

# WATER-WASTEWATER NEXUS IN URBANISING ASIA: BUILDING CAPACITY FOR MONITORING WATER QUALITY RISKS

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# **Water-Wastewater Nexus in Urbanising Asia: Building Capacity for Monitoring Water Quality Risks**

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# 1. Executive Summary

The Nexus Observatory seeks to advance the Nexus Approach to the management of environmental resources by bridging the gap between science and policy. The science-policy divide is responsible for fragmented decision-making and produces silos between sectors, services, and public sector departments. From a scientific point of view disciplinary differences support a divide between research and implementation of the Nexus Approach. The Nexus Observatory is focussed on bridging the science-policy divide by: (a) drawing generalizable principles based on case study analysis of “success” and “failure” of implemented programmes and projects, (b) playing back the process by which researchers proceed from incubating questions to reporting on findings, and (c) translating the results of scientific inquiry for use by decision makers by exploiting the power of big data and data visualisation techniques and applications of data proxies, indices, scenario analysis, and benchmarking.

The Nexus Observatory initiative has five broad goals: (a) cross-fertilisation, (b) piloting, (c) capacity development, (d) policy advocacy, and (e) impact monitoring and evaluation. Data from a variety of sources including UN agencies, Member States, and private data sets (*for example, data sourced from mobile devices*) serves as a basis for the Nexus Observatory initiative. For this purpose the focus has been on building a consortium of regional ministries and research institutes that would provide data on various aspects of environmental resources management. The consortium approach also provides UNU-FLORES an opportunity to engage regional partners, such as Technische Universität Dresden (TU Dresden), Germany and the Institute for Global Environmental Strategies (IGES), Japan in discussions on specific capacity development requirements that advance research on the nexus of water, soil, and waste. This approach led to the development of a consortium on drought risk monitoring in Africa through the conclusion of Cooperation Agreements with regional ministries and research and training institutes in Malawi, Ethiopia, and Tanzania.

Following the approach that was adopted in Africa, a proposal writing workshop was organised in December 2014 in Tokyo, Japan to which researchers from Indonesia, Thailand, Viet Nam, China, and India were invited. At the workshop, a broad consensus to pursue regional research on water quality monitoring was reached. Subsequently, UNU-FLORES signed a Memorandum of Understanding (MoU) with UN-HABITAT to develop, test, and evaluate monitoring methodologies for Sustainable Development Goal (SDG) target 6.3. A panel discussion involving our strategic partners in Asia – IGES and UN-HABITAT – took place as part of the Dresden Nexus Conference (DNC) 2015 to discuss issues relating to data, monitoring, and governance. At DNC 2015 a decision was taken to organise a regional consultation to explore the possibility of establishing a regional consortium for Asia to pursue the priorities identified by researchers at the workshop in Tokyo, Japan in December 2014.

The Ministry of Construction (MOC), Government of Viet Nam and National University of Civil Engineering (NUCE), Ha Noi offered to host the regional consultation for Asia in May 2016. This report presents the key results that emerged at the Ha Noi regional consultation. Decision makers from five countries in Southeast Asia were invited to attend the regional consultation together with researchers who attended the workshop in 2014 in Tokyo, Japan. In addition key donors from the region: The World Bank, Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), and Japan International Cooperation Agency (JICA) also participated in the discussions in Ha Noi. Dr Graham Alabaster from UN-HABITAT provided a context to the discussions by offering an overview of how regional research could potentially contribute towards the development of a monitoring methodology for target 6.3 of the SDGs that could also be used by decision makers in other regions.

The discussions at the Ha Noi workshop focused on water-wastewater nexus challenges and the role of data in supporting robust monitoring of SDGs in each of the five participating countries: Indonesia, Lao PDR, the Philippines, Thailand and Viet Nam. Participants also discussed case studies that could serve as a potential field site for proposed research to develop a monitoring methodology. During the workshop a field visit to a wastewater treatment plant in Ha Noi city was organised by NUCE during which participants were able to discuss common challenges for nexus monitoring in the region. Capacity development priorities relating to curriculum development, face-to-face, online learning,

and PhD-level research projects were also discussed as a means to advance innovations in regional monitoring strategies. The usefulness of the Nexus Observatory as a vehicle to facilitate seamless integration between research, training, and policy advocacy was recognised during the workshop.

This report emphasises some of the key discussion points of the Ha Noi workshop within which future discussions relating to regional research may be situated, notably:

- a. There is scope to improve upon SDG monitoring strategies by focusing on data, monitoring, and governance.
- b. The workshop recognised that a lot more work is required to compliment the bio-physical indicators that presently are the focus of target 6.3 of the SDGs.
- c. Workshop participants emphasised the need to consider the role of institutional and socio-economic indicators around the work on target 6.3.
- d. The workshop resolved to explore the role of a “wastewater-reuse-effectiveness index” as a possible monitoring methodology that: (1) integrates use of bio-physical indicators (e.g. *water quality*), (2) integrates institutional indicators (e.g. *cost-recovery*), and (3) integrates socio-economic indicators (e.g. *willingness to pay for wastewater services*).
- e. To better frame the discussion on the role of indices, participants resolved to focus on developing comparative national assessments on a common theme of significant policy-relevance, namely: the role of combined versus separate sewer systems in facilitating wastewater reuse in an urban context.
- f. The workshop resolved to commission national assessments that would examine cases of success and failure based on a typology that included separate and combined sewers, agro-ecological differences, variations in concentrations of poverty in urban settlements, and decentralised versus centralised governance structures.

## 2. Introduction

A regional consultation took place in Ha Noi, Viet Nam on 24–25 May 2016 to discuss nexus challenges and to ascertain the potential for regional cooperation in Southeast Asia. The UNU-FLORES Nexus Observatory Workshop on “Water-Wastewater Nexus in Urbanising Asia: Building Capacity for Monitoring Water Quality Risks” was organised in collaboration with the Ministry of Construction, Viet Nam, the National University of Civil Engineering, Viet Nam, and the Institute for Global Environmental Strategies (IGES), Japan. During the consultation, participants explored priorities and challenges in relation to water quality and related economic, social, and environmental risks. Member state representatives and researchers from five Southeast Asian countries – Indonesia, Lao PDR, the Philippines, Thailand and Viet Nam – attended the regional consultation.

### 2.1 Background

The regional consultation builds on a proposal writing workshop with researchers in Tokyo, Japan in December 2014. The workshop in 2014, jointly organised by UNU-FLORES and IGES, brought together researchers from China, Indonesia, Thailand, the Philippines, and Viet Nam and had three main objectives:

- i. To introduce partners in Asia to the Nexus Observatory project and plans to establish an Asia Nexus Observatory Consortium for data sharing and in support of improved monitoring and implementation frameworks

- ii. To develop short concept notes clarifying the water-wastewater-soil nexus in the context of urbanising Asia
- iii. To consolidate individual concept notes into a shared concept that identifies the scope for an Asia Nexus Observatory Consortium and informs the design for a regional consultation

Following the workshop in Tokyo, Japan, UNU-FLORES and IGES collaborated to discuss key elements of the shared Asia concept note at a session on data and monitoring as part of the Dresden Nexus Conference (DNC) in March 2015. Based on discussions and feedback, two broad policy priorities emerged in the form of two questions, which informed the regional consultation held in May 2016 in Ha Noi, Viet Nam:

- i. Are decentralised wastewater treatment facilities better placed at mitigating water quality risks?
- ii. Are combined sewers better placed at mitigating water quality risks?

The literature suggests that urbanisation significantly affects the natural water cycle in terms of quantity of water resources available and quality of water that is fit for human consumption. In Asia, water quality risks have the potential to inundate low-lying areas, spread diseases, and destroy crops under peri-urban agriculture. This has the potential to adversely affect local and national economies through increased health expenditures, lowered income from sale of crops, and reduced productivity of agricultural systems. Therefore, safeguarding water resources enhancing ecosystem services and monitoring water quality standards have implications for research, capacity development as well as policy, project, and programme implementation.

The priorities that emerged at the workshop in Tokyo, Japan formed the basis for organising a regional consultation in Asia. It was expected that researchers who participated in Tokyo would play a key role in identifying decision makers from individual countries to contribute to the regional consultation. The Ministry of Construction, Viet Nam and their partner the National University of Civil Engineering, Viet Nam expressed interest in hosting the regional consultation, which took place in Ha Noi on 24–25 May 2016.

## 2.2 Objectives

The main objective of the regional consultation held in Ha Noi, Viet Nam on 24–25 May 2016 was to ascertain the potential for regional cooperation in Southeast Asia on priorities and challenges related to the water-wastewater nexus. The following were specific aims of the regional consultation:

- › To engage decision makers in discussions on how water quality risks in urbanising Asia can be framed within the context of allocations of financial and human resources for infrastructure construction and maintenance, safeguarding public health and development
- › To discuss capacity development requirements as they relate to data generation, collection, sharing, analysis, and coordinated decision-making that support forecasting of water quality risks and their mitigation
- › To discuss the merits of consolidating regional data and knowledge in the form of case studies that would be hosted on the UNU-FLORES Nexus Observatory platform, serving to bridge the science-policy divide

## 2.3 Expected Outcomes

The regional consultation was expected to identify national and regional priorities and challenges related to the water-wastewater nexus as well as existing and planned frameworks for monitoring of water quality and related risks. The latter part also relates to the implementation of Sustainable Development Goal (SDG) target 6.3<sup>1</sup> on water and wastewater management. Specific expectations of the regional consultation were as follows:

- › Ascertain applications of the Nexus Approach in addressing water-wastewater challenges in urbanising Asia.
- › Ascertain common challenges relating to management of water-wastewater resources in urbanising Asia.
- › Ascertain regional priorities for water-wastewater monitoring strategies with specific reference to target 6.3 of the SDGs.



*Group photo of workshop participants*

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<sup>1</sup> SDG target 6.3 reads as follows: by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.

### 3. Day 1: Tuesday, 24 May 2016

#### 3.1 Opening Session

*Chairs:* National University of Civil Engineering (NUCE), Viet Nam and Institute for Global Environmental Strategies (IGES), Japan

Prior to the official opening of the workshop, **Dr Nguyen Hoang Giang**, National University of Civil Engineering (NUCE), Viet Nam and **Dr Pham Ngoc Bao**, Institute for Global Environmental Strategies (IGES), Japan gave a general introduction of the workshop, organisers, and country representatives.

**Dr Nguyen Hong Tien**, Director General of Administration of Technical Infrastructure, Ministry of Construction, Viet Nam extended his welcoming remarks to workshop participants. He started by explaining the aims of cooperation among states in the region and identified a number of key priorities related to the water-wastewater nexus. He went on to give an account of the Nexus Observatory initiative and highlighted the initiative's main objectives: (i) to improve quality and quantity of databases; (ii) to improve links between research, capacity building, and policy; (iii) to provide opportunities for cooperation with national and international organisations on topics of water and wastewater management; (iv) to emphasise linkages between infrastructure, public health, and Sustainable Development Goals (SDGs); and (v) to harmonise and unify data and knowledge in the region. By participating in this Nexus Observatory Workshop, participants have the opportunity to collaborate and contribute to the mentioned objectives. Dr Tien concluded his opening remarks by thanking UNU-FLORES and IGES for cooperating to organise this workshop and extending his hopes for further cooperation.



*Welcome remarks by Dr Nguyen Hong Tien, Director General of Administration of Technical Infrastructure, Ministry of Construction, Viet Nam*

After the opening remarks, **Prof. Pham Duy Hoa**, Rector of NUCE, Viet Nam and **Prof. Reza Ardakanian**, Director of UNU-FLORES, Germany gave welcome remarks. Prof. Hoa emphasised that this workshop serves as an important opportunity for researchers, policymakers, managers, and professionals in the region to come together and share experiences and expertise on water management. Prof. Ardakanian, in his welcome remarks, stressed the important role of research consortia in defining research questions and priorities in the region. He further mentioned the development of the Nexus Observatory and UNU-FLORES's collaboration with UN-Habitat on SDG target 6.3 monitoring. In this regard, he highlighted three main objectives of the workshop: (i) proposal writing for regional Nexus Observatory cooperation; (ii) preparation of country-level concept notes on data and monitoring needs for the management of the water-wastewater nexus; and (iii) preparation of a shared regional concept note defining roles of a regional Nexus Observatory consortium.

The opening session concluded with a keynote on "Data, Monitoring and Governance" by **Dr Mathew Kurian**, Head of Capacity Development and Governance Unit, UNU-FLORES, Germany. As one of the organisers of the workshop, Dr Kurian explained the purpose and background of the workshop. He emphasised the uniqueness of the Nexus Approach and its focus on trade-offs. The workshop in Ha Noi is organised as part of the Nexus Observatory, a flagship initiative of UNU-FLORES. It is, thus, important to consider what can and what needs to be done to maximise full use of this platform in the Southeast Asian region. Dr Kurian further provided context as to

steps that have already been taken and the aims of the present workshop. In December 2014 a proposal writing workshop took place in Tokyo, Japan. This workshop was attended by a number of researchers also present at this workshop. He further explained previous engagement with IGES and their contribution to Dresden Nexus Conference (DNC) 2015 in relation to the outcomes of the proposal writing workshop. It is crucial to not only consider bio-physical aspects and efficiency, but to also draw attention to equity and social development as well as good governance and institutional management. Monitoring frameworks, especially those related to SDGs, demonstrate that there is no one right or wrong way to carry out monitoring and evaluation. Rather each case needs to be assessed in light of the specific context. Dr Kurian suggested to focus on trade-offs and making choices. It is the responsibility of researchers to define acceptable/unacceptable thresholds against which decisions can be made in an informed manner. In addition to a general overview, Dr Kurian also introduced the Global Environmental Monitoring Initiative (GEMI) and UN-Habitat's role in implementing it with the help of proof of concept countries. Concluding his keynote speech, Dr Kurian outlined a number of considerations for the ensuing discussions at the workshop:



*Agenda setting and keynote speech by Dr Mathew Kurian, UNU-FLORES*

- i. The issue of data – there is a need to move beyond bio-physical aspects and to also consider the role of financing, the role of institutions, and governance. For effective monitoring all these aspects should be assessed in an integrated manner. Furthermore, data needs to be translated, so that it becomes useful for policy making.
- ii. The possibility of setting up a research consortium for Asia – doing so would allow for engagement with real-world practical implementation projects as well as benefitting from existing case studies and projects that have demonstrated good practice in data collection and monitoring. It may also enable working across sectors and disciplines. The exact focus of the consortium should be defined by country representatives.
- iii. Capacity building needs – the joint UNU-FLORES-Technische Universität Dresden (TU Dresden) PhD programme may serve as a platform for training of in-country experts. The existing experience with a Tanzanian student was highlighted.
- iv. Concept notes developed at the proposal writing workshop in Tokyo in December 2014 should form the basis for discussions during the workshop.



*Regional Nexus Observatory Workshop held in Ha Noi, Viet Nam*





*Workshop participants discuss the water-wastewater nexus in urbanising Asia*

## **3.2 Session 1 – Country Presentations by Researchers: Water-Wastewater Nexus in Urbanising Asia**

*Chair: Ministry of Construction (MOC), Viet Nam*

### **3.2.1 Philippines**

**Prof. Augustus C. Resurreccion**, Professor at the Institute of Civil Engineering, University of the Philippines presented on the research framework related to the water-wastewater nexus in the Philippines. He defines the water-wastewater nexus as one part of the bigger Water-Energy-Food Nexus. One of the crucial problems is a lack of water supply facilities. The quality of water varies considerably from upstream to downstream with some downstream water also being used for irrigation. Another area of concern is the lack of sanitation facilities. These challenges raise issues of inequality of water access, health concerns, and other problems of surface water quality and resource competition. Furthermore, he emphasised problems related to financing, policy effectiveness, and a lack of awareness by the population of challenges and existing programmes that address these issues. Prof. Resurreccion continued to highlight that researchers could provide some technical solutions. However, to be successful participatory approaches and community engagement are needed. The proposed research framework for integrated water and wastewater management considers five aspects: (i) resources, (ii) conversion and storage, (iii) transmission and distribution, (iv) utilisation, and (v) systems modelling and decision-making. He pointed out, however, that data to respond to these five aspects is limited and dispersed among various agencies. One solution could be the establishment of a data resource centre hosted at the university. The aim is to develop standards and business models for water management. Regarding challenges for monitoring of SDG target 6.3, Prof. Resurreccion raised four challenges: (i) need for an effective monitoring scheme to gather and manage data, (ii) poor identification of pollution sources, (iii) overlapping functions of academic and government institutions, and (iv) human and resource capacity for data and research to enable resource assessments and modelling.

### 3.2.2 Thailand

Dr Pharino Chanathip, Associate Professor of Environmental Engineering at Chulalongkorn University presented on water and wastewater challenges in Thailand. She started her talk by considering major water challenges in Thailand. These include the management of water supply to cover water demands. Existing water supplies show a 30% deficiency as they do not currently cover the needs of all sectors. Albeit water storage plans and allocation strategies, the supply varies from year to year depending on high impact events – during wet years, water supply is sufficient; during dry years it is not. Another major challenge is the distribution and allocation of water, including the issue of water quality and the use of taps. If water usage would be addressed, demand may be reduced. Dr Chanathip then moved on to introducing the main wastewater challenges faced in Thailand. Only 34% of wastewater is treated. While significant pollution is caused by agriculture and industry, wastewater treatment is only aimed at municipal systems. She pointed out that non-point sources are a major contributor to water quality, but have not been made a priority. This relates to the complete disconnect of wastewater treatment systems from the financing system. With regard to research priorities, Dr Chanathip emphasised that there is a need to assess the water demand of different sectors. A major concern is the lack of a payment system for wastewater treatment. Payments are only made for clean water, which does not provide an incentive system to balance water supply and demand. Enhancing awareness and understanding environmental behaviour, evaluating the effectiveness of water governance (especially in times of crisis), and increasing efficiency of monitoring and reporting through technological innovation are therefore deemed important areas of research in Thailand. Dr Chanathip also highlighted a number of SDG challenges, although it is acknowledged that concrete gaps still need to be identified. She drew attention to the need to address welfare concerns of minority groups who do not have access to clean water, energy, etc. There is a need for social and technical mechanisms as well as new economic approaches that are coupled with good governance.

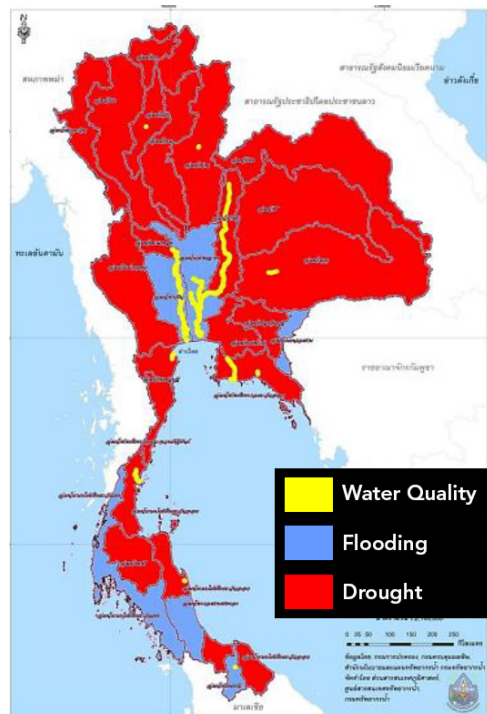


Figure 1: Urgent water challenge from public hearing in Thailand (Source: Strategic Plan for Water Resource Management, Department of Water Resource, March 2015 (In Thai): <http://oopm.rid.go.th/watermanagement/StrategicPlanMain.pdf>, pg. 2-47)



### 3.2.3 Lao PDR

Associate Professor, **Dr Chanda Vongsombath**, Deputy Dean at National University of Lao PDR gave a presentation on the research priorities to address the water-wastewater nexus in Lao PDR. He started by giving some background on water quality monitoring activities in Vientiane, the capital of Lao PDR. He particularly emphasised the need for improved water supply, including consideration for water quality. This is especially relevant for urban water supply. The Department of Natural Resources and Environment (DONRE) has already set up eight monitoring points in the capital city, along the Mekong River. However, there is a lack of water quality monitoring in other parts of the country. Dr Vongsombath went on to highlight a number of research priorities, which include the conservation of marshes, biological monitoring, and criteria for water quality monitoring. He also provided an overview of challenges for the future. These include an absence of power leading to a lack of compliance, a lack of technical skills, a lack of cooperation and coordination, and limited financial resources.

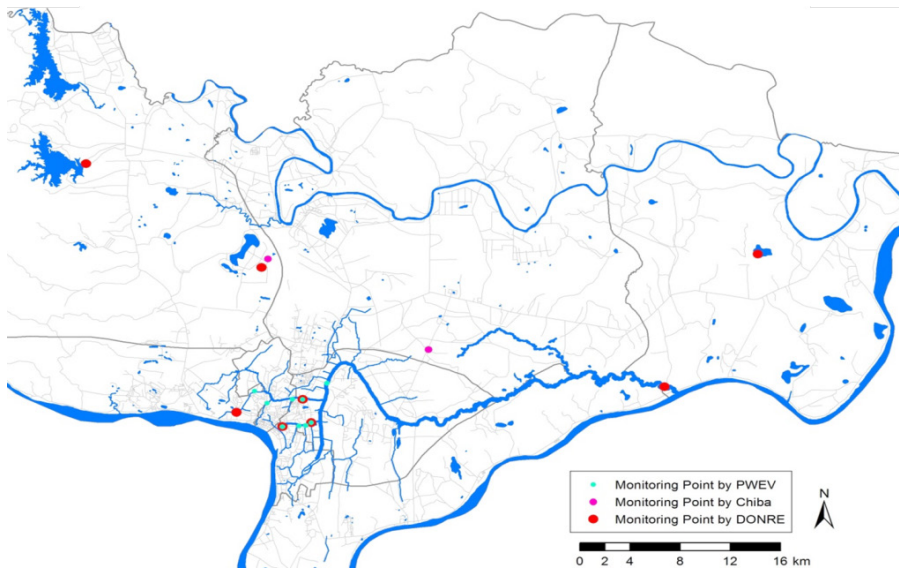


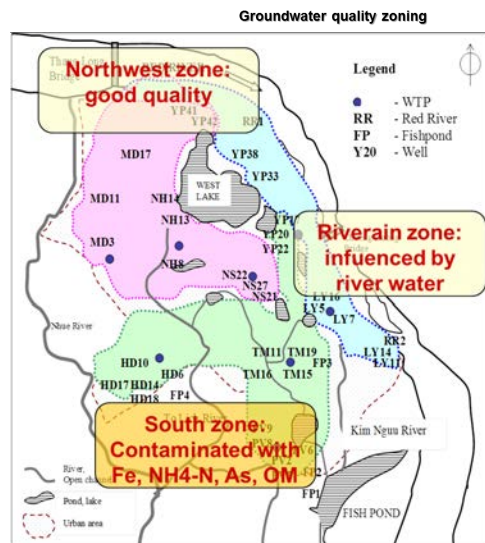
Figure 2: Water quality monitoring points in Vientiane capital

### 3.2.4 Indonesia

**Prof. Rizaldi Boer**, Professor at the Center for Climate Risk and Opportunity Management in Southeast Asia and the Pacific, Bogor Agricultural University presented on the situation in Indonesia. He started his presentation by giving an overview of key issues that need to be considered and of which only limited understanding exists at the moment. He emphasised that socio-economic issues and climate change need to be taken into account and that it is important to work across sectors. Often a product's environmental costs are not considered. These include the cost of pollution, loss of water quality, and eco-system degradation. If these costs were considered evaluations may arrive at different results. A life-cycle analysis for resource use may serve as a useful tool. With regard to research priorities, Prof. Boer raised the need to design tools and methods that allow for an assessment of the water footprint. An index could be used to increase resilience and sustainability. However, he pointed out that a common approach is needed. He further talked about the challenges for monitoring, such as data gaps. These could be overcome by a combined approach, utilising remote sensing technology as well as data collection on the ground. For monitoring systems to be reliable, collection of data should be continuous. However, automatic sampling of water quality is limited – there is a lack of dedicated staff and the primary focus is on the industrial sector. Additionally, global data sets should be downscaled to the local level and protocols for data sharing developed.

### 3.2.5 Viet Nam

Associate **Prof. Tran Thi Viet Nga**, Dean of the Department of Environmental Engineering at National University of Civil Engineering was the final speaker in Session 1. She talked about water and wastewater management in Viet Nam and started by highlighting the impacts of rapid urbanisation on water supply demands and wastewater production. She explained that Viet Nam has formulated clear goals for water and wastewater management in its Orientation 2025 and Vision 2050. A number of gaps still exist with regard to access to water. Further, there is a need to increase the percentage of treated wastewater in coming years considering that less than 20% gets treated at the moment. With regard to research priorities, the quality of monitoring processes should be assessed and enhanced, centralised and decentralised approaches to wastewater treatment should be explored and used flexibly depending on the local circumstances and the use of a novel index to evaluate water quality risks should be explored. Additionally, Prof. Nga mentioned the issue of pricing of wastewater and coordination among state authorities and management. Viet Nam is facing many environmental challenges, such as coastal water pollution related to industrial wastewater. For SDG monitoring this means that root causes of pollution must be identified as well as the lack of experience and capacity in disaster management addressed. This requires a shift in focus from mere economic considerations.



*Nga et al. 2003*

**Figure 3: Groundwater quality zone in Ha Noi city (Nga et al. 2003)**

### 3.3 Session 2 – Panel Discussion: Nexus Priorities and Monitoring in Urbanising Asia

*Chairs:* Japan International Cooperation Agency (JICA) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)



*(From left) Dr Mathew Kurian (UNU-FLORES) with Dr Tim McGrath (GIZ) and Mr Takashi Wako (JICA) who jointly chair Session 2*

Setting the scene for the panel discussion on common water-wastewater monitoring and targets, **Dr Tim McGrath**, Technical Advisor, Policy Advisory Team Leader, Wastewater Management Programme of GIZ, Viet Nam and **Mr Takashi Wako**, Policy Advisor on Urban Environment at JICA, Viet Nam gave introductory remarks. Dr McGrath emphasised the imbalance between water and wastewater investments in Viet Nam and drew attention to a new policy that has been issued to address this trend. He encouraged participants to consider a number of questions: how did other countries in the region resolve these issues and how to make full use of capacities of existing systems? He further commented that he finds it interesting that water and wastewater are being discussed together in this workshop. Mr Wako added that there seems to be a change in focus of water management as a whole. Water basin management using an integrated approach has received much more attention. The question of what challenges this would create for governments was raised in this regard.

The first comment was made by **Dr Nguyen Hong Tien**, Director General of Administration of Technical Infrastructure, Ministry of Construction, Viet Nam, who said that challenges are numerous. Viet Nam has received significant support from international organisations to make big improvements, but the change in approaches have also created its own challenges including those for data management and stabilising a stronger business model for water supply to ensure good supply and investment. For wastewater treatment, this is reflected in the area of public infrastructure, which means development has had to come primarily from official development assistance (ODA). Demand for investment in water treatment and drainage is huge, but many existing facilities are not utilised to their full potential. He further highlighted that the rate of urbanisation is currently at 32.5%, creating new challenges. There is a general lack of funding and coordination among agencies that manage various databases. The need for capacity building was also emphasised. For a long time, water supply was the main priority. But in recent years, the trend has moved towards a more business-oriented approach with a steady increase in investments. Dr Tien underlined that a cost management system should include a service fee for wastewater treatment as doing so would increase awareness of the issue. Standards for water drainage are under the jurisdiction of the Ministry of Natural Resources and Environment (MONRE), but supply and treatment is the responsibility of

both the Ministry of Construction (MOC) and local government. This makes it more challenging to harmonise approaches. He further highlighted the lack of enforcement due to challenges in coordination among authorities, the lack of a database system and consistent data collection. Viet Nam has a number of indicators for water quality. However, there is no standardised format for data collected. He suggested that an agreement should be reached on the harmonisation of data in order to enable information sharing. A common data system could be developed to allow regional sharing. In addition, capacity building for managers, policymakers, and people in companies is needed to better manage these issues. Technical meetings are beneficial, but if you want to bring in decision makers it can be difficult, especially when working with municipal/local governments.

**Ms. Thiparpa Yolthantham**, Department of Control, Ministry of National Resources and Environment, Thailand commented that in Thailand water pollution caused by local people does not get charged. There is a need to connect with the population and raise awareness on water pollution. She said that Thailand would like to pursue Public Private Partnerships to address the wastewater issue, but that this is not possible at present. There is a lack of public willingness to pay for wastewater services, although a framework exists. Commenting on what Ms Yolthantham had said, Dr McGrath raised the question of whether this is an issue of willingness to pay or willingness to charge.

**Dr Vincente B. Tuddao, Jr.**, Director III, Assistant Regional Director for Technical Services, Department of Environment and Natural Resources, the Philippines commented regarding the situation in the Philippines. There, the paradigm of water management is placed at the watershed basin scale. Only then are issues of water supply, including both supply and demand considered. With regard to the supply side, the Philippines is currently working towards reducing non-use water losses in the supply chain. He emphasised that rationing becomes necessary due to water supply deficits. This is the reason why building another dam to deal with the dry season and therefore drought is being considered. Good protocols need to be established to deal with these challenges. Dr Tuddao further pointed out that most pollution is caused by domestic waste. There is a general reluctance of households to get connected to the sewer system. He explained that tariffs for water supply and wastewater treatment have been integrated to avoid non-payment for wastewater treatment. This is done through the Clean Water Act, an example of good implementation including Public Private Partnerships. Thus far the system has been tested in Metro Manila, but steps are being taken to introduce it in other cities. A key target constitutes the connection of all households in Metro Manila to wastewater treatment facilities as the biggest contributor to pollution is the untreated waste from domestic households. To this case study presented, Mr Wako commented that Metro Manila serves as a good case study for how water supply and wastewater are managed. He then asked participants to share how similar policies are implemented in other cities.

For Lao PDR, **Mr Vanhxy Phiomanyvone**, Deputy Director of Pollution Management Division, Pollution Control Department, Ministry of Natural Resources and Environment shared the experience in Lao PDR. There the Ministry of Natural Resources and Environment is responsible for water supply and waste treatment. He added that policies on how to work with the local authority and private companies to improve water supply and wastewater treatment are necessary. There is also a lack of funding and technical tools for monitoring water quality. He emphasised that he would like to collaborate with other countries in the region to improve water and wastewater management.

**Dr Rizaldi Boer** commented on the situation in Indonesia on behalf of the policymaker, who was unable to attend the workshop. In Indonesia, strategic environmental plans and assessments required by all local governments must address how water resources should be managed. Doing so requires enhanced collaboration between the national government and universities, so that science can support the long-term plans. Regarding implementation monitoring, performance indicators must be defined. There are efforts by the national government to develop indicators that can be downscaled to the local level. In the future, these indicators may be used to consider budget allocations. In relation to budget allocations, Dr McGrath reiterated the importance of investments and budgets for monitoring, data collection, and management. These aspects should be integrated into government planning and budgeting.

The final contribution in this session was made by **Mr Le Duy Hung**, Senior Infrastructure Specialist, World Bank, Viet Nam. He echoed previous comments by drawing attention to the importance of data collection and databases. However, he said that budgets constitute only a minor issue. Rather, the main challenge is the coordination between agencies to collect and manage data. He emphasised the importance of this workshop and extended his willingness to collaborate using a regional approach. A major challenge for Viet Nam and the ASEAN region is how to ensure the sustainable management of projects and programmes. Cost recovery should be a priority. This includes addressing the issue of operation and maintenance and the need for low-cost technology in order to keep the cost for services low.

### 3.4 Field Trip to Wastewater Treatment Facility in Ha Noi

In the afternoon, workshop participants visited a wastewater treatment facility in Ha Noi. The trip was organised by the National University of Civil Engineering and allowed participants to discuss issues related to treatment methods, wastewater treatment charges, open versus closed systems, combined versus separate systems as well as issues of capacity and training, drought, and flood.



*Researchers and policymakers from five Southeast Asian countries discuss water-wastewater nexus issues at a local wastewater treatment facility in Ha Noi*



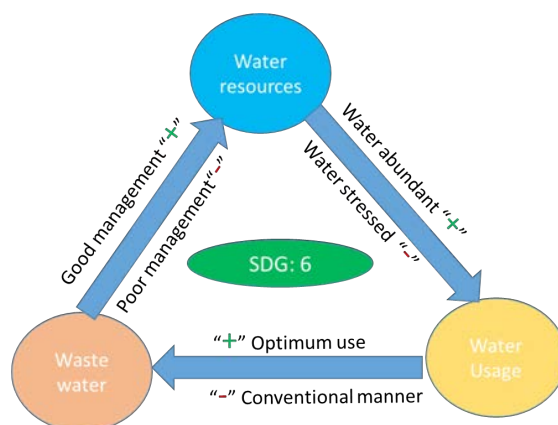
*Researchers and policymakers from five Southeast Asian countries visit a local wastewater treatment facility in Ha Noi*



## 4. Day 2: Wednesday 25 May 2016

### 4.1 Session 3 – Water-Wastewater Nexus Priorities: Data, Monitoring, and Governance

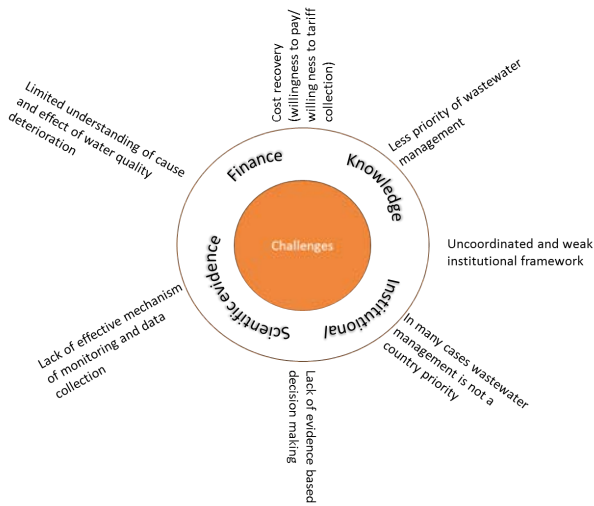
*Chair: Institute for Global Environmental Strategies (IGES), Japan*



**Figure 4: Summary of Day 1 (Source: IGES)**

Day 2 of the workshop started with a recap of Day 1 by **Dr Bijon Kumer Mitra**, Policy Researcher, IGES, Japan. He summarised key points discussed the previous day, which included research and policy challenges and priorities. Three major problems crystallised, namely water scarcity, flooding, and water quality deterioration. These are exacerbated by challenges regarding knowledge, finances, institutions, and scientific evidence. These problems and challenges that have been identified require research on the following aspects: monitoring parameters and methods, wastewater inventories, index development, and water pollutant footprints. Regarding the policy priorities, the following were highlighted: development of monitoring frameworks, databases, building institutional capacity, issues of data/knowledge sharing, increased coordination between levels of government, collaboration with donor agencies, and community participation.

The second part of Session 3 was dedicated to a presentation by **Dr Graham Alabaster**, Chief Waste Management and Sanitation, Urban Basic Services Branch, UN-Habitat, Switzerland on monitoring priorities for SDG target 6.3. In his talk, he emphasised the need for a more inclusive approach when addressing issues of water and wastewater. This requires a realistic and integrated method. For instance, in the case of the Middle East, consideration must be given to the relationship between the migrant crisis and water. Dr Alabaster then went on to explain the process of attaining the SDGs and the major differences to the Millennium Development Goals (MDGs). A key characteristic of the SDGs is the fact that they are much more far-reaching than the MDGs. Concerning the issue of data and sources of data, he mentioned that in many cases data is already available, but dispersed. SDG 6 on water and sanitation has six sub-targets. Compared to the MDGs these offer a more comprehensive framework, which also includes water as a resource and ecosystems – the whole water cycle. Additionally, the SDG framework allows for flexibility and calls for national target setting, which serves as the driver for the implementation of SDGs.



**Figure 5: Challenges identified by participants (Source: IGES)**

Dr Alabaster emphasised that monitoring mechanisms should be driven by national monitoring approaches, meaning they should be country-led in order to adapt to the specific circumstances. In this regard it is crucial to identify capacity gaps in data and utilise new data sources, such as remote sensing. Often, Geo-information System (GIS) data is already freely available. It is also important to identify the responsible authority for the implementation of SDGs. A number of countries have established special units that consider monitoring of SDGs – e.g. statistical commissions. Monitoring frameworks under the SDGs should also focus on equity, which means disaggregation of data to enable consideration of the needs of various groups of society. He also acknowledged that aggregation of data at national level will be a great challenge going forward. To deal with these challenges the Global Environmental Monitoring Initiative (GEMI) has been established. GEMI aims to use existing information and develop monitoring guides. These guides have already been developed. He added that GEMI takes a progressive monitoring approach (a ladder approach) to allow for flexibility depending on a country’s needs and capacity. A number of proof of concept countries to test the methodologies have already been identified. Dr Alabaster invited participants of the workshop to comment or get involved in GEMI. The global baseline collection will commence in 2017.



*Dr Graham Alabaster, UN-Habitat explains the SDG Monitoring Agenda for Target 6.3*



*Dr Graham Alabaster, UN-Habitat talks about water and sanitation in relation to sustainable development*

## 4.2 Session 4 – Roundtable Discussion: Nexus Monitoring Strategies in Urbanising Asia

*Chair: UN-Habitat*

**Dr Graham Alabaster** invited participants to comment on the issues of harmonisation of indicators and the institutional dimension with respect to coordination across ministries. What are the critical issues to consider?

The first to speak was a **policymaker from the Ministry of Construction**, Viet Nam. She would like to seek advice on the issue of water and wastewater management. In Viet Nam data is synthesised at local level with a report prepared at the Ministry of Construction. This causes significant delays in data analysis and its use for management processes. She also mentioned that wastewater discharge norms exist, but that environmental impacts are not sufficiently evaluated. For example, substance concentration over time is not taken into account even though this may have an impact on water sources. She raised two questions: (i) How can the Nexus Approach address these issues? (ii) How can research studies/outcomes be applied by policymakers?

**Mr Vanhxay Phiomanyvone**, a policymaker from Lao PDR added that national conditions for policy development vary from country to country and should be considered.

In Thailand, policies and strategies exist, but management is not effective, said **Ms Thiparpa Yolthantham**, a policymaker from Thailand. A major concern is how to overcome the unwillingness of people to pay for wastewater treatment and how to increase knowledge and build capacities.

**Dr Vicente B. Tuddao, Jr.**, a policymaker from the Philippines, suggested that additional indicators on water availability and water quality are needed. The nexus can address the entire



basin. Like the previous speaker, he stressed the need to increase capacity building as well as the application of remote sensing. A common strategy among ASEAN countries should be developed, so that data and information sharing becomes possible and comparisons can be drawn. This would require the identification of a base data set for indicators in the region.

To this, **Prof. Augustus C. Resurreccion**, a researcher from the Philippines, added that universities could be involved as data centres and assist with monitoring efforts. Dr Graham Alabaster complemented this comment by emphasising the need to decide on a minimum level of data needed to make key management decision. He acknowledged the role of academic institutions to support and guide monitoring principles and implementation. He then asked which ministry is responsible and what indicators should be used.

The researcher from Indonesia, **Prof. Rizaldi Boer**, responded, explaining that a lot of research in this area is taking place at universities. Some collaboration between ministries and universities already exist. This could enable universities to support the testing of the methodology using a network. This network could support the country in applying the monitoring strategy effectively as well as enable sharing of data and information in the region.

**Prof. Tran Thi Viet Nga**, a researcher from Viet Nam, reiterated the importance of developing indicators and methodologies. It may be possible to identify a research team that includes the participation of representatives from the region. This team could suggest a methodology for the region or even globally, which would include the development of a synthesised set of indicators derived from national approaches.

Adding to this, **Dr Bijon Kumer Mitra** from IGES stressed that simplified indicators should form the starting point. Although each country has its own water quality standard, it needs to be assessed against the global target and if the latter has been reached.

Concluding Session 4, **Dr Graham Alabaster** remarked that participants should consider how information can be cross-mapped against the global indicators. This should not be a great problem since the SDG framework allows for some differences between regions and countries.



*Prof. Tran Thi Viet Nga, Dean of the Department of Environmental Engineering, National University of Civil Engineering, Viet Nam comments on monitoring strategies*

### 4.3 Session 5 – Capacity Building Requirements to Support Effective Nexus Monitoring

*Chair: UNU-FLORES*

This Session involved breakout groups. **Ms Kristin Meyer** from UNU-FLORES introduced the topic and the following guiding questions:

- › Do monitoring strategies for water and wastewater exist in your country? Are national targets already in place? Do these align with SDG 6?
- › What challenges do you face regarding data?
- › What mechanisms for data management and monitoring are in place in your country?
- › Does coordination across ministries exist? How could collaboration between sectors be improved?
- › What are the main capacity needs in your country/ for the region?

Feedback from breakout groups:

#### **Group 1 – Indonesia (Prof. Rizaldi Boer), Lao PDR (Dr Chanda Vongsombath) and Thailand (Ms Thiparpa Yolthantham)**

Challenges regarding data are prevalent. These include problems of aggregation of data, involvement of various organisations that hold data, and the limited sharing of data between organisations. Often, voluntary reporting systems are used. These are not always effective and enforcement is weak. Knowledge and capacity gaps regarding data collection and analysis need to be addressed. Furthermore, quality control mechanisms are weak in some countries. Although a number of countries have coordination committees, their effectiveness varies. There is great demand for technical staff and connecting to experts to carry out coaching. Regarding concrete topics for training, the group identified the usefulness of developing an index based on indicators that are aligned with SDG target 6.3.



*Prof. Rizaldi Boer, researcher from Indonesia presents the results of Group 1*

#### **Group 2 – Lao PDR (Mr Vanxay Phiomanyvone), the Philippines (Prof. Augustus C. Resurreccion), and Viet Nam (policymaker)**

Environmental laws already exist in each country. These include monitoring requirements and demand agencies to carry out monitoring. In the case of the Philippines, self-monitoring reports are prepared by industry. However, there is a lack of enforcement. Regarding the issue of water monitoring, only water quality parameters are measured. A number of challenges have been identified. These include a lack of infrastructure to collect data as well as issues concerning the frequency and timeliness of data. Furthermore, communication between agencies and sharing of information are weak. Frequently overlaps of



*Prof. Augustus C. Resurreccion, researcher from the Philippines presents the results of Group 2*

topics, mandates, and functions occur. There is a need to improve the collection and analysis of data, develop technical capacity as well as to improve the education and training of people working for agencies carrying out monitoring activities.

### **Group 3 – the Philippines (Dr Vincente B. Tuddao, Jr.), Thailand (Dr Pharino Chanathip) and Viet Nam (Prof. Tran Thi Viet Nga)**

National targets already exist, but environmental laws and strategies need to be complied with. All three countries are currently in the process of establishing targets relating to SDGs. Major challenges include the standardisation of data since each country has its own standards and methodologies vary. Water quality standards also vary from country to country. Similar to other groups, Group 3 stressed that there is no single entity for data collection and monitoring. The lack of a central point of information means that information and data are not shared. It was highlighted that politics determines the level of transparency applied. Often, ministries do not want to share complete information and data. The issue of data automation and continuous data collection were highlighted as being of great importance, in particular with regard to the validation of data. At present, manual sampling is used. Investment and technology will be needed in this regard. Furthermore, the effectiveness of data management has been identified as a particular challenge. Coordination between ministries is very weak. A strong legal basis must be established and relevant agencies that deal with water and wastewater management identified. This way close collaboration can be established. Inter-ministerial action plans could be another way to enhance collaboration. Regarding capacity building, training on how to interpret data to enable development of policies that are rational and sensible should be carried out.



*Dr Vincente B. Tuddao, Jr., policymaker from the Philippines presents the results of Group 3*

## **4.4 Session 6 – National Project Sites and Regional Monitoring Priorities**

*Chair: UNU-FLORES*



*Breakout Group 1*

Like the previous session, Session 6 involved breakout groups. Responding to questions raised during the field trip to the wastewater treatment facility the previous day, **Dr Mathew Kurian** from UNU-FLORES asked participants to consider the different types of sewer systems – combined versus separated. Further, he introduced the idea of a wastewater-reuse-effectiveness index.

**Group 1 – Indonesia (Prof. Rizaldi Boer), Lao PDR (Dr Chanda Vongsombath) and Thailand (Ms Thiparpa Yolthantham)**



*Breakout Group 2*

Countries of Group 1 use both combined and separated sewer systems and shared good practice cases. Regarding indicators in use, they are mostly bio-indicators. These, however, cannot detect the specific types of substances found in the water. Therefore, a combination of indicators is needed. This includes global change indicators, such as climate and demographic change, historical water quality data, and engagement with civil society organisations that are involved in wastewater management. In this way, the potential for reuse for various purposes can be assessed.

**Group 2 – Lao PDR (Mr Vanhxay Phiomanyvone), the Philippines (Prof. Augustus C. Resurreccion), the Philippines (Dr Vincente B. Tuddao, Jr.), Thailand (Dr Pharino Chanathip), and Viet Nam (Prof. Tran Thi Viet Nga)**



*Breakout Group 3*

Countries in Group 2 use different types of sewer systems. They discussed which indicators may be used for a wastewater-reuse-effectiveness index, including water quality parameters. These, however, depend on the use and purpose of the treated wastewater. Indicators may include: volume of water, type of sewer system, policies on reuse of treated wastewater, value of water and water productivity, cost of treatment for the particular purpose. The agreement was that indicators should be as simple as possible and consider the purpose of water reuse as well as the perception of water reuse. In general, stormwater might not need as much treatment. Therefore, separated systems or a combination of separate and combined systems are preferred. It is crucial to consider the value of water and to comply with water quality standards. There is a need for guidelines and/or regulations on the use of treated wastewater based on the needs of the individual country.

#### **4.5 Session 7 – Ha Noi Nexus Observatory Workshop: Outcome Document**

*Chair: Institute for Global Environmental Strategies (IGES), Japan*

In this last session, outcomes of the workshop and next steps regarding future areas of cooperation were discussed. **Dr Robert Didham** from IGES presented the outcome document and facilitated the discussion. Participants raised a number of questions regarding the level of national government and research institute participation. Furthermore, the value of the Nexus Observatory serving as a common platform to enhance cooperation for data and information sharing was emphasised by various participants, in particular by researchers.

#### **4.6 Closing Remarks**

**Dr Nguyen Hong Tien**, Director General of Administration of Technical Infrastructure, Ministry of Construction, Viet Nam began his closing remarks by expressing his sincere thanks for the participation and organisation of the workshop. He is very supportive of the consortium idea that would enable the sharing of information and data. This would enable collaboration and the possibility to find solutions together in relation to water and wastewater issues. Dr Tien is looking forward to continuing and sharing experiences. He extended his particular thanks to international participants and hopes to meet again in the future.

**Dr Mathew Kurian**, UNU-FLORES thanked participants for accepting the invitation to attend this workshop. He particularly thanked the Ministry of Construction, Viet Nam for hosting the regional consultation and the National University of Civil Engineering, Viet Nam for their contribution. He mentioned in particular, Dr Tien and Dr Nga. Dr Kurian further thanked IGES for facilitating connections and contributing to the success of the consultation. He also thanked Dr Alabaster for attending Day 2 of the workshop.

# Appendix 1: Regional Consultation Programme

## PROGRAMME

DAY 1 | Tuesday, 24 May 2016

8:30 – 9:00	<b>Registration for Workshop</b>		
<b>Opening Session</b>	Chair: NUCE & IGES		
9:00 – 9:50	Opening Remarks	Dr. Nguyen Hong Tien, Director General, MOC, Viet Nam	10 min.
	Welcome Remarks	Prof. Reza Ardakanian, Director of UNU-FLORES	10 min.
	Welcome remarks	Assoc. Prof. Pham Duy Hoa, Rector NUCE, Ha Noi, Viet Nam	10 min.
	Keynote: Data, Monitoring and Governance	Dr. Mathew Kurian, UNU-FLORES	20 min.
9:50 – 10:20	<b>Group Photo &amp; Coffee Break</b>		
<b>Session 1</b>	<b>Water-Wastewater Nexus in Urbanizing Asia</b> Chair: MOC		
10:20 – 11:20	Philippines presentation on priorities to address water-wastewater nexus	Prof. Augustus C. Resurreccion	10 min.
	Thailand presentation on priorities to address water-wastewater nexus	Dr. Pharino Chanathip	10 min.
	Lao PDR presentation on priorities to address water-wastewater nexus	Assoc. Prof. Dr. Chanda Vongrombath	10 min.
	Indonesia presentation on priorities to address water-wastewater nexus	Prof. Rizaldi Boer	10 min.
	Viet Nam presentation on priorities to address water-wastewater nexus	Assoc. Prof. Tran Thi Viet Nga	10 min.
<b>Session 2</b>	<b>Panel Discussion: Nexus Priorities &amp; Monitoring in Urbanizing Asia</b> Co-Chair: JICA & GIZ		
11:20 – 12:30	Moderator's Remarks: Priorities and monitoring strategies for Urbanizing Asia		
	Panel Discussion: Common Water-Wastewater monitoring & target  <i>Policy makers:</i> Dr. Sigit Nugroho (Indonesia), Mr. Vanhxay Phiomanyvone (Lao PDR), Vincente B. Tuddao, Jr. PhD, CESO IV (Philippines), Ms Thiparpa Yolthantham (Thailand), Dr. Nguyen Hong Tien (Viet Nam)		
	<ul style="list-style-type: none"> <li>› <i>What are your country's water and wastewater-related development priorities?</i></li> <li>› <i>What are necessary data and monitoring requirements for project support?</i></li> </ul>		
12:30 – 14:00	<b>Lunch</b>		
14:00 – 17:30	<b>Field Trip to Wastewater Treatment Facility in Ha Noi</b> Coordinator: NUCE		
	<b>Rest Period at Hotel</b>		
19:00 – 21:00	<b>Welcome Reception and Dinner</b>		

WATER-WASTEWATER NEXUS  
IN URBANIZING ASIA



DAY 2 | Wednesday, 25 May 2016

<b>Session 3</b>	<b>UNU-FLORES Nexus Observatory: Data, Monitoring and Governance</b> Chair: IGES	
<b>9:00 – 9:30</b>	1. Day 1 Recap: Dr. Bijon Kumer Mitra, IGES	10 min.
	2. Presentation: Monitoring priorities for SDG target 6.3	Dr. Graham Alabaster, UN-HABITAT 20 min.
<b>Session 4</b>	<b>Discussion on Nexus Monitoring Strategies in Urbanizing Asia</b> Chair: UN-HABITAT	
<b>9:30 – 10:30</b>	Identifying and prioritizing of common strategies for monitoring the Water-Wastewater Nexus in Urbanizing Asia & coordinating cross-country action to overcome the challenges.	
<b>10:30 – 11:00</b>	<b>Coffee Break</b>	
<b>Session 5</b>	<b>Capacity Building Requirements to Support Effective Nexus Monitoring</b> Chair: UNU-FLORES	
<b>11:00 – 12:30</b>	Chair's Remarks	Ms. Kristin Meyer, UNU-FLORES 10 min.
	<i>Break out groups focused on discussing:</i> Common challenges for monitoring regional water-wastewater priorities and monitoring strategies	35 min.
	<i>Panel discussion involving researchers from participating countries to discuss:</i> Capacity development priorities to support effective nexus monitoring	45 min.
<b>12:30 – 14:00</b>	<b>Lunch</b>	
<b>Session 6</b>	<b>National Project Sites &amp; Regional Monitoring Priorities</b> Chair: UNU-FLORES	
<b>14:00 – 15:30</b>	Chair's Remarks	Dr. Mathew Kurian, UNU-FLORES 10 min.
	<i>Break out groups focused on discussing:</i> National projects for monitoring regional water-wastewater priorities and development of nexus monitoring strategies	35 min.
	<i>Panel discussion involving decision makers from participating countries to discuss:</i> Data collection, sharing and analysis to support effective regional monitoring of SDG target 6.3	45 min.
<b>15:30 – 16:00</b>	<b>Coffee Break</b>	
<b>Session 7</b>	<b>Ha Noi Nexus Observatory Workshop: Outcomes Document</b> Chair: IGES	
<b>16:00 -17:30</b>	Chair's Remarks: Presentation of Draft Outcomes Document	Dr. Robert Didham, IGES 15 min.
	<i>Roundtable Discussion on Outcomes and Future Actions</i>	60 min.
	Reaching Agreement on Outcomes Document	15 min.
<b>17:30 – 17:45</b>	<b>Closing Remarks</b> by MOC, NUCE & UNU-FLORES	

## Appendix 2: Instructions for Participants for Preparation prior to the Regional Consultation

### Instructions for Decision Makers

#### Day 1

*Session 2 – Nexus Priorities and Monitoring in Urbanizing Asia*

General:

- › Your presentation will be 3-4 minutes long
- › The format of the presentation will be as part of a panel; **no** PowerPoint presentations
- › The table below should be used as a guide to structure your presentation

Guiding Questions	Inputs from Decision Makers
National priorities regarding water and wastewater	
National Goals and Targets regarding Water and Wastewater Management (these include overall goals, such as water security and public health as well as more specific targets, such as water quality standards)	
Relationship of National Goals and Targets to SDG Monitoring, especially of Target 6.3 (by 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and at least doubling recycling and safe reuse globally)	
National approaches to monitoring water and wastewater management	
Monitoring strategies/ activities related to SDG target 6.3	



## Day 2

### Session 6 – National Project Sites and Regional Monitoring Priorities

General:

- › Your presentation will be 3-4 minutes long
- › The format of the presentation will be as part of a panel; no PowerPoint presentations
- › The table below should be used as a guide to structure your presentation

Guiding Questions	Inputs from Decision Makers
Existing/ Planned Policies to address Water-Wastewater challenges	
Discuss one national project relevant to the water-wastewater nexus	
Key Sectors and Stakeholders that are/ will be involved	
Data needs, data acquisition technologies, data sharing, data analysis and capacity development needs	

## Instructions for Researchers

### Day 1

#### Session 1 – Water-Wastewater Nexus in Urbanizing Asia

General:

- › Your presentation will be 10 minutes long
- › We encourage you to use a PowerPoint to highlight key points (**no more than 5 slides** including the title slide)
- › The table below should be used as a guide to structure your presentation (we encourage incorporation of the concept note and, if appropriate, discussions that took place in at the NOW in Tokyo in December 2014)

Guiding Questions	Inputs from Researcher
Research priorities to address the water-wastewater nexus	
Sectoral and resource linkages	
Challenges for monitoring of SDG target 6.3	

## Day 2

### Session 5 – Capacity Building Requirements to Support Effective Nexus Monitoring

General:

- › Your presentation will be 3-4 minutes long
- › The format of the presentation will be as part of a panel; **no** PowerPoint presentations
- › The table below should be used as a guide to structure your presentation

Guiding Questions	Inputs from Researcher
Overview of capacity needs nationally in relation to water-wastewater nexus monitoring	
Overview of capacity needs for the region in relation to water-wastewater nexus monitoring	
Ideas for enhancing regional cooperation through capacity development activities (this could include information sharing, best practice sharing, forums for regular dialogue etc.)	

## Day 2

### Session 7 – Roundtable Discussion on Outcomes and Future Actions

General:

- › No presentation will be required for this session
- › You will have seen the table below in December 2014; we would like you produce an updated version
- › The updated content of the table will be used as important background information for the Outcomes Document that will highlight common challenges, priorities and future actions on data/ information sharing, best practice exchange, capacity development needs and possible monitoring frameworks

	Key challenges	Available data	Responsible agencies for data collection	Data storage tank (if any)	Data and capacity needs
Water					
Wastewater					
Risk Management					

## Appendix 3: List of Participants

### Indonesia

1. Prof. Rizaldi Boer, *Professor at the Center for Climate Risk and Opportunity Management in SE Asia and Pasific (CCROM SEAP), Bogor Agricultural University*

### Lao PDR

1. Associate Prof. Chanda Vongsombath, *Deputy Dean, National Univ. of Lao PDR*
2. Mr Vanhxy Phiomanyvone, *Deputy Director of Pollution Management Division, Pollution Control Department, MONRE, Lao PDR*

### Philippines

1. Prof. Augustus C. Resurreccion, *Professor at Institute of Civil Engineering, University of the Philippines*
2. Vincente B. Tuddao, Jr., PhD, CESO IV, *Director for Governance and Enforcement Office of the Undersecretary for Field Operations Department of Environment and Natural Resources*

### Thailand

1. Dr Pharino Chanathip, *Associate Professor, Environmental Engineering, Chulalongkorn University*
2. Ms Thiparpa Yolthantham, *Department of Pollution Control, MONRE, Thailand*

### Viet Nam

#### Ministry of Construction

1. Associate Prof. Nguyen Hong Tien, *Director General of Administration of Technical Infrastructure, Ministry of Construction (MOC)*
2. Mr Vu Luan, *Administration of Technical Infrastructure (ATI), Ministry of Construction (MOC)*
3. Mr Phung Anh Duc, *Administration of Technical Infrastructure (ATI), Ministry of Construction (MOC)*
4. Ms Pham Thanh Huong, *Administration of Technical Infrastructure (ATI), Ministry of Construction (MOC)*
5. Ms Bui Thu Hang, *Administration of Technical Infrastructure (ATI), Ministry of Construction (MOC)*
6. Ms Tran Thao Huong, *Head, Department of Sewerage, Administration of Technical Infrastructure (ATI), Ministry of Construction (MOC)*

#### National University of Civil Engineering

1. Associate Prof. Pham Duy Hoa, *Rector*
2. Dr Nguyen Hoang Giang, *Head, International Cooperation Department, NUCE*
3. Dr Ta Quynh Hoa, *Deputy Director, International Cooperation Department, NUCE*
4. Ms Nguyen Thi Huong, *Officer, International Cooperation Department, NUCE*

5. Ms Le Thi Thuy Linh *Officer, International Cooperation Department, NUCE*
6. Associate Prof. Tran Thi Viet Nga, *Dean, Department of Environmental Engineering - NUCE*
7. Ms Nguyen Phuong Thao, *Department of Environmental Engineering - NUCE*
8. Prof. Tran Huu Uyen, *Department of Environmental Engineering - NUCE*
9. Ms Vu Phuong Thuy, *Department of Environmental Engineering - NUCE*
10. Ms Do Hong Anh, *Department of Environmental Engineering - NUCE*
11. Associate Prof. Dinh Van Thuat, *Deputy Director, Science and Technology Department, NUCE*
12. Dr Do Duy Dinh, *Director, PR Department, NUCE*
13. Ms Pham Thi My Lan, *Deputy Director, PR Department, NUCE*
14. Ms Tran Ngoc Trang Ninh, *PR Department, NUCE*

#### **Ministry of Natural Resources and Environment**

1. Dr Micheal Parson, *Policy Advisor of Minister, MONRE*
2. Dr Nguyen Tung Lam, *Director, Green Growth Center of Ispone*
3. Mr Nguyen Hong Minh, *Department of Pollution Control, Vietnam Environmental Agency (VEA), MoNRE*
4. Ms Nguyen Hoang Anh, *Department of Pollution Control, VEA*

#### **Vietnam Association for Water Supply and Sewerage**

1. Mr Cao Lai Quang, *Chairman, VWSA*
2. Associate Prof. Ung Quoc Dung, *Vice-chairman, VWSA*
3. Associate Prof. Tran Duc Ha, *Director, IWASSE, VWSA*

#### **Hanoi University of Architect**

1. Dr Tran Thanh Son, *Dean, Department of Infrastructure Engineering and Urban Environment*

#### **Hanoi University of Science**

1. Assoc. Prof. Nguyen Thi Ha, *Head, Department of Environmental Technology, Hanoi University of Science, VNU*

#### **Institute for Global Environmental Strategies (IGES), Japan**

1. Pham Ngoc Bao, PhD, *Water and Sanitation Specialist*
2. Dr Bijon Kumer Mitra, *Policy Researcher*
3. Dr Robert J. Didham, *Senior Policy Researcher*

**UN-Habitat**

1. Dr Graham Alabaster, *Chief Waste Management & Sanitation, Urban Basic Services Branch, United Nations Human Settlements Programme, Geneva Office*

**UNU-FLORES**

1. Dr Mathew Kurian, *Head of Unit, Capacity Development and Governance*
2. Ms Kristin Meyer, *Research Assistant, Capacity Development and Governance*

**Donor Agencies and International Organisations in Viet Nam****World Bank Group**

1. Mr Le Duy Hung, *Wastewater Specialist, Urban Program*

**Japan International Cooperation Agency (JICA)**

1. Mr Takahashi Wako, *Water and Sanitation Team*

**Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)**

1. Dr Tim McGrath, *Policy Advisor Team Leader, Wastewater Management Programme*
2. Ms Mai Phan, *Team leader, Vocational Training in the Waste Water Sector*
3. Ms Pham Thi Van Lan, *Capacity Development Adviser, Wastewater and Solid Waste Management Programme*

*The views expressed in this publication are those of the author.*

*The author is responsible for ensuring that all figures, tables, text and supporting materials are properly cited and necessary permissions were obtained.*

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The United Nations University Institute for Integrated Management of Material Fluxes and of Resources (UNU-FLORES) was established in Dresden, Germany in 2012 with the support of the Federal Ministry of Education and Research (BMBF) and the Ministry for Higher Education, Research and the Arts (SMWK) of the Free State of Saxony, Germany. As part of the United Nations University (UNU), the Institute helps build a bridge between the academic world and the United Nations. UNU encompasses 13 research and training institutes and programmes located in 12 countries around the world. UNU as a whole aims to develop sustainable solutions for pressing global problems of human survival and development.

UNU-FLORES develops strategies to resolve pressing challenges in the area of sustainable use and integrated management of environmental resources such as water, soil, and waste. Focusing on the needs of the UN and its Member States, particularly developing countries and emerging economies, the Institute engages in research, capacity development, advanced teaching and training, as well as dissemination of knowledge. In all activities, UNU-FLORES advances a Nexus Approach to the sustainable management of environmental resources.

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## ADVANCING A NEXUS APPROACH TO THE SUSTAINABLE MANAGEMENT OF ENVIRONMENTAL RESOURCES

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