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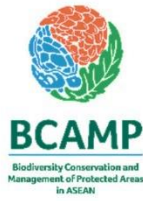


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Assessment Report of the Status on the Nexus between Biodiversity and Health, Food and Nutrition, and Traditional Medicine in ASEAN Member States



This publication was produced through the support of the ASEAN Centre for Biodiversity (ACB) in collaboration with the United Nations University-International Institute of Global Health (UNU-IIGH) through the *Biodiversity Conservation and Management of Protected Areas in ASEAN* (BCAMP) Project. The views and opinions expressed herein should not be taken, in any way, to reflect the official position or opinion of the United Nations University-International Institute of Global Health (UNU-IIGH), the ASEAN Member States, and the ASEAN Secretariat.

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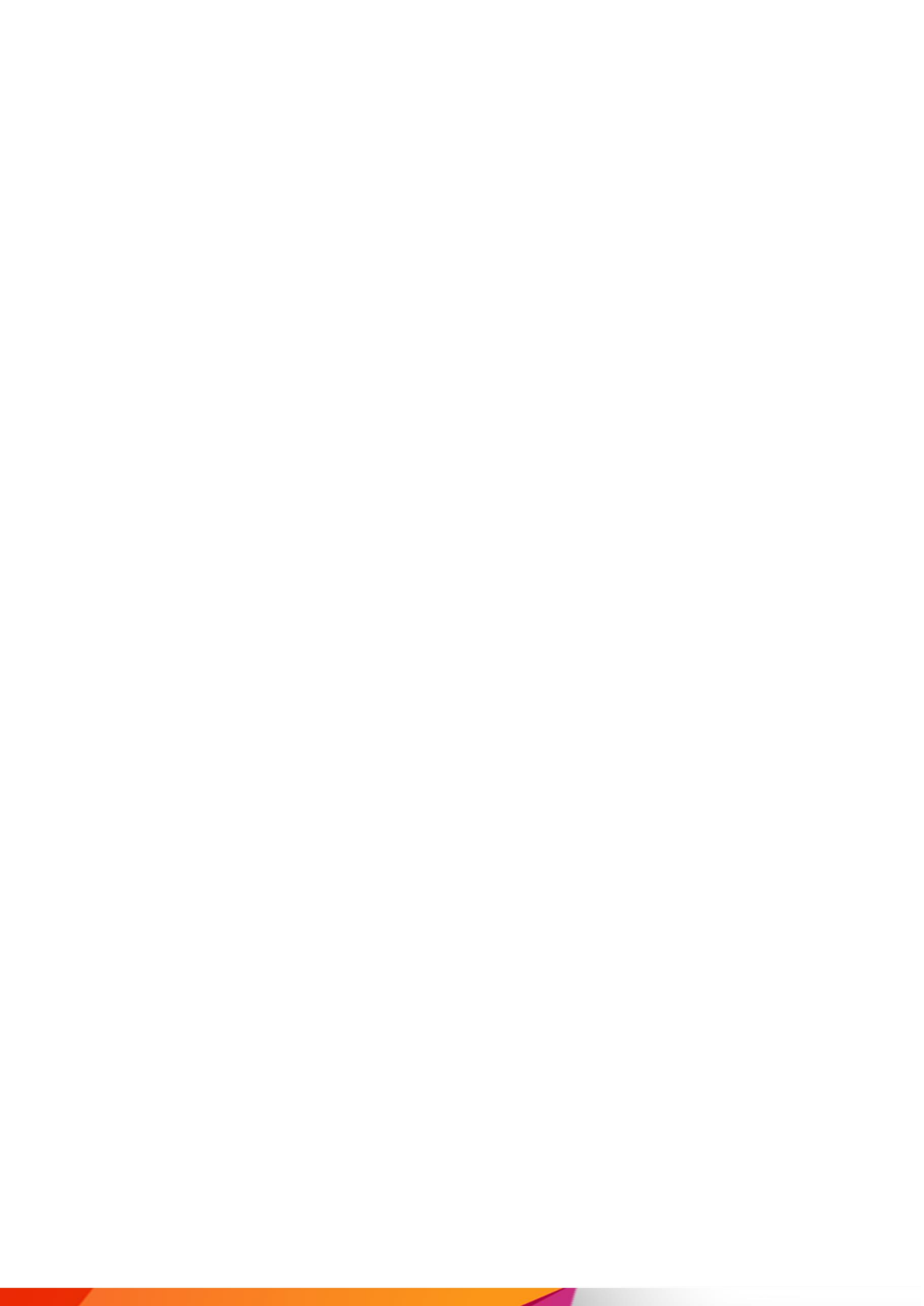
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LIST OF ACRONYMS

ABS	Access and Benefit Sharing
ABVC	ASEAN BioDiaspora Regional Virtual Center
ACB	ASEAN Centre for Biodiversity
ADB	Asian Development Bank
AEC	ASEAN Economic Community
AFCC	ASEAN Multi-Sectoral Framework on Climate Change
AHP	ASEAN Heritage Parks
AIFS	ASEAN Integrated Food Security
AMAF	ASEAN Ministers on Agriculture and Forestry
AMR	Antimicrobial Resistance
APEIR	Asia Partnership on Emerging Infectious Disease Research
APAARI	Asia-Pacific-Association of Agricultural Research Institutions
APFORGEN	Asia Pacific Forest Genetic Resources Programme
APSED	Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies
ASEC-ONE Health	ASEAN Secretariat Working Group for ONE Health (ASEC-ONE Health)
ATMHSC	ASEAN Traditional Medicines and Health Supplements Committee
BCAMP	Biodiversity Conservation and Management of Protected Areas in ASEAN
CBD	Convention on Biological Diversity
CCS	Country Cooperation Strategy
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
COVID-19	Coronavirus disease 2019
DFAT	Department of Foreign Affairs and Trade
EIDs	Emerging Infectious Diseases
EPT	Emerging Pandemic Threats
FAF	Food, Agriculture and Forestry
FAO	Food and Agriculture Organization
FRIM	Forest Research Institute Malaysia
GAP	Good Agricultural Practices
GMP	Good Manufacturing Practices
GPP	Global Partnership Programme
HIA	Health Impact Assessment
HPAI	Highly Pathogenic Avian Influenza
IDRC	International Development Research Center

IFPRI	International Food Policy Research Institute
INSP-AI	Implementing the National Strategic Plan for Avian Influenza
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
IPGRI	International Plant Genetic Resources Institute
IRRI	International Rice Research Institute
ISSC-MAP	International Standard of Sustainable Collection of Medical and Aromatic Plants
IUCN	International Union for Conservation of Nature
JAIF	Japan-ASEAN Integration Fund
LGUs	Local Government Units
LIFT	Livelihoods and Food Security Trust Fund
MBDS	Mekong Basin Disease Surveillance
MoHS	Ministry of Health and Sports
MONRE	Ministry of Natural Resources and Environment
NGO	Non-Governmental Organisation
NPANM	National Plan of Action for Nutrition of Malaysia
NTFP	Non-Timber Forest Product
NTFP-EP	Non-Timber Forest Produce-Exchange Programme
OIE	World Organisation for Animal Health (formerly the <i>Office International des Epizooties</i>)
PITAHC	Philippine Institute of Traditional and Alternative Health Care
SAARC	South Asian Association for Regional Cooperation
SARS	Severe Acute Respiratory Syndrome
SARI	Severe Acute Respiratory Infection
SFA	Singapore Food Agency
SFFM	Strategic Framework for Food Management
SPA-FS	Strategic Plan of Action on Food Security
SOMHD	Senior Officials Meeting on Health Development
TCAM	Traditional, Complementary and Alternative Medicine
TCM	Traditional and Complementary Medicine
TKDL	Traditional Knowledge Digital Library
UNCTAD	United Nations Conference on Trade and Development
UNU-IIGH	United Nations University-International Institute of Global Health
WHO	World Health Organization
WHO-SEARO	World Health Organization-South-East Asia Regional Office



BACKGROUND AND OBJECTIVES

The relevance of biodiversity to ensure the health and well-being of people is well acknowledged (MA, 2005). The joint publication by the Convention on Biological Diversity (CBD) and the World Health Organization (WHO) in 2015, *Connecting Global Priorities: Biodiversity and Human Health, a State of Knowledge Review*, gave a policy fillip to the possibility of mainstreaming of health and biodiversity in respective sectors. It highlighted that loss of biodiversity led to negative human health consequences, while better access to biodiversity and ecosystems had significant mental and physical health benefits, across different scales and contexts.

Over the years, the importance of biodiversity towards achieving health goals has become more evident with the rising trends in infectious diseases and non-communicable diseases (NCDs). The ASEAN region, witnessing rapid lifestyle changes, is especially vulnerable. The growing number of outbreaks of newly emerging and re-emerging infectious diseases mainly of zoonotic origin has also been a major concern in the Region. The current pandemic of Coronavirus disease 2019 (COVID-19) shows the vulnerability of impaired socio-ecological systems as revealed by the complexity and deep intersectoral nature of the situation, and seriousness of the costs of inaction in conservation of biodiversity and ecosystems that are conventionally considered non-dominant sectors of health (Settele et al., 2020). However, being a bio-culturally megadiverse region that is further well-integrated culturally and economically, several leverage points exist in the ASEAN region including resource availability, knowledge prevalence, and transboundary cooperation that can help address the loss of health and well-being.

Following the *Second ASEAN Conference on Biodiversity* held in 2016 in Bangkok, Thailand, when Biodiversity and Health was adopted as a Strategic Focus Area for the ASEAN region, UN University-International Institute for Global Health (UNU-IIGH) has been working closely with the ASEAN Centre for Biodiversity (ACB) and partners to identify how the interlinkages between the sectors may be operationalised in the Region, across the 10 ASEAN Member States (AMS). This requires identifying relevant regional and multilateral policies, national policies and implementation activities, and mechanisms of implementation, including academic and policy institutions that could take the lead in the different themes. An information sharing workshop was organised in November 2018 in Manila, Philippines where the AMS delegates shared ideas and reflections on areas within the Biodiversity and Health theme that are important to the Region, in addition to sharing national experiences.

The following five (5) sub-themes were identified in this workshop:

1. Traditional Medicine and Biodiversity
2. Food and Nutrition and Biodiversity
3. One Health and Biodiversity
4. NCDs and Biodiversity
5. Biodiversity planning and Health

This scoping document has been prepared by UNU-IIGH, under the ACB through the project *Biodiversity Conservation and Management of Protected Areas in ASEAN (BCAMP)*. An extensive literature review was undertaken with updated information on focal agencies, institutions, key challenges and strategies sought from the AMS through the ACB.

The following are the objectives of the study:

1. Identify current policy priorities and joint implementation possibilities in the Region across the sectors in each of the thematic areas set out in the report of the Manila meeting in November 2018
2. Identify best practices relating to knowledge use and implementation that can be appropriately replicated across the Region, with specific attention given to transboundary and collaborative arrangements.
3. Prepare a Policy Brief highlighting how the ACB may work with relevant ASEAN bodies

Methodology

Two (2) approaches were taken for this review:

1. Secondary data collection from published materials viz. policy documents, academic publications, grey literature.
2. Following this, to fill in data gaps (especially in relation to the institutional frameworks and governance and updated information), primary data collection was attempted. An open-ended questionnaire was sent to the AMS to seek additional information.

The secondary data collection was mainly done by searching through online platforms such as Google Scholar, PubMed, and Scopus databases. Plain Google search was also done so as not to exclude grey literature and other policy relevant non-academic reports. The search only covered literature in English which is a limitation of the study. Key terms relating to the five themes were used for various string searches. The literature from the year 2000 to 2020 was collected.

The materials consisted of general policies of the ASEAN region, of the individual AMS, and global policies relevant to the ASEAN. Additionally, related studies and sub-regional collective activities (e.g. Mekong river basin work, haze pollution joint work of Indonesia, Malaysia, and Singapore) were also used.

The topics that were covered in the literature search under each of the thematic areas are highlighted below:

- Traditional medicine and biodiversity: Medicinal flora and fauna used, conservation of threatened species, wildlife trade, cultivation and sustainable collection practices, non-timber forest produce; projects or activities of traditional medicine in public health especially in the context of infectious diseases, non-communicable diseases, mental health, nutrition, value chains, community enterprises, livelihoods, pharmaceutical and nutraceutical products (quality, safety, efficacy, rational use, certification systems), associated traditional knowledge, intergenerational learning, protection of knowledge, access and benefit sharing, traditional knowledge holders (regulation, recognition), access to traditional medicine, cultural and spiritual dimensions, healing landscapes *etc.* Searches also included related research, education and capacity development programmes, policies, institutions and networks linked to traditional medicine and medicinal plants.
- Food, nutrition and biodiversity: Agricultural systems and related policies on crop improvement for nutrition, land use changes, use of chemicals and pesticides, subsidies, sustainable farming, diet diversification, traditional diets and links to nutrition, associated traditional knowledge, water, homestead gardens and their impact on health *etc.*
- One Health: Zoonotics and other emerging and re-emerging infectious diseases, antibiotics and other chemical use and antimicrobial resistance, agriculture and livestock farming and their impacts on biodiversity and ecosystems, land degradation, wildlife conservation, trade,

neglected tropical diseases, pandemic preparedness, food safety climate change, ecohealth, planetary health, health in social-ecological systems health in all policies, related policies, intersectoral approaches, research, education, and capacity development programmes, networks etc.

- NCDs and biodiversity: NCDs, healthy lifestyles, physical inactivity, mental stress, determinants of NCDs, occupational health, environmental health, change in production and consumption, change in dietary habits, food contamination, policies related to unhealthy foods, access to health services, healthy urban spaces, mental health, etc.
- Biodiversity planning and health: Biodiversity, ecosystems, climate change and health related regional planning, intersectoral approaches and frameworks, science-policy interface, implementation status, major challenges, global policies, networks etc.

An initial review of the gathered materials for this study was done, and those that were not directly linked to biodiversity, ecosystems, and health-related areas were removed. Materials that did not have a significant nexus to this study, or were outdated in terms of their relevance to existing policies were also removed. This resulted in around 300 documents for detailed screening. Additional data was also collated from the AMS' presentations at the 2018 workshop held in Manila.

Following data collection, a questionnaire with open-ended questions was sent to the AMS, to seek additional information. Three (3) of the AMS (Myanmar, the Philippines, and Singapore) responded to the questionnaire. This helped to partially fill the gaps in the literature survey.

An initial draft of this report was prepared, which was reviewed by representatives from the ACB and BCAMP project. Four (4) of the AMS (Malaysia, Myanmar, the Philippines, and Singapore) provided inputs to the report during the final review. This report is a summary of all the data collected and studied.

1. Traditional Medicine in the Context of Biodiversity

Across the ASEAN region, almost all the AMS recognise the social legitimacy and importance of traditional medicine towards providing health and well-being especially in rural areas. Apart from this, the AMS recognise the importance of conserving medicinal resources and associated traditional knowledge, developing novel pharmaceutical products, and improving livelihoods.

Several assessments clearly show the richness of both medicinal resources and traditional medicine practices in the Region. It is estimated that 100 million people who live in the forests of South and Southeast Asia depend on non-timber forest products (NTFPs) (Diaz et al, 2018). Apart from providing healthcare to the local communities and populations that cut across nutrition, medicine, and mental health among other needs for well-being, traditional medicine practices also have proven to be crucial to provide healthcare to marginalised groups, for instance, refugees and migrants (Wodniak, 2018).

Studies have shown that high trade has led to overexploitation in several instances, endangering the population of several species of flora and fauna, including those in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) lists (UNCTAD, 2017). Organisations such as TRAFFIC International and International Union for Conservation of Nature (IUCN) have introduced guidance on inventorying medicinal plants and resources, documenting related traditional knowledge, subscribing to sustainable harvest, undertaking value addition, equitable management of resources, and tackling illegal movement of resources, including poaching. Recent reports suggest that these interventions have only been partly effective, and the illegal trafficking of exotic flora and fauna materials in the name of traditional medicine continues to grow in the Region. All of this calls for increased community engagement and empowerment.

Traditional medicine is also being viewed as a resource to inform the public of the development of new pharmaceuticals, nutraceuticals, and health supplements. According to *the Second Edition of the ASEAN Biodiversity Outlook* (ACB, 2017) “Genetic resources have become increasingly valuable over time as the discovery of new medicinal plants and the development of drugs and health supplements from these sources have rapidly progressed. Biotechnology, as an industry that maximizes the potential of these products, boasts of an annual growth of 3.7 per cent from 2011 to 2016 with a reported revenue amounting to USD 323 billion (IBISWorld, 2016).” From most of the AMS, there are continuing efforts for ethnomedical explorations and bioprospecting reported through international collaboration. Assuring protection of intellectual property rights and developing good models of fair and equitable sharing of benefits also continue to remain as challenges that are not fully addressed, though there are efforts being made to act on these concerns.

Medicinal plants – status (conservation concerns, sustainable use, trade)

The assessment of the use of key biological resources, as well as the trade and threat status of such resources at regional, national and sub-national levels, and the development of suitable management plans integrating social, economic, and ecological dimensions of resource use are important. Whereas there is data from some of the AMS on detailed mapping of native flora and fauna, as well as conservation efforts, there is no comprehensive assessment of the medicinal flora and fauna used across the Region.

The *First Asian Plant Conservation Report in 2010* (CNC- DIVERSITAS 2010) examined conservation progress in Asia, and offered suggestions on how to achieve plant conservation targets under the Global Strategy for Plant Conservation framework. The report, which was presented during the Tenth Meeting of the Conference of Parties to the CBD in Nagoya, Japan, highlighted the activities of the ACB and the ASEAN Wildlife Enforcement Network.

Though there was a joint ASEAN ministerial statement in 2005 including an action plan up to 2010 which led to this assessment report, the follow up action plans are not available. Also, during the conduct of the study for this assessment report, it was discovered that some of the AMS have yet to start doing an inventory of their flora, due to political instability.

The data on threat status of wild medicinal plants across the Region is fragmented. In 2017, United Nations Conference on Trade and Development (UNCTAD) and CITES brought out a report which analysed the use of traceability systems as a tool to strengthen existing CITES processes of medicinal plants from the Greater Mekong sub-region countries, involving Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam (UNCTAD, 2017). This was limited to the period between 2004-2015, and to a limited number of species. The report highlighted the increasing illegal trade of commercially important species and their socio-economic impacts. There is a need to extend this study to all endangered medicinal flora and fauna in the Region with the participation of both the public and the private sector. Currently from the literature it can be ascertained that there is no time series data on the impact of trade on medicinal species or their conservation status.

The Conservation Assessment and Management Plan, IUCN's approach to threat assessment, was successfully implemented in India and several other countries for the last two (2) decades. The AMS may use this approach as a model for developing their action plans.

Conservation strategies and programmes

It is important to build on and strengthen community-based participatory models of conservation action, both *in situ* and *ex situ*, and promote sustainable use within biodiversity planning strategies, and integrate them with health care and livelihood programmes. Facilitating capacity development of resource managers and other relevant stakeholders in conservation-related processes of medicinal flora and fauna is also critical in regulating collection, encouraging sustainable harvest practices and cultivation by communities to reduce stress on wild populations of biological resources.

Implementation of good agricultural practices; post-harvest crop improvement; management of biotechnological approaches such as tissue culture, micro-propagation, synthetic seed technology; and molecular marker-based approaches should be applied to improve yield and to modify the potency of medicinal plants. Whereas these are happening across the subnational scale, a comprehensive regional approach would help develop the potential of the sector. There is inadequate regional data on any existing regional coordinated efforts for conservation of medicinal resources.

Sustainable use

Encouraging regional and international networking and up-scaling existing good practices in the area of sustainable utilisation of medicinal resources is important. There are regional networking efforts by non-governmental organisations (NGOs), such as the Non-Timber Forest Produce- Exchange Programme (NTFP-EP), which has highlighted projects like community-based conservation initiatives, projects related to indigenous food and health, sustainable community livelihoods, tenure rights and governance aspects, and the gender dimensions in this area.

The target of the International Standard for Sustainable Wild Collection of Medicinal and Aromatic Plants (ISSC-MAP) is to ensure that the collection, management, production, trade, and marketing of medical and aromatic plants are sustainably managed. Cambodia has set a good model, by implementing the ISSC-MAP for species threatened by over harvesting.

Encouraging and facilitating multi-stakeholder approach to sustainable use of biological resources, including the engagement of harvesting communities, private sector along the trade chain, resource managers, civil society and small and medium scale enterprises. Promoting the use of the best practice framework for sustainable and equitable use of wild medicinal plants – *viz.*, the *FairWild Standard* – including for sustainable harvesting and trade by communities, strengthening of governmental policies, and ensuring trade in medicinal resources is fair and sustainable.

Other broader Asia-Pacific initiatives like Asia Pacific Forest Genetic Resources Programme (APFORGEN) have organised projects to develop national capacity and regional collaboration for sustainable use of forest genetic resources in tropical Asia. The Asia Pacific Association of Forestry Research Institutions, Bioversity International, Forest Research Institute Malaysia (FRIM), International Tropical Timber Organization, along with agencies like the Food and Agriculture Organization (FAO), have collaborated for technical and scientific cooperation, training and information-exchange amongst countries in the Asia-Pacific region. Eight (8) of the AMS have been part of this project. This has taken a comprehensive approach with target beneficiaries, including forest research institutions, policymakers, local communities, government forestry departments, NGOs and private forestry companies. This focused to strengthen national programmes on forest genetic diversity; enhancing regional networking and collaboration; facilitating assessment and conservation of genetic diversity of priority forest species; and facilitating sustainable use in natural and man-made forests.

Along with its partners, the ACB has implemented several taxonomic capacity development activities with the support of the Japan-ASEAN Integration Fund (JAIF) and additional support from the East and Southeast Asian Biodiversity Information Initiative (ESABII) on Taxonomy for all the AMS. This includes a wide range of topics including CITES policies, identification of threatened species, and the interface of protected areas databases, among others. It is important to have a health focus in such programmes (ACB, 2017).

The Southeast Asian Regional Office (SEARO) of the WHO presented the AMS with a framework and guidelines for facilitating the regulation of herbal medicines and products used in traditional medicine in a 2003 meeting in which Indonesia, Myanmar, and Thailand participated.

Associated traditional knowledge

“Associated traditional knowledge” includes addressing erosion, documentation, intergenerational learning, protection, databasing people’s registers, access and benefit sharing (ABS), and the recognition of knowledge holders. There is a need to formulate interdisciplinary ethnomedicinal studies based on community needs through participatory methodologies like multiple evidence-based approaches. Currently, there is insufficient data on exhaustive documentation of community practices. It is recommended that further studies on People’s Biodiversity Registers and community protocols on health and nutrition could be undertaken. Moreover, their databasing in systems like the Traditional Knowledge Digital Library (TKDL) model could be taken up in a focused manner.

Presently, there are a lot of activities being done concerning ABS in the Region; the individual AMS could work together to coordinate these activities (ACB, 2017). This would further maintain and nurture indigenous and local knowledge innovations and practices associated with plant resources to support customary use and sustainable livelihoods. This would also help in mainstreaming the knowledge of traditional healers in the health sector, and reinforce intergenerational transfer of knowledge and skills. Additionally, it is important to create legal recognition and accreditation of traditional knowledge holders. In this regard, the Thailand example of self-regulatory associations and accreditation guidelines is worth emulating across the Region.

Community learning through peer-to-peer exchange could be taken up to strengthen the confidence of the traditional knowledge holders. There is a strong gender and livelihood dimension in this area as a major part of knowledge holders, considering that plant collectors and processors are mostly women from economically vulnerable contexts.

In the 10-year framework programme of the *Regional Strategy for Traditional Medicine in the Western Pacific (2011-2020)* of the WHO Western Pacific Regional Office (WHO WPRO), due emphasis has been given to protection and conservation of indigenous health resources, including traditional knowledge and bio-resources. Under the five (5) strategic objectives of this framework, promotion, protection and sustainable use of traditional medicine resources is a key objective. Additionally, the framework outlined the conduct of baseline national assessments of existing indigenous natural health resources and the monitoring of their exploitation; the process of developing, monitoring, and enforcing policies and regulations to prevent exploitation; and the protection and conservation of indigenous health resources.

Strategic actions were likewise stated in the framework; these include: ensuring that appropriate agencies are established and fully informed on issues related to intellectual property rights and on the protection, conservation, and promotion of traditional medicine; developing collaborative national and local conservation and cultivation programmes, for the long-term availability and accessibility of important natural health resources, especially those included in national essential medicines lists; and educating and empowering indigenous people and communities on their rights, and the proper use of their natural health resources.

Indicators for conservation and cultivation programmes at the AMS level and the regional level, as well as educational programmes for communities on intellectual property rights, have also been outlined. However, the implementation report of this strategy is awaited. The SEARO region also has a traditional medicine action plan from 2016-2020.

Amongst the AMS, Indonesia, Malaysia, Myanmar, Thailand, and Viet Nam have national herbal monographs, while Indonesia, Thailand, and Viet Nam have national pharmacopoeias. A number of studies have highlighted the challenges of implementing a community-based model for traditional knowledge and genetic resources due to conflict of interest. Indonesia, Lao PDR, Malaysia, Myanmar, the Philippines, and Viet Nam, have considerable ethnobotany literature on genetic resources and traditional knowledge, showing the importance of the Region.

Sociocultural landscapes and protected areas and health and well-being

Identifying key areas for protection and promoting bio-cultural sites like sacred groves and therapeutic landscapes, including heritage education, are important but currently not reported. These are closely linked to the strategic objectives of the ASEAN Heritage Parks (AHP) Programme.

Community enterprises, ABS, livelihoods

Community-based enterprises that utilise traditional medicinal resources and products should be promoted. The policies relating to ABS, as well as value addition activities at the local level can be streamlined.

Concerning the institutional mechanism of implementation, while it falls under the jurisdiction of the ministry of health or public health and the ministry of environment, other ministries relating to sectors such as agriculture, trade and commerce, and science and technology, are also relevant to specific sub-thematic areas of interest. For instance, Thailand works across the Ministries of Health and Environment in promoting traditional medicine and conserving medicinal resources. Some of the AMS like Singapore have provided expert opinion to traditional medicine regulatory bodies, and have also contributed to the ASEAN Traditional Medicine and Health Supplement Product Working Group.

At the regional level, the ASEAN Economic Community (AEC) Plan of Action on social forestry and development of micro, small, and medium enterprise is highly complementary, and presents openings for capacity development of community forest enterprises (CFE) and strategic market linkages. Initiatives to build capacity CFEs in the Region and collaborative proposal developments are ongoing with the ASEAN Coordinating Committee on Micro, Small and Medium Enterprises. The ASEAN region has some common policies and task forces that seek to strengthen and promote traditional medicine. In many ways, these are also reflected in country policies, including integration of traditional medicine based on primary health care, and have been adopted by institutions providing training on traditional medicine practices (See Table 1).

Key takeaways

The Traditional Medicine sector needs to have a comprehensive plan of action encompassing conservation and sustainable use of resources; community health and nutrition; production systems and livelihoods; protection and promotion of traditional knowledge and equitable benefit sharing.

Building on existing initiatives

- Build on and strengthen community-based participatory models of conservation action (*in situ and ex situ*) and sustainable use within biodiversity planning strategies, and integrate them with health care and livelihood programmes (refer specific country level projects) and collaborative projects promoted by the government, NGOs, and the private sector.

Possibilities of joint implementation

Regional level

- Build on existing regional institutions of ASEAN (such as the ASEAN Task Force on Traditional Medicine), WHO (such as the WPRO strategy 2011-2020), International Plant Genetic Resources Institute (IPGRI), FAO, UNCTAD, and other agencies to strengthen mapping, threat assessment, conservation and sustainable use of medicinal resources for traditional medicine and public health, in an equitable manner.

National level

- Encourage and facilitate multi-stakeholder approach to sustainable use of biological resources, including the engagement of harvesting communities, private sector along the trade chain, resource managers, and civil society. It can be complemented by promoting the use of best practice frameworks for sustainable and equitable use of wild medicinal plants – viz., the FairWild Standard
- Leverage where potential for policy coherence is obvious - for example most countries have policies to promote traditional medicine under the ministry of health. However, the resource base utilisation is a concern to the ministries of environment, and could be linked to the ministries of agriculture (to promote cultivation and to track unsustainable and illegal use) and rural development (to promote value addition, livelihood security). This would require investing in training and capacity development activities for implementing authorities at multiple levels, including in their service training programmes.

Potential initiatives

The sector needs to have an integrated plan of action encompassing the following:

- Resource status assessment – Inventory of resources, conservation, trade (illegal trade) market studies, knowledge management, and related research should be done. This could lead to developing appropriate regional, national, and sub-national management plans integrating social, economic, and ecological dimensions of resource use.
- Conservation and sustainable use - In-situ, ex-situ programmes, cultivation practices, sustainable collection practice, industry/market linkages, home gardens, good agricultural practices, and quality standards could be implemented in an integrated manner.
- Support for community health, nutrition and well-being, such as by linking medicinal resources to key health and nutritional challenges, promotion of usage, and awareness creation. The formulation of interdisciplinary, ethno-medical, and nutritional studies based on community needs should be encouraged through participatory methodologies, like multiple evidence-based approaches.
- Promotion of the documentation and protection of associated traditional knowledge, such as by furthering local ethnomedicinal documentation, creating registries, raising awareness on TKDL and data surveillance, and supporting IPLCs and knowledge holders. Unfortunately, there is currently insufficient data of detailed documentation of community practices. Further studies on People's Biodiversity Registers and community protocols with respect to health and nutrition and their databasing in the TKDL model could be taken up in a focused manner in the Region, with national focal centres.
- Strengthening of ABS through the existing initiatives, such as a platform for linking knowledge holders with prospectors and facilitating ABS, could be undertaken at national and regional levels towards improving local livelihoods.
- Identification and protection of healing landscapes, sacred areas, and heritage sites
- Promotion of regional and international networking and up-scaling of existing good practices

Table 1. Regional and country-wise policies and relevant implementing institutions relating to Traditional Medicine and Biodiversity

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
ASEAN	<ol style="list-style-type: none"> 1. ASEAN Agreement on Regulatory Framework for Traditional Medicines- ASEAN Agreement on Traditional Medicines (2013) 2. ASEAN Agreement on Traditional Medicines and Health Supplements 3. ASEAN Economic Community Blueprint 2025 4. ASEAN Regional Action Plan on Trade in CITES 5. Wild Fauna and Flora (2011–2015) 	ASEAN Taskforce on Traditional Medicine	<ol style="list-style-type: none"> 1. ASEAN Traditional Medicines and Health Supplements Committee 2. ASEAN Alliance of Health Supplements Associations 3. ASEAN Alliance of Traditional Medicine Industries 4. TRAFFIC International present in region and promote FairWild Standard 	<ol style="list-style-type: none"> 1. Sharing and Exchange of Updated Information 2. Capacity development 3. Research and Development 4. Networking, regional collaboration and cooperation 5. No region-wide mapping and threat assessment of resources used, but some of the AMS have done exhaustive work 6. Traditional medicine is mostly considered as a marketable commodity than as critical healthcare in communities. Consequently, equity and rights to practices are concerns highlighted 7. Bushmeat consumption and trade (CIFOR 2014) 	AEC Blueprint 2025 – The development of the healthcare industry in the Region will include traditional knowledge and medicine, taking into account the importance of effective protection of genetic resources, traditional knowledge, and traditional cultural expressions.
Brunei Darussalam	<ol style="list-style-type: none"> 1. Integration of Traditional, Complementary Alternative Medicine (T/CAM) into the mainstream healthcare services under the new Vision 2035 and Health Strategy-Together Towards a Healthy Nation 2. National Policy on T/CAM, Ministry of Health Brunei Darussalam 3. Wildlife Protection Act of 1978 (revised in 1984) 4. Wild Fauna and Flora Oder of 2007 	T/CAM Unit under the Department of Medical Services, Ministry of Health 2012		Currently no training system for traditional medicine in country	
Cambodia	<ol style="list-style-type: none"> 1. National Policy on Traditional Medicine (2010) 	National Centre of Traditional Medicine was	<ol style="list-style-type: none"> 1. ABS policy in place. 2. Research on traditional medicine ongoing with several 	<ol style="list-style-type: none"> 1. Lack of technical and financial support 	

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	<ol style="list-style-type: none"> 2. Sub-decree on the Production, Import, Export and Commerce of Traditional Medicine in the Public Sector. Ministry of Health, Royal Government of Cambodia 1998 3. Sub-decree on the National Policy on Drugs, Ministry of Health, Royal Government of Cambodia 1998 4. Law on Forestry 2002. Ministry of Agriculture, Forestry and Fisheries, Royal Government of Cambodia 5. Ministerial Declaration (Prakas) on Classifications and List of Wildlife Species in Cambodia 2007 	started in the early 2000	<p>foreign partners (Aix- Marseille University, Institut de Recherche Pierre Fabre, Guangxi University of Chinese Medicine, Kumamoto University, Université de Caen Normandie, Daegu Haany University)¹</p> <p>3. TRAFFIC, WWF, IUCN (2008). An overview of the use and trade of plants and animals in traditional medicine systems in Cambodia.</p>	<p>challenges in implementing the law and regulation on traditional medicine</p> <ol style="list-style-type: none"> 2. Slow integration of the National Health Sector Strategic Plan National Health Sector Strategic Plan not covered by health insurance limited progress of regional and international cooperation 3. Awareness-raising and capacity development on monitoring and use flora and fauna resources (Ashwell and Walston, 2008) Wildlife and livelihoods (Coad et al. 2019) 	
Indonesia	<ol style="list-style-type: none"> 1. In the 1990, there was a modernisation policy for traditional medicine 2. In 2000, a policy to integrate traditional medicine in healthcare was created 3. Law No.5/1990 on Conservation of Biological Resources and Ecosystems Regulating Ecosystems Conservation and Species especially in Protected Areas 	Ministry of Health	School of Traditional Medicine Technical Production Programme at the University of Gajah Mada which offers a diploma course/ programme	WHO Country Cooperation Strategy (CCS) for Indonesia (2014-2019) does not refer to traditional medicine at all	There is limited data available in the English language. Indonesia has established 25 botanical gardens relating to 15 ecoregions managed by local governments under the supervision of <i>Lembaga Ilmu Pengetahuan Indonesia</i> (LIPI). There are also several natural history museums, these can have a strong focus on traditional medicine and health education (ACB, 2017).
Lao PDR	<ol style="list-style-type: none"> 1. 1996 policy to promote traditional medicine (Ministry of Health) 2. 2003, Prime Minister Decree 	1. Institute of Traditional Medicine, 2010 traditional medicine	Institute of Traditional Medicine had joint medicinal plant research activities with several countries and institutions,		

¹ Sothea K, 2019, Access and Benefit Sharing implementation: Case in Cambodia, presented at IMPLEMENTATION OF THE NAGOYA PROTOCOL, LAO PLAZA –VIENTIANE, Lao PDR, 28 – 29 November 2018

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	<p>No. 155/PM to ensure sustainable use and management of medicinal resources</p> <p>96 plants have been identified of conservation concern under this</p> <p>3. Law on Drugs and Medical Devices 2000 that regulates the production and movement of natural drugs</p> <p>4. Lao PDR Environmental Outlook 2012</p> <p>5. National Biodiversity Strategy to 2020 and Action Plan to 2010</p> <p>6. Forestry law 2007</p> <p>7. Wildlife and aquatic life law 2007</p>	<p>division within Food and Drug Department</p> <p>2. Ministry of Natural Resources and Environment (MONRE)</p>	<p>specifically, ASEAN Regional Centre for Biodiversity Conservation, University of Illinois, Chicago, International Cooperative Biodiversity Groups programme, Palm Leaf Manuscript Project with National Library of Laos; The California Community Foundation Project, National University of Laos, Kunming Institute of Botany, Korean Research Institute on Bioscience and Biotechnology, IUCN, The AgroBiodiversity Initiative, International Cooperation Unit on Biodiversity and Environmental Conservation, The Chinese University of Hongkong, Centre for Human Ecology Studies of the Highlands, Pha Tad Ke Botanical Garden</p>		
Malaysia	<p>1. Traditional and Complementary Medicine Act, 2016</p> <p>2. Malaysia-WHO CCS 2016-2020</p> <p>3. International Trade in Endangered Species Act 2008</p> <p>4. National Policy on Biological Diversity 2016-2025</p> <p>5. Access to Biological Resources and Benefit Sharing Act 2017</p> <p>6. T&CM Blueprint 2018-2027:</p> <p>7. Health Care Strategy of T&CM in Primary Health Care (2013)</p> <p>8. National Traditional and Complementary Medicine</p> <p>9. National Policy of T&CM (2007)</p> <p>10. Wildlife Conservation Act 2010</p> <p>11. Patent Act 1983</p> <p>12. Poisons Act 1952</p>	<p>1. In the WHO-Malaysia CCS, Under the strategic priority 2 on Universal Health Coverage, developing a strategic plan for T&CM is a focus</p> <p>2. Ministry of Energy and Natural Resources: National Focal Point for Convention on Biological Diversity and Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization.</p>	<p>1. Division of Herbal Development under the Ministry of Agriculture and Agro-based Industry (2014)</p> <p>2. Herbs are included in the first Entry Point Project for the nation's Agriculture National Key Economic Area. Under the National Key Economic Area - Research Grant Scheme 6 reports including Directory of Herbal Cultivators in Peninsular Malaysia, consumer preferences etc., have been published.</p> <p>3. Guidelines on Good Manufacturing Practice for Traditional Medicines and</p>	<p>1. The policies do not provide details on how traditional medicine can be a recourse for indigenous community health.</p> <p>2. Challenges to strengthen the documentation research, development and integration of traditional medicine into the mainstream system</p> <p>3. Challenges in establishing linkages on the tangible and intangible properties of traditional medicine on economic and socio-cultural landscapes</p> <p>4. Awareness on ABS³:</p>	<p>1. Documentation for: Traditional Knowledge of Malay Traditional Medical Practitioners</p> <p>2. Traditional Knowledge of Orang Asli (ILC) Medicinal Plants⁴</p>

³ Malaysia review inputs

⁴ Malaysia review inputs

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	<p>13. Dangerous Drugs Act 1952</p> <p>14. Sales of Drugs Act 1952</p> <p>15. Control of Drugs and Cosmetics Regulations 1984</p>		<p>Health Supplements First Edition (2008) Herbal Medicine Research Centre, Institute for Medical Research, Ministry of Health Malaysia National Pharmaceutical Regulatory Agency, Ministry of Health Malaysia</p> <p>4. Twelve authoritative books related to documentation of Malay traditional knowledge on medicinal plants in Peninsular Malaysia were published. Ministry of Energy and Natural Resources (2007-until now) sponsored a research, development and</p> <p>5. pre-commercialisation project entitled Documentation of traditional knowledge related to medicinal plants used by the Orang Asli in Peninsular Malaysia. A total of 11 authoritative books/proceedings were published.</p> <p>6. Malaysia Traditional Knowledge Digital Library (MyTKDL) under Intellectual Property Corporation of Malaysia (MyIPO) FRIM: Application of Traditional Knowledge Towards the Sharing of Benefits & Improvements of the Indigenous Local</p>	<p>ensuring good quality products; and ensuring stronger participation of private sector and local communities.</p>	

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
			Communities' (ILC) Livelihoods ²		
Myanmar	<ol style="list-style-type: none"> 1. Myanmar Traditional Medicine Council Law 2000 2. Traditional Medicine Drug Law, 1996 3. WHO CCS 2014–2018 4. The Conservation of Biodiversity and Protected Areas Law 2018 (The Pyidaungsu Hluttaw Law No. 12, 2018) 5. Forestry Law of 1992 	<ol style="list-style-type: none"> 1. National Wildlife Law Enforcement Taskforce Ministry of Health working with other relevant sectors including biodiversity, to establish nurseries of medicinal plants which are traditionally used for six major diseases such as diabetes, hypertension, tuberculosis, malaria, diarrhoea and dysentery. Under the WHO CCS priority area 1 strengthening health systems, traditional medicine is an important area. 	<ol style="list-style-type: none"> 1. From the first four-year people health plan (1978- 1981), traditional medicine services have been incorporated into mainstreaming of health programme. 2. In 1989, Department of Traditional Medicine was established as a separate Department under Ministry of Health 		<p>As of 2014, nine (9) herbal gardens covering 124 hectares have been established in collaboration of health, biodiversity and other relevant sectors; The National Herbal Park, established in 2006, has an area of 79.5 hectares and is located at the centre of Nay Pyi Taw has 900 species. Popa Mountain Park has 363 medicinal plant species. These are meant for conservation and supporting community livelihoods.⁵</p>
Philippines	<ol style="list-style-type: none"> 1. Republic Act No. 8423 - Traditional and Alternative Medicine Act of 1997, to promote traditional medicine products, technologies and further ensure integration of traditional medicine in national healthcare. Organisational structure extends to zonal level and engages in training and education to promote traditional medicine based primary health care (PHC). 2. The Indigenous Peoples' Rights Act of 1997 3. RA 9147: Wildlife Protection and Conservation Act 	<ol style="list-style-type: none"> 1. Philippine Institute of Traditional and Alternative Health Care (PITAHC) – conducts research, documentation of Philippine traditional medicine; collaborates with multiple agencies and academic institutions 2. Division of Standards and Accreditation to certify healers and practitioners and training programmes 	<ol style="list-style-type: none"> 1. Philippine Traditional Knowledge Digital Library on Health 	<ol style="list-style-type: none"> 1. A Clearing-House mechanism on research in traditional medicine required; ASEAN level collaboration on research and development to be strengthened; National Implementation of the ABS Guidelines for research institutions. 2. WHO CCS for the Philippines (2017-2022) does not refer to traditional medicine at all 	<p>The implementing rules of the TAMA support the protection, conservation and sustainable use of genetic resources and its associated traditional knowledge in accordance with the bioprospecting law and the IPRA. PITAHC works with the Philippine Council of Health Research and Development (PCHRD) regarding documentation of traditional knowledge in health. PITAHC collaborates with agencies such as PCHRD, NCIP, DENR,</p>

² Malaysia review inputs

⁵ Inputs from the presentations of the Regional Workshop on Biodiversity and Health held from 5 to 7 November 2018 in Manila, Philippines.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
		<p>on various traditional medicine practices.</p> <p>3. Division of Research and development involved in developing herbal products. engaged in awareness raising activities</p> <p>4. National Commission of Indigenous Peoples</p>			Department of Agriculture, Bureau of Plant Industry and National Museum. ⁶
Singapore	<p>1. Traditional and Complementary Medicine (TCM) Practitioners Act 2000 (amended in 2019), aims to regulate TCM, promote TCM training and regulate TCM materials</p> <p>2. Endangered Species (Import and Export) Act. 2008</p>	<p>1. Traditional and Complementary Medicine Department under Ministry of Health (since 1995)</p> <p>2. TCM Practitioners Board regulates practice</p> <p>3. Health Sciences Authority regulates traditional medicine products</p>	<p>1. 8 million Singapore dollar TCM research grant to foster partnerships between hospitals, universities and TCM institutions to address chronic illnesses</p> <p>2. SGD 5 Million TCM Development grant to help develop capacities and information technology facilities of TCM practitioners</p>	<p>1. Matching research interests of mainstream science with TCM</p> <p>2. Lack of trained resources for creating evidence.</p>	Singapore TCMP Registration Examination is mandatory for practice. As of 31 December 2018, there were 3,256 registered practitioners (252 registered for acupuncture only). ⁷
Thailand	<p>1. Protection and Promotion of Traditional Thai Medicine Wisdom Act. 1999</p> <p>2. Ministerial Regulation on control of Thai Traditional herbs for commercial 2015</p> <p>3. Thai Traditional Medicine Professions Act 2013 (earlier Practice of the Art of Healing Act B.E. 2542 (1999)).</p> <p>4. Drug Act B.E. 2510 – Food and Drug Administration, Ministry of Public Health.</p>	<p>1. Department of Thai Traditional and Alternative Medicine</p> <p>2. Ministry of Public Health,</p> <p>3. Institute of Thai Traditional Medicine</p> <p>4. Ministry of Natural Resources and Environment</p> <p>5. Ministry of Agriculture and Cooperatives;</p>	<p>1. 1957 Wat Phra Chetuphon (Wat Pho) Traditional Medicine Association was established offering training courses on Thai medicine and Thai pharmacy</p> <p>2. In 1980 Thai Traditional Medicine Promotion Foundation was established under which the Ayurved Vidhayalai School (Jevaka Komarapaj) for the teaching of applied Thai traditional medicine</p>		Promotion of Thai traditional medicine, protection and conservation of herbs for health and community livelihoods, research on Thai medicinal plants, preparation of databases, university curriculum for teaching Thai medicine ⁸

⁶ AMS survey responses from the Philippines

⁷ AMS survey responses from Singapore

⁸ Inputs from the presentations of the Regional Workshop on Biodiversity and Health held last 5-7 November 2018 in Manila, Philippines.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	<p>5. To comply with ASEAN harmonisation of rules and regulations on product registration, production standards, and quality control of traditional medicinal products</p> <p>6. Ministerial Notification on Protected Herb (Kwao Khrua) B.E. 2549 (2006)</p> <p>7. Thai Traditional and Alternative Medicine Strategic Plan (2012–2016)</p> <p>8. National Strategic Plan for Thai</p> <p>9. Wisdom and Thai Healthy Lifestyle Development (2012–2016)</p> <p>10. National List of Essential Medicines - List of Herbal Medicinal Products 2012</p> <p>11. Wildlife Conservation and Protection Act B.E., 2535 (1992)</p>	<p>6. Research institutes and universities.</p>	<p>3. Collaborating Center for the Development of Thai Traditional Medicine and Pharmacy was established by the Ministry of Public Health (1989)</p> <p>4. Federation of Thai Traditional Medicine Practitioners of Thailand was established comprising of 28 foundations, association and clubs working on Thai Traditional Medicine.</p>		
Viet Nam	<p>1. Circular 14/2009/TT-BYT: Implementation of WHO- Good Agricultural and Collection Practices Principles and Standards; Decision 3886/2004/QĐ-BYT: Implementation of WHO- Good Manufacturing Practices (GMP) Principles and Standards</p> <p>2. Circular 16/2011/TT-BYT: Roadmaps for WHO-GMP Implementation for Herbal Medicines Manufacturers; Circular 10/2012/TT-BYT: licensing of herbal medicine traders to control distribution and sale of herbal medicines.</p>	<p>1. Division of Herbal medicines management, Ministry of Health</p>		<p>1. Lack of national database on genetic resources and traditional knowledge</p>	<p>1. Regulation of Herbal Medicines in Viet Nam (Drug Administration of Viet Nam 2013)</p> <p>2. Implementation of ABS regulations in Viet Nam (Nguyen 2015)</p>
Sub-regional arrangements	<p>1. Malaysia, the Philippines, Viet Nam, Indonesia</p> <p>2. Malaysia, the Philippines, Viet Nam, Indonesia, Thailand, Myanmar</p>	<p>1. Under Regional Strategy for Traditional Medicine - Western Pacific – 2011-2020</p>	<p>1. IPGRI involved in inventorying and documenting medicinal plants in</p>		<p>Sub regional studies - <i>Medicinal Plants Research in Asia, Volume 1: The Framework</i></p>

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	<p>Greater Mekong region</p> <p>3. Regional Strategy for Traditional Medicine - Western Pacific – 2011– 2020 (WHO) SEARO (Indonesia, Thailand, Myanmar)</p> <p>4. Traditional Medicine Action Plan for the South-East Asia Region 2016–2020</p> <p>5. Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation Task Force on Traditional Medicine (Bangladesh, India, Myanmar, Sri Lanka, Thailand, Bhutan and Nepal)</p>	<p>(WHO)- Strategic objective 4: To promote protection and sustainable use of traditional medicine resources - Undertake baseline national assessments of existing indigenous natural health resources and the monitoring of their exploitation; Develop, monitor and enforce policies and regulations to prevent exploitation and to protect and conserve indigenous health resources</p>	<p>14 A-P countries (2003)⁹</p> <p>2. FAO with partners – documenting status of medicinal plants, value addition potential, policy options (APAARI & FAO, 2013)</p> <p>3. UNCTAD – focusing on improving traceability of sourcing of NTFPs esp. medicinal plants listed in CITES¹⁰</p> <p>4. World Health Organization</p> <p>5. APFORGEN – Cambodia, Indonesia, Lao PDR, Malaysia, Myanmar, Philippines, Thailand, and Viet Nam- Strengthening National Capacity and Regional Collaboration for Sustainable Use of Forest Genetic Resources in Tropical Asia</p>		<p>and Project Workplans. International Plant Genetic Resources Institute – Regional Office for Asia, the Pacific and Oceania (IPGRI-APO), Serdang, Selangor DE, Malaysia. (Batugal et al. 2004)</p>

⁹ IPGRI, 2003, Medicinal Plant Research in Asia- Vol 1, The Framework and Project Plants, Report of the IPGRI-RDA Meeting, Kuala Lumpur, 2003

¹⁰ Applicability of traceability systems of CITES listed medicinal plants in Mekong, UNCTAD, 2017

2. Food and Nutrition in the Context of Biodiversity

Ensuring food and nutrition security for its population is an important concern for all countries. Food security is defined as a state where “all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (World Food Summit, 1996). The focus is then on food availability, access, and utilisation. Utilisation refers to adequate diet, clean water, sanitation, and health care to reach a state of nutritional well-being where all physiological needs are met. This brings out the importance of non-food inputs (linked to ecosystems) in ensuring food security.

Food security is linked to other health-related concepts such as nutrition security that is defined as “when all people at all times consume food of sufficient quantity and quality in terms of variety, diversity, nutrient content and safety to meet their dietary needs and food preferences for an active and healthy life, coupled with a sanitary environment, adequate health, education and care” (ASEAN AIFS Framework document, 2015-2020). When agricultural practices effectively and explicitly incorporate nutrition objectives, concerns and considerations to improve nutrition through increasing the availability, access to and consumption of a nutritionally adequate diet from a variety and diversity of nutritious and safe foods, it is referred to as nutrition enhancing agriculture that depends on access to biodiversity (ASEAN AIFS Framework document, 2015- 2020)¹¹.

The more commonly used concept of sustainable agriculture is defined as “the efficient production of safe, high quality agricultural products, in a way that protects and improves the natural environment, the social and economic conditions of farmers, their employees and local communities, and safeguards the health and welfare of all farmed species” (Bernabe, 2015). It is important to keep in mind that although intensifying agricultural practices has significant impacts on food security and livelihoods, the high use of pesticides in the production process pollutes waters and contaminates food resulting in vulnerability to various illnesses, including vector-borne and zoonotic diseases (Lam et al., 2017). However, these studies also emphasise that information on causal linkages with health is still sparse and requires more research. All the above concepts have been highlighted to demonstrate the linkages between biodiversity conservation, maintaining environmental integrity, and sustainable agricultural practices towards ensuring food and nutritional objectives.

Across the ASEAN region, it is acknowledged that agrobiodiversity needs to be enhanced to address food and nutrition insecurity, a major health issue in the region (WHO, 2017; 2018; Global Nutrition Report, 2018). Given that the impacts of changes to climate are already visible, varieties of staples that are resilient and can cope with the various changes and provide adequate nutrition and food security need to be identified from available germplasm pool (ACB, 2017). This indicates a need to invest in germplasm conservation, both *ex situ* and *in situ* in farmer’s fields and wild relatives.

The ASEAN Integrated Food Security (AIFS) and the Strategic Plan of Action on Food Security (SPA-FS) has identified several strategic areas of focus and partners that can be used as a basis to build on future interventions. Several organisations in the Region such as the International Rice

Research Institute (IRRI), FAO, International Food Policy Research Institute (IFPRI), the National Agricultural Research System, or even NGOs such as Oxfam, Tebtebba Foundation, and other national and regional actors are active on this front. The ASEAN Good Agricultural Practices (GAP) project aims to streamline country implementation of GAP, and focuses on fruit and vegetable production towards ensuring nutritional security and addressing potential food hazards to health.

¹¹ ASEAN Integrated Food Security (AIFS) Framework and Strategic Plan Action on Food Security (Spa-Fs)

The focal government agency for this sector is usually the ministry of agriculture, but academic and policy documents suggest that there is increasing collaboration between the ministry of agriculture, the ministry of health, and the ministry of natural resources and environment. Participatory and multi-stakeholder involvement is highly emphasised in several documents to facilitate effective implementation.

The ASEAN region is rich in agrobiodiversity, and in dietary diversity even within sub regions in the AMS. The Region is also home to rich fish diversity, and considered vital to meet global seafood demand resulting in significant exploitation of fish resources. Fisheries and aquaculture are an important source of protein and micronutrients and of course, livelihoods and well-being for the people in the Region. It is estimated that by 2030, the Region will supply nearly a quarter of global fish. Managing between capture fisheries and aquaculture is therefore an area of concern (Chan et al, 2017).

However, the Region's dietary diversity is under strain. Consequently, malnutrition, which includes both undernourishment and obesity, is rising across the region, primarily led by unhealthy diets. It has been estimated that 7.7 per cent of under-five population suffers from overweight malnutrition (global average being 5.9 per cent), 25 per cent of under-fives suffer from stunting, and 8.7 per cent of this population has underweight issues (global average being 7.3 per cent). Amongst adults, about 28 per cent of women of reproductive age are anaemic, 7.6 per cent have diabetes, and 8 per cent are obese. For men, 7.3 per cent have diabetes and about 5 per cent are obese (Global Nutrition Report, 2018; ASEAN Secretariat 2016)¹².

Furthermore, the rapid growth of urbanisation increases food demand, waste and effluent production, and environmental degradation. To address this, urban and peri-urban agrobiodiverse agriculture is being promoted that focuses on sustainable production methods (Soni and Salokhe, 2017). Several countries have put in place policies and programmes to safeguard and augment agrobiodiversity (see Table 2 below). Major drivers of poor nutrition in the Region -- which is energy dense but nutrient poor -- include growing international trade, poor dietary diversity (referred as 'Burgerization' of food), conspicuous consumption, rise in meat consumption, and sedentary lifestyles (Soon et al, 2014). The conservation of agrobiodiversity also has a high social relevance, as it is estimated that more than 70 per cent of the population in the Region is dependent on agriculture (Lao PDR 2018). Strengthening sustainable-use practices in various land and seascapes is a priority in the Region, as seen in the interventions in the AHPs, and also in the implementation approaches of the different countries (ACB, 2017). Increasingly, we notice a focus on ensuring sustainable use of wild foods, including wild game and plants. More emphasis on the health of indigenous peoples and relating it to local health traditions, medicinal plants, wild foods and indigenous diets, is required to address particular issues of indigenous and local community health (Diaz et al, 2018).

The focus on sustainable diets and nutritional diversity for health requires mainstreaming of nutritional and food security goals across different sectors such as agriculture, health, and environment. However, it is understandable that institutionally, the mandate of implementation falls within the health sector goals, whereas implementation requires cooperation of both the environment and agriculture sectors. This is probably one theme where mainstreaming is already evident as is a priority for the agricultural, environment, and health sectors. The theme is featured in the policies of the WHO, and in the different ministries of agriculture and environment. It also is an important cross sectoral theme within the ASEAN region, with ASEAN already designing a cross-pillar programme with the agriculture and environment departments with the FAO. Additionally, it is also closely linked to ensuring community participation and possibilities for transboundary cooperation.

The ASEAN region has a well thought-out strategic framework to address these issues. The ASEAN Economic Community Blueprint 2025 - ASEAN cooperation on food, agriculture and forestry (FAF) is a strategic mechanism to address the identified challenges. While the cooperation is a comprehensive

¹² Global Nutrition Report, 2018 available at <https://globalnutritionreport.org/media/profiles/v2.1.1/pdfs/south-eastern-asia.pdf>

mechanism to address various challenges identified in this report across themes, the Blueprint does not refer to biodiversity or ecosystems. This appears to be a major gap that needs to be addressed by the ACB and its partners.

The AIFS 2014 and the SPA-FS Relating to Food Security Via Food Trade and Food Market aims to establish a conducive environment, while the AEC— which will be fully operational in 2020— can collaborate, operate, and unify in many aspects relating to production of food, trade, and processing within the Region. Additionally, it seeks to enable exchange of information, transfer of new technology, sharing of knowledge amongst various stakeholders (*i.e.* authorities, traders, scientists, research institutes and farmers). This will be coordinated by the *ASEAN Ministers of Agriculture and Forestry* (AMAF) established to also address the issues relevant to food security, including rising food prices. Progress on this initiative will inform future intervention strategies in this thematic area.

Key takeaways

A clear nexus approach involving germplasm conservation and productive resources, such as soil, water, and landscapes is desirable. It will also be ideal if the approach will link health outcomes (food security, nutritional security through dietary diversity) to the livelihoods of those including indigenous and local communities, as well as those living in urban and peri-urban settlements.

Building on existing initiatives

- Build on existing ASEAN level initiatives such as the *AIFS framework* and the *AEC Blueprint 2025 - ASEAN cooperation on FAF* to promote dietary diversity and nutritional security along with food security focusing on sustainable agricultural practices.

Possibilities of joint implementation

Regional level

- Studies indicate lack of sufficient or no data on status and trends of nutritional and health status of populations especially for different sections (children, women, men, elderly, others) and their linkages to agricultural practices and drivers such as trade, lifestyles, pollution. Focusing on research and capacity development in this area will advance both knowledge and help prioritise health and conservation actions

At national level

- Foster increased collaboration between health, environment, and agriculture sectors along with rural development to ensure synergistic planning and implementation.

Potential initiatives

- Strengthen efforts on conservation of germplasm of wild and domesticated crops and faunal sources of food
- Focus on promoting urban and peri-urban farming. Work with AMS who are keen to promote biodiversity-friendly cities, like Singapore and Viet Nam.
- Bring together regional and national expertise such as IRRI, FAO, IFPRI, and national agricultural institutes to focus on strengthening sustainable agricultural practices towards ensuring food and nutritional security; and ensure collaboration between different sectoral expertise (e.g. health, agriculture, development, and environment)
- Engage communities on their traditional ecological knowledge on wild crop species and practices which is also important to address climate change-related potential crop vulnerabilities.

- Foster and strengthen training and capacity development on the importance of ensuring sustainable methods of production in agriculture, and ensure nutritional and food security is achieved for different stakeholders involved in the supply lines of food produce and products. It would also be useful to consider organising multi-stakeholder trainings with producer, processor, and consumer groups to understand each stakeholder interest, challenges, and opportunities to advance this agenda.
- Update the ASEAN Food Composition Database as reference for nutritional information of various types. It can also be developed as a reference for the different ASEAN foods to be used for dietary assessment data, nutrition labelling, and supporting a nutrition- enhancing agriculture agenda.

Table 2. Regional and country-wise policies and relevant implementing institutions relating to Food and Nutrition and Biodiversity

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
ASEAN	<ol style="list-style-type: none"> 1. ASEAN Integrated Food Security (AIFS) Framework and SPA-FS -2015 - 2020 Relating to Food Security via Food Trade and Food Market 2. ASEAN Economic Community Blueprint 2025 - ASEAN cooperation on FAF 3. ASEAN Food Safety Policy 4. ASEAN Food Safety Regulatory Framework 	<ol style="list-style-type: none"> 1. AMAF, ASEAN Economic Ministers, and ASEAN Health Ministers Meeting 	<ol style="list-style-type: none"> 1. The United Nations International Children's Fund (UNICEF) and WHO, with support from the EU-UNICEF Maternal and Young Child Nutrition Security Initiative in Asia 2. The Asian Development Bank (ADB) and the Asia-Pacific Association of Agricultural Research Institutions (APAARI) 	Rise in nutritional insecurity; poor dietary diversity, population size migration policy; public policy to retain or encourage plant-based diets; integration of food, health and environmental approaches to create resilient regional food systems; and the incorporation of food into the broader human security agenda	
Brunei Darussalam	<ol style="list-style-type: none"> 1. Health Promotion Blueprint 2011-2015 	<ol style="list-style-type: none"> 1. Community Nutrition Department and Dietetics Services, Food Quality and Safety Division 			Promoting measures such as nutrition labelling and encouraging the availability of healthy food choices and portion sizes
Cambodia	<ol style="list-style-type: none"> 1. Agricultural Sector Strategic Development Plan (2006- 2010) in Cambodia 	<ol style="list-style-type: none"> 1. Council of Agricultural and Rural Development: Food security and nutrition Coordination 	Nutrition Program to address malnutrition of children and pregnant women	<ol style="list-style-type: none"> 1. As per the 2006- 2010 plan, 35 per cent of population live under poverty line and 20 per cent under food security. 2. Limited access to natural resources 3. Lack of access to technology 4. Mainly rain-fed agriculture 	
Indonesia	<ol style="list-style-type: none"> 1. Health section of long-term development plan (2005-2025) focuses on improving nutritional status of community, environmental health through a suite of policies 	<ol style="list-style-type: none"> 1. BAPPENAS (National Planning Agency) 			Limited information is available in English literature
Lao PDR	<ol style="list-style-type: none"> 1. National Nutrition Strategy (2016–2025) 2. Agriculture Development Strategy to 2025 and Vision to 2030 focusing on agrobiodiversity, sustainable use, climate change 			Challenges remain in terms of environmental policy and climate change adaptation, social protection, decentralized governance	

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	<p>adaptation and supportive policy environment.</p> <p>Agriculture, natural resources and rural development identified as a core sector</p> <p>3. National Agriculture and Forestry Research Institute coordinates National Information sharing mechanism on PGRFA</p> <p>4. National Food Safety Policy (NFSP) 2009</p> <p>5. Fisheries Law 2008</p>			<p>and chronic malnutrition. Emerging concerns include urbanization and migration, off farm employment, food safety (for both producers and consumers), disaster risk and resilience, increasing productivity and institutional sustainability¹³</p>	
Malaysia	<p>1. Malaysia's Agrofood Policy (NAP 2011-2020)</p> <p>2. National Nutrition Policy of Malaysia (NNPM)</p> <p>3. National Plan of action for Nutrition of Malaysia III (2016-2025)</p> <p>4. National Adolescent Health Plan of Action 2015-2020</p> <p>5. National Sustainable Consumption and Production 2016-2030</p> <p>6. National Food Safety Policy</p> <p>7. National Food Safety Action Plan (2010- 2020)</p> <p>8. Way Forward of Ministry of Agriculture and Agro- based Industry: Priorities and Strategic 2019-2020</p>	<p>National Coordinating Committee on Food and Nutrition (NCCFN), Ministry of Health, Ministry of Health (Nutrition Division & Food Safety and Quality Division) Ministry of Agriculture and Food Industry</p>		<p>1. Double-burden of malnutrition</p> <p>2. Food and nutrition security among vulnerable groups especially children under 5 of ages, urban poor, indigenous population, maternal, elderly.</p> <p>3. Increasing trend in Food Consumer Price Index (CPI)</p> <p>4. Unhealthy food environment and consumption.</p> <p>5. Uncontrolled marketing on food and beverages to children and in mass media.</p> <p>6. Incoherent policies between sectors affected nutrition intervention</p> <p>7. Mainstreaming nutrition in various sectors especially in agriculture, economic, trade, consumer affairs, social protection and etc.</p>	

¹³ The strategic review on food and nutrition security in Lao People's Democratic Republic in 2016 by the World Food Program, at the request of the Ministry of Planning and Investment, Lao PDR.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
				8. Inadequate nutrient information of new food in the existing Malaysia Food Composition Database to ensure accuracy of dietary assessment and food consumption analysis ¹⁴	
Myanmar	<ol style="list-style-type: none"> 1. Myanmar National Action Plan for Food and Nutrition Security 2015 2. Myanmar Multisectoral National Plan of Action for Nutrition 2018-2022 	The Ministry of Agriculture, Livestock and Irrigation; Ministry of Health and Sports (MoHS); Ministry of Social Welfare, Relief, and Resettlement; Ministry of Education	<p>Livelihoods and Food Security Trust Fund (LIFT) Strategy 2019-2023</p> <ul style="list-style-type: none"> • Nutrition • Financial inclusion • Agriculture, markets and food systems • Decent work and labour mobility <p>Livelihoods and Food Security Fund - UK AID, EU, Australian Aid, SDC, USAID, Canada, Irish Aid</p>	Maternal and child undernutrition (stunting, wasting, micronutrient deficiencies, and low birth weight)	
Philippines	<ol style="list-style-type: none"> 1. Agriculture and Fisheries Modernization Act (AFMA) law, 1997 2. Philippine Plan of Action for Nutrition (PPAN)-NNC (2017–2022) 3. Barangay Plan of Action for Nutrition 4. Organic Agriculture Act 2010 – Climate Change Adaptation Measure 5. Community- Based Management of Acute Malnutrition 6. Republic Act 11061: Food Safety Act 	Department of Health-National Nutrition Council		Enhancing integrated, systems-based approaches, strategies and institutional arrangements that span across different sectors, ministries and intergovernmental organisations	
Singapore	<ol style="list-style-type: none"> 1. Promote urban farming and Agri food innovation 	Singapore Food Agency (SFA) formed as a statutory board under the Ministry of Environment and Water Resources (MEWR) in 2019	The Singapore Food Story (SFS) Research and Development Programme led by SFA and A*STAR was initiated to support the national agenda of strengthening Singapore's food security and 30 by 30 goal i.e. to produce		Focus on food safety and food security- country still highly dependent on imports from region

¹⁴ AMS review inputs from Malaysia.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
		coordinates across multiple agencies including Singapore Land Authority (SLA), Agency for Science, Technology and Research (A*STAR) and private sector)	30 per cent of our nutritional needs by 2030.		
Thailand	<ol style="list-style-type: none"> 1. Food and Nutrition Plan (FNP) in the fourth five-year National Economic and Social Development Plan 2. National Food Committee Act 2008 3. Strategic Framework for Food Management (SFFM) 2010 4. Sustainable agriculture policy 5. Strategic Framework for Food Management in Thailand of the National Food Committee 	<p>National Economic and Social Development Council</p> <ul style="list-style-type: none"> • Ministry of Public Health • Ministry of Agriculture and Commodity • Ministry of Industry • Ministry of Commerce <p>SFFM covers: Food Security, Quality & Safety, Education & Research, Management</p>		<ol style="list-style-type: none"> 1. Standards & indicators on nutrition & related disease 2. Food based dietary guidelines 3. Food, nutrition & dietetic education 4. Promotion for more vegetable & fruit consumption 5. Reduction of sugar, fat & salt in food 6. School food & nutrition programme 7. Community based nutrition programme to promote nutrition and health 8. Nutrition & related disease surveillance & survey 9. Food and nutrition management during crisis¹⁵ 	<ul style="list-style-type: none"> • Antenatal Cares • Growth Monitoring and Promotion • Food production • Food and nutrition education • Food sanitation & safety • School lunch and milk program since 1992
Viet Nam	<ol style="list-style-type: none"> 1. National Nutrition Strategy for 2011 – 2020, With a Vision toward 2030 	<p>Ministry of Health Ministry of Agriculture and Rural Development Ministry of Education and Training <i>etc.</i> along with Provincial People's Committees and others</p>		Emerging challenges in nutrition and food safety; double -burden of nutrition; large scale urbanisation leading to issues of social structure, food production, and biological environment; climate change; population growth	c

¹⁵ National Food Committee 2014

3. One Health and Ecohealth

One Health and Ecohealth have become important priority areas in the Region due to the frequent epidemics of newly emerging and re-emerging infectious diseases which are largely zoonotics; increased use of antibiotics and pesticides in agriculture and livestock farming, increasing antimicrobial resistance, issues on food safety and nutrition, and NCDs, among others. One Health is being used as an overarching framework to align intersectoral and interdisciplinary collaboration that integrates the complex relationships between human health, animal health, agriculture, wildlife, vectors, microorganisms, environment, and development. Our review shows that there are several global and regional cooperation initiatives under this overarching framework involving the AMS including research and capacity development programmes. There are also various national policies and strategic plans related to the above sub-themes. These include both dominant (public health and veterinary aspects) and non-dominant sectors (such as biodiversity, environment, agriculture and land management, and climate change) in relation to One Health. To analyse the complexity and develop a pragmatic approach of implementation, a combination approach of Ecohealth and One Health is suggested by researchers (see Box 1 for essential elements of different approaches).

The Ecohealth approach was initiated in Southeast Asia region by the International Development Research Center (IDRC) following the Severe Acute Respiratory Syndrome (SARS) epidemic and Avian Influenza outbreak and later developed into a regional Asia Partnership on Emerging Infectious Diseases Research (APEIR). The impact of agricultural intensification, ecosystem degradation, urbanisation and their underlying drivers in relation to epidemics have been examined considerably in the Region by different networks (outlined in the appendix). In the past, the ACB tried to link the need to recognise community traditional knowledge in the national and regional policies and their relevance in Community Health Impact Assessment (HIA) through participatory processes which is recognised under the constitution of countries like Thailand (Lajaunie & Morand, 2015; Morand and Lajaunie 2019). Such initiatives can have strong community empowerment and policy response at different levels, and highlight how the process needs to be at different scales. Additionally, the ecosystem service for disease regulation provides an interesting conceptual framework in understanding how biodiversity provides regulation of pathogens and reservoirs or vectors. Such broader approaches to address Ecohealth and One Health also call for a broader definition of health (than the currently used WHO 1948 definition) and intersectoral strategic framework (Ibid.)

According to the ASEAN Secretariat, in the wake of COVID-19 pandemic, “guided by the ASEAN Post-2015 Health Development Agenda and its Governance and Implementation Mechanism, the ASEAN Health Sector Cooperation deployed and operationalized the established and existing health mechanisms for technical exchanges, information sharing, and updates on policy-related measures in responding to COVID-19. Employing an all hazards approach through the whole-of-health-system and whole-of-government approach, the ASEAN Health Sector addressed the COVID-19 threat in the whole spectrum of preparedness, detection, mitigation, and response measures through the various health platforms. All ASEAN Member States through the ASEAN Senior Officials Meeting on Health Development (SOMHD) and SOMHD Plus Three reaffirmed their commitment to further enhance coordination and cooperation to control the spread of the COVID-19.” ASEAN Emergency Operations Centre Network for public health emergencies led by Malaysia, and the ASEAN Plus Three Field Epidemiology Training Network are actively involved in the process.

A linked programme called the ASEAN BioDiaspora programme is a real-time, web-based risk assessment tool, linking multiple datasets including air travel data, demography data of the AMS, human population density, animal populations, industrialisation and utility distribution, vector locations, and other relevant datasets. The ASEAN BioDiaspora Regional Virtual Centre (ABVC) for big data analytics and visualisation complements the national risk assessments, readiness and response planning efforts. Led by the Philippines, the ABVC recently produced reports on Risk Assessment for International Dissemination of COVID-19 across the ASEAN region. The AMS initiatives in Ecohealth and One Health may be linked with such initiatives for better integration.

Apart from the current COVID-19 epidemic, SARS, H1N1, and H9N7 have also posed huge challenges to the Region's health security in the past. According to the literature (Lucero-Prisno III, 2014) MERS and the Ebola virus pose important threats as there are migrant workers from the Region living in the affected parts of the world.

Box 1. Essential elements of One Health, Planetary Health and Ecohealth concepts

Perspective	Definition/Scope	Approach	Reference
Biodiversity and Health	Biodiversity underpins ecosystem functioning and the provision of goods and services that are essential to human health and well-being	"Human beings are an integral, inseparable part of the natural world, and that our health depends ultimately on the health of its species and on the natural functioning of its ecosystems" (Chivian & Bernstein 2008)	Connecting Global Priorities- Biodiversity and Human Health - A State of Knowledge Review" -Jointly published by WHO and CBD (2015) (UNEP/CBD/SBSTTA/19/6/ Add.1, 27 August 2015
Planetary Health	The achievement of the highest attainable standard of health, wellbeing, and equity worldwide through judicious attention to the human systems—political, economic, and social—that shape the future of humanity and the Earth's natural systems that define the safe environmental limits within which humanity can flourish. Put simply, planetary health is the health of human civilisation and the state of the natural systems on which it depends	"Situates human health within human systems. The threats that our species faces are not abstract physical risks, such as disease, climate change, ocean acidification, or chemical pollution. The risks we face lie within ourselves and the societies we have created." "Planetary health concerns the natural systems within which our species exists - for example, the health and diversity of the biosphere. Human beings live within a safe operating space of planetary existence." (Horton and Lo 2015)	Whitmee, S. et al. "Safeguarding human health in the Anthropocene epoch: report of The Rockefeller Foundation–Lancet Commission on planetary health." <i>The Lancet</i> 386.10007 (2015): 1973-2028.
One Health	"One Health' is an approach to designing and implementing programmes, policies, legislation and research in which multiple sectors communicate and work together to achieve better public health outcomes. ¹⁶ "The areas of work in which a One Health approach is particularly relevant include food safety, the control of zoonoses (diseases that can spread between animals and humans, such as flu, rabies and Rift Valley Fever), and combatting antibiotic resistance (when bacteria evolve after being exposed to antibiotics and become more difficult to treat)."	Scope includes agriculture, food safety and security, nutrition, livestock farming and veterinary sciences, anti-microbial resistance, newly emerging and re-emerging infectious diseases (EID), zoonotics, pollutants, environmental health, conservation medicine, entomology, water systems, global trade, climate change, biodiversity and ecosystems, land degradation, integrative medicine, public health, wildlife conservation	https://www.who.int/features/qa/one-health/en/
Ecohealth	"It is a holistic, transdisciplinary and cross- sectoral approach, emphasizing the intimate interconnections between ecosystem health, human health and social justice."	"Founded upon and guided by the principles of the ecosystem approach." "In particular, it aims to consider how biological, physical, social and economic environments mediate human health outcomes in research, policy and practice."	CBD/SBSTTA/21/9 – Guidance on Integrating Biodiversity Considerations into One Health Approaches

¹⁶ <https://www.who.int/features/qa/one-health/en/>

Perspective	Definition/Scope	Approach	Reference
Health in social-ecological systems (HSES)	“One health”, “ecosystem health”, “systems biology” and SES conceptual thinking towards what we provisionally call “health in social-ecological systems” (HSES)	“HSES moves beyond “one health” and “eco-health” expecting to identify emerging properties and determinants of health that may arise from a systemic view ranging across scales from molecules to the ecological and socio-cultural context, as well from the comparison with different disease endemicities and health systems structures.”	Zinsstag J, Schelling E, Waltner- Toews D and Tanner M, 2011, From “one medicine” to “one health” and systemic approaches to health and well-being, Preventive Veterinary Medicine 101: 148-156

As Southeast Asia is characterised by high human and domestic animal densities, growing intensification of trade especially in wildlife, drastic land use changes, and biodiversity erosion, the Region is a hotspot to study complex dynamics of zoonoses (Lajaunie, Morand, & Aure´ lie Bino, 2014). Risk assessment and linking ecological, social dynamics with epidemiological pattern is important (Morand et al.,2015). This is to be done with improved cross-sectoral collaboration, involving stakeholders at different levels. It requires certain methodological guidelines and has transaction costs linked to ensuring co-operation between different sectors in terms of time and resources. Through three (3) components—field-based data management, professional training workshops, and higher education— a study (Binot et al., 2015) suggests a new approach to networking of various sectors from local to national through a participatory modelling. This framework could stimulate a long-term dialogue process, based on the combination of case studies implementation and capacity development.¹⁶¹⁷ It aims for implementing both institutional One Health dynamics (multi-stakeholders and cross-sectoral) and research approaches promoting systems thinking and involving social sciences to follow-up and strengthen collective action. This implies that high level political commitment is essential to ensure the success of the One Health approach.

Key Takeaways

In light of new and emerging infectious diseases which are mainly zoonotic, it is important to understand the relative significance of both dominant and non-dominant sectors. Such a systems framework is offered by One Health which should be adopted into sub-national, national, and regional planning.

Building on existing initiatives

- Assess, improve, and further institutionalize national and sub-national mechanisms for multisectoral coordination of One Health Initiatives.
- Adapt and apply relevant tools and frameworks, such as Asia Pacific Strategy for Emerging Diseases and Public Health Emergencies (APSED) III based on national One Health priority needs.
- Leverage regional platforms such as ASEAN, South Asian Association for Regional Cooperation (SAARC) and others to develop regional approaches for prevention, control, and elimination of prioritised zoonoses, and other issues such as Antimicrobial Resistance (AMR), cross-border collaboration, and information exchange.

¹⁷ See ASEAN - CANADA Global Partnership Programme on Mitigation of Biological Threat Newsletter, 2nd Nov 2016. Canada Global Partnership Programme (GPP) - ASEAN Program. ASEAN and Canada’s GPP are working together towards strengthening five key areas in the region: Laboratory Capacity, disease surveillance, surveillance networks, security and multi-sectoral collaboration. The main objective of the partnership is to strengthen the capacity of the AMS to mitigate a wide range of biological threats as well as outbreaks of emerging and dangerous pathogens. The cooperation will also involve the following organisations: Canada’s IDRC, USAID, Australian DFAT, WHO, CORDS, ASEAN Plus Three Partnership Laboratories, ASEAN Plus Three Field Epidemiology Training Network, BioDiaspora, and MBDS

Possibilities of joint implementation

Regional Level

- Support the continued documentation and sharing of experiences on best practices, lessons learnt, successes and failures of multisectoral collaboration mechanisms.
- Build on and strengthen ASEAN Secretariat Working Group for ONE Health (ASEC-ONE Health), which coordinates various health-related initiatives of the ASEAN Secretariat, and aims to maximise the use of resources and promotes efficiency and integration across national borders. Seven (7) essential non-health sectors were identified for ASEAN: water and sanitation; food supply; utilities and energy; public transportation; communication; security and order; and finance and banking.
- Develop regional based surveillance systems and develop One Health-based health systems within ASEAN
- Enhance research collaboration and share findings between the AMS to enhance the activities for surveillance, prevention, and control of future zoonotic disease outbreaks. It is recommended that the AMS be more actively involved in existing initiatives (like PREDICT)

National level

- Advocate One Health approach in intersectoral policy planning
- Strengthen collaboration with wildlife and environment sectors, and raise One Health awareness and enhance understanding and engagement of other stakeholders (including social sciences and sectors such as disasters and pandemics management, customs and border security, education, food regulatory, and academia).
- Strengthen the capacities of field workers in wildlife health
- Increasing triangulation surveillance and health systems in the field of wild animals based on One Health
- Conduct studies on land use change and impact on zoonotic diseases and emerging infectious diseases
- Engage ministries of finance and planning agencies to allocate sufficient national budgets for One Health coordination and activities.

Potential initiatives

- Identify and prioritise One Health needs to use as the basis for developing, maintaining, synergising and advancing multisectoral collaboration across health, environment and animal sciences and related production and service sectors such as agriculture and tourism.
- Develop road maps with resourced work plans for prioritised issues relating to various aspects of strengthening approaches to One Health, containing clear roles and responsibilities for different agencies.
- Following the principles of good emergency practices, prepare, during “peace time”, coordination mechanisms for emergencies and ensure sustainability of multisectoral collaboration beyond emergencies and/or availability of external funding sources.
- It is recommended that the ASEAN build on and strengthen community-based participatory models of conservation action (in situ and ex situ) and sustainable use within biodiversity planning strategies and integrate them with health care and livelihood programmes (refer specific country level projects) and collaborative projects promoted by government, non-organisations, and the private sector. Support rigorous research on evolving issues such as urbanisation, encroachment into forest areas in view of increasing wildlife-human conflict and emerging disease risks by involving relevant sectors.

Table 3. Regional and country-wise policies and relevant implementation institutions relating to One Health and Biodiversity

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
ASEAN	<ol style="list-style-type: none"> 1. ASEAN Leaders' Declaration on Antimicrobial Resistance (AMR) 2. ASEAN plus three leaders' statement on cooperation on AMR 3. The ASEAN Health Cluster 2 Work Programme for 2016 to 2020 4. ASEAN Cooperation on Animal Health (ASEAN Highly Pathogenic Avian Influenza [HPAI] Task Force) 5. APSED 2010 6. Regional Strategic Framework for Veterinary Epidemiology Capacity Development and Networking in ASEAN (Epi Framework). 7. The ASEAN Strategic Plan 2016-25 for Food, Agriculture and Forestry: The Livestock Sub-Sector 8. ASEAN Food Safety Policy 9. ASEAN Food Safety Regulatory Framework 10. ASEAN Health Cluster 4 Work Programme for 2016-2020 (ASEAN Secretariat, 2016) 		<ol style="list-style-type: none"> 1. The ASEAN Technical Working Group Pandemic Preparedness and Response Senior Officials Meeting on Health Development (SOMHD), 2. ASEAN Experts Group on Communicable Diseases, 3. ASEAN Sectoral Working Group on Livestock 4. Highly Pathogenic Avian Influenza (HPAI) Task Force 5. ASEC-ONE Health 6. The Emerging Pandemic Threats 2 (EPT2) programme assists countries to reduce the risks and impact of pandemic threats, applying a One Health approach. Implementing partners include three projects— PREDICT 2, One Health Workforce, and the Preparedness and Response Project and partners the Food and Agriculture Organization, and the World Health Organization 7. ASEAN Risk Assessment Centre for Food Safety. 8. ASEAN Food Reference Laboratories 		The ASEAN Strategic Plan 2016-25 for Food, Agriculture and Forestry: The Livestock Sub-Sector (FAO RAP & ASEAN Secretariat 2014)
Brunei Darussalam	No data access				
Cambodia	<ol style="list-style-type: none"> 1. Policy on Infection Control 2. The National Policy to Combat Antimicrobial Resistance 2014 3. Cambodia–WHO CCS 2016–2020 4. National Working Group on Air pollution/ 	Ministry of Health		The National Policy to Combat Antimicrobial Resistance 2014 mentions about animal husbandry but there is not reference to One Health	

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	Detection of Chemical Hazards & HIA				
Indonesia	<ol style="list-style-type: none"> 1. Implementing the National Strategic Plan for Avian Influenza (INSP-AI) 2. Guidelines for Communication Prevention and Control of Disease (New Infection/EID and Targeted Zoonotic) 3. Cross sector co-ordination guidelines facing outstanding events/ Zoonoses Emerging Infectious diseases (EIDs) Plague 4. Guidelines for implementing emergency management systems for emergency and emergency response of animal diseases 5. Communication strategy for the prevention and control of new/recurrent infectious diseases and targeted zoonoses with the One Health approach 6. National Action Plan for Health Security (NAPHS) for Indonesia 2020-2024 	<p>For 1-5: Ministry of coordinating human development and cultural affairs; Ministry of Health; Ministry of Agriculture; Ministry of Environment and Forestry</p> <p>For 6: Ministry of Health with 21 other ministries</p>			<p>One Health training modules for three health sectors (public health, livestock and wildlife);</p> <p>Integrated information and health surveillance system with data on disease cases in humans, domestic animals and wildlife from across the country;</p> <p>Training of Trainer officers in three sector</p> <p>Basic Training on Zoonotic Disease from Wildlife Handling to Field Officers</p> <p>Training for Wildlife Health Surveillance System (SehatSati)</p> <p>Integrating 3 Sectors Surveillance Systems into Zoonosis and EID Information Systems (SIZE)¹⁸</p>
Lao PDR	<ol style="list-style-type: none"> 1. Multi-sectoral One Health National Action Plan on Anti-Microbial Resistance for 2017 – 2021 	<ol style="list-style-type: none"> 1. Ministry of Health and Ministry of Agriculture 2. National Avian and Human Influenza Co-ordination Office between the Ministries of Health and Agriculture 3. National Emerging Infectious Disease Coordination Office 	National Center for Laboratory and Epidemiology established as a World Health Organization (WHO) National Influenza Center; U.S. Centers for Disease Control and Prevention (CDC) Influenza-like illness and severe acute respiratory infection (SARI) surveillance networks		

¹⁸ Inputs from the presentations of the Regional Workshop on Biodiversity and Health held last 5-7 November 2018 in Manila, Philippines.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
Malaysia	<ol style="list-style-type: none"> 1. Malaysia Strategy for Emerging Diseases and Public Health Emergencies II 2017- 2021 2. Malaysian Action Plan on Antimicrobial Resistance 2017-2021 3. Malaysian Good Agricultural Practices 4. National Action Plan for Prevention, Eradication, Containment and Control of Invasive Alien Species in Malaysia 5. National Nutrition Policy of Malaysia 6. National Plan of Action for Nutrition of Malaysia (NPANM) III, 2016-2025 7. National Food Safety Policy 8. National Food Safety Action Plan (2010-2020) 	<p>Ministry of Health (MOH) National Disaster Management Agency; National Security Council;</p> <p>Department of Veterinary Services and Department of Agriculture; Ministry of Agriculture among others</p> <p>National Food Safety and Nutrition Council National Coordinating Committee on Food and Nutrition</p>	<p>Health Action International Asia Pacific on Antibiotic usage</p> <p>Malaysian Farm Certification Scheme for Livestock Farm Practices Scheme and Malaysian Aquaculture Farm Certification Scheme PREDICT Malaysia Ecohealth alliance</p>	Food and nutrition security as well as food safety and quality issues during emergencies ¹⁹	
Myanmar	WHO CCS Myanmar 2014– 2018 supports APSED	Ministry of Health	Disaster Management and Public Health Emergency project		
Philippines	<ol style="list-style-type: none"> 1. EO 168 s.2014: Inter- 2. Agency Task Force for Management of Emerging Infectious Disease in the Philippines 3. One Health Summit (DOH-DA-DENR) 4. The Philippine Action Plan to Combat Antimicrobial Resistance through One Health Approach to address human health, animal health and environment risks 5. Malacañang AO 10, 6. s.2010: Creation of the Philippine Inter-Agency Task Force on Zoonoses 		Joint Disease Surveillance being undertaken Ebola Reston virus – Luzon 2010 Henipah virus – Sultan Kudarat, 2014 Avian Influenza – Luzon, 2018		

¹⁹ AMS review inputs from Malaysia.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
Singapore	1. National Strategic Action Plan for Antimicrobial Resistance (AMR) – One Health collaboration in the key areas of education; surveillance of AMR and antimicrobial utilisation; research.	Ministry of Health, SFA, AVS/National Parks and National Environmental Agency	1. Awareness raising by National Centre for Infectious Diseases, Health Promotion Board and stakeholders and professionals in the One Health Sector.		<ul style="list-style-type: none"> • Collaboration in food safety through the One Health Framework; • Dengue prevention and control programmes; and • Specialist Diploma in One Health Course²⁰
Thailand	1. National AMR surveillance system for humans in 1998 2. National Strategic Plan for Preparedness, Prevention and Solution of Emerging Infectious Diseases (2013-2016) 3. National Strategic Plan on AMR 2017-2021 4. Mechanism of Surveillance Rapid Response Team 5. Thailand Global Health Strategic Framework 2016-2020 6. WHO CCS Thailand 2017–2021	1. Ministry of Public Health 2. Thai Coordinating Unit for One Health	Several joint projects in the Region with some of the AMS		
Viet Nam	1. Integrated National Operational Programme for Avian and Human Influenza				
Sub-regional arrangements	1. World Health Organization Framework for Zoonoses in the Asia-Pacific Region 2. Mekong Basin Disease Surveillance Network 3. Cambodia, Indonesia, Lao PDR, Myanmar, the Philippines, Viet Nam and Thailand 4. Several initiatives listed in the detailed table in the appendix.		<ul style="list-style-type: none"> - Asian Development Bank - World Bank - ASEAN - WHO - FAO - OIE, or World Organisation for Animal Health (formerly the <i>Office International des Epizooties</i>) - International Federation of Red Cross - United States CDC - USAID - United States Defense Threat Reduction Agency - Bill and Melinda Gates Foundation Global Fund to Fight AIDS, Tuberculosis and Malaria 		

²⁰ AMS survey responses

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
			<ul style="list-style-type: none"> - UNITAID - Gavi the Vaccine Alliance - Fleming Fund - Ending Pandemics Organisation - Pasteur International Network - Doherty Institute - Wellcome Trust Laboratories - Oxford University - French Development Agency - United Kingdom Department for International Development - German Technical Cooperation Agency - Japan International Cooperation Agency - Republic of Korea International Cooperation Agency 		

4. Non-communicable diseases (NCDs) and Biodiversity

It has been estimated that more than 70 per cent of deaths in several Southeast Asian countries are attributable to NCDs (WHO, 2017; 2018). Underlying factors range from sedentary lifestyles, high sodium and sugar intake and exposure to various pollutants. With increasing urbanisation, issues of stress and mental health have also been found to be on the rise. In its country strategic approaches with each of the AMS, the WHO has highlighted NCDs as an important focus area (see Table 4 below) along with tackling infectious diseases. Policies on NCD speak of having a 'whole of society' and 'whole of government approach' (WHO, 2017; 2018). Towards tackling NCDs, several strategies have been formulated, the most common being:

- *Promoting active lifestyles.* Encourage activities by establishing urban parks for leisure (also being referred to as therapeutic gardens), that are seen to encourage people to move outdoors, and have positive effects on human microbiome and on mental well-being. Countries like Singapore are championing this cause, in addition to investing in sustainable urban infrastructure that encourages active living. Fashioning the country to be a City in Nature, Singapore, led by the National Parks Board, is promoting research to understand biophilic interactions of people including the well-being effects of different types of nature interactions (*viz.*, Nature parks, green spaces, therapeutic gardens for the elderly, play gardens for children, etc) on people. In a similar vein, Lao PDR seeks to promote physical activity and dietary diversity through the Vientiane Healthy city initiative (led by the Ministry of Health). Malaysia has a multi-level approach to tackle NCDs. This includes promoting active living, combatting obesity and nutritional insecurity, encouraging diet diversity in rural areas, and training rural health workers to promote these activities. These are in addition to monitoring NCD risk factors, including environmental changes (facilitated and led by the Ministry of Health).
- *Disincentivising unhealthy foods especially foods high in sodium and concentrated sugars, and promoting dietary diversity and traditional foods, involving traditional knowledge and practitioners.* Viet Nam has focused on tackling malnutrition, poverty and hunger since 1996. Addressing malnutrition, both obesity and under nutrition, has been a focus of several policies of the Thailand government as seen by campaigns such as 'No big belly campaign' or "Agriculture for School Lunch Programme".
- *Disincentivising and regulating polluting activities, both at domestic and transboundary levels.* This theme recurs in WHO Country strategic documents of all the AMS.
- *Investing in awareness-raising and capacity development activities on addressing NCDs, and possible actions that may be taken by different actors in society.* This has been specifically highlighted, for instance in the case of Malaysia, Singapore Thailand, Viet Nam, and more broadly within the ASEAN common declarations and policies such as ASEAN Health Cluster 1: Promoting Healthy Lifestyle that focuses on promoting healthy lifestyle, active aging, food and nutrition security, and developing capacities, awareness, information sharing amongst the AMS.
- *Recognising the importance of working with partners, including WHO and other international and regional partners,* the Bandar Seri Begawan Declaration on Non- Communicable Diseases in ASEAN (2013) commits the AMS to address NCD scourge in the Region, focusing on healthy diets and sustainable lifestyles, that are reflected in various domestic policies.
- *Increasing visibility of mainstreaming activities for this sector,* it is often seen that the ministries of health, agriculture, rural development, environment are brought into the policy implementation process.

Key Takeaways

Apply Health in All Policies approach systematically across sectors and planning processes. The environment sector has specific connections as it relates to food and nutritional security, equitable access to safe environment, and to active lifestyle.

Building on existing initiatives

- Bring together and coordinate multiple stakeholders including WHO regional offices, their affiliated research institutes in different countries, and other research organisations that work on issues of relevance (environmental management, pollution, healthy cities, city planning, nutrition and health, rural development). Further, working with NGOs, civil society organisations, and representatives of local and indigenous communities will help ensure deeper communication to intended populations and identify clear challenges and opportunities to address the burden of NCDs in the Region.

Possibilities of joint implementation

Regional level

- Build on existing ASEAN level initiatives such as the Bandar Seri Begawan Declaration, and national campaigns to encourage training, capacity development, and sharing of experiences between the AMS. Further, given the issues of transboundary pollution, ensure that the ASEAN initiatives enable more collaborative activities to share resources and knowledge on mitigating and preventing adverse activities.

National level

- As concepts of 'whole of government' and 'whole of society' approaches are already built into policies on NCDs, opportunities exist to leverage on this to synergise efforts from all relevant sectors such as agriculture, environment, communication, finance, consumer affairs, housing and local government, education, social and private sector entities in mitigating NCDs incidence.
- Encourage healthier diets and healthy lifestyle practices by actively promoting healthy eating and diet diversity, revitalising traditional foods, and physical activities. This point overlaps with ensuring food and nutritional security goals under the Food and Nutrition theme, and indicative of synergies in designing action plans between sectors.

Potential initiatives

- Promote the concept of active living, especially in urban areas by encouraging more green spaces in cities
- Data and knowledge gaps exist amongst several AMS on population dynamics, burden of disease, and possible interventions that can address both health and environment simultaneously. Investing in research involving multiple sectoral priorities is an urgent need in order to make informed policy and implementation plans, and further add clarity to information on causal relationships and trends in interlinkages between environment and health. It would be pertinent to build on research initiatives being championed by governments such as Singapore that are looking at improvements to physical and mental health owing to biodiversity and ecosystem planning and interventions.

Table 4. Regional and country-wise policies and relevant implementing institutions relating to Non-Communicable Diseases and Biodiversity

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
ASEAN	<ol style="list-style-type: none"> 1. <i>Bandar Seri Begawan</i> Declaration (2013) to address NCD issues in region 2. ASEAN Health Cluster1: Promoting Healthy Lifestyle work programme 2016 – 2020 – Health Priority 1 Prevention and Control of NCDs 				All AMS finalise and implement national multi-sectoral strategy on NCDs
Brunei Darussalam	<ol style="list-style-type: none"> 1. National Multisectoral Action Plan for the Prevention and Control of Non-Communicable Diseases (2013), focuses on reducing tobacco consumption, promoting balanced and healthy diets, increasing physical activity. 2. 2035 National Wawasan Brunei (social, environmental and economic goals)- Vision of 'Together towards a Healthy Nation' requiring every sector to be involved 	1. The National NCD Prevention and Control Strategic Planning Committee			*Government of Brunei Darussalam (2010; 2013)
Cambodia	<ol style="list-style-type: none"> 1. Health Strategic Plan 2016-2020 2. National Strategic Action Plan for Disaster Risk Reduction 2013- 2020 	1. Ministry of Health			High incidence of NCDs- driven by urbanisation and aging population, malnutrition
Indonesia	<ol style="list-style-type: none"> 1. WHO country cooperation for 2014–2019 2. NAPHS for Indonesia 2020-2024/Ministry of Health with 21 other ministries and institutions 	1. Ministry of Health			
Lao PDR	National Multisectoral Action Plan for the Prevention and Control of Non-Communicable Diseases 2014-2020, focuses on dietary diversity and opportunities for physical activity through Vientiane Healthy City initiative; raise awareness through public	1. Ministry of Health			

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	campaigns and ensure 'whole of government' approaches including especially Ministries of Environment, Education, Trade				
Malaysia	<ol style="list-style-type: none"> 1. National Strategic Plan for Non-Communicable Diseases 2016-2025 2. National Environmental Health Action Plan. The Malaysia Environmental Health Information System is being developed to enable creation of state environmental profiles to facilitate, mitigate or predict actions before events occur. 3. NPANM III 2016- 2025, 4. National Strategic Plan for Active Living 2016-2025 5. <i>Komuniti Sihat Perkasa Negara</i> (KOSPEN) initiative. It aims to empower health volunteers at local levels to promote health diets, active living, monitoring of NCD risk factors including environmental changes amongst others 6. Policy Options to Combat Obesity in Malaysia 2015-2020. 7. Salt Reduction Strategy to Prevent and Control NCD for Malaysia 2015-2020. 8. National Strategic Plan for Tobacco Control 2015-2020. 9. National Strategic Plan for Cancer Control Programme 2016- 2020. 10. Malaysia Alcohol Control Action Plan 2013-2020 	<ol style="list-style-type: none"> 1. Ministry of Health, supported by the WHO and UNAIDS, the United Nations Development Programme, the United Nations Population Fund, the United Nations Children's Fund, the United Nations High Commissioner for Refugees, and the United Nations University International Institute for Global Health. 2. Nutrition Division MOH in collaboration with the Ministry of Rural and Regional Development (in rural areas), and with the Department of National Unity and Integration (for urban and sub-urban areas). 3. The Cabinet Committee on Healthy Lifestyles Environment 4. The Coordinating National Committee on Food and Nutrition 		<ol style="list-style-type: none"> 1. Increasing trend of obesity at various age groups. 2. Increasing trend of NCDs especially diabetes mellitus 1 in 3 Malaysian adults having hypertension and hyper Cholesterol-emia. 3. Low consumption of fruits and vegetables; High salt, sugar and fat consumption. 4. Sedentary lifestyle and physical inactivity 5. Incoherent policies between sectors affected NCDs environment intervention and policies.²¹ 	National Strategic Plan for Non-Communicable Diseases (Department of Public Health 2016)

²¹ AMS review inputs from Malaysia.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
Myanmar	WHO CCS Myanmar 2014–2018	Ministry of Health			
Philippines	<p>Vision of All for Health towards health for all</p> <p>1. Adopted the WHO Package of Essential Non-Communicable Disease Interventions for Primary Health Care in Low-Resource Settings (PEN), strengthening access to preventive and clinical NCD services in primary health care facilities. Focus also on improving well-being that addresses environmental issues that impact health, lifestyle problems in addition to focus on a comprehensive nutrition programme</p> <p>2. Universal Health Care Act (RA 11223) s. 2019 “An Act Instituting Universal Health Care for All Filipinos, prescribing Reforms in the Health Care System and Appropriating Funds Thereof” – Chapter VIII Section 30 wherein LGUs are also directed to enact stricter ordinances to strengthen and broaden existing health policies, the laws to the contrary notwithstanding and implement effective programmes that promote health literacy and healthy lifestyle among their constituents to advance population health and individual well-being, reduce the prevalence of non-communicable diseases and their risk factors, particularly tobacco and alcohol use.</p> <p>3. AO No. 2011-003 dated April 14, 2011: National Policy on Strengthening the Prevention and</p>	<p>1. Department of Health – aims to strengthen cross sector collaboration to ensure whole of government and whole of society identified as a priority area.</p> <ul style="list-style-type: none"> - Department of Environment and Natural Resources - Department of Education - Commission on Higher Education - Civil Service Commission - Department of Transportation - Land Transportation Franchising and Regulatory Board - Department of Finance - Department of Trade and Industry - Department of Labour and Employment - Civil Society Organisations : Philippine College of Chest Physicians, Philippine Medical Association, Philippine College of Physicians, Philippine Pediatrics Society, Philippine Academy of Family Physicians, Action on Smoking and Health 		<p>1. Difficulty in implementing policies at the Local Government Unit Level (Devolved System), as well in other national government agencies because of conflicting priorities/interests (i.e. Health vs. Trade)</p> <p>2. Lack of human resources²²</p>	

²² AMS survey inputs received from the Philippines

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	Control of Chronic Lifestyle-Related Diseases, assess mental health issues and improve health indicators				
Singapore	"Transforming Singapore into a City in Nature".	National Parks Board	Includes the following: Urban Redevelopment Authority, Housing Development Board, PUB - Singapore's National Water Agency; Land Transport Agency; JTC Corporation; National Healthcare Group, SingHealth, National University Health System		
Thailand	<ol style="list-style-type: none"> 1. National Food Committee Act 2008 2. SFFM 2010 3. Thailand healthy lifestyle strategic plan, 2011-2020 4. Thailand Global Health Strategic Framework 2016-2020 	<p>Ministry of Public Health</p> <p>Ministry of Agriculture and Cooperatives</p> <p>Ministry of Industry</p> <p>Ministry of Social Development and Human Security among others</p>	Thai Expert Advisory Group of food industry	Globalisation and the mushrooming of international trade and economic treaties pose critical risk for health policy addressing NCD prevention and control	
Viet Nam	WHO CCS 2007-2011	Ministry of Health		Physical inactivity, unhealthy diets; More than 70 per cent death by NCDs (Nguyen & Hoang, 2018)	

5. Biodiversity Planning and Health

How the environment sector takes into account health-related issues in the planning for biodiversity management and use is the focus in this theme. Information in the National Biodiversity Strategy and Action Plans (NBSAPs) of the AMS' speak about conservation of resources and ecosystems to ensure health of the environment and the people. Some of the AMS focus on looking at the broader well-being of people, and consider health in a more expansive fashion, such as in Myanmar, the Philippines, Thailand, or as specified in the ASEAN Cooperation on Environment strategy. The focal institution is the ministry of natural resources and environment in most of the AMS. Most countries follow the CBD mandate and the priorities of the AMS in biodiversity mainstreaming activities. For such activities, regulations relating to use of resources are handed over to respective sector ministries, even if overall focal point is the ministry of environment.

However, mainstreaming into the health sector is still not explicit amongst a majority of the AMS, as seen in the *ASEAN Biodiversity Outlook*. While reporting on progress towards achieving the Aichi Biodiversity Targets, the AMS are largely silent on health and biodiversity links (part of Target 14). However, measures to achieve related targets such as addressing Pollution (Target 8), water and sanitation (Target 14), sustainable agriculture (Target 7), sustainable consumption and production (Target 4) and climate change action (Target 15) appear quite proactive, albeit not interlinked (ACB, 2017). One of the key recommendations from the report, however is to learn from initiatives such as Healthy Parks, Healthy People.

Given the high level of biocultural diversity in the Region, it is not surprising that the dependence on biodiversity for various health and well-being needs continues to be high. At the same time, productive and resource-rich areas are witnessing large scale land use changes owing to infrastructure development, and for other economic options such as commercial plantation development (IPBES, 2018; ASEAN Secretariat, 2017). Clearly environmental degradation is unfolding in the Region, with consequent rise in pollution, vulnerabilities to disasters such as flooding and other regulatory functions, and reduced access to food and medicinal resources and options from bioresources that are as yet undiscovered (ASEAN Secretariat, 2017). It is estimated that between 1970-2009, the Region witnessed 1,211 reported disasters, including floods and cyclonic storms (68 per cent), earthquakes and tsunamis (9 per cent, 7 per cent landslides), volcanic eruptions (4 per cent), epidemics (8 per cent), droughts (3 per cent) and forest fires (1 per cent) resulting in more than four (4) million deaths, and high economic and health impacts (ASEAN Disaster Risk Management Initiative Report, 2009). Additionally, it has repercussions towards health outcomes, with explicit health costs rising due to pollution and derangement of various ecosystem functions including of air, land, and water, with increase in morbidities from pollution and illnesses due to vector borne diseases (see related references in NCD section, and ASEAN Secretariat, 2017a). The spiritual and cultural values associated with biological resources and ecosystems are also affected, thereby impacting the well-being of populations that depend on them.

The issue of biodiversity conservation and ensuring ecosystem integrity is closely linked to mitigating the impacts of climate change. The need to ensure conservation of agrobiodiversity to ensure food security through crops that will be able to withstand various consequences of climate change, ensuring ecosystem functions such as water regulation, flood mitigation, and soil fertility is not compromised, and further enables local communities' dependent on natural resources for their livelihoods and ways of living to continue to access, use, and add value to them are all part of climate-environment interventions. Loss of biodiversity has been clearly linked to loss of multiple future options from medicines, resilience from natural and economic shocks and specifically, health and well-being (IPBES, 2019).

Different AMS are attempting to address the issue of biodiversity conservation in multiple ways. One tool being introduced by the Philippines aims to undertake biodiversity budget tagging, which is similar to climate tagging, to raise visibility of biodiversity in sectoral implementation and foster a 'whole of government' approach. Such approaches may get the health sector to consider biodiversity

conservation and sustainable use and value addition in its plans. However, a direct link to green urban spaces to conserve biodiversity in cities as a mitigation tool is not mentioned much as a solution, except in cases such as Singapore, and to some extent, Lao PDR. Singapore also has a 'whole of government' coordination approach to address climate change impacts, that is oriented towards building resilience. Thailand has a *GREEN and CLEAN Hospital* mission that focuses on promoting hygienic practices, environmental protection, and nutritional security, and at the same time seeks to address carbon emissions.

Researches have highlighted the importance of biodiversity and ecosystems towards building climate resilient disaster preparedness, and at the same time manage health emergencies such as the COVID-19 pandemic (Djalante et al., 2020). However, they figure more in interventions suggested to address NCDs, indicating the lack of coherence in reporting on linked issues between sectors.

Key Takeaways

Links between biodiversity and health are insufficiently explored in national and regional policy documents about the environment and health. *ASEAN Biodiversity Outlook*, post-2020 biodiversity regional planning, and ASEAN health cluster post-2020 planning need to have a stronger focus on the explicit intersectoral linkages to ensure effective mainstreaming of biodiversity in the health sector, and vice versa.

Building on existing initiatives

- Strengthen initiatives aimed at enhancing ecosystem resilience through aspects related to conservation of resources, enhancing ecosystem functions that are important for regulation of natural processes, such as flooding. These are activities that can creatively engage local populations and further help to avoid and mitigate health and well-being risks. This also requires the participatory cooperation of local communities, and may include research, monitoring and surveillance of biodiversity utilisation, value addition and allied activities.
- Advocate the inclusion of these priorities in the next round of NBSAP development, and biodiversity planning processes both in the Region and at level of the individual AMS.

Possibilities of joint implementation

Regional level

- Build on existing ASEAN initiatives for transboundary collaboration to address drivers of biodiversity loss and loss of well-being parameters such as clean air, water, cultural landscapes (viz., ASEAN Heritage Parks), energy, infrastructure production and consumption systems among others.

National level

- Clear advantages exist in linking implementation of climate, development and biodiversity policies as the issues are interlinked. A coherent approach in policy designing and implementation activities involving the issues should be fostered in order to leverage on synergies in financial and human resources.

Potential initiatives

- Rise in NCDs and in pandemics indicate that we need to invest in nature-based interventions, especially as a preventive measure for good health and quality of life. The recent COVID-19 outbreak provides a good opportunity to persuade related sectors to come together for joint action including surveillance, research studies, developing capacities, design and implementation of policies and monitoring and reporting. This also links to the existing SDG planning and implementation frameworks at multiple governance levels.

Table 5. Regional and country-wise policies and relevant implementing institutions relating to Biodiversity planning and Health

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
ASEAN	<ol style="list-style-type: none"> 1. ASEAN Multi-Sectoral Framework on Climate Change: Agriculture, Fisheries and Forestry Towards Food Security- (AFCC) advocates institutional coherence, focus on livelihoods and context specific decision making and partnerships with all levels of Stakeholders including governments (ASEAN Secretariat, 2018) 2. ASEAN Biodiversity Outlook 2 (2017) 3. ASEAN Environmental Education Action Plan 2014-2018 providing a regional framework for enhancing public awareness on environmental management 4. ASEAN Cooperation on Environment strategy consists of ASEAN Ministerial Meeting on the Environment ASEAN Secretariat 2017b), 5. Agreement to co-operate on issues of pandemic diseases, climate change and consequence, food security through, among others, the implementation of the ASEAN Integrated Food Security Framework (AIFS), the Strategic Plan of Action on Food Security in the ASEAN Region (SPA- FA) (2015-2020), as well as the Vision and Strategic Plan for ASEAN Cooperation in Food, Agriculture and Forestry (2016-2025), and the 2030 Agenda for Sustainable Development; 				

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	6. ASEAN Krabi Initiative: Science, Technology & Innovation (STI) for a Competitive, Sustainable and Inclusive ASEAN-focus on Food, Energy Water Nexus To help protect shared marine waters in the region, ASEAN has adopted the ASEAN Marine Water Quality Criteria in 2002. Seventeen parameters were unanimously agreed and adopted as ASEAN common marine water quality for the protection of the coastal and marine environment and human health.				
Brunei Darussalam	1. The Brunei Darussalam Long Term Development Plan – Wawasan 2035 2. Health adaptation strategy for climate change	1. Ministry of Health 2. Ministry of Industry and Primary Resources		Links to environment sector unclear in climate and health strategy	
Cambodia	1. National Biodiversity Strategy and Action Plan 2016 2. Royal Rectangular Strategy IV 2019-2023 3. National Adaptation Programme of Action on Climate Change 2006 4. National Strategic Development Plan 2014-2018 5. Cambodia Climate Change Strategic Plan 2014–2023	1. National Committee on Environment and Health chaired by one of Secretary of States for Health 2. Inter-Ministerial WG on Environment and Health 3. Inter-ministerial WG on Human Health and Climate Change	1. Project to strengthen the resilience to climate change in the health sector 2. Develop capacity of health workers on emergencies preparedness, during and post disasters.	1. Different priorities of different sectors 2. Resource mobilisation 3. Limited capacity and knowledge about linkages 4. Less chance to work directly with the Department of Biodiversity of the Ministry of Environment.	1. Strengthening collaboration of the existing working groups through networking or regular meeting 2. Develop capacity of health workers on environment, climate change, biodiversity, air pollution 3. Conduct research for evident-based policy advocacy 4. Raise awareness of the community to understand the important of Biodiversity conservation for better health through information sharing and Behavioural Communication Change.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
					5. The Preventive Medicine Department, Ministry of Health will work closely with the Department of Biodiversity to address common issues related health and biodiversity ²³
Indonesia	<ol style="list-style-type: none"> 1. Law No. 5 of 1990 on the Conservation of Biological Resources and Ecosystems 2. Law No. 5 of 1994 on the Ratification of the United Nations Convention on Biological Diversity 3. Law No. 41 of 1999 on Forestry 4. Law number 1 of 2014 on the Management of Coastal Areas and Small Islands 5. Indonesian Biodiversity Strategy and Action Plan 2003-2020 	<p>Ministry of Environment and Forestry</p> <p>BAPPENAS (National Planning and Development Agency)- focal point for mainstreaming biodiversity to other sectors</p>		Explicit links to health and biodiversity not captured	
Lao PDR	<ol style="list-style-type: none"> 1. Strategy on Climate Change and Health 2018 2. Environmental Health Standard 2018 3. Hygiene and Health Promotion Law 2011 4. Health Impact Policy 2006 and HIA Guideline 2011 			<ol style="list-style-type: none"> 1. Lack of support from the Ministry of Natural Resources and Environment 2. Limited knowledge lack of practical experiences and sustainability of funding 	The solutions to address the challenges include: capacity development, coordination with MAF (DoF), MOH (Department of Hygiene and Health Promotion and Department of Food and Drug and MONRE, and advocacy to the policymakers of the three sectors ²⁴
Malaysia	<ol style="list-style-type: none"> 1. The National Environment Health Action Plan (NEHAP) focuses on multiple points of intervention required to address enhancing the quality of the environment and public health. Interventions are aligned to Regional Environment Health Action Plan for Southeast Asia 2. Biodiversity policy recognises the value 	Ministry of Health, Engineering Services Division		A broader integration of health priorities in land use planning (<i>viz.</i> , mental health, food and nutrition) are not embedded within the current policy.	

²³ Inputs received at the Regional Workshop on Human Health and Biodiversity held last 5-7 November 2018 in Manila, Philippines.

²⁴ Inputs received at the Regional Workshop on Human Health and Biodiversity held last 5-7 November 2018 in Manila, Philippines.

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	<p>of biodiversity to ensuring health through</p> <p>3. Traditional medicine, and in development of public health relevant medicinal products (Biodiversity and Forestry Management Division, 2016).</p>				
Myanmar	<p>1. Harmony and balance between economic development and environmental conservation across multiple sectors</p> <p>2. National Environmental Policy of 1994 has constituted environmental rules on the utilisation, conservation, and prevention of degradation of its water, land, forest, mineral, marine resources, and other natural resources;</p> <p>3. 2008 Constitution, environmental provision stated that the government shall protect and conserve the natural environment. But it also stated that the “national legislature can, but does not need to enact laws to protect the environment and help restore areas degraded or damaged by mining and forestry activities or those that have experienced destruction of plants, wildlife, and habitat;</p> <p>4. National Sustainable Development Strategy (2009) spelled out the country’s goal for sustainable management of natural resources by prioritizing improved forest resource management, sustainable energy production and consumption, biodiversity conservation, sustainable freshwater resources management, sustainable management of land resources and mineral resource utilisation</p> <p>5. Conservation of Biodiversity and</p>	<p>1. Environmental Conservation Committee, chaired by Ministry of Natural Resources and Environmental Conservation with members from other Ministries</p> <p>2. Conservation of Biodiversity and Protected Area Law implemented by National Steering Committee for Biodiversity and Protected Areas led by Minister</p> <p>3. Ministry of Natural Resources and Environmental Conservation</p> <p>4. Ministry of Agriculture, Livestock and Irrigation</p> <p>5. Ministry of Education</p> <p>6. Ministry of Planning, Finance and Industry</p> <p>7. Ministry of Health and Sports</p>			

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
	<p>Protected Areas Law, 2018</p> <p>6. Law relating to Aquaculture (1989)</p> <p>7. Pesticide Law (1990)</p> <p>8. Freshwater Fisheries Law (1991)</p> <p>9. Law relating to Fishing Rights of Foreign Fishing Vessels (1989, amended in 1993)</p> <p>10. Myanmar Marine Fisheries law (1990, amended in 1993)</p> <p>11. Myanmar Mines Law (1994)</p> <p>12. Fertilizer Law (2002)</p> <p>13. Plant Pest Quarantine Law (1993, amended in 2011)</p> <p>14. Seed Law (2011)</p> <p>15. Conservation of Water Resources and River Law (2006)</p> <p>16. Environmental Conservation Law (2012)</p> <p>17. Animals Health and Development Law (2012)</p> <p>18. Conservation of Biodiversity and Protected Areas Law (2018)</p> <p>19. Forest Law (2018) National Biodiversity Strategy and Action Plan (2015-2020)</p>				
Philippines	<p>1. The Philippine Biodiversity Strategy and Action Plan 2015-2028</p> <p>2. EO 489 s. 1991: Institutionalizing the Inter- Agency Committee on Environment and Health</p> <p>3. JDC 01 DOST- DA- DENR- DOH-DILG s. 2016: Regulations of Modern Biotechnology</p> <p>4. NEHAP 2018- 2022– launched</p> <p>5. National Climate Change Action Plan</p> <p>6. Integrated Coastal Resource Management Plan - Population, Health and Environment</p>	Department of Environment and Natural Resources			<p>a) Joint disease surveillance;</p> <p>b) Continuing Supreme Court mandamus on Manila bay rehabilitation;</p> <p>c) Boracay rehabilitation plan; and the Collaborative water quality monitoring - Other elements for human health and biodiversity framework are: Food security: traditional food, diet diversification; Natural wealth creation: pharmaceutical and traditional medicines; Emerging and re- emerging infectious</p>

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
					diseases, zoonotic diseases; Nature- based approaches to human health: value of green spaces to physical, mental and cultural well-being, and the Biodiversity- climate change adaptation- disaster risk reduction management and health ²⁵
Singapore	<ol style="list-style-type: none"> Inter-Ministerial Committee on Climate Change (IMCCC), Cooling Singapore Urban therapeutic gardens; improve mental and physical well-being; urban horticulture 	<p>The IMCCC enhances Whole-of-Government coordination on climate change policies to ensure that Singapore is prepared for the impacts of climate change. Established in 2007, IMCCC is chaired by the, Senior Minister and Coordinating Minister for National Security</p> <p>National Parks, Singapore is committed to enhancing and managing the urban ecosystems of Singapore's City in Nature as the lead agency for greenery, biodiversity conservation, and wildlife and animal health, welfare and management.</p> <p>Healthcare Sector (National Healthcare Group,</p>	<p>The IMCCC, MOH is involved in the Resilience Working Group (RWG), chaired by Permanent Secretary (National Development) and Permanent Secretary (Environment and Water Resources). Under the RWG, the Resilience Sub-Group (RSG) serves as the clearing-house for the RWG, and both MOH and NEA are the lead agencies for its Public Health Cluster.</p> <p>Under the resilience working group there are other clusters such as coastal protection, water resources and drainage, biodiversity and greenery, urban infrastructure and energy demand clusters.</p> <p>National Parks coordinates the biodiversity and greenery cluster.</p>		<p>Research experiments to investigate the well- being effects of different forms of nature interactions (e.g. green exercise, nature programmes, exposure to green spaces with different typologies such as therapeutic gardens and parks with Intensified nature) on various study populations, for translation to well- being solutions that may be applied</p> <p>Macro scale studies to gather insights on people's behaviour patterns, perceptions and preferences in relation to nature provision and engagement with nature, to shape the transformation of Singapore's greenery provision²⁶</p>

²⁵ AMS survey inputs received from the Philippines

²⁶ AMS Survey inputs - Singapore's vision of a City in Nature: On 4th March 2020, Mr Desmond Lee, 2nd Minister for National Development announced that the National Parks Board will work with the community to transform Singapore into a City in Nature. This new vision builds on what Singapore has achieved as a biophilic City in a Garden - Safeguarding of Singapore's nature reserves and establishing of Nature Parks which have enabled Singaporeans to benefit from the positive effects of nature on their health and well-being; Therapeutic Gardens designed and programmed for seniors (There are currently 4 therapeutic gardens at HortPark, Bishan-Ang Mo Kio Park, Choa Chu Kang Park and Tiong Bahru Park.); and Nature Play Gardens designed for children to play outdoors

Country	Major Policies	Focal policy institutions and others	Non-policy and other important implementing institutions	Challenges	Remarks
		SingHealth, National University Health System) and academia (NUS)			
Thailand	<ol style="list-style-type: none"> Section 56 of the Constitution of Thailand provides right to community participation to preserve and exploit environment and biodiversity in a manner not hazardous to health (ICEM 2003) National Strategy 2018- 2037 (20-year strategy) Draft National Adaptation Plan on Climate Change in Health sectors 2018 – 2030 Master Plan Integrated Biodiversity Management 2015-2021; National Environmental Health Action Plan; and Climate Change Master Plan 2015-2050. <ul style="list-style-type: none"> National Committee on Climate Change Policy (NCCC) Draft National Adaptation Plan on CC in Health sectors 2018-2030 (H- NAP) 	Ministry of Natural Resources and Environment; Ministry of Agriculture and Cooperatives; Research institutes and universities.	Collaboration between Department of Health, UNEP and GIZ on risk- based National Adaptation Plan (Risk- Nap) project;		Climate Change Adaptation methods of Thailand in the health sector includes: <ol style="list-style-type: none"> development of health and Climate Change adaptation in communities; strengthen environmental health services for prevention; development of public health action plan on heat, haze and drought; collaboration between DOH, ONEP and GIZ on risk-based National Adaptation Plan (Risk-Nap) project; and the heat- health warning system²⁷
Viet Nam	<ol style="list-style-type: none"> Biodiversity Law (2008)- Decree 65/2010 National Action Plan to Combat Illegal Wildlife Trafficking Decree No.32/2006/ND-CP of 30th March 2006 on the Management of Endangered, Precious and Rare Species of Wild Plants and Animals Decree No. 160/2013/ND- CP on Criteria to Determine Species Endangered Precious and Rare Species Prioritized Protection 	Ministry of Natural Resources and Environment. Mainstreaming activities facilitated by delegating responsibilities to Ministries on resource use & conservation relevant to the sector - viz., the Ministry of Health, Ministry of Agriculture and Rural Development, Ministry of Science and Technology.			

in specially-curated nature play areas and to enjoy the benefits of connecting with nature. Taken together, these programmes will bring Singaporeans closer to nature, thereby bringing forth benefits to health and well-being.

²⁷ Inputs received at the Regional Workshop on Human Health and Biodiversity held last 5-7 November 2018 in Manila, Philippines.

Taking stock and options forward (Short, medium and long term)

This section highlights the major areas that ASEAN and the AMS are focusing on in the Biodiversity-Health nexus, including identifying the prevailing gaps and opportunities.

Table 6. Snapshots of areas that ASEAN and the AMS are currently focusing on the Biodiversity and Health Nexus

Country	Major existing focus areas relating to biodiversity-health identified across the countries and region	Remarks
ASEAN	Strengthen capability to address NCDs - especially mental health and lifestyle ailments, other areas of focus include food safety, traditional medicines, safe technologies, collaboration on emerging and re-emerging infectious diseases, and antimicrobial resistance Communication, knowledge management and knowledge sharing, strengthen capacity to manage ASEAN health risks and issues	ASEAN Health Clusters 1.2.3 and 4 cover these topics and are valid until 2020. Next phase planning is an opportunity to identify specific issues to address ASEAN Food Safety Policy ASEAN Food Safety Regulatory Framework
Brunei Darussalam	Traditional medicine	Data for other sectors not found still
Cambodia	NCDs especially nutrition, disaster preparedness especially under rapid urbanisation, infectious diseases, traditional medicine	Focus on capacity development, resource mobilisation, communication
Indonesia	One Health, nutrition, traditional medicine	Focus on intersectoral collaboration, strengthening governance mechanisms, policy coherence; Need to address capacity development and awareness in the areas highlighted
Lao PDR	Focus on NCDs, especially food and nutrition to tackle stunting a major problem; One Health, strengthen traditional medicine	Resource mobilisation is a challenge, intersectoral cooperation still a challenge; invest in research and capacity development for different stakeholders, communication and awareness raising
Malaysia	Traditional medicine, NCDs, food and nutrition security, food safety and quality	Intersectoral collaboration requires strengthening
Myanmar	One Health coordination, traditional medicine promotion and resource conservation,	Communication between environment and health sectors is weak, Research agenda to be strengthened specifically on traditional medicine, on One Health coordination, capacity development, inter-ministerial (especially environment and health sectors) coordination and policy coherence to be strengthened too, intersectoral cooperation crucial
Philippines	Ecosystem resilience, food and nutritional security, traditional medicine, green spaces to tackle NCDs	Resource mobilisation, mainstreaming, localisation of national laws, capacity development and research; policy coherence and

Country	Major existing focus areas relating to biodiversity-health identified across the countries and region	Remarks
		inter- institutional cooperation and coordination still an issue, difficulty in implementing policies at the local government unit level and in other national government agencies because of conflicting priorities and interests (e.g. health vs. trade)
Singapore	Urban biodiversity, green spaces to address NCDs, zoonotic disease surveillance	Coordination with health sector to be enhanced
Thailand	Traditional medicine, One Health, environmental health	Research, developing capacity, intersectoral collaboration esp. between health, environment and agriculture, especially focusing on plant, animal and microorganism taxonomy, development of vaccines, develop Thai traditional medicine; coordinate Thai One Health network
Viet Nam	One Health, traditional medicine, green cities	

Constraints identified that impede efforts to undertake interlinked biodiversity and health activities

The following were identified as important challenges to be overcome in order to have effective cross sectoral implementation across health, environment and other relevant sectors²⁸.

- *Lack of data.* It is evident from the review that there are different kinds of data insufficiencies in the Region. First, data on policies and status of implementation from some of the AMS such as Brunei Darussalam, Myanmar, and Viet Nam are hard to obtain as some of these are in national languages and not translated into English. Second, relevant data from most countries also need to be deduced from related literature, with significant gaps in determining cause-effect relationships between loss of environmental and bio-cultural resources and human well-being, and further on current status of implementation or progress of initiatives. Furthermore, existing data repositories need to be made more useful in understanding conservation needs, utilisation potential, and avenues for cross sectoral collaboration.
- *Insufficient resources.* Almost all countries have indicated that mainstreaming and policy coherence and bringing synergies in implementation across sectors require investing in multiple efforts – from raising awareness, building infrastructure, institutional collaboration, innovative design, and planning of policies. This implies resource mobilisation - that again is a challenge within a country, calling for increasing advocacy efforts in influential policy forums.
- *Insufficient awareness and capacities of different stakeholders:* The interlinkages between different sectors across agriculture, rural development, trade, health, and environment are not immediately obvious to different stakeholders, especially to policymakers in various sectors, indicating a need for building awareness and developing capacities to handle synergies in implementation.

²⁸ These constraints were identified both from literature and from AMS inputs

Opportunities in the ASEAN region

One of the biggest opportunities in the Region is the high level of structural cooperation that already exists among the AMS through the *ASEAN Secretariat* and various departments. As presented at the Workshop in Manila, mainstreaming of biodiversity into other sectors is seen as a priority area in the region, and into the health sector is seen as a strategic area of focus. While some policies are already in place through the *Health Division of ASEAN Secretariat*, they are due to be reviewed and updated after the year 2020. That said, there are frameworks or declarations or established norms of engagement on all the themes discussed here for the ASEAN region. The status of their implementation is however not clear.

Given that the Global Biodiversity Framework is being negotiated, and the importance of healthy and resilient environments for health of people is being understood across different stakeholder and policy forums, it is a good time to invest in bold initiatives that link environmental management with human well-being. The other opportunity is that both the WHO and the CBD are now insisting on having whole of government and whole of society approaches, especially in tackling public health-related issues. This naturally gives a mandate to institutions like the ACB to engage with multiple sector focal points (from representatives of local communities to researchers to governmental bodies) in advancing this approach.

Possible roles of the ACB

All of the suggested interventions to strengthen the biodiversity-health mainstreaming across the various themes directly relate to biodiversity conservation, sustainable use, and ensuring mainstreaming. The ACB, as the focal point for biodiversity in the Region, can play a bridging role in getting the different related institutions at the regional and country levels to synergise and coordinate activities. Some suggested roles include:

Traditional medicine. Given that traditional medicine practices are dependent on availability of medicinal resources, ensuring their sustainable use is crucial. This implies that a clear understanding of the population status and the movement and trade of these resources across the Region (that shares biological and cultural borders between member states) is needed. Whereas such information has been collected by agencies and even by government or research institutions, they need to be updated and organised in an integrated fashion (taxonomic, utilisation, trade, population status, etc). This will enable mapping and monitoring of resource use and further regulating illegal trade.

Developing novel and value-added products to enhance and diversify livelihood opportunities and improve resource productivity also needs to be encouraged. The ACB is well-placed to capitalise on existing institutions (research, government, NGOs, community networks) to coordinate research, develop capacity and design of product development protocols, and resource inventories (digital databases) in the Region and within countries.

Food and Nutrition. The food and nutrition sector requires a clear nexus approach as it involves conservation of germplasm and productive resources like soil, water, and landscapes. Additionally, the sector is linked to livelihoods of millions of people at local levels, has clear health outcomes such as food security and nutritional security through dietary diversity, and is highly relevant to commodity chains and value added products. Each of these falls under the remit of different sectors from environment, agriculture, health, rural development and commerce, and science and technology. This implies that to address the various challenges in this area, it is pertinent that these various sectors synergise efforts towards integrated policy design and implementation. The ACB could effectively play the role of a bridging institution in this context by enabling the different agencies, research communities, and practitioner stakeholder representatives to come together. At the ASEAN level, through the AIFSAP, such an approach is already insinuated and similar approaches are being considered across several countries too (through sustainable agriculture programmes, promoting agrobiodiversity efforts and even certification schemes). It will be useful to leverage on these existing initiatives (as seen in those mentioned in supplementary information and scoping document) to strengthen efforts towards achieving this objective.

NCDs. These diseases are an outcome of loss of access to cultural, provisioning, and regulating ecosystem services. They are linked to loss of diversity of resources (especially in food and nutritional security related diseases) and to loss of access to parts of landscapes that encourage active living and avenues for mental well-being. In the Southeast Asian region, given that NCDs are considered the major cause of deaths, addressing them is a top priority for the WHO Regional Offices. However, the interventions need to be made by urban planners and by environmental agencies. In some cases, as in Malaysia, Singapore, Thailand, and Viet Nam, efforts by the environmental agencies towards green urban spaces are proactive. Synergising their efforts with the ministries of health, transportation, and urban planning will help capitalise on independent efforts and resources. The ACB is well placed to play the role of bringing together the different sectors within the ASEAN framework (in line with the *Bandar Seri Begawan Declaration on NCDs*) and enable collaborative implementation of research, capacity development, and implementation activities.

One Health. The concepts of One Health and EcoHealth are entrenched in ensuring ecosystem integrity and species interactions. It is clear that more research is required to establish causality of environment-health linkages, developing capacities of different stakeholders towards the pertinence

of the approaches and that addressing this requires active interventions from the environment and biodiversity angles. The ACB again can take a lead role in the discussions ongoing in the Region in the development of One Health approaches representing this angle, especially given the CBD guidance on One Health and the joint work programme between the CBD and the WHO on Health and Biodiversity.

Biodiversity Planning. The COVID-19 crisis also gives an opportunity to ensure that future biodiversity planning is cognisant of impacts to various health and well-being needs of populations. This has direct implications on how NBSAPs are designed and implemented and which stakeholder groups are consulted and included. It is clear that intersectoral implementation will be key to achieve multiple objectives (health, agriculture, environment, climate, urban planning, *etc.*). The ACB is well-placed to coordinate consultations in this regard to identify areas of synergy between the different sectors.

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Appendix 1. One Health and Ecohealth related Initiatives

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
Building Capacity for Ecohealth Research in Asia	Network / Training course	Developing a network of Ecohealth researchers in Southeast Asia is to build capacity in ecosystem approaches to health management, thereby reducing the risks of EIDs and improving livelihoods	Faculty of Veterinary Medicine, University of Calgary, University of Calgary, AB, Canada, Ontario Veterinary College, University of Guelph, Atlantic Veterinary College, University of Prince Edward Island	IDRC and AusAID
APEIR	Research/ capacity development	To create a trust- based network among researchers and policy makers. Originally set up to fight avian influenza by strengthening and supporting research initiatives, the partnership now looks to fight emerging infectious diseases	ADPC	Initially funded by IDRC, the Canadian International Disease Research Centre, and including China, Cambodia, Indonesia, Lao PDR, Thailand and Viet Nam
Community based disaster risk reduction	Implementati on project	Community based disaster risk reduction	Thailand national programme	
Emerging Pandemic Threats (EPT) programme	Implementati on project	One Health strategy to aggressively pre- empt or combat diseases that could spark future pandemics. The EPT programme draws on expertise from across the animal- and human-health sectors to build regional, national, and local capacities for early disease detection, laboratory-based disease diagnosis, rapid disease response and containment, and risk reduction	Some ASEAN Member States	U.S. Agency for International Development, Washington DC, USA
Institutional Arrangements for Achieving One Health and Ecohealth Outcome	Implementati on project	A framework on assessing the efficiency, effectiveness and feasibility of different types of institutional arrangements and for better understanding the barriers and bridges to working across sectors in different countries. This includes criteria for	Some ASEAN Member States	International Livestock Research Institute, Asia

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
		assessing impacts within and between sectors.		
Inter-regional course on public health and emergency management	Training programme	Inter-regional course on public health and emergency management	Some ASEAN Member States	ADPC
Modelling Risk: The Use of Geo-Temporal Models for Focusing Risk Reduction Interventions		To identify the regions where the next emerging infectious diseases (EIDs) are most likely to emerge (EID 'hotspots') and using data on human travel and trade patterns we can take this strategy further by identifying the hotspot regions which are most likely to propagate the spread of a new EID	Some ASEAN Member States, EcoHealth Alliance, University of California, Davis, Columbia University	USAID
Participatory research in three Agro-Ecological zones in Cambodia		Analysis of basic characteristics of backyard poultry raising systems in these zones and how these relate to the risk of avian influenza infection and spread	Cambodia national programme	Centre for Livestock and Agriculture Development, Cambodia
The Joint FAO/OIE/WHO Global Early Warning and Response System (FAO, OIE, WHO 2019)	Programme/ project	Builds on the added value of linking the alert mechanisms of FAO, OIE and WHO and triangulating needed expertise and disciplines from the three organisations to provide a unique opportunity for joint risk assessment of potential health threats	ASEAN Member States	Animal Diseases Emergencies and Early Warning, Food and Agriculture Organization of the United Nations, Italy; OIE; FAO; WHO
The U.S. Government's Strategic Framework for Addressing Emerging Threats	Programme/ project		ASEAN Member States	Director for Medical Preparedness Policy, National Security Staff, The White House, USA
World Health Organization Framework for Zoonoses in the Asia-Pacific Region	Policy	Under Asia Pacific Strategy for Emerging Diseases (APSED 2005), a unique zoonoses framework has been developed to guide collaboration between human and animal health sectors: can be used to address any zoonotic disease events and emergencies; covers all areas of work including risk reduction,	Some ASEAN Member States	World Health Organization, Western Pacific Regional Office, Manila, the Philippines CIRAD (Centre for International Research for Agricultural Development-France

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
		surveillance for information sharing; coordinated response, and collaborative research on Animal Health and Emerging Diseases section - involved in a number of activities e.g. genetic assessments of pathogens; vector-host relationships; vaccines; assessing risks; EID animal health surveillance conference (2011)		
'One Health', Increasing Cross Sectoral Functioning Capabilities for APEC Member Economies			Philippines	DAFF, APEC members - Animal and Human Health Programme Manager
Development of a Community based Training Package on One Health	Training programme	Report: Development of a Community based Training Package on One Health	Thailand national programme	
The ASEP Public Health Network	Network	To build a platform for public health policy dialogue between Asia and Europe.	Some ASEAN Member States	
Greater Mekong Subregion Responses to Infectious Diseases Project (GMS-RID)	Programme/ project	To improve cross- border infectious disease surveillance and response focusing on API, malaria, TB and other emerging infectious diseases in the GMS; To manage malaria drug resistance control including malaria containment and elimination projects; To establish public private partnerships, with a focus on USAID Global Development Alliance (GDA) initiatives.	Cambodia, China, Lao PDR, Thailand, and Viet Nam	USAID
Japan/ASEM Initiative for the Rapid Containment of Pandemic Influenza Stockpile Component		To supplement the shortfall of stockpiles in Asia by adding to the ASEAN stockpile (see corresponding sections).	ASEAN Member States	Japan Trust Fund on Health
ASEAN Plus Three Workshop on Human and Animal Health Collaboration	Programme/ project	Recommendations for collaboration among ASEAN Nations for responses to human and animal health EID challenges	ASEAN	

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
Bringing public policy to bear on livestock sector development	Programme/ project	Developing strategies to protect the mainly small private livestock sector. Recommendation s for the way ahead.	Some ASEAN Member States	World bank
Field Epidemiology Training programmes	Training programme		Some ASEAN Member States	
Highly Pathogenic Emerging and Re-emerging Diseases -the first regional One Health programme in Asia	Programme/ project		Some ASEAN Member States	European commission
ASEAN Foundation Communication and Information Systems for the Control of Avian Influenza (CISCAI)		To research, design, develop, field-test and deploy sustainable communication and information systems that will support national efforts to control the spread of avian influenza among animals and humans in Lao PDR and Viet Nam.	Lao PDR and Viet Nam.	Japan-ASEAN Solidarity Fund
Community- Based Avian Influenza Control Project (CBAIC)	Programme/ project	Developed and tested models to reduce the risk of H5N1 transmission in Indonesian commercial poultry through training, one-on-one technical assistance, and farm commodity support - in 330 broiler farms with total annual production of 17 million birds in West Java, an area reporting the majority of H5N1 cases in animals and humans in Indonesia	Indonesia	USAID
Thailand Sub-Committee for the 2 nd National Strategic Plan for Prevention and Control of Avian Influenza and Preparedness for Influenza Pandemic	National plan	To continue the first strategy - the main aim to prevent avian influenza and influenza pandemic: prevention of outbreaks, solutions where needed with human based initiatives with collaboration between domestic and international sectors across disciplines. There is a mechanism for continuous coordination, management and monitoring and evaluation.	Thailand national programme	

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
ASEAN Plus 3 Emerging Infectious Diseases Project Phases I and II		To enhance regional preparedness and capacity through integrated approaches to prevention, surveillance and timely response to EID.	ASEAN Plus Three3	AusAID
ASEAN programmes towards regional multi-sectoral pandemic preparedness and response		To promote regional multi-sectoral pandemic preparedness and response		USAID
Agriculture and Technical Cooperation Working Group (ATCWG)	Programme/ project		Asia-Pacific Economic Cooperation (APEC) - Australia, Brunei Darussalam, Canada, Chile, China, Hong Kong, China, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Chinese Taipei, Thailand, United States, Viet Nam	Australian Government Department of Agriculture, Fisheries and Forestry
Implementing the National Strategic Plan for Avian Influenza (INSP-AI)	Policy/ strategy	To improve the accessibility and quality of health services for the community through supporting the Government of Indonesia in its efforts to implement the health-related aspects of prevention and control of Avian Influenza), specifically H5N1, and pandemic preparedness nationwide	Indonesia	European commission
Prevention and Control of Avian and Human Pandemic Influenza in Myanmar		To strengthen national capacity in pandemic preparedness planning, surveillance, outbreak investigation, rapid response and containment and health system	Myanmar	European commission
Small and Medium-sized Enterprise (SME) Working Group		To strengthen the resilience of SMEs to better respond to a pandemic	Some ASEAN Member States	

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
ASEAN Cooperation on Animal Health (ASEAN HPAI Task Force)		To strengthen the ASEAN Secretariat's capacity for regional coordination and communication in controlling HPAI		ADB
Integrated National Operational Programme for Avian and Human Influenza		Task force was given responsibility to coordinate actors and sectors and prepare a plan to undertake activities and achieve objectives and outputs identified in the integrated national Plan for Avian Influenza Control and Human Pandemic Influenza Preparedness and Response (Red Book).	Viet Nam	
ASEAN-Japan Project for Stockpile of Antivirals and PPE against Potential Pandemic Influenza		To establish and maintain a stockpile of antiviral drugs and personal protective equipment (PPE) against potential pandemic influenza for the ASEAN region.	Japan + ASEAN	Japan-ASEAN Integration Fund (JAIF)
APEC Business Advisory Council	Network	To promote business continuity planning and disaster preparedness for avian and pandemic influenza.	Asia-Pacific Economic Cooperation (APEC) - Australia, Brunei Darussalam, Canada, Chile, China, Hong Kong, China, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Chinese Taipei, Thailand, United States, Viet Nam	
Ayeyawady- Chao Phraya- Mekong Economic Cooperation Strategy (ACMECS) Initiatives on Animal and Human Influenza	Programme/ project	To address animal and human influenza properly as part of efforts toward social progress under the public health and agriculture cooperation frameworks.	ACMECS	Thailand
Health Working Group	Network	To plan and prepare for health-related threats to economies, trade and security, focusing mainly	Asia-Pacific Economic Cooperation (APEC) - Australia,	APEC, US Government, private

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
		on naturally occurring and intentionally caused health threats.	Brunei Darussalam, Canada, Chile, China, Hong Kong, China, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Papua New Guinea, Peru, the Philippines, Russia, Singapore, Chinese Taipei, Thailand, United States, Viet Nam	
Mekong Basin Diseases Surveillance (MBDS)	Network	To develop mechanisms for building strong cross-border programmes, implement them in pilot sites and develop tools and skills among key stakeholders to solve issues of cross-border infectious disease epidemics in a coordinated way.	Cambodia, Lao PDR, Myanmar, Thailand, Viet Nam, China	The Rockefeller Foundation, Nuclear Threat Initiative's (NTI) Global Health, Security Initiative (GHSI), WHO, CDC, Google.org
Range of training courses, meetings, workshops related to zoonotic diseases <i>e.g.</i> Zoonotic Diseases Project: Workshop for Development of Community-based Zoonotic One Health Initiative Training course (June 2011)	Training programmes/ networking	Regional cooperation network established in 1966 for education, training and research in tropical medicine and public health under the Southeast Asian Ministers of Education. The Network serves as a focal point in higher education and research in tropical medicine and public health.	Southeast Asian countries	Southeast Asian Ministers of Education Tropical Medicine and Public Health Network (SEAMEO TROPMED Network)
APACH (Asia Pacific Academic Consortium for Public Health)	Network	International non-profit organization registered in Honolulu, USA comprising many of the largest and most influential schools of Public Health in the Asia-Pacific region. Aims to enhance regional capacity to improve the quality of life and to address major public health challenges through the delivery of education, research and population health services by member institutions	55 members throughout the Asia-Pacific region	
ASEAN University Network	Network	No specific One Health activities but is an important network and potential focal point for educational initiatives	ASEAN	

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
CGIAR research programmes	Research/ capacity development	One health seminars, lectures, links with Chang Mai University and Gadjah Mada to develop ecohealth capacity	Southeast Asian countries	ILRI, Asia
Connecting Organisations for Regional Disease Surveillance (CORDS)	Network	Strengthen the standard of infectious disease surveillance globally by connecting and enhancing existing and nascent regional disease surveillance networks. Establish new networks, particularly in conflict or low- resource settings.	NTI, MBDS Network, Middle East Consortium on Infectious Disease Surveillance, South- eastern European Health Network, APEIR, Southern African Centre for Infectious Disease Surveillance (SACIDS), East African Integrated Disease Surveillance Network (EAIDSNet). Intergovernmental organisations participate as observers	The Rockefeller Foundation, The Nuclear Threat Initiative (NTI), The Skoll Global Threats Fund, and The Peter G. Peterson Foundation
EcoHealth/One Health Resource Centre (EHRC)	Research/ capacity development	Set of pilot research project, plus assistance to translate the knowledge gained into feasible policies and actions	Cambodia, Indonesia, Lao PDR, Thailand, Viet Nam and China (Yunnan Province)	ILRI, Asia
Forecasting	Research	Through ABIN, wildlife and biosecurity professionals will gain access to a unique national collaborative environment to support disease diagnosis, surveillance, research and training activities	Australia, SE Asia, Pacific	Australian Department of Agriculture, Fisheries and Forestry
Highly Pathogenic Emerging Diseases (HPED)	Programme/ project			EU - implemented by OIE/ WHO/ FAO
Indozone communication network, National Commission of Zoonotic Diseases and DG for Animal Husbandry and Animal Health, Ministry of Agriculture	Network	Pandemic preparedness and response strategies, SOP for Influenza pandemic, 100 referral hospitals and referral laboratories, effective media platform for dialogue and information sharing among animal-human health stakeholders	Department of Health Policy and Administration, Faculty of Public Health, University of Indonesia	
Regional Steering Committee for Asia				FAO, OIE, WHO, ASEAN, SAARC,

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
and the Pacific GF-TADs				The Pacific Community, donors
Building Capacity for Ecohealth Research in Asia	Programme/ project	Their mission is 'to work for, and with, communities in need to foster the health of animals, people, and the environments that sustain us		Veterinarians without Borders/ Vétérinaires sans Frontières - Canada
Asian Partnership for Emerging Infectious Disease Research	Research	Partnership (collaborative) research in application of ecohealth principles to managing factors of emerging infectious diseases		IDRC and Asian donors
Ecohealth Emerging Infectious Diseases Research Initiative (EcoEID)	Research		Thailand, Viet Nam, Indonesia, China, Lao PDR, the Philippines	IDRC/DFATD/AUS AID
Ecosystem Approaches to the Better Management of Zoonotic Emerging Infectious Diseases in the Southeast Asia Region (EcoZD)	Programme/ project		Viet Nam, Lao PDR, Cambodia, Indonesia, China, Thailand	IDRC
Eco-Bio-Social dengue control programmes	Programme/ project	Dengue control	Thailand, Viet Nam, Indonesia, China, Lao PDR, the Philippines	IDRC/WHO
Lawa Model: Integrated Opisthorchiasis Control in Northeast Thailand	Programme/ project		Thailand	IDRC
The Research Institute for Humanity and Nature (RIHN) project	Research	EIDs	Lao PDR, Viet Nam, Bangladesh, Yunnan China	IDRC
Building Ecohealth Capacity in Asia (BECA)	Training/ capacity development	EIDs	Thailand, Lao PDR, Cambodia, Viet Nam, China	IDRC
The Field Building Leadership Initiative in Southeast Asia (FBLI)	Training/ capacity development	Ag and health	Thailand, Indonesia, Viet Nam, China	IDRC
Integrated assessment of environmental sanitation and health (NCCR North-south)		Ag and health	Viet Nam, Thailand	SDC

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
The Southeast Asia One Health University Network (SEAOHUN)	Network	Established in 2011 with support from the USAID Emerging Pandemic Threats RESPOND Project, focused on cross-sectoral disease surveillance, training, and outbreak response, in order to develop a well-prepared One Health workforce to prevent, detect, and respond to the threat of infectious diseases. SEAOHUN currently consists of 62 universities, 115 faculties and government agencies from 4 member countries. SEAOHUN's vision is to empower a regional network of social and intellectual excellence on One Health, working to respond to outbreaks of infectious and zoonotic diseases.	Indonesia, Malaysia, Thailand, and Viet Nam	USAID
ASEAN Leaders' Declaration on Antimicrobial Resistance (AMR):	Policy	Strengthening the regulatory systems, pharmaceutical and food supply chain management, health financing mechanisms, agricultural value chain management to ensure equitable, timely and sustainable access to safe, efficacious, affordable and quality antimicrobials, environmental management of antibiotic residues and impacts		
The ASEAN Health Cluster 2 Work Programme for 2016 to 2020	Policy		ASEAN	
Zoonotic Emergence Network (ZEN)	Network		China and Malaysia	
Infectious Disease Emergence and Economics of Altered	Programme /project			USAID, Ecohealth alliance

Programmes/ projects	Strategic focus	Thematic focus	Key partners	Supported by
landscapes (IDEEAL)				
Deep Forest Project	Programme /project	A study of the effects of land use change on viral diversity, and set up the Wildlife Health Unit and the Wildlife Health, Genetic and Forensic Laboratory, with Sabah Wildlife Department and Danau Girang Field Centre	Malaysia	Ecohealth Alliance
One Health Network Southeast Asia	Research projects	This is a collaborative platform funded by the European Union to facilitate sharing, networking, close co-operation and exchange within and across One Health research projects in Southeast Asia. The network currently hosts two Southeast Asia based projects, which are both run under the EU INNOVATE programme: The ComAcross project The LACANET project		European union
GREASE Network	Network	To improve the management of epidemiological emergent risks in Southeast Asia by strengthening synergies and skills sharing. It is currently coordinated by the CIRAD/Kasetsart University office (office of the international affairs of the Veterinary Medicine Faculty) in Bangkok	Thailand, Lao PDR, Cambodia, Viet Nam, the Philippines and Indonesia	