SUSTAIN EU-ASEAN

Sustain and Enhance Cooperation on Sustainable Development between Europe and Southeast Asia

Research Roadmap

Biodiversity in Southeast Asia

1. Introduction

The SUSTAIN EU-ASEAN project aims at facilitating academic cooperation between researchers from the EU and the Southeast Asia on research topics that are of common concern. This paper identifies trends in the state of biodiversity and linkages between Europe and the Southeast Asian region and outlines a roadmap for future research.

The paper is based on the outcomes of a SUSTAIN EU ASEAN foresight workshop series. Workshops were held in Berlin and Bangkok in October 2015 and January 2016. They brought together experts and scientists in the areas climate and energy, resources and waste, biodiversity, and water from the EU and Southeast Asia (see Annex for a list of participants). The issue specific research roadmaps were derived in thematic working groups.

2. Environmental Analysis

Biodiversity in Southeast Asia

Southeast Asia is a primary biodiversity hotspot. Covering three percent of the earth's surface, it contains over 20 percent of all known plant, animal, and marine species. With Indonesia, Malaysia, and the Philippines, three ASEAN member states are amongst the world's 17 mega-diverse countries and four of the 25 biodiversity hotspots are located in the South East Asian region. Although it occupies the three percent of the Earth's surface, it posses a significant share of the global terrestrial, inland and marine biodiversity (Fuentes, Inciong, & Jose-Castillo, 2012).

Fig. 1: Biodiversity hotspots (source: Myers et al. 2000)

Natural resources such as primary forests are of crucial importance for biodiversity and the provision of ecosystem services. Ecosystem services are fundamental to all socio-economic activities and include the provision of water, energy, or raw materials (provisioning services), regulating services such as carbon sequestration, flood protection, or the purification of air and water, supporting services such as soil formation or photosynthesis, and cultural services.

Terrestrial Biodiversity: forest and agricultural biodiversity shall continue to contribute to the ecological stability of the ASEAN region and beyond. Deforestation and land conversion for the development of agricultural landscapes to produce crops, biofuels and also for urban expansion are the most serious threats for critical ecosystems. Specifically, pressure on agro-ecosystems is projected to intensify due to a growing population.

Addressing these pressures requires the participation of cruical stakeholders and comprises multiple measures that are directly or indirectly linked to enhancing the productivity of prevalent cropping systems, reducing post-harvest losses, sustainable management of forest, and minimisation of wasteful and excessive consumption (ASEAN Biodiversity Outlook, 2010).

Inland Water Biodiversity: Inland water ecosystems comprise wetlands, peatlands and freshwater bodies. ASEAN inland water ecosystems are high value areas for biodiversity. Their ecosystem functions, however, are often undervalued and at water ecosystems are at imminent risk of conversion for development expansion (ASEAN Centre for Biodiversity 2010, 164). Minimising pressures on freshwater ecosystems and avoiding negative impacts requires an integrated management approach (ASEAN Centre for Biodiversity 2010, 164). Reducing the impact on water quality, minimizing the risk of eutrophication through sewage treatment, protection of wetlands and its restoration, control of agriclutural run off should be the primary objective in the ASEAN region (ASEAN Centre for Biodiversity 2010, 165)
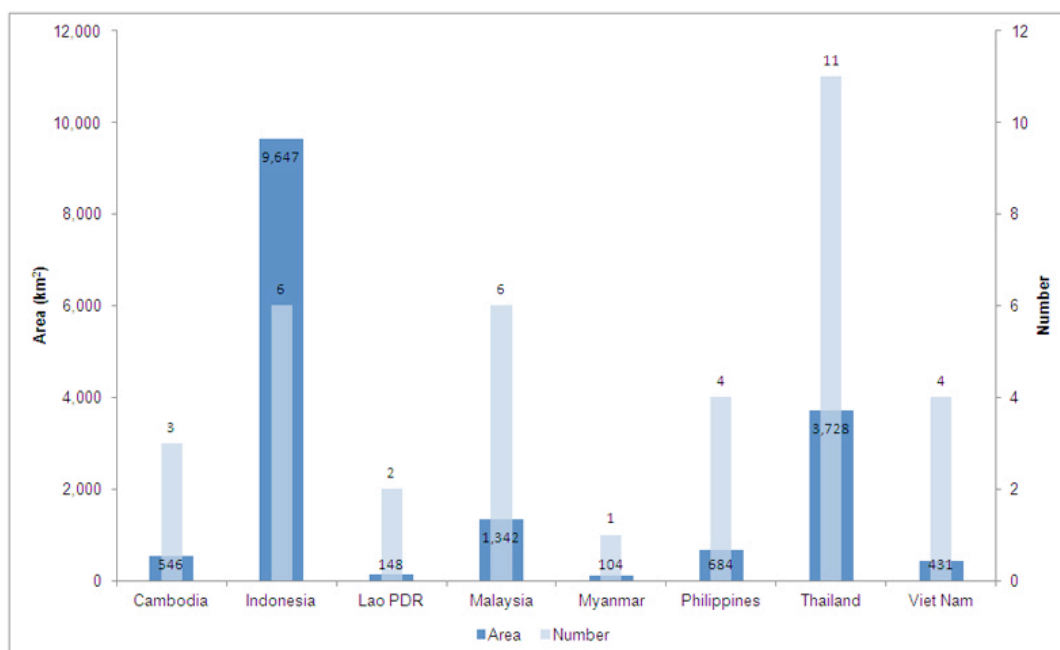

Figure 1: Number and area of RAMSAR sites in Southeast Asia. (ASEAN Centre for Biodiversity n.d. Data source: The List of Wetlands of International Importance (2012).)

Marine and Coastal Biodiversity: The ASEAN region's marine and coastal ecosystem are highly prone to multiple pressures which affect their ability to supply food, functional buffer zones for natural calamities and also livelihoods for the communities. The 2010 AESEAN Biodiverstiy Outlook highlights the „urgent need to establish marine protected areas (MPAs) and MPA networks, as well as promulgate policies that allow marshes, mangroves and other coastal ecosystems to persist and even migrate inland to make these ecosystems more resilient to the impact of sea level rise, and thus help protect the vital services they provide" (ASEAN Centre for Biodiversity 2010).

Textbox: Glimples of Biodiversity of ASEAN Member Countries (source: ASEAN Centre for Biodiversity 2010).

1. **Brunei Darussalam:** The island is a habitat of 100 non flying mammal species out of which fifty percent are rodents, 390 species of animals, 98 species of amphibians and 50 species of reptiles, 400 species of coral, 50 species of fresh water fish and 144 species of marine fish.

2. **Cambodia:** Cambodia is a home for 123 mammal species, 88 reptile species, 545 bird species, 874 fish species, 70 coral species, 63 amphibians and 8 seagrass species, 490 fresh water fishes and 410 salt water fishes are recored.

3. **Indonesia:** In Indonesia, 515 species of mammals, 781 species of reptiles, 35 species of primates, 270 species of amphibians, 1595 species of birds. It is one of the mega diversity conutry in the world.

4. **The Lao PDR:** The well documented fauna of Lao consists of 150 species of reptiles, 200 species of amphibians, 700 species of birds, 90 species of bat, 100 species of mammals and 500 species of fish.

5. **Malaysia:** Malaysia is a home for 450 species of mammals, 742 species of birds, 242 species of amphibians, 567 species of reptiles, 290 species of fresh water fish and 500 species of marine fish.

6. **Myanmar:** The Union of Myanmar is a habitat of 251 mammals species, 1056 birds species, 272 reptiles species, 82 amphibians species, 310 fresh water species, 465 marine species, 841 medicinal plant species.

7. **Philipines:** The Philipines is 17th mega diverse conuntries having 3214 species of fish and ranks 4rth in bird endemism and 49% of terrestrial wildlife.

8. **Singapore:** A tropical island city state has 52 mammal species, 98 reptile species, 28 species of amphibians, 364 species of birds, 31 different mangrove species, 12 seagrass species, 200 species of sponges, 256 species of hard corals.

9. **Thailand:** Thailand harvors 200 species of coral reefs, 302 species of vertebrate animals, 982 species of birds, 350 species of reptiles, 137 species of amphibians, 2820 species of marine fish, 720 species of fresh water fish, 83000 species of invertebrate animals.

10. **Vietnam:** Vietnam is a home of 3000 aquatic creatures, 11000 forms of sea life like crustaceans, mollusks and 10000 fauna species have been identified.

Trends

Southeast Asian biodiversity is extremely exposed to pressures and almost the entire region's biodiversity state is considered either critical or at least vulnerable (Fig. 2). Major cause of biodiversity loss in Southeast Asia is the conversion, fragmentation and degradation of natural habitats.
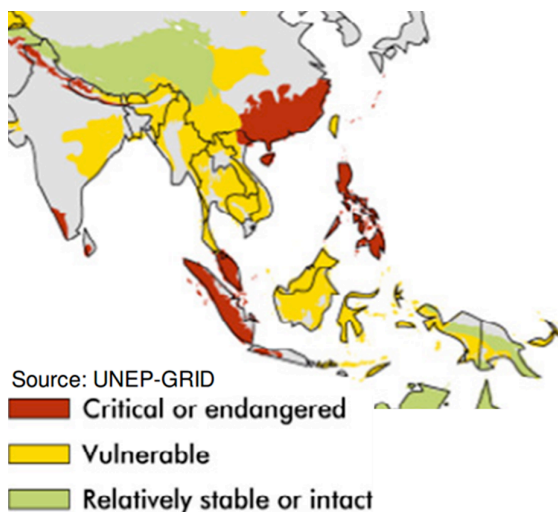
Source: UNEP-GRID

■ Critical or endangered

■ Vulnerable

■ Relatively stable or intact

Fig. 2: State of biodiversity hotspots in Southeast Asia (source Slingenberg et al. 2009, data; UNEP-GRID)

The loss and degradation of ecosystems compromises their ability to provide services on multiple spatial scale levels: According to the FAO, for example, the reduction of forest cover in Southeast Asia influences the global carbon balance, reduces its potential for local and regional flood protection, and threatens opportunities for rural employment. Land use change, is estimated to contribute significantly to the global emission of greenhouse gases. Reductions in forest area in the ASEAN region between 2010 and 2020 are expected in the loss of 8.72Gt CO_2eq stored GHG; which is roughly equivalent to 85% of the European Union's (EU15) transport emissions in 2010 (FAO 2011). Despite some countries such as Vietnam or the Philippines recorded increasing forest cover (Fig. 3), the annual rate of deforestation in South-East Asia still is among the highest in the world (Kim, Sexton, and Townshend 2015) and the region has lost 13% of its forest area over the past 20 years (UNESCAP 2014).[1]
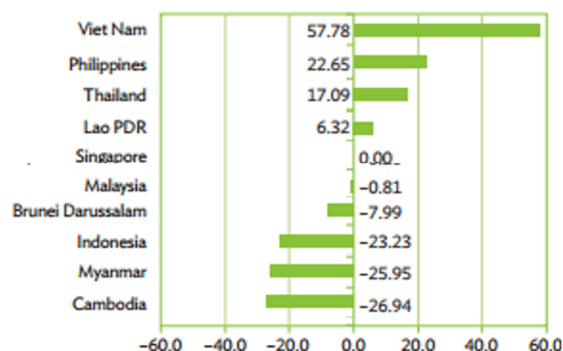

Fig. 3: Percentage Change of Land Area covered by Forests, 1990, 2015. (ADB 2015)

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[1]There are wide discrepancies among available estimates on forest cover and its changes. This is due to different assessment and reporting methods. (Kim, Sexton, and Townshend 2015)

Most importantly, the two countries with largest forest areas in the region, Indonesia and Myanmar, showed shrinking forest areas which leads to an overall decrease of forests in Southeast Asia (FAO 2015; Kim, Sexton, and Townshend 2015; Miettinen, Stibig, and Achard 2014; Stibig et al. 2014).
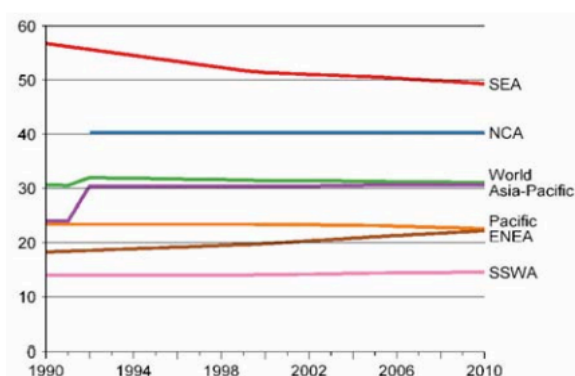

Fig.4: Forest Cover as a percentage of land area, Asia and the Pacific and World, 1990-2010. (source: UNESCAP 2014)

Despite deforestation rates in Indonesia were declining in recent years it still had the world's second greatest loss of forest area in absolute terms between 2010 and 2015 before Myanmar (FAO 2015). Indonesia, Myanmar and Cambodia lost about 20 per cent of their forest cover; and Malaysia and Lao about 10 per cent between 1990 and 2011 (UNDP 2014)

	Country	Annual forest loss	
		Area (000 ha)	% of 2010 forest area
1	Brazil	984	0.2
2	Indonesia	684	0.7
3	Myanmar	546	1.7
4	Nigeria	410	4.5
5	United Republic of Tanzania	372	0.8
6	Paraguay	325	1.9
7	Zimbabwe	312	2.0
8	Democratic Republic of the Congo	311	0.2
9	Argentina	297	1.0
10	Venezuela (Bolivarian Republic of)	289	0.5

Fig. 5: Countries reporting the greatest annual forest area reduction 2010-2015 (source: FAO 2015, 15)

Besides shrinking forest areas, forest degradation is another source of biodiversity loss and it is important to differentiate between primary forests which are rich in biodiveristy and less biodiveristy-rich planted forests (Subramanian et al. 2011; UNESCAP 2014).

Aquatic ecosystems in Southeast Asia comprise coral reefs; coastal systems, including estuaires; mangroves; inland wetlands; and rivers and lakes. The Mekong river is home to the world's largest freshwater fisheries and 65 million people depend on its provision of fish and irrigantion water (ASEAN Centre for Biodiversity 2013).

Pressures and Drivers of Biodiversity Loss

Deforestation, forest degradation and habitat destruction are related to direct pressures and indirect factors (drivers). Pressures on biodiversity stem from a range of factors including

- the overexploitation of biological resources such as timber or fish,

- the conversion of primary forests to plantations and agricultural land;

- agricultural runoff (nitrogen deposition, herbicides);

- urbanisation and human settlements (untreated waste and sewage);

- toxic industrial waste that degrades soil and waterbodies

- the provision of energy (e.g. hydroelectricity, or biofuels), and

- impacts of climate change on vulnerable ecosystems

(ASEAN Centre for ASEAN Centre for Biodiversity 2014; Secretariat of the Convention on Biological Diversity 2014; Stibig et al. 2014; Subramanian et al. 2011; UNU-IAS 2010)

Participants of the working group on biodiversity concluded that main driver behind deforestation, forest degradation and habitat destruction is the expansion of agricultural land at the expense of primary forests. Agricultural land use is rising specifically in the most forested countries in the region: Indonesia and Myanmar (Fig. 6). This development is related to a shift from traditional peasant subsistence farming to a large scale industrialised agriculture and aquaculture which is highly integrated in global value chains and aims at providing food, commodities and fuels (Fox et al. 2009; Grogan et al. 2015; Sodhi et al. 2010; Stibig et al. 2014).
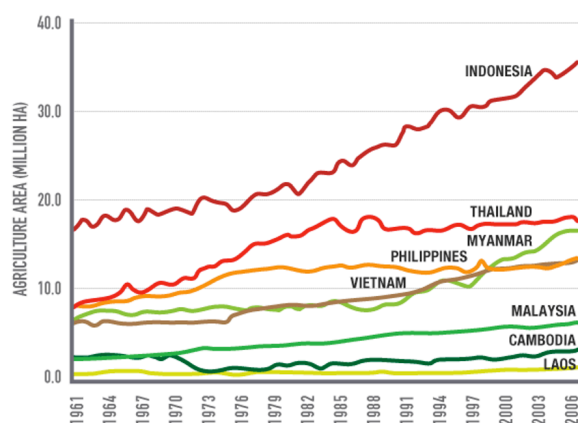

Fig. 6: Agricultural land use in South East Asia (Subramanian et al. 2011)

Beyond land use, the working group identified other relevant socio-economic drivers that relate to biodiversity loss. These include poverty, urbanisation, institutional failures including law enforcement, and energy policies abroad that increase demand for biofuels.

The 5th assessment report of the Intergovernmental Panel on Climate Change (IPCC) WG II concludes that "a large fraction of terrestrial and freshwater species face increased extinction risk under projected climate change during and beyond the 21st century, especially as climate change interacts with other pressures, such as habitat modification, overexploitation, pollution, and invasive species (high confidence)" (Settele et al. 2014). The shifting

of moth ranges to higher elevation (Chen et al., 2009) provides strong evidence of climate change in SEA over the last 42 years. Also, forest fires negatively affect biodiversity in SEA (Koh et al., 2013). Invasive species in SEA causes the displacement of native biodiversity due to synergistic factors like invasive species advantageous life history traits (Osunkoya, Othman, & Kahar, 2005), modification of ecosystem (Peters, 2001), competition for resources (Huong & Sodhi, 1997), environmental disturbance, hybridization and economic loss (Brook, Sodhi, & Ng, 2003).

Management of Biodiversity through Rural Development Initiatives

Overall, in ASEAN region agriculture biodiversity is a prominent economic sector and also a important factors for the alleviation of poverty through sustainable development. Biodiversity is the only means of food, health and livelihood for more than one billion of people living in extreme poverty. To manage the agricultural biodiversity in the context of rural development, poverty eradication and food security the following areas (inter alia) need to be covered (ASEAN Foundation).

1. Participatory approach for agricultural diversification
2. Implementation and diffusion of sutainable farming and fishing practices
3. Establishing a research system to promote national agriculture
4. Integrated quality systems for agro-industry
5. Safety and risk assessment of GMOs
6. Community based approach for enterpreneurship
7. Supply chain management for agro-business

Increased participation of small farmers in high value agri-markets their access towards rural credits and their advanced practices through science and technology will help to come up with the more productive and sustainable management of agriculture and sustainable management of agricultural biodiversity.

3. Objectives and policy measures

Objectives and policy measures can be derived from SDG 15: *Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss* and the *Aichi Biodiverstiy Targets* for 2011-2020.

SDG 15 aims at the conservation, restoration and sustainable use of ecosystems and ecosystem services. The degradation of land and ecosystems should be reduced and biodiversity loss prevented. To this end, sustainable management practices should be implemented and ecosystem and biodiversity values be integrated into national and local planning, development processes, poverty reduction strategies. The list of relevant indicators as proposed in the most recent report of the *Inter-agency and Expert Group on Sustainable Development Goal Indicators* (E/CN.3/2016/2*)* comprises inter alia: Forest area as a percentage of total land area; forests under sustainable management practices; net permanent forest loss; Percentage of land that is degraded over total land area; or the number of national development plans and processes integrating biodiversity and ecosystem services values.

The Aichi Biodiversity Targets for 2011-2020 aim at mainstreaming biodiversity into development strategies and planning processes, and its integration into reporting and accounting systems. By 2020, the rate of loss of all natural habitats is at least halved and where feasible brought close to zero, and the degradation and fragmentation of habitats is significantly reduced. Pollution of soil and inland freshwaters from excess nutrients is

reduced to levels that are not detrimental to ecosystems. The extinction of known threatened species has been prevented and their conservation status has been improved. Areas that are used for agriculture, aquaculture and forestry are managed sustainably. Ecosystems and ecosystem services are restored (at least 15 per cent of degraded ecosystems are restored by 2020) and the contribution of biodiversity to carbon stocks has been enhanced. The implementation of national biodiversity strategies and action plans is enhanced through participatory planning, knowledge management (including traditional knowledge) and capacity building.

Policy measures that support these objectives are the provision of incentives for maintaining biodiversity and ecosystem services, for example through Payment for Ecosystem Services Schemes (PES), the phasing out of environmentally harmful subsidies specifically related to agriculture, the establishment of protected areas, capacity building for monitoring and enhanced law enforcement, and participatory planning.

4. Strategic Roadmap for research

Halting biodiversity loss by protecting biodiversity and promoting sustainable use of terrestrial ecosystems through participatory approaches

Specific Challenge:

Biodiversity provides ecosystem services (provisioning, regulating, maintaining and cultural) crucial for human well-being. Ecosystem services provided by biodiversity relate to secure livelihoods by providing food, water and medicin, to enhance resilience against climate change, conservation of threatened species, and carbon storage and sequestration. The EU biodiversity strategy inter alia aims at 'a bigger EU contribution to averting global biodiversity loss'.

The ASEAN region has made progress in terms of human and economic development over the last decades and is increasingly integrated into the world market. This development, however, has come at the cost of biodiversity and ecosystems that both provide global ecosystem services and support millions of livelihoods in the region. Biodiversity in the Southeast Asian region is declining rapidly due to

- the overexploitation of biological resources such as timber or fish,

- the conversion of primary forests to plantations and agricultural land;

- agricultural runoff (nitrogen deposition, herbicides);

- urbanisation and human settlements (untreated waste and sewage);

- toxic industrial waste that degrades soil and waterbodies

- the provision of energy (e.g. hydroelectricity, or biofuels), and

- impacts of climate change on vulnerable ecosystems

Local communities specifically depend on ecosystem services as basis of their existence. Biodiversity and natural ecosystems are catalysts for sustainable development on the local level. Maintaining agricultural biodiversity ('agro-biodiversity') and locally adapted traditional crop varieties is crucial for food security, including adaptation to climate change, or pests and disease control. On the other hand, rural populations are severely affected by biodiversity loss and the degradation of ecosystems. Participatory approaches that aim at better inclusion of local stakeholders might benefit both local population and sustain global ecosystem services and thus contribute to more sustainable development.

Scope:

The challenge is to systematically explore, assess and evaluate existing participatory approaches for strengthening the role of local population in promoting biodiversity protection – ranging from information to PES schemes to the provision of economic incentives to ownership schemes. A sound knowledge base on participatory approaches and their applicability under different socio-economic and political environments would make it easier to unlock their potential for implementing sustainable management practices. Still, ASEAN countries differ in their socio-economic and political environments for the participation of local communities. The

assessment should identify and build on good practice examples for local participation and be responsive to specific socio-economic framework conditions in the respective countries.

Proposals should include a plan for the creation of a multi-stakeholder forum consisting of civil society, industry, public authorities.

Expected Impact:

- Create a EU-ASEAN multi-stakeholder forum comprising civil society, industry, public authorities that develops a strategic research agenda for participatory approaches to maintain biological diversity based on best practices across the ASEAN region.

- Integration of biodiversity protection, rural development, poverty eradication and food security

- Improve cooperation between EU and ASEAN in biodiversity issues.

- Identify solutions for involving and enabling local population to effectively influence policy making

- approaches for incentivising local communities to maintain biodiversity.

- incentivizes local farmers to preserve genetic diversity in situ approach of crop species by maintaining agro-biodiversity, traditional varieties of crops and conservation areas for wild relatives of crops.

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Annex

Participants in Berlin workshop (5-6.10.2015)		Participants in Bangkok workshop (26-28.01.2016)	
Name	Institution	Name	Institution
Pierrick Fillon-Ashida	EC	Aneta Slaveykova Nikolova	UNESCAP
Ralph Sims	Advisory board	Anil Kumar Anal	Asian AIT
Fritz Barth	European Water Platform	Boris Antic	University of Novi Sad
Dietmar Lampert	ZSI	Brahmanand Mohanty	ADEME/ AIT
Doris Wilhelmer	AIT	Bundit Fungtammasan	University of Bangkok
Gerd Rücker	DLR	Chayathorn Thanawattanadamrong	Thailand Greenhouse Gas Management (TGO)
Stefan Werland	FUB	Dietmar Lampert	ZSI
Boris Antic	Uni Novi Sad	Dirk van Amelsfort	Viktoria Swedish ICT
Lasse Loft	Senkenberg	Doris Wilhelmer	Austrian AIT
Catherine Abon	Uni Potsdam	Friedhelm Call	DLR
Susanne Langsdorf	Ecologic	Gerd Rücker	DLR
Sandy Bisaro	GCF	Heinrich Wyes	CAREC
Oliver Lah	WI/FUB	Holger Baer	FU Berlin
Shritu Shrestha	WI	Kamol Sukin	Heinrich Böll Stiftung
Ahmad Hafiz	CSCP	Kathleen Dematera	Clean Air Asia (CAA)
Erika v. Schneidemesser	IASS	Manfred Hornung	Heinrich Böll Stiftung
Leena Kaisen	AWI	Mirko Goletz	DLR
Henning Wilts	WI	Ms. Nareerat	TGO
tbc	Uni Utrecht	Philippe Bergeron	SUSTAIN Consultant
Erskin Blunck	HfWU	Oliver Lah	WI
Christoph v. Stechow	PIK, MCC	Rae Kwon Chung	UNESCAP
Heiko Apel	Uni Postdam	Ruth Erlbeck	GIZ
Mirko Goletz	DLR-VF	Shritu Shrestha	WI
Hannah Janetschek	IASS	Simon Grimley	EURAXESS/NSTDA
		Stefan Werland	FU Berlin
		Tali Trigg	GIZ
		Venkatachalam Anbumozhi	ERIA
		Henning Wilts	WI
		Ampai Harakunarak	ASEAN Secretariat
			Asian Development Bank
		Irene Crisologo	University of the Philippines Diliman
		Pattharaporn Suntharasaj	NSTDA
		Phawika Rueannoi	NSTDA
		Martius, Christopher	CIFOR