatic environments” in which animal production, with a strong emphasis on aquaculture) were the predominant production system
- 9 projects were funded under the activity “Fork to farm: food, health and well-being” particularly food safety issues, functional food and nutrition, here again with a focus on seafood and aquaculture products
- 3 projects were funded under the activity “Life sciences, biotechnology and biochemistry for sustainable non-food products and processes”.

4.3 Developments in ASEAN affecting food security research (from Hoste, 2012)

The global changes below have direct impacts on food security and safety research in ASEAN:

- Increasing food and nutrition insecurity as a consequence of high population densities and the presence of 642 million people living below the poverty line
- Impact of the global economic crisis and market instability: domestic food products have undergone average inflation in Asia of between 10 and 20% in 2011. According to the Asian Development Bank (ADB, 2011), a 10% increase in food prices leads to 64 million more people into extreme poverty in developing countries in Asia.
- Rapid growth of urbanization: in 2050, 63% of the population in Asia will live in urban areas. Rising affluence amongst the middle classes in the ASEAN region is associated with changes in food consumption patterns, looking for quality products of good health or towards diets that are richer in meat, dairy, and seafood.
- Climate change: the occurrence of more frequent and intense extreme events leads to increased health risks (emerging diseases, zoonoses, etc.), pressure on biodiversity and greater vulnerability for populations. The Pacific Ocean and the topology of the ASEAN region renders crops vulnerable to variations in typhoons and El Niño Southern Oscillation (ENSO) dynamics, increased flooding, and increased salinity and long droughts. In 2011, 42% of natural disasters took place in Asia, with 90% of

casualties and 73% of those affected from this region. Finally, many islands and coastal regions are less than 10 meters above sea level and the latest reports from the Intergovernmental Panel on Climate Change (IPCC) report of a rise in sea level of between 18 and 60 cm by 2100, threatening rice basins and the deltas of the great Asian rivers.

- Increasing land pressure on available land. The consequences are rapid degradation (erosion, loss of fertility), deforestation, conversion of agricultural land to industrial areas or large plantations (oil palm, rubber), competition between food and energy and very strong competition for water resources.

4.4 Priorities of main international agencies regarding food security challenges in ASEAN

The international agencies which have cooperation programmes in ASEAN are aware of the impact of these changes on food security, and their 2020–2030 strategies agree that future food security challenges will include population growth, pressure on natural resources and ecosystem services, and adverse impacts of climate change on agriculture, affecting growing conditions and making adaptation measures necessary.

Main international agencies such as the European Commission, Asian Development Bank, FAO, and ASEAN have defined priorities regarding food security challenges in Southeast Asia as follows:

4.4.1 The European Union (EU)

In a general communication in 2010 on an EU policy framework to assist developing countries in addressing food security challenges (European Commission, 2010), the EU has identified four pillars to address food security challenges in developing countries (including developing countries in Asia); increasing availability of food, improving access to food, improving nutritional adequacy of food intake and enhancing crisis prevention & management. While all four pillars should be addressed, the EU prioritises four main levels of action: smallholder agricultural development, governance, regional integration and assistance mechanisms for vulnerable populations. In these areas, the EU and its member states should:

- Improve smallholder resilience and rural livelihoods. The EU should focus on ecologically efficient agricultural intensification for smallholder farmers, substantially increase support to demand-led agricultural research for development, extension and innovation (relying on traditional knowledge and new technologies); encourage greater participation of civil society and farmer organizations in policy making and research programs and

increase their involvement in the implementation and evaluation of government programs; improve the regulatory and institutional conditions for responsible private investments in all stages of the agricultural value chain and stimulate public-private investments.

- Support effective governance
- Support regional agriculture and food security policies. The EU should support the development and implementation of regional level agricultural policies and strategies, including on livestock management and food safety, to step up integration of regional food and agricultural markets. The EU should also enhance policy dialogue with regional organizations on agriculture, food security and nutrition, as well as regional and national information systems in support of agriculture, food security and nutrition policies, and those for early warning purposes.
- Strengthen assistance mechanisms for vulnerable population groups. The EU should support countries to establish and operate targeted and flexible social transfer policies adapted to local contexts. The EU has an objective to promote better integration of nutrition in development policies, including in education & health and related capacity building, and provide specific support to countries in transition and fragility using LRRD principle (Linking Relief and Rehabilitation to Development).

4.4.2 The Asian Development Bank (ADB) and the Asia-Pacific-Association of Agricultural Research Institutions (APAARI)

In their operational plan for sustainable food security in Asia and Pacific (2008–2012), ADB has set out three main pillars to tackle food security challenges. These three pillars have been confirmed as priorities for research investment by APAARI through a regional consultation on agricultural research for development in Asia and the Pacific (APAARI, 2009).

ADB and APAARI both define the following thematic research priorities for the Asia-Pacific Region:

- Productivity enhancement and sustainability for food and nutritional security and poverty alleviation, particularly in food staples and those that will diversify incomes from the farm sector through use of science and technology;
- Improved value chain development and management (prevention of post-harvest losses, food safety and quality): improving connectivity among producers, particularly small households and farm households headed by women, food and agriculture industries, markets, and consumers—particularly poor urban and rural food purchasers
- Increased resilience in two major areas: climate change, and those resulting from economic shocks (market volatility)

In its 2020 strategy, ADB will mainly tackle food security challenges through initiatives to support climate resilience and sustainability to enhance resource management (Strategy 2020, The Long-Term Strategic Framework of the Asian Development Bank, 2008–2020).

More specifically, the Southeast Asian sub-region study (Raitzer et al., 2009) quantified expected and historical levels of benefits for the poor and the environment from different areas of research and contrasted relative expected impact potential with current relative allocations across research areas.

The analysis found key gaps between current investments and expected impacts on productivity by enhancing research in Southeast Asia on targeted agricultural products such as rice, vegetables, fruit and aquaculture.

Crop genetics following eco-friendly principles and primary and secondary post-harvest processing on farm/locally to increase shelf life for reducing post-harvest losses and quality to buyer's specification have been identified as key actions

4.4.3 The Food and Agriculture Organization (FAO)

Through its "Regional priority framework for Asia and the Pacific 2010–2019", FAO has identified 5 strategic priorities to address food security in the Asia-Pacific area:

Strengthening food and nutritional security, for which key objectives are to contribute to the eradication of hunger and malnutrition in Asia and the Pacific region in line with the targets of the World Food Summit (WFS) and the Millennium Development Goals (MDGs), and to support regional initiatives towards meeting these goals. The primary tools will be an analysis of vulnerable populations, improved means of information gathering and dissemination, institution building, policy dialogue, situation analysis, advocacy, partnerships and strengthening South-South collaboration. Expected results include an improved policy environment for food and nutritional security, improved policy and technical support, reports on food security issues and strengthened cost-benefit analyses.

Fostering agricultural production and rural development, key objectives of which are to increase agricultural output and productivity, raise rural living standards, improve market access and support agribusiness. The primary tools will be the increased use of new technologies, technical support to members and sub-regions, support to agribusiness and capacity building. Expected results include enhanced policy prescriptions, strengthened research facilities, boosted institutional capacity and promotion of knowledge exchange

Enhancing equitable, productive and sustainable natural resource management and utilization, which key objectives are to reduce natural resource degradation to a sustainable level, increase resource productivity and conserve genetic resources. The primary tools will be capacity building and technical support, gender mainstreaming, strengthening national capacities, regional

collaboration and policy guidance. Expected results include regional assessment and monitoring, capacity building, improved water management, ecosystem-based regional fishery management and effective participatory approaches to forest and biodiversity protection.

Improving capacity to respond to food and agricultural threats and emergencies, which key objectives are to facilitate a shift in emphasis from purely emergency response towards broad-based and concerted disaster risk reduction, preparedness and prevention programmes, with emergency response followed by linking relief and rehabilitation to development (LRRD) to mitigate long-term impacts. Primary tools will be better management information systems, collaboration and partnership on regional mechanisms, advocacy and technical assistance and regional networking and capacity building. Expected results include enhanced capacity, better regional collaboration and networking mechanisms, technical support and capacity building, practical technologies and innovations in disaster risk reduction; linking relief and rehabilitation to the development (DRR-LRRD) spectrum with improved approaches to resettlement and rehabilitation of internally displaced persons.

Coping with the impact of climate change on agriculture & food and nutritional security, for which key objectives are to identify innovative technologies and appropriate practices for coping with the adverse impacts of climate change, and to reduce the contribution of agriculture to GHG emissions while improving its role as a carbon sink. Primary tools will be assistance with policy formulation, technical assistance and capacity building support, advocacy, case studies in selected major food production areas on the impact of climate change, and dissemination of suitable technical options and practices. Expected results include a strengthened FAO contribution to policy dialogues and technical cooperation, exchange of information on research and development of climate change-resilient varieties, development of agricultural strategies with strong potential for climate change adaptation and mitigation, identification and promotion of improved crops, aquaculture and livestock production systems and practices contributing to reduced GHG emissions.

4.4.4 The Association of Southeast Asian Nations (ASEAN)

To enhance the international competitiveness of food and agriculture and forestry products as well as further strengthen food security arrangements in the region, ASEAN has defined seven priority areas for regional cooperation (ASEAN, 2008):

- Strengthening food security in the region
- Facilitation and promotion of intra and extra ASEAN Trade in agriculture and forestry products
- Generation and transfer of technology to increase productivity and develop agribusiness

Joint priority	Main concerns/specifies for international organisations/agencies			ASEAN	Covered in the FP7 with ASEAN participation	Synergy with EU roadmap for implementing H2020 Specific Programme for Societal Challenge 2*	
	EU	ADB/APAARI	FAO			Activity/Sub-Activity	Main Line/International approach
Enhance productivity of food and agriculture	<ul style="list-style-type: none"> Ecologically efficient agricultural intensification Extension and innovation Stimulate public-private investments 	<ul style="list-style-type: none"> Productivity enhancement and sustainability, applicable to the local area farming systems: rice, vegetables, fruit and aquaculture Use of crop genetic following eco-friendly principles 	<ul style="list-style-type: none"> Increase resource productivity & conserve genetic resources New technologies & technical support, support to agribusiness & capacity building Improved water mgt, ecosystem-based regional fishery mgt & participatory approaches to forest & biodiversity protection 	<ul style="list-style-type: none"> Transfer of technology Management & conservation of natural resources 	Poorly	Activity: Sustainable agriculture and forestry Sub-Activity: Increasing production efficiency and coping with climate change, while ensuring sustainability and resilience	Main Line: Genetic resources & biodiversity in agriculture Cooperation with developing countries (MDGs) and international bodies such as FAO Main Line: Resource efficient & productive farming Cooperation with countries with strong agriculture
Improving the resilience of the agriculture & rural sectors against the impacts of climate change	<ul style="list-style-type: none"> Improve smallholder resilience 	<ul style="list-style-type: none"> Resilience of the agriculture and rural sectors against the impacts of climate change and associated climate variability 	<ul style="list-style-type: none"> Reduce contribution of agriculture to GHG emissions while improving its role as a carbon sink Agricultural strategies with strong potential for climate change adaptation Development of climate change-resilient varieties 	<ul style="list-style-type: none"> Strengthening ASEAN cooperation 	Poorly	Activity: Unlocking the potential of aquatic living resources Sub-Activity: Developing competitive and environmentally friendly European aquaculture	Main Line: Preventing and controlling pests & diseases Cooperation: relevant worldwide (industrialised and developing (MDGs)); IPM and animal health for EU-China Main-Line: Ecosystem approach to aquaculture: exploring the two-ways interactions between aquaculture & the ecosystem to achieve environmental integration Transatlantic Marine Cooperation + Asia, Latin Africa, Africa Main-Line: Animal health and disease prevention and mitigation more predictable aquaculture Cooperation with industrialised countries and Asia, Latin America, Africa
Improving value chain development & management	<ul style="list-style-type: none"> Increasing availability of food & improving access to food 	<ul style="list-style-type: none"> Prevention of postharvest losses, food safety and quality; 	<ul style="list-style-type: none"> Analysis of vulnerable populations Increasing use & transfer of new technologies Support to agribusiness and capacity building 	<ul style="list-style-type: none"> Facilitation and promotion of intra and extra ASEAN Trade in agriculture and forestry products Develop agribusiness and silvo business 	No	Activity: Sustainable agriculture and forestry Sub-Activity: Providing ecosystem services and public goods	Main-Line: Better understanding food security issues at EU and world levels Cooperation with international bodies such as FAO, OECD
Response to food & agricultural threats and emergencies	<ul style="list-style-type: none"> Regional and national information systems in support of agriculture, food security and nutrition policies, and those for early warning purposes 	<ul style="list-style-type: none"> Increased resilience from economic shocks (market volatility) 	<ul style="list-style-type: none"> Better management information systems, collaboration & partnership on regional mechanisms Regional networking & capacity building Practical technologies & innovations on DRR-LRRD 	<ul style="list-style-type: none"> Human resource development Strengthening ASEAN cooperation 	Poorly	Activity: Sustainable and competitive agrifood sector for a safe & healthy diet	Main-Line: The limitation of negative impacts of consumption patterns on the environment: Facilitating sustainable consumption patterns Cooperation with industrialised & developing countries
Supporting public policies aimed at reducing structural inequality and poverty	<ul style="list-style-type: none"> Support effective governance Support regional agriculture and food security policies Strengthening assistance mechanisms for vulnerable population groups 	<ul style="list-style-type: none"> Promoting infrastructures that link farmers to markets; Market outreach through building networks and partnerships 	<ul style="list-style-type: none"> Strengthening South-South collaboration Improving policy environment for food & nutritional security Gender mainstreaming Strengthening national capacities 	<ul style="list-style-type: none"> Private sector involvement & investment 	No		
Strengthening food safety and nutritional security	<ul style="list-style-type: none"> Improving nutritional adequacy of food intake 	<ul style="list-style-type: none"> Sustainability for food and nutritional security and poverty alleviation, particularly in food staples and those that will diversify incomes from the farm sector through use of science and technology 	<ul style="list-style-type: none"> Increasing use of new technologies Technical support to members & subregions Support to agribusiness & capacity building. Boosting institutional capacity & promotion of knowledge exchange 	<ul style="list-style-type: none"> Functional food 	Yes	Activity: Sustainable and competitive agrifood sector for a safe & healthy diet Sub-Activity: Healthy and safe foods and diets for all	Main-Line: A healthy diet for the maintenance of good health/to optimise health through the lifecourse Main-Line: Prevention of non-communicable diseases and disorders through improved diet and lifestyle Cooperation with industrialized (diet disease) &, developing countries (food security)

Table 13: Synthesis of the synergies of food security priorities for the main international organizations/agencies and cross analysis with indicative activities, main lines and opportunities for international cooperation for the Societal Challenge 2 of [Horizon 2](#)

- Agricultural rural community and human resource development,
- Private sector involvement and investment
- Management and conservation of natural resources for sustainable development
- Strengthening ASEAN cooperation and joint approaches in addressing international and regional issues.

In 2009, ASEAN has adopted an Integrated Food Security (AIFS) Framework and Strategic Plan of Action on Food Security (SPA-FS) to embrace food security as a matter of permanent and high priority policy and to encourage partnership with concerned institutions, agencies, dialogue partners and international organizations.

Research and development is mentioned as one of the implementation mechanisms among other actions such as exchange information, crop production, post-harvest and handling, training and extension, trade promotion in the areas of crops, livestock, fisheries and forestry.

Functional food is among the first scientific concerns that has been put into an integrated S&T programme to be jointly tackled by the ASEAN countries in order to achieve the ASCC Blueprint 2009–2015 objectives (to realise an ASEAN Community that is people-centred and socially responsible with a view to achieving ensuring solidarity and unity among the nations and peoples of ASEAN). The goal of this program is to set up a strong ASEAN research network on functional foods, operational by 2015.

4.5 Synergies and analysis of food security priorities among international agencies

Table 13 gives a synthesis of the synergies of food security priorities for the EU, ASEAN, FAO, ADB and APAARI.

*Challenge 2 = Food Security, Sustainable Agriculture, Marine and Maritime Research and the Bio-Economy given in the roadmap for implementing Horizon 2020 Specific Programme by the EU (roadmap non-published by the EU).

In the two last columns, the table matches these priorities with indicative activities, main lines and opportunities for international cooperation from Societal Challenge 2 – “Food Security, Sustainable Agriculture, Marine and Maritime Research and the Bio-Economy” from the roadmap for implementing the Horizon 2020 Specific Programme.

4.6 Conclusions

Food and agricultural research in its broadest sense is one of the ways to help solve key problems such as eradication of poverty and hunger, prevention of conflict and making food accessible, varied and safe.

On both a local and a global scale, EU and ASEAN public and private research sectors need to work on those questions likely to trigger innovation processes in societies or linked to the production or preservation of public goods. Besides, addressing jointly the global

challenge of food security and safety and taking up Southeast Asian context and research capacities should contribute to build the European Knowledge Based Bio-Economy by bringing together European and Southeast Asian science, industry and other stakeholders, to exploit new and emerging research opportunities that address social, environmental and economic challenges.

From the analysis of the synergies of international agencies’ priorities and ASEAN specificities and research capacities, at least four main axes of research might be defined to structure EU-ASEAN joint S&T cooperation:

4.6.1 Helping to develop ecologically intensive agriculture to feed Europe and Southeast Asia

Increasing agricultural production is still a major priority for Europe and Southeast Asia but agricultural systems should break with the conventional agricultural model in which systems are increasingly artificial and uniform,

and should be designed to use ecological processes and functions.

The EU should benefit from major scientific skills and experience of ASEAN regarding key topics and commodities that seem to have a clear mutual added-value for both Europe and Southeast Asia:

Diversified, adaptable plant breeding with rice as a crop model, as rice is the principle crop and major export of many ASEAN countries. EU-ASEAN cooperation will support efforts to achieve sustainability of primary food production in Europe as well as in other regions. As such, it will be of use for producers of other cereals and will ensure steady supply of cereals for the consumers. These activities might build upon the existing networks and research capacities of the International Rice Research Institute (IRRI) based in the Philippines, Cuu Long Rice Research Institute (Vietnam), the Department of Rice Research (Thailand) and others.

Examples of relevant topics for EU-ASEAN collaboration in this area were identified by the SEA-EU-NET project (2008–2012): “Exploiting genetic diversity of major cereals for sustainable intensification of agriculture production under climate change constraints” (SEA-EU-NET, 2010, Annex 2)

Designing ecologically intensive aquaculture systems, as ASEAN’s seafood production will have to increase in order to meet both the EU and ASEAN’s demands. Half of EU aquaculture products are now imported, the majority of which come from Southeast Asia, and the balance of trade of EU with Asia is already in deficit by € 3.97 billion. At the same time, Asia is also experiencing a rapidly increasing local demand for aquatic products from its own middle class, creating imbalances and food security risks for seafood. In the EU, consumers also increasingly need to have confidence in the way their food is produced, especially since geographical and cultural distance make the link between producers and consumers relatively weak for globally traded products. The activities will build upon the FP7 projects ASEM Aquaculture Platform, SEAT Project, AFSPAN, SARNISSA and AQUAMED as well as on research capacities from the Asian Institute of Technology (AIT), Kasetsart University (Thailand), Can Tho University (Vietnam), SEAFDEC, SEARCA, the University of Visayas, Bureau of Fisheries and Aquatic Resources (Philippines), and WorldFish (Malaysia).

Examples of relevant topics for EU-ASEAN collaboration in this area were identified by the SEA-EU-NET project (2008–2012): “Ecological intensification of aquaculture systems in a changing and uncertain world” (SEA-EU-NET, 2010, Annex 2)

Enhancing the sustainability of cash-crops (oil palm, rubber, cassava...) through research and S&T collaboration. The dramatic expansion of tree-crop areas in Southeast Asia (85% of palm oil is produced in Malaysia and Indonesia) has been subject to heavy criticism in the last decade, particularly in Europe, regarding the environmental and social impact of this development.

These activities might build upon expertise from national research institutions experienced in oil palm R&D in Southeast Asia (IOPRI in Indonesia, PORIM and MPOB in Malaysia, OPRC in Thailand, INPI in Singapore, etc.), as well as environmental and social NGOs, private companies from Southeast Asia – some of whom have already been working on methods and tools to evaluate environmental impact – and European commodity importers.

An example of a relevant topic for EU-ASEAN collaboration in this area was identified by the SEA-EU-NET project (2008–2012): “Guaranteeing policy and economic tools efficiency to mitigate environmental impacts of the trade flows between Europe and Southeast Asia” (SEA-EU-NET, 2011, Annex 2).

4.6.2 Innovating, to make food accessible, varied and safe

Joint research on contaminants, nutrition & health and organoleptic qualities of staple foods exported from Southeast Asia to Europe would clearly have an added-value for the EU. Concerns about food safety in export markets requires compliance with food safety standards by the food industry in ASEAN. The aim is to minimize the risks associated with the presence of toxic contaminants (e.g. by developing systems requiring very little pesticide input or using organic farming systems), or linked with the presence of toxinogenic contaminants (eg. by developing crop management sequences or storage conditions that would hamper mycotoxin development) of products that are sold to European markets. EU-ASEAN collaboration could tackle issues like the development of rapid methods for the screening of mycotoxins of relevance in the whole supply chain; enabling, also through the organization and/or participation at proficiency tests or interlaboratory studies ASEAN industry and/or public laboratories to perform food control by reliable analytical methods complying with international trading.

The activities might build upon previous FP projects outputs like FP7 “MYCORED” project (www.mycored.eu), FP6 NoE “MoniQA” (www.moniqua.org) or FP6 SELAMAT (www.selamat.net) that already have interactions (previous training courses and conferences in Southeast Asia) and scientific expertise from ASEAN universities and research centers like University Gadjah Mada, SEAMEO BioTrop and SEAFast Center (Indonesia), Universiti Putra and University Sains (Malaysia), Nong Lam University (Vietnam), Chulalongkorn University, BIOTEC and AIT (Thailand).

An example of relevant topic for EU-ASEAN collaboration in this area identified by the SEA-EU-NET project (2008–2012): “Accessibility of Safe Food by Food Insecure Households” (SEA-EU-NET, 2011, Annex 2).

4.6.3 Foreseeing and managing infectious disease risks linked to wildlife and domestic animals

70% of emerging diseases are of animal origin. With increased trade and climate change, health risks have become global, and are a crucial issue in Southeast Asia due to the high urbanization rate and dramatic expansion of livestock production. Multi-sectoral cooperation and strong partnerships between Europe and Southeast Asia will contribute to preventing, detecting, containing, eliminating, and responding to animal and public health risks attributable to zoonoses and animal diseases with a major impact on food security.

The activities could build upon the Grease network “Management of emerging epidemiological risks in Southeast Asia” (<http://www.grease-network.com/>) which is developing synergies among European and ASEAN research institutions on Transboundary Animal Diseases (TADs) and Emerging Infectious Diseases (EIDs) at the interface between research, training & education. Activities might also build upon scientific excellence in this area from several universities and research centers like Kasetsart University and Mahidol University (Thailand), Institut Pasteur (Lao PDR and Cambodia), the National Institute for Veterinary Research (Vietnam), SEARCA, SEAMEO (Philippines), the Royal Veterinary College (UK), FAO and OIE.

An example of relevant topic for EU-ASEAN collaboration in this area identified by the SEA-EU-NET project (2008–2012): “Anthropogenic changes and emerging diseases: a ‘One health’ approach” (SEA-EU-NET, 2010, Annex 2).

4.6.4 Supporting public policies aimed at reducing structural inequality and poverty

Structural inequalities associated with “underdevelopment” have concerned the international community since the UN Millennium Development Goals were set out. It is clear that both policy regulation and mobilization of civil society will be required to reduce these structural inequalities in the poorest ASEAN countries. Public policy, like any other change factor, must be a priority focus of joint research and EU support. This means that public, local, national and international action should be jointly reconsidered by Europe and Southeast Asia and its scope broadened to cover several new issues that are commonly handled by agricultural research. A particular emphasis should be done on issues of nutritional quality – ensuring that the poorest populations have access to nutritious food.

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5 Water Management

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Water security presents a major global challenge for the future owing to a rapidly growing and unsustainable demand for water, increasingly urbanised populations, the effects of climate change and rapid shifts in land use. Global water demand has tripled in the past 50 years and just 2.5% of the world's water is fresh water, of which only 0.4% is available and accessible for use²⁴ ²⁵. Water is intrinsically linked to the most immediate challenges we face today including food security, health, climate change, economic growth, and poverty alleviation²⁶.

The United Nations projects that by 2025, half of countries worldwide will face water stress or outright shortages. By 2050, three out of four people around the globe could be affected by water scarcity²⁷. Water problems in Asia today are severe—one in five people (700 million) do not have access to safe drinking water and half of the region's population (1.8 billion people) lacks access to basic sanitation. Although Asia is home to more than half of the world's population, it has less freshwater—3,920 cubic meters per person per year—than any continent other than Antarctica. As population growth and urbanization rates in the region rise, the stress on Asia's water resources is rapidly intensifying. Climate change is expected to worsen the situation. According to the Intergovernmental Panel on Climate Change (IPCC)²⁸, by 2050, more than one billion people in Asia alone are projected to experience negative impacts on water resources as a result of climate change.

Population growth between 1950 and 1995 caused the per capita availability of water to drop almost 70 percent in South and Central Asia, 60 percent in China and Mongolia, and about 50 percent in Southeast Asia²⁹.

If the trend remains as such, per capita water availability is expected to be 10–15% lower than the current levels by 2025³⁰. Within ASEAN, overall water demand is expected to increase by one-third by 2015. There is no physical scarcity of water in Southeast Asia, but there is scarcity due to economic scarcity, wherein access to water is limited by human, institutional and financial constraints to distribution to different user groups. High rates of development put pressure on the water supply and sanitation, and increase competition for water resources. Unsustainable exploitation of water resources is characterized by diminishing water availability per person, increasing water abstraction from surface and groundwater sources, depletion of the aquatic environment, inadequate storage and inefficient distribution facilities, causing a growing scarcity of water throughout Southeast Asia.

A large part of the Southeast Asian region has a monsoon climate in which the rainy season may bring severe floods that cause tremendous damage in river basins. Prolonged dry seasons may cause temporary water shortages in the same river basins.

Issues associated with water management will undoubtedly be of increasing importance across Southeast Asia over the next 20–50 years, in the face of increasing populations and consequent competition for water resources. The key water challenges for the ASEAN region are set out in the ASEAN Strategic Plan of Action of Water Resources and Management³¹ ³² and include collecting and maintaining high quality data, mitigating the impacts of water related hazards (especially to subsistence farmers and the poor), sustaining and improving water quality, improving governance systems, for example of interconnected surface and groundwater resources, and acquiring financing for the development of new water infrastructure.

³⁰ Millennium Development Goals Report, 2012; United Nations, New York, <http://www.un.org/millenniumgoals/pdf/MDG%20Report%202012.pdf>

³¹ ASEAN Strategic Plans for Water Resource Management: A Report; ASEAN Secretariat, Jakarta, October 2005

³² Strategic Plans for Water Resource Management: A Report; ASEAN Secretariat, Jakarta, <http://www.aseansec.org/awgwr/ASEAN%20Strategic%20Plan%20of%20Action%20on%20Water%20Resources%20Management.pdf>

Challenges the region may encounter include³³:

- Overall demand for water is expected to increase by about one-third over the next 20 years.
- Whilst most Southeast Asian countries do not have a physical scarcity of water, seasonal scarcity does occur. This needs to be examined in more detail and the results be used as a basis for the planning of water supply strategies for the future.
- Although there is no physical water scarcity across Southeast Asian Countries (excepting Singapore), potentially rapid rates of economic development may put considerable pressure on countries in terms of financing the sustainable development of water supply and sanitation schemes.
- As a response to seasonal water scarcity and growing urban centers, demand for groundwater will increase. Management plans need to be developed to ensure the sustainable exploitation of this critical resource and to maintain its quality.
- Protection of water quality and access to clean water for underprivileged groups has been and will be a significant activity for all nations over the next 20 years.
- In many countries it is considered that the impacts of extreme events and climate change and variability will be of as much concern to governments as many of the above issues. Subsistence farmers and the poor are more severely impacted by such factors and consequently may suffer increase poverty levels and risks of starvation unless adequately planned for.
- Whilst many countries are aware of the need for change to improve water resources management, there needs to be continued support at all levels to ensure that this happens.
- Fragmentation of the management of water between several agencies within countries needs to be examined to determine if improved institutional arrangements can be developed. It is particularly important that surface water and groundwater are managed by the same agency given their usual interconnectivity.
- Capacity building at a range of levels is also a universal requirement in the region.

It would appear that major challenges include collection of high quality data, mitigating the impact of extreme events on water resources, sustaining and improving water quality and water supply, improving governance systems and acquiring financing for the development of new water infrastructure.

Developed nations including the EU invested heavily in water infrastructure during the twentieth century to provide their increasing populations with drinking water supply, food through navigation, and to protect them from floods. Flows of rivers are regulated and managed,

³³ ASEAN Strategic Plans for Water Resource Management: A Report; ASEAN Secretariat, Jakarta, October 2005

reducing peak flows, increasing low flows and protecting water quality, thus reducing the risk of water-related disasters and increasing the reliability of water services.

Developing countries in ASEAN have made significant investments in water infrastructure and many are successfully addressing catastrophic water risks, but generally have not yet achieved the infrastructure and institutional capacity to manage their water resources to optimise sustainable growth and provide universal and reliable water services. Similarly, in some of the countries of ASEAN, inadequate water infrastructure and management institutions hamper development. Poor water supply and sanitation adversely affect the health of the population, food production is unpredictable because lack of irrigation infrastructure leaves fields vulnerable to unchecked drought and floods, and electricity supplies are unreliable³⁴. The investment climate is also poor in water infrastructure as water management policies are not yet sufficiently evolved.

Science and technology collaboration between EU and ASEAN to enhance the quality of life, tackle issues related to water scarcity, flooding, and policy development is driven by the following factors:

- Urgent needs of research (fundamental and applied) collaboration (bi- and multilateral) in water resource management.
- Possibility of future funds available for ASEAN countries for water resource management in EU research programmes.

5.1 Current Status of EU-ASEAN Water Management Cooperation

5.1.1 Evolution of publications since 2000

Significant numbers of publications can be seen from both EU and ASEAN institutes. Publications related to water-related issues in different focus areas are categorized in Figure 13. Among the 390 total publications³⁵ ³⁶, the highest proportion is related to policies and management (almost 39% of the total publications on water related research). Impact studies of climate change and interrelationships between water and energy are an emerging research focus but have low numbers of publications at present. Flooding has been a serious problem in some of the countries in ASEAN and is therefore one of the prime research interests, in addition to wastewater, agriculture and water quality issues.

³⁴ Millennium Development Goals Report, 2012; United Nations, New York, <http://www.un.org/millenniumgoals/pdf/MDG%20Report%202012.pdf>

³⁵ Database for publication from Scopus, www.scopus.com

³⁶ Database for publication from ISI Web of Science, <http://ip-science.thomsonreuters.com/mjl/>

²⁴ Facts and Trends: UN Water; 2006, http://www.unwater.org/downloads/Water_facts_and_trends.pdf

²⁵ McKinsey & Company. 2010. Charting our Water Future: Economic Frameworks to Inform decision making. 2030 Water Resources Group. http://www.2030waterresourcesgroup.com/water_full/

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²⁷ The United Nations World Water Development Report (UN WWDR) Volume 1: Managing Water under Uncertainty and Risk; UNESCO 2012

²⁸ Impacts of climate change on water resources: A global perspective; www.ipcc.ch/ipccreport/tar/WG2/index.ph

²⁹ Asian Development Bank, Water for All. The Water Policy of the Asian Development Bank (Manila, ADB, 2001)

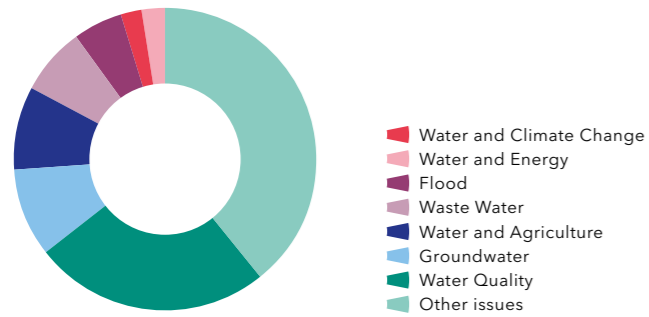


Figure 13: Share of co-publications on water in ASEAN from 2000-2012
Source: Scopus – retrieved by ZSI in February 2013 – and ISI Web of Science
Definition: EU=EU27+NO, CH, TR. ASEAN=10 ASEAN Member States

Annual trend of total publications

The annual number of water management publications with authors from the EU and ASEAN has increased from 12 in 2000 to 62 in 2012. More research is expected in the future regarding water issues, addressing problems faced by the ASEAN region and tackling possible solutions.

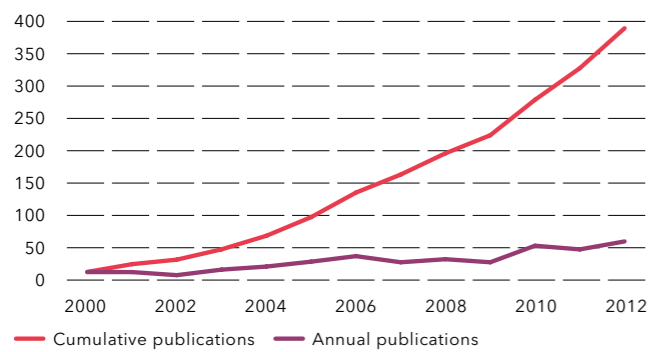


Figure 14: Trend of number of publications related to water issues in ASEAN
Source: Scopus and ISI Web of Science

The cumulative number of publications in each focus area in each year is shown in Figure 15 and Figure 16. The highest number of joint publications relate to water quality, of which there were 18 in 2006 alone. Research in water quality increased from 2000 to 2006 and then declined, which may be due to a lack of availability of funds for joint research collaborations.

Groundwater has been one of the most important research topics, especially in Thailand, and Vietnam. Similar trends can be seen for research in agriculture and water issues. As agriculture is important in ASEAN more research in this topic is expected. Publication analysis reveals that research has not yet covered studies of climate change impact, land use, and water resources management within the food-energy nexus.

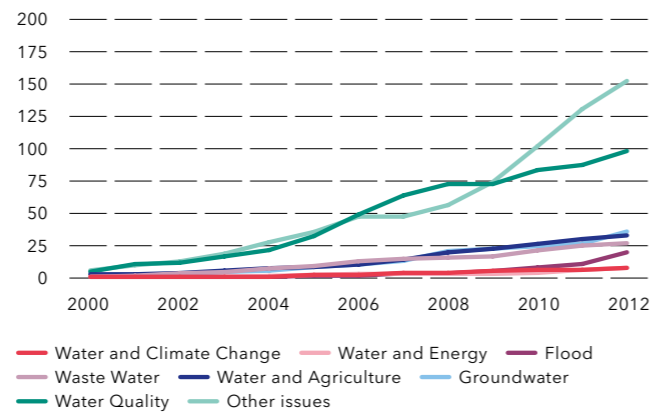


Figure 15: Cumulative number of publications from 2000-2012
Source: Scopus and ISI Web of Science

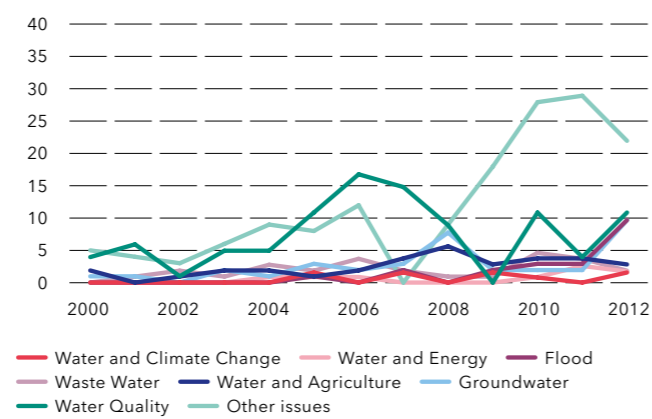


Figure 16: Annual trend of publications in different issues
Source: Scopus and ISI Web of Science

5.1.2 Publications from ASEAN countries

Thailand accounts for the largest share of co-publications. Of 390 publications, Thai researchers have co-authored 134, almost 35% of the total, followed by Vietnam, Malaysia, Singapore and Indonesia. The major research focus in ASEAN has been water quality, as shown in Figure 18.

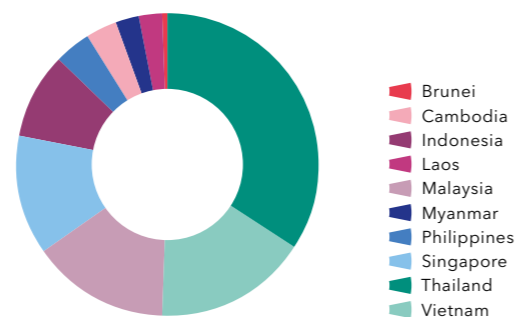


Figure 17: Number of publications from different ASEAN countries
Source: Scopus and ISI Web of Science

Top 10 EU authors	Country	Records	Top 10 ASEAN authors	Country	Records
Wassmann, Reiner (Karlsruhe Institute of Technology, Campus North)	DE	38	Mohammad, Abdul Wahab (Universiti Kebangsaan)	MY	24
Hilal, Nidal (Swansea University)	GB	27	Ujang, Zaini (Universiti Teknologi)	MY	16
Berg, Michael (Swiss Federal Institute of Aquatic Science and Technology)	CH	19	Viet, Pham Hung (Hanoi University of Sciences)	VN	16
Dalsgaard, Anders (Københavns Universitet)	DK	17	Tuong, To Phuc (International Rice Research Institute)	PH	14
Neue, Heinz Ulrich (Helmholtz Zentrum für Umweltforschung)	DE	14	Bouman, Bas A. M. (International Rice Research Institute)	PH	13
Gijzen, Huub J. (UNESCO-IHE Institute for Water Education)	NL	13	Guieysse, Benoit (Nanyang Technological University)	SG	13
Ulbricht, Mathias (Universität Duisburg-Essen)	DE	12	Koottatep, Thammarat (Asian Institute of Technology)	TH	11
Chiu, Tze Yen (AECOM DB)	GB	12	Cam, Phung Dac (National Institute of Hygiene and Epidemiology)	VN	11
Brix, Hans (Aarhus Universitet)	DK	12	Lantin, Rhoda S. (International Rice Research Institute)	PH	11
Valentin, Christian (Université Pierre et Marie Curie)	FR	11	O-Thong, Sompong (Thaksin University)	TH	11

Table 14: Top 10 productive authors in Water related publications from this record. Source: Scopus and ISI Web of Science

EU-Orgs	Country	Records	ASEAN-Orgs	Country	Records
Wageningen University and Research Centre	NL	89	International Rice Research Institute	PH	116
Swiss Federal Institute of Aquatic Science and Technology	CH	39	National University of Singapore	SG	107
Imperial College London	GB	38	Nanyang Technological University	SG	84
CIRAD Centre de Recherche de Montpellier	FR	36	Asian Institute of Technology	TH	74
Universität Hohenheim	DE	33	Universiti Teknologi	MY	54
UNESCO IHE Institute for Water Education	NL	33	Chulalongkorn University	TH	54
Karlsruhe Institute of Technology, Campus North	DE	33	Chiang Mai University	TH	46
Delft University of Technology	NL	32	Universiti Kebangsaan Malaysia	MY	38
Katholieke Universiteit	BE	31	Prince of Songkla University	TH	34
Newcastle University	GB	29	Kasetsart University	TH	34
University of Nottingham	GB	28	Universiti Sains	MY	32
Danmarks Tekniske Universitet	DK	26	Khon Kaen University	TH	32

Table 15: Top 10 most productive institutions from EU and ASEAN from this record. Source: Scopus and ISI Web of Science

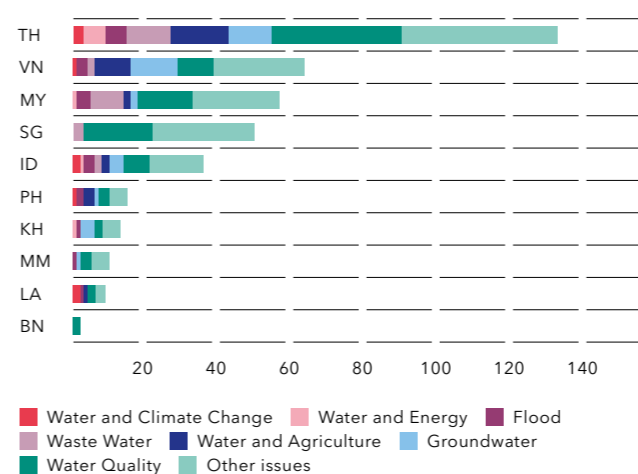


Figure 18: Number of research conducted and publications in different countries in ASEAN

5.1.3 Publications in different issues on water of countries in ASEAN

Figure 19 illustrates the number of publications in each focus area from each country. There are 99 publications in water quality of which 36 have authors from Thailand.

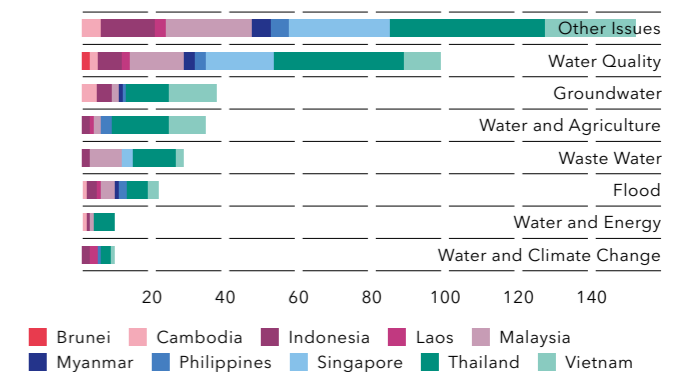


Figure 19: Publications in different water issues of countries in ASEAN

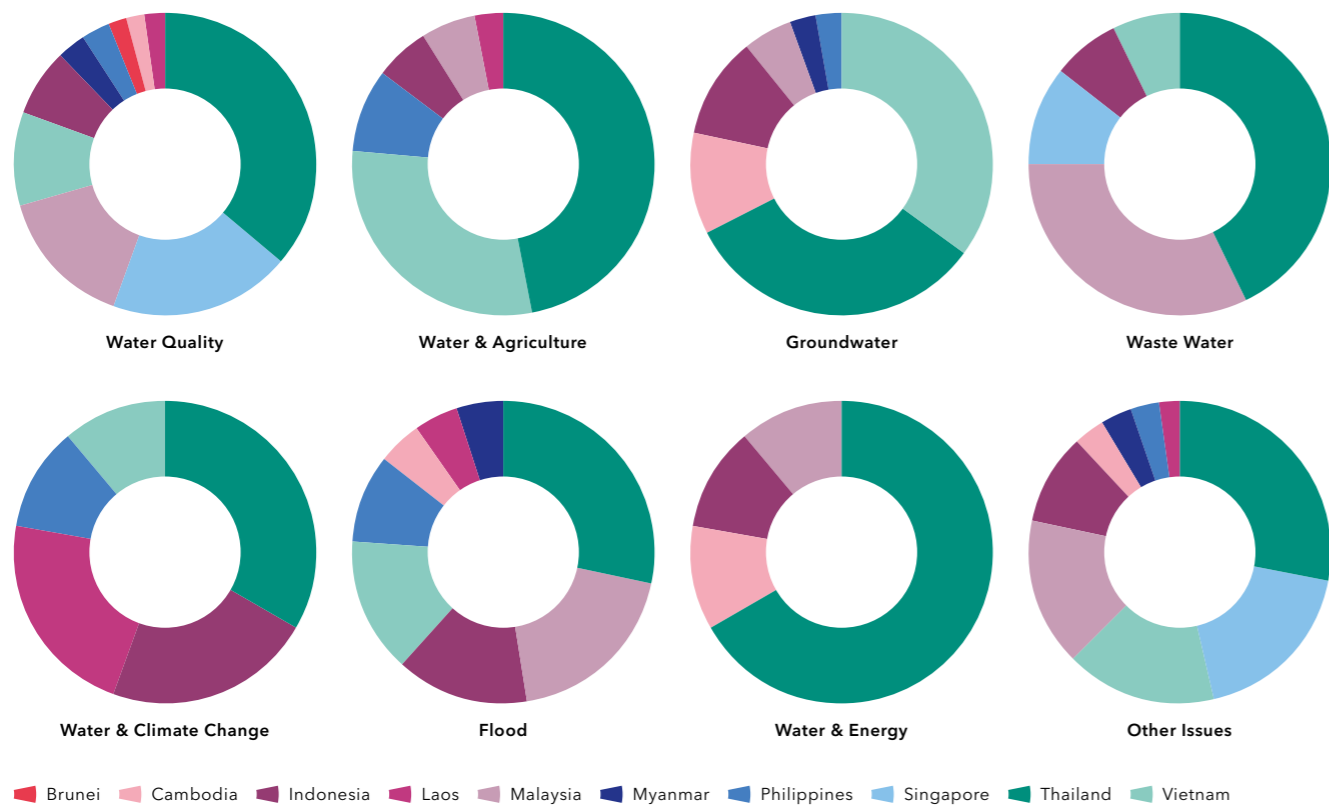


Figure 20: Research and publications focused on different countries in ASEAN and for different aspects of Water management (2000-2012)

Most research has been conducted on water quality, followed by groundwater, agricultural water, and waste water. Flooding has also been identified as a major research area in this region. If the volume of research conducted by each country in each focus area is separately quantified, as shown in Figure 20, Thailand is the leading nation in all sectors. All aspects of water resources have been studied by Thailand with 36 publications related to water quality, 16 on agricultural water, 12 on waste water, 43 on different management issues and very few on water and energy and climate change. Water management issues are mainly focused on urban water management and trans-boundary river issues with the Mekong river.

5.2 Research Funding and collaborative research between EU and ASEAN partners

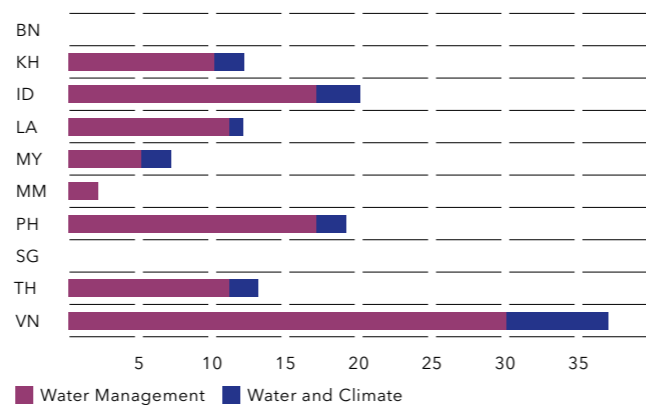


Figure 21: Number of water management³⁷ and Climate change projects in ASEAN countries (Source: Various donor agencies websites including EU, ADB, World Bank and National Governments)

³⁷ Water management projects include waste water management, water supply, sanitation, drainage and irrigation, agricultural water supply, etc.

S. No.	Projects	Year	ASEAN countries/locations
1	Systems research for integrated resource management and land use analysis in South and Southeast Asia - IRMLA	2001	Vietnam, Philippines
2	Decision support system for ecosystem upgrading and flood control of a sustainable development in the red river system (China, Vietnam) pilot phase	2001	China, Vietnam
3	Sustainable farming at the rural-urban interface – An integrated knowledge based approach for nutrient and water recycling in small-scale farming systems in peri-urban areas of China and Vietnam	2002	China, Vietnam
4	Production in aquatic peri-urban systems in Southeast Asia	2005	Vietnam, Cambodia, Thailand
5	Contributing to sustainable reconstruction and development in the tsunami-hit regions of Thailand by designing, implementing and disseminating pilot technologies for energy-efficient housing and water management	2005	Thailand
6	Highland aquatic resources conservation and sustainable development	2009	Guangdong, China; Uttarakhand and West Bengal, India and Northern and Central Vietnam
7	Sustainable Livelihoods and Biodiversity in Riparian Areas in Developing Countries	2009	Vietnam
8	Solutions for environmental contrasts in coastal areas	2009	Vietnam
9	Coordinating twinning partnerships towards more adaptive governance in river basins	2009	Thailand
10	Integrated Renewable Energy Solutions for Seafood Processing Stations	2008	Thailand, Indonesia, Cambodia, Philippines, Vietnam
11	Integrated Sustainable Solid Waste Management in Asia	2009	Thailand, Cambodia, Philippines, Vietnam
12	Stratospheric ozone: Halogen impacts in a varying atmosphere	2009	Malaysia
13	ASEM Aquaculture Platform	2009	Thailand, Malaysia, Vietnam
14	Biodiversity of freshwater ecosystems: Status, trends, pressures, and conservation priorities	2009	Malaysia

Table 16: EU funded research specifically in Southeast Asia for Water Resources/Water Resources Management (2000-2013)
Source: EC FP6 and FP7 database

The majority of research projects have been conducted for water management, especially on water sanitation, water and agriculture and drinking water for the purpose of meeting the Millennium Development Goals³⁸. Very few research funds are allocated for climate and water issues as well as for water resource management in context of urbanization, water governance and policy issues etc. Most of the projects in this region are funded by the Asian Development Bank, World Bank and some other development agencies. Other funding agencies such as the World Bank and ADB have contributed funds for flood management, water sanitation, and river basin management. The details of relevant projects are provided in Annex II – Water Projects.

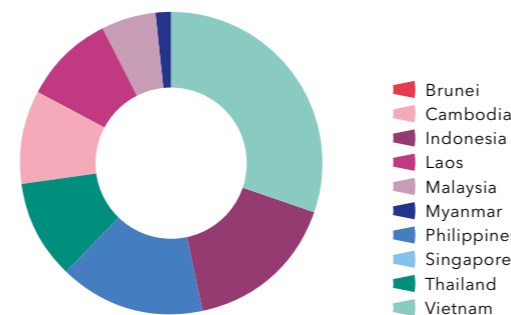


Figure 22: Numbers of projects in ASEAN countries by ADB, WB, FAO, EU

³⁸ Millennium Development Goals Report, 2012; United Nations, New York, <http://www.un.org/millenniumgoals/pdf/MDG%20Report%202012.pdf>

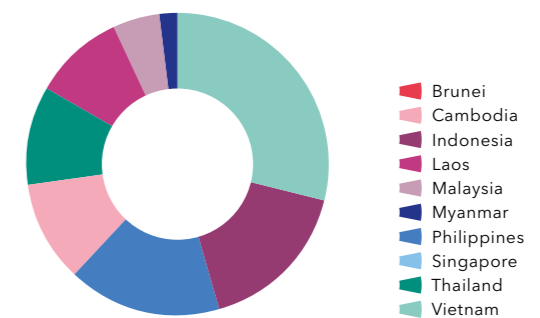


Figure 23: Water Management projects in ASEAN countries

5.3 Aggravating factors, Focus Areas and Research Priority

Understanding the boundaries within which development occurs is fundamental and argues in favour of more strategic approach in which some of the potentially divisive questions on water management can be addressed as part of a joint process among the countries, such as:

- How much water can safely be abstracted?
- Can multiple benefits be achieved?
- How to best share benefits of development?
- How can peoples' livelihoods be secured and a balance achieved with conservation of ecosystems and biodiversity?

- How can shortfalls in water supply in times of drought be managed and similarly, how to manage the excess amount of water during heavy rain fall?

Population growth and changing lifestyles, rapid urbanization and economic development are dramatically increasing the demand for limited water resources in developing countries³⁹ ⁴⁰. In the last century, water use grew more than twice as fast as the population. As a result, floods, droughts and water shortages become even more frequent in many developing countries where rainfall is already irregular and water resources scarce. ASEAN countries need to invest in the sustainable management of their water resources, share water from transboundary rivers and lakes and learn to adapt to changes in water availability. As mentioned by Wolf (2006)⁴¹, regional cooperation for financial and social benefits can be increased with proper management of these scarce resources. In general, the region's water infrastructure sector needs the urgent attention of all stakeholders. A regional consensus has emerged as to the need for policy and institutional reform, and appropriate action is being taken by governments, municipalities, companies and associations of water users.

Three broad categories of activities are distinguished in the water sector: two of them have to do with the construction of hydraulic infrastructure and its subsequent operation and maintenance; Water Resources Development and Water Conservation and their control. The third category, Water Resources Management is rather different. It requires an integrated approach to water encompassing policy development and the preparation of national and regional development and management plans. It provides a balanced planning framework in order to optimise water use and control. It also includes the implementation of these plans i.e. through institutional measures and by coordinating the construction and operation of hydraulic works.

The Southeast Asian Region has been endowed with sufficient quantity of water resources. Topographically, each country has a substantial extent of fluvial deposits with very fertile land ideal for agricultural production. The climate is generally humid tropical, with average rainfall varying from 1,600 mm to 3,400 mm⁴².

A key characteristic of water resources is their uneven distribution in time and space. Over the years water resources management focused almost exclusively on redistributing water to users, which is basically, a supply side approach. However, as the stress on resources increases, emphasis should be more on the demand i.e. utilizing the resources in an integrated framework. In

Challenges	Description
Challenge 1	Improve access to safe drinking water and sanitation
	Reduce by 50% inadequate access to safe drinking water by 2015
Challenge 2	Managing water resources efficiently and effectively
	Review of water policies and legislation
	Institute demand and supply management techniques in water supply
Challenge 3	Institute demand and supply management techniques in irrigation
	Moving towards integrated river basin management
	Establish river basin management organizations
	Develop decision support systems
Challenge 4	Promote equitable sharing among water users and the environment
	Mitigate water related hazards and maintain ecological balance
	Translating awareness to political will and capacities
	Improve governance
	Encourage multiple stakeholder participation in water resources development and management
Challenge 5	Mainstreaming gender concerns in the framework for action
	Develop, enhance and strengthened institutions on a decentralized and participatory manner
	Build individual capacities
	Moving towards adequate and affordable water services
Challenge 5	Enhance public-private partnerships
	Recognize that water is a natural asset and has social, cultural and economic functions and values

Table 17: The long term strategic plan of action for water resources management challenges and actions in Southeast Asian countries (extracted from the report: ASEAN strategic planning on water resource management)

general, the need for water resources management is related to four main factors. The first is the desirability of achieving equitable distribution of water among the users. The second is the importance of economic efficiency of water use. The prevention of hazards and other negative environmental impacts is the third factor; while the need for long-term sustainability of water resources and of the water supply facilities is the fourth factor. Water problems are increasingly more and more interconnected and intertwined with other development-related issues, and also with social, economic, environmental, legal and political considerations, at local and national levels, and sometimes even at regional and international levels.

The ongoing thrust of the academic research and development endeavour is to come up with improved assessment of water situations to deal with different issues, to deal with the protection of water resources and to provide protection against extreme events is commendable. However, in order to address present day water resource development and management issues, water resource professionals and water managers need information in

two broad areas that need to be adequately supported by research. The first is applied problem solving, particularly in the form of comparative case studies where successful and unsuccessful experiences in addressing complex management issues are/can be documented and made available for practitioners. The other knowledge niche water professionals/managers are looking for researchers to fill in is the policy discussions that analyse the impact of social, political, economic and technological trends on water resources and that integrate science, policy and management.

It is unfortunate that science and decision making have evolved as almost separate entity, whereas, there is a clear necessity for policy analysis that is scientifically informed and a scientific analysis that is relevant to policy. A commitment of the scientific community and educational institutions to achieve these is a necessity to address various water challenges. This calls for a nexus between the community of science and technology (S&T) and the users of research outcomes referring to decision-makers, water managers and water users. A true nexus approach can only be achieved through close collaboration of all actors from all sectors. Active participation by and among government agencies, the private sector and civil society is critical at all stages of developing and performing scientific and technological research so as to ensure that the outcome of research and guidelines provided for implementation would be adopted in practice. It is expected that this mode of operation is followed in all future collaborative research endeavours.

The following thematic areas for future research cooperation have been identified. There may be overlap among some areas, and some can be grouped under a broader umbrella of water governance.

5.3.1 Integrated Water Use and Management

Integrated water use and management considers three aspects: dimensions of water (surface water and groundwater, quantity and quality, and their interactions with consideration of storage enhancement through artificial recharge of groundwater system); interactions with land and environment; and interrelationships with social and economic development. With a comprehensive and participatory approach and considering the natural system integration as well as human system integration, the objective would be to develop a planning and management framework at basin scale that would guide water managers in a specific situation to adopt IWRM principles on the ground. In a sub-set of this focus area, emphasis could be given on Urban Water Management, Integrated Flood Management and Water Use and Water Quality Management.

5.3.2 Climate Change and Water Resources Management

Climate change has had substantial impacts on both availability and demand for water resources. It is important to understand the processes driving these changes, the sequences of the changes and their manifestation at different spatial and temporal levels with regard to different management functions. The objective should be to come up with an adaptive framework for water managers to address various issues in water management considering the climate change impact. The activities and scope of this thematic area can be linked with the thematic area 1 (Integrated water use and management), where the basin-scale integrated water use and management scenario would be analysed considering the additional external factor of climate change impacting all sectors and their water demand and water supply.

5.3.3 Extreme Events and Risk Management

Water managers and decision-makers should have proper management strategies to deal with the extreme climatic conditions of floods and droughts. Increased water-related risks associated with the changes in frequency and intensity of extreme events will put additional strain on water resources management and increased uncertainties about quantity and quality of water supplies. The research endeavour in this case should contribute, for a specific situation under consideration, an understanding for water managers of the risk, as mentioned and the risk treatment that could be adopted so that proper steps are taken to adapt to the changes expected and to render water infrastructures and services more resilient in coping with extreme conditions.

5.3.4 Water Conservation, Water Use Efficiency and Productivity Enhancement

The desired outcome of water conservation, water use efficiency and productivity enhancement is regulated water demand by different sectors, increased water use productivity, conservation of resources to maintain healthy aquatic ecosystems and maintenance/enhancement of water quality. For a specific case study situation, the research endeavour should provide clearly understandable definitions, principles and expectations on conservation, efficiency and productivity, and should demonstrate through field level experimentation and studies the process of achieving the defined expectations.

5.3.5 Transboundary Waters: Water Sharing and Conflict Resolution

Transboundary waters refer to water bodies that transcend political boundaries (either national or international). Development and management of transboundary waters resources is very complex given that water is

³⁹ ADB, 2008. Strategy 2020, The Long-Term Strategic Framework of the Asian Development Bank, 2008-2020

⁴⁰ Report of the World Summit on Sustainable Development, Johannesburg, South Africa, 26 August-4 September 2002 (UN Publications, E.03.II.A1 and corrigendum) Chapter 1, resolution 2, annex

⁴¹ Wolf, A. T., 2006 Human Development Report: Conflict and Cooperation over Transboundary Waters; UNDP

⁴² <http://www.earthtrends.wri.org>

fugitive – so not respecting political boundaries. As demand for water increases across communities, states and sectors, the likelihood of conflict over water increases. As ASEAN is planning the AEC (ASEAN Economic Community) 2015, there is an urgent need for transboundary issues, policies and infrastructure to be developed. Such developments would require broad framework agreements laying down basic principles of cooperation as well as project-specific agreements to apportion costs and provide a basis for joint efforts to mobilize finance. The objective of a collaborative research work on this theme would be to develop a framework (including collaborative analytical tools) suitable for the specific situation under consideration to enhance capacity to address the question of equitable sharing of the resource as well as to prevent transboundary water conflict and degradation.

5.3.6 Water, Energy and Food Nexus

The Water-Energy-Food nexus explores how these three areas are interlinked, and how development in one area can affect the others. Energy is needed for water and wastewater treatment as well as distribution to consumers. Water needs to be stored for farmers to be used for irrigation of crops. Management of watersheds is important to sustain sufficient flows for hydropower production, as well as providing cooling water for thermal power plants. To address such competing water needs for the water, energy and food nexus means exploring opportunities to optimise water infrastructure for multiple purposes to supply water to cities and industry. This infrastructure includes engineered structures such as dams, reservoirs, canals and irrigation systems. But it also includes ecosystems and watersheds that act as 'natural infrastructure': mangroves that buffer against severe storms, floodplains that absorb flood waters, forests that stabilize soils, lakes and wetlands that clean and store water. Interactions are numerous and substantial as demand for these resources and services increased over the years. Improved water, energy and food security at national level can be achieved through a nexus approach that integrates management and governance across sectors and scales. The research thrust under this thematic area is to come up with a framework of analysis and evaluation to understand the interdependencies within the perspective of mutually beneficial and economic outcomes without compromising sustainability, and to provide guidelines to decision-makers on appropriate policies, strategies and investments to achieve water, energy and food security.

5.3.7 Technology and Information Management

The technologies currently in use in most of the developing countries are the same as those employed in developed countries. However, appropriate provisions are not there for the proper operation and maintenance of

existing and new installations. An excellent example of the serious consequences of inadequate operation and maintenance is the large volume of unaccounted-for water in many urban centres in developing countries. Also, most countries do not have adequate information for comprehensive management of water resources. The data collected by different agencies involved in the water sector have produced numerous sources of information systems without much coordination and coherence. The task would be to adapt technically-sound, affordable, simple, cost-effective and sustainable technologies in water supply, sanitation and waste management; as well as to develop a national data and information management system with a comprehensive knowledge base for water availability and water use.

5.3.8 Water Governance

Water governance refers to the range of political, social, economic and administrative systems that are in place to develop and manage water resources, and the delivery of water services at different levels. Even though governance has become a popular concept especially during the post-2000 period in the field of water management, there is still no accepted definition for this concept, or on how good governance can be achieved. Ethical issues such as responsibility, accountability, transparency, equity and fairness are fundamental requirements for good governance. The research thrust under this theme would be to come up with: what is governance in a realistic and practical term and what are the current situations in the ASEAN countries; what are the critical governance-related issues and their in-depth analyses; where should specific ASEAN countries be in terms of governance in 2030; and what policies should be formulated and implemented so that governance objectives for 2030 can be achieved in individual ASEAN countries.

5.4 Conclusions

Keeping in view of the urgent needs and strategies as well as policies to be developed for water resource management in ASEAN; joint EU-ASEAN water resources management remains one of the best ways to assist in solving the key problems and in developing the policies to tackle the challenges as stated by the ASEAN governments. Issues coming up in Southeast Asia may apply to Europe as well, solutions to problems in Europe may be found in Southeast Asia. In conclusion, there is urgent need for collaboration between EU researchers and ASEAN partners on the following priority issues:

- Flood and drought preparedness and mitigation programme
- Knowledge and monitoring of water resources for better water management including water conservation and efficiency

- Urbanization, sustainable regional water infrastructure
- Transboundary river basin management
- Water governance and policy issues

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<http://www.earthtrends.wri.org>

Annex I – FP7 Health Projects with ASEAN Partners

	Theme	Project	Southeast Asian partners	EC contribution
Health Policy	Health Policy	European Urban Health Indicators Part Two: Using indicators to inform policy (EURO-URHIS 2)	Chi Le-Ha, VN Dai Hoc Y Khoa Pham Ngoc Thach (Pham Ngoc Thach University of Medicine), VN	€ 2,915,121
		Developing And Testing Of New Methodologies to Monitor and Evaluate Health Related EU-Funded Interventions in Cooperation Partner Countries (EVAL-HEALTH)	Mahidol University, TH	€ 2,859,568
		Health Equity and Financial Protection in Asia (HEFPA)	Yayasan Smeru, ID Centre for Advanced Study, KH Upecon Foundation, Inc, PH International Health Policy Program Foundation, TH Research and Development Center for Community Health Strategy, VN	€ 2,885,767
		Health system stewardship and regulation in Vietnam, India and China (HESVIC)	Hanoi School of Public Health, VN	€ 2,999,894
		Mobility of Health Professionals (MOHPROF)	University of the Philippines Manila, PH	€ 2,340,347
		Optimizing drug safety monitoring to enhance patient safety and achieve better health outcomes (MONITORING MEDICINES)	The Zuellig Foundation, Inc., PH	€ 1,995,096
		Reaching out and linking in: Health systems and close-to-community services (REACHOUT)	Eijkman Institute for Molecular Biology, ID	€ 5,674,678
		Chikungunya	Integration of Chikungunya research (ICRES)	University of Malaya, MY Biomedical Sciences Institutes Limited by Guarantee, SG
Infectious Diseases	Dengue	Dengue research Framework for Resisting Epidemics in Europe (DENFREE)	Institut Pasteur du Cambodge Foundation, KH Mahidol University, TH	€ 5,999,062
		Innovative tools and strategies for surveillance and control of dengue (DENGUETOOLS)	Mahidol University, TH National University of Singapore, SG University of Malaya, MY	€ 5,606,488
		International Research Consortium on Dengue Risk Assessment, Management and Surveillance (IDAMS)	University of Malaya, MY Gadjah Mada University, ID	€ 5,999,213
	HIV/AIDS	The antiretroviral roll out for HIV in India – strengthening capacity to promote adherence and patient follow-up in the context. (HIVIND)	Hanoi Medical University, VN	€ 2,946,420
	Influenza	Health system analysis to support capacity development to respond to pandemic influenza in Asia (ASIAFLUCAP)	University of Indonesia, ID International Health Policy Program Foundation, TH Ministry of Science and Technology, VN	€ 2,599,997
		Identification of Mechanisms Correlating with Susceptibility for Avian Influenza (IMECS)	Vien Ve Sinh Dich Te Trung Uong, VN	€ 2,797,287
		Rapid, robust & scalable platform technology for fully automated reference laboratory grade Polymerase Chain Reaction (PCR) based diagnostics regardless of global setting (RANGER)	Queen Sirikit National Institute of Child Health, TH	€ 2,982,200
		Meningitidis	The genetic basis of meningococcal and other life threatening bacterial infections of childhood (EUCLIDS)	Biomedical Sciences Institutes, SG
NCDs	Neglected Infectious Diseases	Syndromic approach to Neglected Infectious Diseases (NID) at primary health care level: an international collaboration on integrated diagnostic-treatment platforms (NIDIAG)	Gadjah Mada University, ID	€ 5,000,000
	Diabetes	Identification of epigenetic markers underlying increased risk of T2D in South Asians (EPI-MIGRANT)	National University of Singapore, SG	€ 2,999,052
	Social Determinants of Health	INDEPTH Training and Research Centres of Excellence (INTREC)	Gadjah Mada University, ID	€ 1,997,402
		Asian Regional Capacity Development for Research on Social Determinants of Health (ARCADE-RDSH)	Hanoi Medical University, VN	€ 1,996,595

Annex II – Water Projects

	Project title	Agency /partner	Approval /start date	ASEAN country/ location	Category/Purpose	Funding
1	East Jakarta Water Supply Developmant Project	ADB	2013	Indonesia	The proposed ADB loan will help Aetra Air Jakarta (Aetra) in the production and distribution of clean water, including the expansion and maintenance of the water assets for the East Jakarta concession in Indonesia.	US\$ 44,700,000
2	River Basin Water Resources Management and Development	ADB	2011	Indonesia	Agriculture and natural resources / Water-Based Natural Resources Management. The TA will build on previous and ongoing ADB/government capacity building initiatives and support for decentralized water resources management in the selected river basins Management	US\$ 1,800,000
3	Greater Mekong Subregion Flood and Drought Risk Management and Mitigation Project (CAM)	ADB	2012	Regional	Agriculture and natural resources/ Irrigation, Drainage, and Flood Protection. The project will support the Government of Cambodia as it undertakes structural and nonstructural measures to prepare for and manage disaster risks linked to floods and droughts.	US\$ 47,750,000
4	Strengthening Integrated Water and Flood Management Implementation	ADB	2012	Thailand	Agriculture and natural resources/ Irrigation, Drainage, and Flood Protection. The TA has two components. Under the first component, the TA will support to develop planning and implementation procedures and guidelines for water project assessment, monitoring and evaluation. An IT-based monitoring and evaluation system will also be developed following the guidelines. The second component is the Yom River Basin study.	US\$ 1,500,000
5	Integrated Citarum Water Resources Management	ADB	2007	Indonesia	Agriculture and natural resources/ Water-Based Natural Resources Management. The purpose of the TA is to prepare an investment project for Integrated Citum Water Resources Management. The proposed project will promote integrated water resources and environmental management within the Citarum River basin, addressing conservation, utilization and mitigation of impacts, and covering watershed management, agriculture, water supply, and energy, for the benefit of all water users in the river basin.	US\$ 2,445,000
6	Angat Water Transmission Improvement Project	ADB	2012	Philippines	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The Project will secure raw water supply to the 13 million inhabitants of Metropolitan Waterworks and Sewerage System (MWSS) service area, through the rehabilitation of the Angat transmission line.	US\$ 940,000
7	Urban Water Supply and Sanitation Project	ADB	2012	Cambodia	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The technical assistance (TA) will support institutional strengthening, capacity development, and assist Ministry of Industry, Mines, and Energy (MIME) to develop its regulatory functions.	US\$ 800,000
8	Water Supply and Sanitation Sector Project	ADB	2012	Laos	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The Project will support expansion of systems by providing capital to well-performing provincial nam papas (PNPs or water supply utilities) who require financing for minor rehabilitation works to restore and improve a system s functionality and/or who have tried to access capital from commercial banks for expansion but were unsuccessful due to initial collateral requirements or repayment terms.	US\$ 800,000
9	Water Supply and Sanitation Sector Development	ADB, Republic of Korea e-Asia Knowledge Partnership Fund	2011	Indonesia	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The TA will support BAPPENAS in reviewing and assessing the water supply and sanitation sector; defining key issues and bottlenecks and how to overcome these; developing a sector roadmap; and contributing to the development of a stronger project pipeline for urban and rural water supply and sanitation projects, all of which will help achieve MDG targets.	US\$ 500,000
10	Strengthening Urban Water Supply Regulation	ADB	2011	Laos	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. Improved regulation in the urban water supply sector in the Lao PDR.	US\$ 500,000
11	Greater Mekong Subregion Flood and Drought Risk Management and Mitigation Project (LAO/VIE)	ADB	2012	Regional	Agriculture and natural resources / Irrigation, Drainage, and Flood Protection. The impact of the Project will be reduced economic losses resulting from floods and droughts. The outcome will be improved capacities and preparedness to manage and mitigate the impacts of flood and drought events.	US\$ 101,447,000
12	Greater Mekong Subregion Flood and Drought Risk Management and Mitigation Project	ADB	2008	Regional	Agriculture and natural resources/ Irrigation, Drainage, and Flood Protection. The Regional Technical Assistance (RETA) will improve the ability of communities in Cambodia, Lao PDR, Thailand, and Vietnam to prepare for, respond to, and recover from the negative impact of floods and droughts.	US\$ 2,662,000
13	Water Sector Investment Program –Tranche 2	ADB	2011	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation.	US\$ 25,500,000
14	Supporting Water Operators' Partnerships	ADB	2010	Indonesia	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The Technical Assistance (TA) Supporting Water Operators Partnerships in Indonesia provides technical and financial assistance, through a demand driven approach, to urban water utility operators that want to improve their services.	US\$ 1,250,000

15	Da Nang Water Supply Project	ADB	2010	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The TA will examine the constraints that most crucially impact on the sustainability of water operations in the city of Danang and its peri-urban areas, and will make recommendations on the best way to address these, and so achieve sustainable provision of safe water.	US\$ 2,650,000	35	Promoting Climate Resilient Rural Infrastructure in the Northern Mountain Provinces	ADB	2012	Vietnam	Agriculture and natural resources / Water-Based Natural Resources Management. The proposed TA will demonstrate appropriate and effective methods to reduce the possible damage due to climate change and other weather factors.	US\$ 2,000,000
16	Hai Phong Water Supply Project	ADB	2008	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The PPTA will help to enhance the performance and efficiency of the water supply services for the population of HaiPhong in urban and peri-urban areas.	US\$ 1,000,000	36	Climate Change Impact and Adaptation Study in the Mekong Delta	ADB	2009	Vietnam	Agriculture and natural resources / Water-Based Natural Resources Management. TA supports the Government's National Target Plan (NTP) for responding to climate change, as well as Vietnam's commitments under the United Nations framework Convention on Climate Change.	US\$ 1,630,000
17	Water Resources Management Sector Development Program	ADB	2011	Cambodia	Agriculture and natural resources/ Irrigation, Drainage, and Flood Protection. The Project will (i) strengthen the capacity of the Government and empower beneficiary communities to sustainably manage water resources; (ii) increase agricultural production in a sustainable and participatory way; and (iii) enhance beneficiary livelihoods and market opportunities for surplus crop, livestock and fisheries production	US\$ 63,080,000	37	Flood Management in Selected River Basins Project (Phase II)	ADB	2009	Indonesia	Multisector / Multisector. The TA will support the preparation of a sector loan for selected river basins in Indonesia to: (i) strengthen upstream-downstream cooperation in the basins; (ii) strengthen watershed conservation activities; (iii) flood plain management, providing public information on flood risks; (iv) reduction of flood peaks and/or improvement of drainage capacity; and (vi) flood governance	US\$ 1,200,000
18	Urban Water Supply and Sanitation Project	ADB	2012	Cambodia	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The technical assistance (TA) will support institutional strengthening, capacity development, and assist Ministry of Industry, Mines, and Energy (MIME) to develop its regulatory functions.	US\$ 800,000	38	Water District Development Sector Project	ADB	2008	Philippines	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The PPTA will prepare a loan project suitable for ADB to consider financing. The ensuing loan will help improve living conditions of the urban population outside Metro Manila, enhance competitiveness by developing water supply infrastructure, and provide capacity building of water utilities.	US\$ 1,200,000
19	Support for Thailand's Flood Management Knowledge Forum	ADB	2011	Thailand	Multisector / Multisector. In response to the on-going flood disaster in Thailand, The Royal Thai Government and ADB seek to take early steps in support of Government efforts to strengthen the strategy for flood management.	US\$ 225,000	39	Second Rural Water Supply and Sanitation Sector Project	ADB	2009	Cambodia	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation	US\$ 26,100,000
20	Supporting Post-Tsunami Activities and Coastal Zone Management in Thailand	ADB	2005	Thailand	Agriculture and natural resources / Water-Based Natural Resources Management. The Project will assist the Government in promoting sustainable Coastal Zone Management (CZM) by improving the relevant legal and regulatory framework and ensuring adequate field-level coordination of government and non-government agencies involved in CZM.	US\$ 150,000	40	Second Rural Water Supply and Sanitation Sector Project	ADB	2008	Cambodia	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation	US\$ 600,000
21	Independent Review of SamutPrakarn Wastewater Management Project	ADB	2001	Thailand	Water supply and other municipal infrastructure and services/ Waste Management. The objectives of the proposed SSTA are to (i) review the project, mainly its environmental, ecological, and public health aspects, and comment on the initiatives taken to date, and (ii) provide guidance and recommendations for further action, as required.	-	41	Ho Chi Minh City Water Supply Project	ADB	2008	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The impact of the project will be to improve urban livability and competitiveness in Ho Chi Minh City through developing water supply infrastructure.	US\$ 1,800,000
22	River Basin Water Resources Management and Development	ADB	2012	Vietnam	Agriculture and natural resources/ Water-Based Natural Resources Management	US\$ 700,000	42	Hue Water Supply Project	ADB	2008	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The proposed project objectives are to (i) increase coverage to over 75% in the province; and (ii) improve the performance and efficiency of the water supply services in Hue City and other urban and peri-urban areas of the districts.	US\$ 1,500,000 (Water Financing Facility-NET TF)
23	Urban Environment and Climate Change Adaptation	ADB	2012	Vietnam	Water supply and other municipal infrastructure and services/ Waste Management.	US\$ 1,000,000	43	West Jakarta Water Supply Development Project	ADB	2007	Indonesia	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. PALYJA's capital expenditure program will enhance and expand water supply infrastructure in West Jakarta, with a particular focus on growing the number of low income domestic customers, and will help meet the MDG target for water supply.	US\$ 50,000,000 (Private Sector Loan)
24	MFF: Water Sector Investment Program	ADB	2011	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The Program will assist water supply companies in Vietnam to strengthen their business practices and improve their performance.	US\$ 1,000,000	44	Northern and Central Region Water Supply and Urban Development Project	ADB	2004	Laos	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The TA aims to assist the Lao government to reduce poverty and improve the quality of life of the urban population in Lao PDR through urban services improvements and investments.	-
25	Climate Change Impact and Adaptation Study in the Mekong Delta	ADB	2009	Vietnam	Agriculture and natural resources/ Irrigation, Drainage, and Flood Protection. The TA supports the Government's National Target Plan (NTP) for responding to climate change, as well as Vietnam's commitments under the United Nations framework Convention on Climate Change.	US\$ 1,630,000	45	Second Rural Water Supply and Sanitation Sector Project	ADB	2009	Cambodia	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The Project is designed to expand access to improved rural water supply and sanitation (RWSS), and improve health of rural residents in 6 project provinces around the Tonle Sap basin in Cambodia.	US\$ 26,100,000
26	Central Region Rural Water Supply and Sanitation Sector Project	ADB	2009	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The project will increase access to water supply and sanitation, improving the health and quality of life of the rural population in six selected provinces in the central coastal region of Vietnam.	US\$ 45,000,000	46	Northern and Central Regions Water Supply and Sanitation Sector Project - Supplementary	ADB	2010	Laos	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The project will improve the quality of life of residents in small towns in the Lao PDR and make the small towns better able to function as market, services, and manufacturing centers supporting the rural hinterlands.	US\$ 7,390,000
27	Hai Phong Water Supply Project	ADB	2008	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The PPTA will help to enhance the performance and efficiency of the water supply services for the population of HaiPhong in urban and peri-urban areas.	US\$ 1,000,000	47	Central Region Rural Water Supply and Sanitation Sector Project	ADB	2008	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation.	US\$ 750,000
28	Central Region Rural Water Supply and Sanitation Sector Project	ADB	2008	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation	US\$ 750,000	48	Second Red River Basin Sector Project	ADB	2002	Vietnam	Agriculture and natural resources/ Water-Based Natural Resources Management. The objective of the proposed Project is to improve agricultural performance of poorer communities through sustainable improvements in irrigation, better drainage, watershed protection and flood protection, within a framework of integrated water resource management in the Red River basin.	US\$ 109,523,000
29	Mainstreaming Climate Resilience into Development Planning	ADB	2012	Cambodia	Multisector / Multisector. Cambodia is one of the countries selected worldwide for the Pilot Program for Climate Resilience (PPCR), which aims to demonstrate ways in integrating climate risk and resilience into development planning.	US\$ 7,000,000	49	Third Water Supply and Sanitation for Low Income Communities Project	ADB	2006	Indonesia	Water supply, sanitation, Central government administration, Other social services and sub-national government administration	US\$ 137.50 million
30	Flood Damage Emergency Reconstruction Project	ADB	2012	Cambodia	Multisector / Multisector. The project will rehabilitate infrastructure (national, provincial, and rural roads and irrigation facilities) damaged by the 2011 flood to be implemented from April 2012 to March 2015.	US\$ 67,180,000	50	Improving Operational Performance of the Water Supply Sector Project	ADB	2004	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. In February 2011, the Asian Development Bank (ADB) approved a \$1 billion multitranch financing facility (MFF) to fund operational improvements for urban water supply during 2011-2020. The MFF provides access to financing to many water companies to help them improve their operations and expand their water supply systems, including intake works, production transmission, and distribution.	US\$ 1,100,000
31	Greater Mekong Subregion Nam Ngum 3 Hydropower Project	ADB	2011	Laos	Energy/ large hydropower. It will export 2,072 gigawatt-hours of energy every year to Thailand, generating export revenues for Lao PDR, boosting clean energy supply in Thailand and displacing the emission of 1 million tons of carbon dioxide annually.	US\$ 115,650,000	51	Third Provincial Towns Water Supply and Sanitation	ADB	2011	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The Project aims to improve water supply and environmental sanitation conditions in the Project towns through integrating critically-needed infrastructure developments with community awareness and participation, improved financial management and cost recovery by WSCs, and local regulations on sanitation, wastewater management, and water source protection.	US\$ 83,000,000
32	National Integrated Water Resources Management Support Project	ADB	2011	Laos	Multisector / Multisector. This capacity development project will provide a road map for achieving effective IWRM and provide the Department Water Resources, Ministry of Natural Resources and the Environment with a nationally owned project.	US\$ 4,210,000							
33	Angat Water Transmission Improvement Project	ADB	2012	Philippines	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The Project will secure raw water supply to the 13 million inhabitants of Metropolitan Waterworks and Sewerage System (MWSS) service area, through the rehabilitation of the Angat transmission line.	US\$ 940,000							
34	Climate Resilience and Green Growth in Critical Watersheds	ADB	Proposed	Philippines	Multisector / Multisector. The proposed TA is aimed at strengthening the capacity of LGUs in critical watersheds including the lower Marikina river basin, Camarines Sur and Davao Oriental.	-							

52	Ho Chi Minh City Water Supply Project	ADB	2008	Vietnam	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The impact of the project will be to improve urban livability and competitiveness in Ho Chi Minh City through developing water supply infrastructure.	US\$ 1,800,000	68	Sustainable farming at the rural-urban interface-An integrated knowledge based approach for nutrient and water recycling in small-scale farming systems in peri-urban areas of China and Vietnam	EU	2002	China, Vietnam	Rapidly urbanising areas in Asia cause a growing concern about contamination of waters, soils and crops due to inappropriate use of urban wastes and agrochemicals and (wet and dry) atmospheric deposition. The problem remains poorly quantified so flawed will contribute to participatory farming strategies that focus on effective water and nutrient recycling and stakeholders' interaction, to sustain integration between rural and urban areas.	€ 1,330,000
53	Pasig River Catchment Sewerage Project	ADB	2008	Philippines	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation.	US\$ 300,000	69	Production in aquatic peri-urban systems in southeast Asia	EU	2005	Vietnam, Cambodia, Thailand	Peri-urban aquatic food production systems (PAFPS) are central to the livelihoods of many poor people, however, wetlands accommodating these systems commonly represent the only accessible means of disposing of human excreta. Although attention has been drawn to the benefits of such wetlands, generally their value is unmeasured and impacts of contamination, altered access rights, urbanisation, changing consumer perceptions and varying land, water and waste values remain unknown. The proposed project will permit a detailed, holistic situation analysis of PAFPS at 4 sites in SE Asia, followed by pilot studies to test enhanced management strategies and planning approaches.	€ 1,089,758
54	Jilin Water Supply And Sewerage Development Project	ADB	2005	Philippines	Water supply and other municipal infrastructure and services/ Water Supply and Sanitation. The Project will help (i) reduce water pollution; (ii) protect water resources; (iii) address water shortage through recycling effluent and meet the demand for high-quality treated water by 2010; (iv) promote sustainable economic development; and (v) improve the environment, living conditions, and public health standards	US\$ 232,200,000	71	Contributing to sustainable reconstruction and development in the tsunami-hit regions of Thailand by designing, implementing and disseminating pilot	EU	2005	Thailand	The aim of this project is to contribute to the sustainable rehabilitation and development after the Tsunami destructions in Thailand by designing, applying, evaluating and disseminating appropriate innovative technologies for energy-efficient housing and water management.	€ 749,690
55	Ho Chi Minh City Environmental Sanitation (Nhieu Loc-Thi Nghe Basin) Project	World Bank	2011	Vietnam	The development objective of the Ho Chi Minh City Environmental Sanitation (Nhieu Loc-Thi Nghe Basin) Project is to reduce the incidence of flooding and increase the collection of wastewater in the Nhieu Loc Thi Nghe (NLTN) Basin in Ho Chi Minh City (HCMC), in an environmentally and financially sustainable manner.	US\$ 199.96 million	75	Highland aquatic resources conservation and sustainable development	EU	2009	China, India and Vietnam	Environment (Including Climate Change) ENV. Project partner will complete a detailed multidisciplinary situation analysis of highland aquatic resources, focused on values, livelihoods, conservation issues and wise-use options at five sites in Asia.	€ 1,914,379
56	Rural Water Supply and Sanitation National Target Program in the Red River Delta	World Bank	2012	Vietnam	The objective of the Results-Based Rural Water and Sanitation under the National Target Program Project for Vietnam is to increase sustained access to water supply and sanitation services and improve sector planning, monitoring and evaluation in the participating provinces of the Third Phase of the National Target Program for Rural Water Supply and Sanitation (NTP3).	US\$ 227.00 million	77	Sustainable Livelihoods and Biodiversity in Riparian Areas in Developing Countries	EU	2009	Vietnam	Environment (Including Climate Change) ENV. LiveDiverse (LD) will develop new knowledge on the interactions between human livelihood and biodiversity in riparian and aquatic contexts in four developing countries (Vietnam, India, South Africa, Costa Rica).	€ 317,896
57	Vietnam Red River Delta Rural Water Supply and Sanitation Project - Additional Financing	World Bank	2010	Vietnam	The project is expected to introduce sustainable management models for rural water supply schemes, with tariffs set at a level sufficient to cover operations, maintenance and debt service.	US\$ 65.27 million	79	SOLUTIONS for ENVIRONMENTAL CONTRASTS in COASTAL AREAS	EU	2009	Vietnam	Environment (Including Climate Change) ENV. The proposal considers the effects of human mobility on urban settlement growth and restructuring in coastal areas where (i) environment is more fragile and space limited, (ii) every phenomenon is more concentrated and (iii) effects on natural and cultural environment are more acute. Problems are multiplied since the climate change affecting environmental parameters - as sea levels - augments risks of flooding, propagation of pollutants, dislocation of a great number of settlers.	€ 7,768,562
58	Third Water Supply and Sanitation for Low Income Communities Project	World Bank	2006	Indonesia	The Third Water Supply and Sanitation for Low Income communities Project for Indonesia aims to increase the number of low-income rural and peri-urban populations accessing improved water and sanitation facilities and practicing improved hygiene behaviors.	US\$ 275.10 million	80	Coordinating Twinning partnerships towards more adaptive Governance in river basins	EU	2009	Thailand	Environment (Including Climate Change) ENV. The aim of Twin2Go now is to review, assess, synthesize and consolidate the outcomes of these projects in order to make them transferable and applicable to other basins, and to disseminate the project results effectively to relevant authorities, stakeholders and end-users. This will contribute to the overall goal to underpin the implementation of IWRM in line with the targets of the EU Water Initiative.	€ 1,175,022
59	Vietnam Water Supply Development Project	World Bank	2004	Vietnam	The development objective of the Urban Water Supply Development Project for Vietnam is to improve water, and household sanitation services in district towns, and large urban centers in ways that are financially, and environmentally sustainable, thus enhancing the health, and economic potential of resident households.	US\$ 135.00 million	81	Integrated Renewable Energy Solutions for Seafood Processing Stations	EU	2008	Thailand, Indonesia, Cambodia, Philippines, Vietnam	Energy (Energy). A new polygeneration application with renewable energy sources will be planned and demonstrated for the fishery industry. The distributed energy system utilizes cleaning waste of a fish processing plant to produce biodiesel. The biodiesel is used to produce the locally needed cooling/freezing and heating energy. In addition, a power surplus is generated for the electricity network or local industrial use.	€ 4,831,732
60	Provincial and Peri-Urban Water and Sanitation Project	World Bank	2003	Cambodia	The Cambodia Provincial and Peri-Urban Water and Sanitation Project aims to assist the country in moving forward to fulfill the Millennium Development Goals (MDGs) in water supply and sanitation by 2015.	US\$ 23.27 million	82	Integrated Sustainable Solid Waste Management in Asia	EU	2009	Thailand, Cambodia, Philippines, Vietnam	Environment (Including Climate Change) ENV. The general inadequate, when existing, methods of collection and disposal of solid waste in most Asian cities are causing important environmental and social harms, as human diseases spreading, environmental pollution and ground and water pollution. In order to raise awareness, promote an adequate waste collection and treatment system and the economic growth of this activity sector in a technological efficient and sustainable way, new waste management systems must be established, which also take into account the informal sector.	€ 1,234,387
61	LGU Urban Water and Sanitation Project APL2	World Bank	2001	Philippines	The project objective of the Second LGU Urban Water and Sanitation Project (APL) for the Philippines is to extend the outreach of the project to approximately 40 more LGU-managed water utilities.	US\$ 35.26 million	88	Stratospheric ozone: Halogen Impacts in a Varying Atmosphere	EU	2009	Malaysia	Environment (Including Climate Change) ENV. SHIVA aims to reduce uncertainties in present and future stratospheric halogen loading and ozone depletion resulting from climate feedbacks between emissions and transport of ozone depleting substances (ODS). Of particular relevance will be studies of short and very short-lived substances (VSLs) with climate-sensitive natural emissions.	€ 4,748,333
62	Ho Chi Minh City Environmental Sanitation (Nhieu Loc-Thi Nghe Basin) Project	World Bank	2012	Vietnam	The development objective of the Ho Chi Minh City Environmental Sanitation (Nhieu Loc-Thi Nghe Basin) Project is to reduce the incidence of flooding and increase the collection of wastewater in the Nhieu Loc Thi Nghe (NLTN) Basin in Ho Chi Minh City (HCMC), in an environmentally and financially sustainable manner.	US\$ 199.96 million	89	ASEM Aquaculture Platform	EU	2009	Thailand, Malaysia, Vietnam	Food, Agriculture and Fisheries, and Biotechnology (KBFE). This proposal builds on the outputs of the ASEM Aquaculture Platform, established in 2003 as an EU-Asia framework for dialogue, networking and continuing coordination for sustainable aquaculture development.	€ 1,195,483
63	Manila Third Sewerage Project	World Bank	2005	Philippines	The development objectives of the Manila Third Sewerage Project for Philippines are to: (a) increase the coverage and effectiveness of sewerage service delivery in participating areas of Metro Manila (MM) through an integrated approach involving septage management, sewage management, and heightened consumer awareness of water pollution problems and their solutions; and (b) establish the financial and technical viability of new approaches for sewage management in MM.	US\$ 84.46 million	90	Biodiversity of Freshwater Ecosystems: Status, Trends, Pressures, and Conservation Priorities	EU	2009	Malaysia	Environment (Including Climate Change) ENV. BioFresh, a major new FP7 project, will design and provide a single point of access to the extensive information on freshwater organisms that is currently stored in the databases. The BioFresh information portal for freshwater biodiversity will allow scientists and planners to complement, integrate, and analyse quantitative data to discover, evaluate and examine patterns that will shed new light on how freshwater biodiversity responds to global, European, and local environmental pressures.	€ 8,121,488
64	KALAH-CIDSS (Additional Financing) Project	World Bank	2010	Philippines	This project paper seeks the approval of the Executive Directors to provide additional financing (AF) to the Government of the Philippines for the Kapitbisig Laban Sa Kahirapan-Comprehensive and Integrated Delivery of Social Services (KALAH-CIDSS) Project.	US\$ 104.82 million							
65	Mekong Integrated Water Resources Management	World Bank	2012	Mekong region	The development objective of the Integrated Water Resources Management (IWRM) Project is to establish key examples of integrated water resource management practices in the Lower Mekong Basin (LMB) at the regional, national, and sub-national levels, thus contributing to more sustainable river basin development in the Lower Mekong.	US\$ 26.59 million							
66	Systems research for integrated resource management and land use analysis in South and Southeast Asia- IRMLA	EU	2001	Vietnam, Philippines	The problems of increased pressure on scarce resources (land, water, labour), in particular in intensive rice growing environments in S and SE Asia is such that it is no longer sufficient to evaluate management options at the field and farm level. The current project develops a multi-scale analysis framework for natural resource management and sustainable rural development and evaluates this unselected areas characterized by increasing intensification and diversification.	€ 649 997							
67	Decision support system for ecosystem upgrading and flood control of a sustainable development in the red river system (China, Vietnam) pilot phase	EU	2001	China, Vietnam	FLOCODS is an interdisciplinary long-term research project on the functioning of the Red River System (RRS) in flood, in the face of increasing degradation of the ecosystem and climate change. The final product of this project will be a full Decision Support System for ecosystem upgrading and flood prevention with particular emphasis on the RRS. On a short-term basis (2001-2002), the pilot phase of FLOCODS will serve for applied research to lay the scientific foundations and allow initial validation for a generic DSS using RRS as its test bed.	€ 1,341,462							

						Source of funding
91	Multi-stakeholder platform for ASEM S&T cooperation on sustainable water use	Bureau de Recherches Geologiques et Minieres France	2005	Thailand, Vietnam,	To contribute to the commitments of the EU Water Initiative and the MDGs by building and promoting a multi-stakeholder and scientific platform on water resources management.	€ 1,500,000
92	Coordinating Twinning partnerships towards more adaptive Governance in river basins	Universität Osnabrück Germany	2009	Thailand	The aim of Twin2Go now is to review, assess, synthesize and consolidate the outcomes of these projects in order to make them transferable and applicable to other basins, and to disseminate the project results effectively to relevant authorities, stakeholders and end-users.	€ 1,175,021
93	Innovative decision making for sustainable water management in developing countries	University of Natural Resources and Applied Life Sciences, Vienna	2005	Indonesia, Malaysia	Innovative decision making for sustainable management of water	€ 1,820,828 EU contribution € 1,699,999
94	Restoration of tropical peatland to promote sustainable use of renewable natural resources	Stichting Dienst Landbouwkundig Onderzoek, Netherlands	2004	Vietnam, Indonesia, Malaysia	To address global and regional issues of carbon balance, water management, biodiversity and poverty alleviation related to restoration and sustainable management of tropical peatland renewable natural resources.	
95	Strengthening capacity in Indonesia water sector	DHV Asia, Local Consultants	2007	East Asia and Pacific	This project concerns a detailed capacity needs assessment for the Indonesian water sector, in particular for the Ministry of Public Works.	EVD - Partners for Water
96	Water resources and irrigation management capacity building network project	PT IHE Indonesia, Alterra-Wageningen	2006	East Asia and Pacific	The overall objective of this project is to increase the capacity of leading Indonesian Universities in delivering capacity building services to strengthen water sector professionals to perform in a reformed water resources and irrigation management sector.	NUFFIC - NPT Programme
97	Coastal zone management in Banten bay, Indonesia	Badan Pengkajian dan Penerapan Teknologi (BPPT) - Institute for the Assessment and Application of Technology, Jakarta, Indonesia.	2001	East Asia and Pacific	The Banten Bay project aimed to develop a Monitoring and Management Information System (Banten Bay MIS) with a focus on four marine ecosystems to support the coastal zone management process in Banten Bay, NW Java, Indonesia.	The Foundation for the Advancement of Tropical Research (WOTRO), The Netherlands, and the Government of Indonesia.
98	MEKONG river commission integrated training and strategy programme	Mekong River Commission (MRC), Phnom Penh, Cambodia	2002	Southeast Asia	The objective of this project was to develop a long-term Integrated Mekong River Commission (MRC) Training Programme. This was to be based on an MRC Integrated Training Strategy in order to develop a critical mass of human resources at the Mekong River Commission Secretariat (MRCs), the National Mekong Commission (NMC) and National Line Agencies that would ensure effective and sustainable development of the water and environmental resources in the Lower Mekong region according to the shared concepts of Integrated Water Resources Management.	World Bank
99	Stimulating local innovation on sanitation for the urban poor in sub-Saharan Africa and Southeast Asia	Makerere University (Uganda), KNUST (Ghana), AIT (Thailand), 2iE (Burkina Faso), ITB (Indonesia), UCT (South Africa), UFMG (Brasil), Univalle (Colombia)	2011	Worldwide	The 5-year project (2011-2016) will be jointly executed by UNESCO-IHE (principal grantee) and 8 partners from developing countries in sub-Saharan Africa, Southeast Asia and South America (sub-grantees), supported by several external sub-contracting parties and individuals.	Bill & Melinda Gates Foundation
100	Development of a Flood Risk Mitigation Plan for the World Heritage Site of Ayutthaya	ADB, UNESCO-IHE, Thai Ministry of culture, Hydro & Agro informatics Institute (HAI), AIT	2011	Thailand	The project will apply a multi-disciplinary approach involving experts from different fields.	ADB

Annex III – KBBE Projects

Topics dedicated to Southeast Asia and/or with successful Southeast Asian participants (calls KBBE 2007-2013 and corresponding funded projects 2007-2012 plus other funded projects with successful Southeast Asian participants 2007-2012)

Calls	Topics published	Projects funded	Category of topic	ASEAN partners in funded projects
2008-2B	Network of Third countries National Information Points	BIOCIRCLE: Creating a CIRCLE by extending the BIO NCP network to Third Country NIPs	Mandatory participation	Thailand
2009-3	Porcine reproductive and respiratory syndrome (PRRS): new generation, efficacious and safe vaccine, new control strategies	PoRRSCon: New tools and approaches to control Porcine Reproductive and Respiratory Syndrome (PRRS) in the EU and Asia	SICA (China and Southeast Asia)	Vietnam
2009-3	Consolidate alliances with Asia in the field of aquaculture	ASEM-Aquaculture09: ASEM Aquaculture Platform	Mandatory participation (China and Asia)	Malaysia, Thailand, Vietnam
2009-3	Biomass and bioproducts: sustainability certification and socioeconomic implications	Global-Bio-Pact: Global Assessment of Biomass and Bioproduct Impacts on Socio-economics and Sustainability	Mandatory participation (Latin America and/or African ACP and/or Asia)	Indonesia
2009-3	Development of functional foods and ingredients	ECOKNOWS: Effective use of ecosystem and biological knowledge in fisheries	Coordinated call with India - DBT	Philippines
2010-4	Network of Third countries Bio-NCPs	BIO CIRCLE 2: Reinforcing the international cooperation in FP7 FAFB strengthening the CIRCLE of Third Countries BIO NCPs	Mandatory participation (Argentina, Brazil, Chile, China, Egypt, India, Mexico, Morocco, Russia, Ukraine, Tunisia, South Africa)	Thailand
2011-5	Translation mechanisms for targeting interventions on micro-nutrients - Mandatory South Asia and Southeast Asia	SMILING: Sustainable Micronutrient Interventions to Control Deficiencies and Improve Nutritional Status and General Health in Asia	South Asia and Southeast Asia	Cambodia (2), Laos, Vietnam, Thailand
2011-5	Role of aquaculture in improving food security and eradicating poverty worldwide - Mandatory ICPC	AFSPAN: Aquaculture for Food Security, Poverty Alleviation and Nutrition	Different ICPC	Malaysia, Thailand, Vietnam
2011-5	Reducing post-harvest losses for increased food security - SICA	GRATITUDE: Gains from Losses of Root and Tuber Crops SECUREFISH: improving food security by reducing post-harvest losses in the fisheries sector	Different ICPC	Thailand (2), Vietnam Malaysia
2011-5	BioWASTE - Novel biotechnological approaches for transforming industrial and/or municipal biowaste into bioproducts - SICA	CHIBIO: Development of an integrated biorefinery for processing chitin rich biowaste to specialty and fine chemicals	Different ICPC	Indonesia
2012-6	Conversion of bio-waste in developing countries	Proposal BIOWASTE4SP: Turning biowaste into sustainable products: development of appropriate conversion technologies applicable in developing countries	SICA (African ACP, Mediterranean Partner Countries)	Malaysia (3)
2007-1	(Bio-)Technologies for the production of food additives, colorants, and flavours	COLORSPORE: New Sources of Natural, Gastric Stable, Food Additives, Colorants and Novel Functional Foods	General topic	Vietnam
2007-1	Consolidate alliances with Third countries in the field of aquaculture	SARNISSA: Sustainable Aquaculture Research Networks in Sub Saharan Africa	SICA (ICPC)	Thailand, Malaysia
2007-2A	Reduce mycotoxin contamination in the food and feed chain	SEAT: Sustainable trade in ethical aquaculture	SICA (ICPC)	Vietnam, Malaysia, China, Thailand, Bangladesh
2008-2B	New and converging technologies for Precision Livestock Farming in European animal production systems	BrightAnimal: Multidisciplinary Approach to Practical and Acceptable Precision Livestock Farming for SMEs in Europe and world-wide	Targeted topic (ICPC)	Thailand, Malaysia, China
2009-3	Developing new methods for valuing and marketing currently non-marketable forest functions, goods and services	NEWFOREX: New Ways to Value and Market Forest Externalities	General topic	Indonesia
2009-3	International food trade: anticipating the impact of climate change on the safety of European and global food markets	VEG-i-TRADE: Impact of climate change and globalisation on safety of fresh produce - governing a supply chain of uncompromised food sovereignty	SICA	Thailand
2010-4	Sustainable culture of marine microorganisms, algae and/or invertebrates for high added value products	MARINE FUNGI: Natural products from marine fungi for the treatment of cancer	CP-FP	Indonesia
2010-4	Strengthening cooperation in food safety research in the enlarged European Union	FOODSEG: Safe Food for Europe - Coordination of research activities and Dissemination of research results of EC funded research on food safety	CSA-CA	Vietnam
2011-5	Plant photosynthetic efficiency: from a C3 to a C4 system	3to4: 3to4: Converting C3 to C4 photosynthesis for sustainable agriculture	CP-TP	Philippines
2012-6	Food safety and quality issues related to parasites in seafood	Proposal PARASITE: Parasite risk assessment with integrated tools in EU fish production value chains	CP-TP	Philippines, Vietnam, China

Annex IV – List of topics of EU-ASEAN common interest identified in the SEA-EU-NET project (2008–2012)

Exploiting genetic diversity of major cereals for sustainable intensification of agriculture production under climate change constraints (Mandatory ICPC)

Source: SEA-EU-NET, 2010. Report of the European-Southeast Asian-African-Latin American expert workshop on Food security & Primary production mitigating and adapting to climate change, Montpellier, 13–15 October 2010

Cereals are the basis of food safety worldwide, both in terms of human nutrition and source of income for many populations. Future climate scenarios predict an increase in air temperature as well as reduction and greater variability in rainfall. These changes could be particularly harmful to cereal yield as they will generate a wide range of combinations of abiotic stresses to which the actual popular varieties grown in the main cereal producing and consuming countries are not adapted.

The project aims at generating the current lacking knowledge, and developing methodologies and tools to tackle the interaction of abiotic stresses (i.e. heat and drought) in cereals of major importance to European markets. The outputs of the project shall provide the foundation for defining ideotypes and developing new stress tolerant, water use efficient varieties. An integrated scientific approach should be adopted, taking into account plant escape, avoidance and tolerance strategies. The relevant genetic diversity should be characterized and traits of interest and some candidate genes should be identified for both local ICPC and European varietal improvement. These practical tools and methodologies should be developed to assist breeders through an integrated breeding approach.

The project should explore the major hot spots of cereal biodiversity (i.e. Latin America, Southeast Asia, and possibly other zones) where future European climate conditions can be anticipated. It is recommended to consider a set of experimental sites with diverse climate conditions that will provide a relevant setup to discriminate genotype adaptation strategies and plasticity.

A convincing strategy for the effective dissemination, exploitation, take-up in practice and mainstreaming of results is essential. The establishment of generic approaches for the benefit of other cereal crops of strategic importance in distinct environmental regions is highly recommended.

Funding Scheme: Collaborative Project (small or medium-scale focused research project) for specific cooperation actions dedicated to international cooperation partner countries

Additional eligibility criteria: the project financed under this topic should mandatorily link up with the KBBE.2011.1.1-02 topic “Integrated approach to studying effects of combined biotic and abiotic stress in crop plants”. The new project should take into account the outputs generated by the KBBE-2009-1-2-05 Water stress tolerance and water use efficiency in food crops (LCP) – DROPS.

Expected Impact: The main expected impact is the establishment of a knowledge basis for breeding programmes on climate change resilient cereals for which interaction between physiologists and breeders is essential. The developed knowledge, methodologies and tools will be part of the common public goods in terms of climate change response strategies. The project will also support efforts to achieve sustainability of primary food production in Europe as well as in other regions. As such, it will be of use for cereal producers and will ensure steady supply of cereals for the consumers. Especially, the urban poor will benefit from low prices for cereals. The participation of partners from the targeted ICPC countries and from Europe is important to achieve the expected impact of the research to be undertaken. Moreover, the results of the research in this topic should be clearly of interest and potential benefit to SMEs, breeding companies in particular.

Additional information: Future climate scenarios predict an increase in air temperature as well as greater variability in rainfall and less availability of water for crop growth (IPPC, 2007). In particular, growing conditions in the near future will be characterized by higher night time and daytime temperature, and more frequent and intense events of water depletion. Grain yield has already suffered from such conditions. These changes will generate a wide range of combinations of stresses to which the actual popular varieties are not adapted.

The project aims at developing methodologies and tools to tackle the interaction of abiotic stresses in cereals and to support breeding for better crop tolerance under changing climates.

The project will:

- characterize the patterns of abiotic stresses encountered in the targeted hotspots regions,
- quantify and integrate the effects of relevant combinations of stresses,
- identify the genetic responses involved in the tolerance to abiotic stresses.

The growth patterns of promising ideotypes shall be relevant for identifying plant escape, avoidance and tolerance strategies. The project will encompass the development of standardized protocols, the utilization of phenotyping and genotyping platforms, and the calibration of models taking care of G×E interactions.

The relevant genetic diversity shall be characterized and some candidate genes shall be identified for adapting local varietal improvement but also cereal crops in Europe to future climatic conditions. This will give a basis for developing crops with higher water use efficiency. Some practical tools and methodologies shall be developed to assist breeders in an integrated breeding approach and shall be valid for contrasted cereal crops.

Ecological intensification of aquaculture systems in a changing and uncertain world

Source: SEA-EU-NET, 2010. Report of the European-Southeast Asian-African-Latin American expert workshop on Food security & Primary production mitigating and adapting to climate change, Montpellier, 13–15 October 2010

In response to an increasing global demand for aquatic food, aquaculture has evolved and intensified but not without environmental and socio-economic trade-offs. While aquaculture already accounts for half of the global fishery production, its sustainability is challenged. To satisfy the demand of an increasing population, aquaculture may have to grow by another 30 million tons from 2010 to 2030 (FAO). However, large production areas and associated livelihoods are threatened by sea level rise and other effects of climate change including urbanization. Thus for aquaculture to further develop in

the future, it has to be based on ecological intensification of systems, i.e. reducing resource use and waste output through a more efficient use of production factors in the ecosystems where they are located.

Previous and on-going related actions of EU cooperation have focused on: a) Recycling water and nutrients in both peri-urban and rural integrated production systems for poverty alleviation (POND-LIVE, PAPUSSA); b) Reducing nutrient emission in recirculation aquaculture (ZAFIRA); c) Focused food security for vulnerable sectors (FPAVAS); d) Sustaining Ethical Aquatic Products Trade (SEAT); e) Alternatives to fish meal (KBBE.2011.1.2-11: Aquaculture feeds and fish nutrition); f) Networking (Sarnissa, AqASEMO9, AquaMed); and g) Knowledge collection, management and dissemination

The goal of this call is to reduce the vulnerability of the aquaculture sector and the people dependent on it for their livelihood. Specifically, the objectives of the project are to:

- develop new and integrate existing technologies in freshwater and coastal aquaculture aimed at optimizing nutrient and water use, reducing and mitigating environmental impact, and facilitating adaptation to climate-induced changes initially in Southeast Asia and then in Latin America and Africa.
- incorporate ecologically intensified aquaculture development in regional and national climate change strategies.

The project will take stock of the diversity of existing approaches and methodologies. It will target and include a wide range of stakeholders and consider gender and equity issues. Dissemination strategy will utilize most recent technologies, including IT, for producing user-friendly multi-media outputs.

Expected Impact:

- Reduced ecological footprint of intensified aquaculture production systems;
- Reduced variability of yield and income of intensified aquaculture systems;
- Increased EU and local food security;
- Ecologically intensified aquaculture included in national and regional climate change strategies.

Additional information: half of EU aquatic products are now imported, the majority of which come from Asia. EU consumers increasingly need to have confidence in the way their food is produced, especially since geographical and cultural distance make the link between producers and consumers relatively weak for globally traded products. Most EU past and on-going investment has been concentrated on knowledge collection, certification of best hygiene and farming practices, and networking as evidenced by the preparation of current call. The challenge is to identify new ways of producing more with less. In addition, a major challenge will be to convince both commercial and small scale producers to adopt ecologically intensive production systems.

Existing calls: KBBE.2011.1.4-07: Role of aquaculture in improving food security and eradicating poverty worldwide. There exists however, knowledge gaps and significant lessons learned from which this current project call could add value to. For example, new innovative technologies have emerged, that could successfully improve aquaculture sustainability (nutrient recovery, food safety standards, and ICT among others).

Guaranteeing policy and economic tools efficiency to mitigate environmental impacts of the trade flows between Europe and Southeast Asia

Source: SEA-EU-NET, 2011. *Proceedings of the EU-ASEAN Stakeholder Conference, Hanoi, November 2011*

The EU ecological footprint largely arises from the way member States procure their supplies of agricultural and forestry commodities, whose production impacts the biodiversity and carbon balance of producing and consumer countries. The EU is therefore developing a product procurement policy meeting sustainable development criteria in order to take up global environmental challenges and reduce its ecological footprint (and that of the supplying countries). This procurement is particularly crucial in Southeast Asia where major agricultural and forestry commodities (such as oil palm, natural rubber, timber...) are imported to Europe with often hotly controversial issues regarding the sustainability of their production and chain traceability. EU backs private sector initiatives designed to implement voluntary sustainable standards (such as the Roundtable on Sustainable Biofuels, the Roundtable on Sustainable Palm Oil or Forest certification schemes). EU also takes a more directive approach (as with the "Renewable Energies Directive"), whereby suppliers are subjected to sustainability criteria for production of commodities. However, environmental performance of these instruments is poorly known.

The project will aim at analysing the changes in economic and political practices induced by the implementation of multistakeholders initiatives supporting a sustainability-oriented commodity supply chain for Southeast Asia-EU trade flows, in the agro-food, bio-fuels, and forest sectors. The project should provide a better understanding of the impacts of these voluntary schemes on economic agent's behaviours in Southeast Asia and along the commodity chain, investigating the knock-on or learning effects they bring into play.

The project should also consider the robustness of the sustainability criteria adopted by multistakeholders initiatives, and explore methodologies to address their actual contribution to environmental change mitigation and their potential indirect or side effects, such as the indirect land use changes dimension. In order to maximise the benefits, multidisciplinary approaches, involving various disciplines such as economy, social and political sciences, agronomy and the relevant industrial sectors

must be considered. To ensure that the proposed processes are in line with the needs of the civil society, the project should bring together private firms (growers and retailers), local communities, international organisations and NGOs.

Funding scheme: Collaborative Project (small or medium-scale focused research project)

Additional eligibility criterion: Minimum number of participants: 3 from different Member States or Associated countries and 3 from different ICPC from Southeast Asian countries.

Expected impact: The project would contribute to a better understanding of the dynamic and impact of the EU Renewable Energy Directive (RED) or FLEGT into bilateral EU-ASEAN negotiations to assess the environmental impacts of major commodities and agrofuel produced in ASEAN and improve their supply chain traceability. It will also contribute to informing discussions and policy recommendation in international forums dealing with sustainability criteria included in the directive and international voluntary certification bodies, in order to guarantee the sustainability of major commodities and agrofuels produced in ASEAN and imported to Europe.

Accessibility of Safe Food by Food Insecure Households

Source: SEA-EU-NET, 2009. *Report on EU-Southeast Asia Expert meeting on Food Quality, Safety & Traceability Bangkok, Thailand, 24-27 February 2009*

Food safety has been an important agenda by both public and private entities in Southeast Asia (ASEAN) largely to improve the competitiveness of international trade and the rise of middle class consumers that demand safer food. Accessibility of safe food to poor households however is limited due to informal marketing and distribution channels of food supply and higher prices of private-certified food. Food insecure households may value quantity and diversity aspects more than quality. Prevalence of food-borne illness and other hazards associated with food are more common among the poor. Market segmentation between "safe food for the rich" and "unsafe food for the poor" may emerge. Thus it is strategic to appraise food safety risks along the food supply chain to the insecure households in ASEAN and finding ways to alleviate them.

Main development objective: to increase the accessibility of safe food by the food insecure households by improving the awareness of decision makers, food suppliers and consumers of food safety risks linked to poverty and finding ways to alleviate them. The main objective is to determine whether new food safety regulations

(mostly private) generate exclusion from food safety of the poor as consumers, or on the contrary have positive spill over-effects on the poor.

Possible methodology to be implemented:

- Investigation of food consumption patterns and exposure to major food safety risks of food insecure households and their determining factors, including epidemiologic analyses, evaluation of vulnerability of households and its impact on access to food and control of food safety.
- Appraisal of the perception of food safety and demand for food safety by food insecure households.
- Investigation of food supply chains of food insecure households, including the chains of food wastes.
- Appraisal of safety risks along the chains of food supply to insecure households, in relation to varying practices of suppliers, traders and consumers, using traceability tools and HACCP.
- Comparative evaluation of cost and safety risks of food products along different types of food supply chains.
- Institutional analysis of relations between actors and regulations in different food chains and their impact on food safety risks.
- Appraisal of public policies in favour of food safety and their impact on poor consumers, comparing command-and-control versus market-based approaches.
- Evaluation of the cost of different systems of food safety management, of their impact on food budget and possible economic exclusion.
- Evaluation of efficient enablers (such as information tools, training, and credit schemes) to improve food safety management by policy-makers, traders, and consumers in the supply chains of poor households.

Importance of international cooperation: exchange of experience of adequate-low cost methods for appraising food safety risks, perceptions and policies that will have economic impacts of reduction in health care costs.

Expected impact: In order to improve the accessibility of safe food among the poor, understanding of their awareness, perception and attitudes and the constraints that they are facing is crucial. With that understanding, this project will generate recommendations on adequate ways to regulate food safety, including private standards, public regulations, intra-chain cooperation, small-scale and cheap technologies to reduce safety risks at critical points, according to their anticipated impact on the food safety available to the poor; effective information and concentration programs for the local and public decision-makers, the traders in the food chains and the food insecure households which ultimately will decrease the food safety risks and health care costs.

Anthropogenic changes and emerging diseases: a "One health" approach

Source: SEA-EU-NET, 2010. *Report of the European-Southeast Asian-African-Latin American expert workshop on Food security & Primary production mitigating and adapting to climate change, Montpellier, 13-15 October 2010*

As a "One health" approach, animal and human health risks emerge from dynamic interactions between wildlife, domestic animals and humans in various agro-ecosystems and interfaces. Global changes have a significant effect on the habitat and movement of humans, animals and pathogens including their possible vectors. Today's world is marked by unprecedented human footprint on environment with major changes in biodiversity affecting wildlife reservoirs and vectors and by health crises linked to emerging diseases. Social and environmental changes together with increasing mobility and trade dramatically facilitate disease emergence, and exacerbate sanitary and socio-economic impact. Though every country worldwide is concerned, developing countries, with their limited health systems and economic resources, are particularly vulnerable. Improving animal and human health considering the complexity of diverse interactions needs multidisciplinary approach gathering ecology (biodiversity), epidemiology (multi-hosts/multi-pathogens) complex systems, socio-economics, spatial analysis and modelling (including geographic information system, remote sensing of the environment and geostatistics), scenario-based modelling and risk analysis.

- How to integrate climatic, environmental, economic and social factors into ecological and epidemiological patterns and processes? Modelling should be used to explore the role of environmental and socio-economic factors in the spatiotemporal dynamics of emerging diseases.
- How to prevent, monitor and control these emerging infections? Recent tools Appropriate in scenario-based modelling should be developed and implemented as a way to assess the effects of control measures of emerging diseases.
- How to evaluate the efficiency of surveillance and control networks and programs? Comparable environments and diverse social contexts should be considered in order to address the complexity of the emergence of diseases. Socio-economic issues should be taken into account to improve implementation of the risk-based surveillance/control scenarios.

Funding scheme: Small Collaborative Project (SICA): LAC, SE-Asia, Africa (< 3,000,000 EC contribution)

Additional eligibility criteria:

- Participants: Research effort should be shared among institutions at least from 3 continents.

- The project should encourage involvement of private sector including SMEs in the early steps to ensure a realistic approach in the exploitation and delivery of products.

Expected impact:

- Sub-regional/regional/global improved cooperation for emerging diseases control
- Decision support tools and methods, i.e. cost-effective surveillance and control strategies, will be built up in close collaboration and should be adapted to each socioeconomic perspective and socio-ecological context.
- Training (undergraduate students) and workshops (graduate students) from participating countries
- Synergy with FAO programs, Animal Health and the Millennium Development Goals

Additional information:

Justification: A combination of many ecological and socioeconomic factors has led to the development and expansion of agro-ecosystems conducive to the (re-)emergence and dissemination of diseases. Southeast Asia is a hotspot for potential (re-)emergences and an appropriate research model, considering the high variability in human-dominated ecosystems, the high potential impact of the climate change, and the dramatically ongoing biodiversity losses. It could be compared to other systems such as Africa to test the model-based approaches, but also to predict the global risk of disease spread, up to European countries. Diseases from Africa could emerge in Asia and vice-versa. The interest of regional activities is to gain insight into emerging diseases in this region by promoting university exchanges and pooling scientific synergies. For potential partners, this involves organizing and conducting research and training on a regional scale in order to propose appropriate health policies and surveillance responses. Several research activities could be developed in collaboration also with regional OIE, FAO and WHO representatives and other pre-existing networks.

State of the art: Previous EU funded projects (FP6/FP7) were one-disease approach (Avian Influenza, Swine Fever, Foot and Mouth Disease, Tuberculosis, etc.) or species-bases approach (fishes, bees, etc.). This "One health" proposal is multi-hosts, multi-pathogens approach and merges human and animal health issues.

