E-COURSE:
Urban water management - The city blueprint approach

Host institution	National University of Mongolia, School of Engineering and Applied Sciences
Credits	6 ECTS (optional course)
Lecturers	Ochir Altansukh (National University of Mongolia) Munkhsuld Enkh-Uur (National University of Mongolia)
Level	MSc and PhD course
Course duration	16 classes
Type	Research
OpenEDX link	http://online.num.edu.mn/courses/course-v1:NationalUniversityofMongolia+ENVI+2020/about

Summary

This 3 ECTS course serves as an introduction to The city blueprint approach on urban water management. It provides master and doctoral students coming from natural science backgrounds (and a limited exposure to multidisciplinary environmental studies) with a basic understanding of social aspects of environmental sciences, management and policy, in particular, those related to water management. In addition, it introduces students to the urban water management, water governance and integrated water resource management. The course includes data collection, data analysis, individual and group exercises, field work, seminar presentation and report writing.

Target student audiences

MSc and PhD students in environmental science, hydrology and water management

Prerequisites

Required courses (or equivalents):

- Environmental science
- Water management (if available)

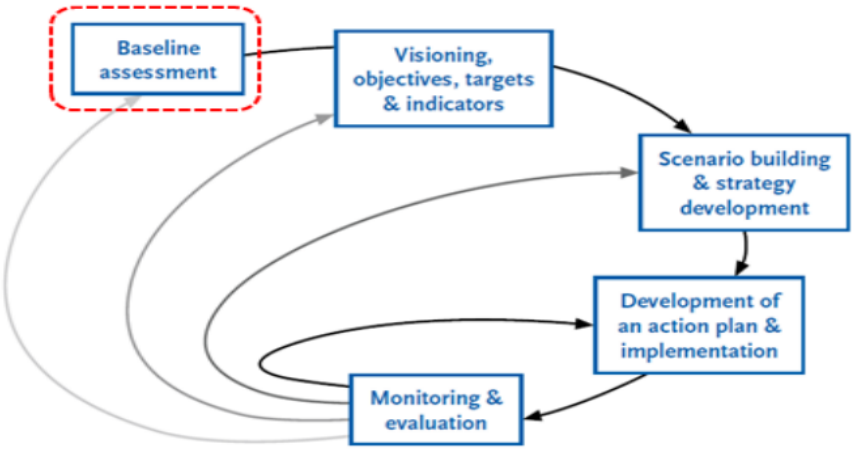
Aims and objectives

The main course objective is to introduce the students to relevant integrated water resource management, water policy, water governance, urban water management, the city blueprint approach which consists of three complementary frameworks.

1. The main challenges of cities are assessed with the Trends and Pressures Framework (TPF).
2. How cities are managing their water cycle is done with the City Blueprint® Framework (CBF).
3. Where cities can improve their water governance is done with the Governance Capacity Framework (GCF).

Moreover, the course explains importance of urban water management, how to use CBA in the city level, and understand strength, weakness, opportunity, threat of the own city based on SWOT analysis.

The City Blueprint Approach is a method to assess the sustainability of Integrated Water Resources Management (IWRM) in municipalities and regions. It is a baseline assessment and a first step in the strategic planning process in cities, depicted in the red box below.



The CBF framework consists of 25 indicators divided over 7 main categories (water quality, solid waste treatment, basic water services, wastewater treatment, infrastructure, climate robustness and governance).

I Water quality	1. Secondary WWT 2. Tertiary WWT 3. Groundwater quality
II Solid waste treatment	4. Solid waste collected 5. Solid waste recycled 6. Solid waste energy recovered
III Basic water services	7. Access to drinking water 8. Access to sanitation 9. Drinking water quality
IV Wastewater treatment	10. Nutrient recovery 11. Energy recovery 12. Sewage sludge recycling 13. WWT energy efficiency
V Infrastructure	14. Stormwater separation 15. Average age sewer 16. Water system leakages 17. Operation cost recovery
VI Climate robustness	18. Green space 19. Climate adaptation 20. Drinking water consumption 21. Climate-robust buildings
VII Governance	22. Management and action plans 23. Public participation 24. Water efficiency measures 25. Attractiveness

The Trends and Pressures Framework indicators consist of a total of 18 indicators (including the sub-indicators) and are divided over the following broad categories: socials pressures, environmental pressures and financial pressures.

Categories	Indicators	Sub-indicators
Social pressures	**1 Urbanization rate**	
	2 Burden of disease	
	3 Education rate	
	4 Political instability	
Environmental pressures	**5 Flooding**	Urban drainage flood River peak discharges Sea level rise Land subsidence
	6 Water scarcity	Fresh water scarcity Groundwater scarcity Salinization and seawater intrusion
	7 Water quality	Surface water quality Biodiversity
	8 Heat risk	Heat island effect
Financial pressures	**9 Economic pressure**	
	10 Unemployment rate	
	11 Poverty rate	
	12 Inflation rate	

The Governance Capacity Framework (GCF) indicators consist of five water-related challenges in cities. The GCF is a governance capacity assessment method consisting of three dimensions, nine key conditions and 27 indicators.

Dimensions	Condition	Indicators
Knowing	1 Awareness	1.1 Community knowledge 1.2 Local sense of urgency 1.3 Behavioral internalization
	2 Useful knowledge	2.1 Information availability 2.2 Information transparency 2.3 Knowledge cohesion
	3 Continuous learning	3.1 Smart monitoring 3.2 Evaluation 3.3 Cross-stakeholder learning
Wanting	4 Stakeholder engagement process	4.1 Stakeholder inclusiveness 4.2 Protection of core values 4.3 Progress and variety of options
	5 Management ambition	5.1 Ambitious and realistic management 5.2 Discourse embedding 5.3 Management cohesion
	6 Agents of change	6.1 Entrepreneurial agents 6.2 Collaborative agents 6.3 Visionary agents
Enabling	7 Multi-level network potential	7.1 Room to manoeuver 7.2 Clear division of responsibilities 7.3 Authority
	8 Financial viability	8.1 Affordability 8.2 Consumer willingness-to-pay 8.3 Financial continuation
	9 Implementing capacity	9.1 Policy instruments 9.2 Statutory compliance 9.3 Preparedness

Finally, students will gain knowledge of IWRM, CBA and willingness to support water management of the city.

General learning outcomes:

By the end of the course, successful students will:

- understand urban water management and IWRM
- be aware of water governance, its actors and institutions,
- learn to apply CBA, includes trends and pressures framework, city blueprint performance framework, governance capacity framework
- compare different results of different countries
- conduct stakeholder interview and analyze results
- visit different water related organizations, including a wastewater treatment plan, and introduce its activity
- understand strength, weakness, opportunity, threat of the pilot city based on SWOT analysis, and convert it into different cities

Applicable learning outcomes:

- be aware of water policies in the city level
- critically reflect on the importance of water management
- apply City blueprint approach
- write report, group discussion, conduct interview

Overview of sessions and teaching methods

The course will make most of the interactive and self-reflective methods of teaching and learning and where possible, avoid standing lectures and presentations. It will start with an overview of IWRM, urban water management and CBA, its application in worldwide. Then it will continue with exercise on different components of CBA such as TPF, CBF, GCF of collecting relevant data from different sources and the collected will be used to assess the different components of CBA, and intermediate results will be reported and presented. Most interestingly, field work to visit different stakeholders of

the water sector in your city will organize (if online learning, it will be organized student itself) to understand real situation, visual interpretation, to collect vital information and datasets. It will continue 1-2 days depending on availability and willingness of stakeholders. Finally, full picture of water management, governance of student's city will be assessed by CBA and final results will be reported and presented.

Course workload

The table below summarizes course workload distribution:

Activities	Learning outcomes	Assessment	Workload (hours)
In-class activities			
Lectures	Understanding theories, concepts, methodology and tools	Class participation	10
Moderated in-class discussions	Understanding various policy and management contexts and common problems in communication in urban water issues	Class participation and preparedness for discussions	10
In-class assignments	Understanding various policy and management contexts and common problems in communication in urban water issues	Class participation and preparedness for assignments	10
Independent work			
Paper review and discussion	Familiarity with and ability to critically and creatively discuss key concepts, tools and methods as presented in the literature	Class participation creative and active contribution to discussion	30
- Application TPF - Application CBF - Application GCF	- to understand TPF, and its application, components. This will include collection of data, calculations, report writing and make presentation. - to understand CBF, and its application, components. This will include collection of data, calculations, report writing and make presentation. - to understand GCF, and its application, components. This will include an interview with stakeholders, collection of data, report writing and make presentation.	Self-work Individual report and presentations	30
Field work	Familiarity with real situation, communicate with field experts, photo taken, collect relevant data and information	Class participation and preparedness for discussions	30
Application of CBA and SWOT analysis	To understand CBA, and water management issues of own city. This will include SWOT analysis of CBA and water management of the city, report writing and make presentation.	Class participation and preparedness for discussions	30
Total			150

Grading

The students' performance will be based on the following:

~ Level of preparedness for participation in class discussions and seminars (30% from 100% for active participation and demonstrated familiarity with the course readings to 0% for completely ignoring in-class discussions);
~ Contribution to group assignments and demonstration of individual work (30% from 100% for clearly demonstrated input to 0% for non-participation);
~ Quality of the approach application and reporting and presenting (40% from 100% for clearly shown the report and presentation to 0% for non-participation);

- correct application of the approach +20%
- write report +10%
- make presentation +10%

Course schedule

Class	In-class hours	Topic	Type
1	4	~ Introduction to IWRM, urban water management and CBA ~ https://www.youtube.com/watch?v=AdQf6CT_w9U&feature=youtu.be ~ https://www.youtube.com/watch?v=XJWJ4LYvKKM&feature=youtu.be	Lecture Video
2	4	~ CBA, its three complementary frameworks o Trends and Pressures Framework (TPF) o City Blueprint® Framework (CBF) o Governance Capacity Framework (GCF)	Lecture E-materials
3	4	~ CBA application in worldwide ~ Previous studies	Seminar
4	4	~ Application of TPF: Social pressures ~ Data collection and assessment	Lecture Seminar
5	4	~ Application of TPF: Environmental pressures ~ Data collection and assessment	Lecture Seminar
6	4	~ Application of TPF: Financial pressures ~ Data collection and assessment	Lecture Seminar
7	4	~ Application of CBF: Water quality and Solid waste treatment ~ Data collection and assessment	Lecture Seminar
8	4	~ Application of CBF: Basic water services and Wastewater treatment ~ Data collection and assessment	Lecture Seminar
9	4	~ Application of CBF: Infrastructure and Governance ~ Data collection and assessment	Lecture Seminar
10	4	~ Application of GCF: Useful knowledge and Continuous learning ~ Data collection and assessment	Lecture Seminar
11	4	~ Application of GCF: Stakeholder engagement and Management a ~ Data collection and assessment	Lecture Seminar
12	4	~ Application of GCF: Agents of change and Multi-level network ~ Data collection and assessment	Lecture Seminar
13	4	~ Application of GCF: Financial viability and Implementing capacity ~ Data collection and assessment	Lecture Seminar
14	4	~ Field work – 1	Seminar
15	4	~ Field work – 2	Seminar
16	4	~ Presenting final results ~ Comparison with different cities, report writing	Seminar

Additional study materials can be found https://www.eip-water.eu/City_Blueprints

Course assignments

Course assignments will constitute a multi-part project:

- ~ Assignment #2 (via MOOC) – TPF application: Short report in class 6
- ~ Assignment #3 (via MOOC) – CBF application: Short report in class 8
- ~ Assignment #4 (via MOOC) – GCF application: Short report in class 10

Assignment #1 will require a greater level of self-organised work from students. It will help students to understand TPF, and its application, components. This will include collection of data, calculations, report writing and make presentation. Maximum 5 pages of the TPF assessment results need to prepare as a report and must submit their report prior to class 6, and the result will be discussed during class 6.

Assignment #2 will require a greater level of self-organised work from students. It will help students to understand CBF, and its application, components. This will include collection of data, calculations, report writing and make presentation. Maximum 5 pages of the CBF assessment results need to prepare as a report and must submit their report prior to class 8, and the result will be discussed during class 8.

Assignment #3 will require a greater level of self-organised or group work from students. It will help students to understand GCF, and its application, components. This will include an interview with stakeholders, collection of data, report writing and make presentation. Maximum 5 pages of the GCF assessment results need to prepare as a report and must submit their report prior to class 8, and the result will be discussed during class 8.

Literature

Compulsory:

1. Enkhuur.M, Altansukh.O and et all, (2020) "Application of the city blueprint approach in landlocked Asian countries: A case study of Ulaanbaatar, Mongolia", Water, MDPI, volume 12, No 1, 199, https://www.mdpi.com/2073-4441/12/1/199
2. Koop, S. H. A. and C. J. van Leeuwen "The challenges of water, waste and climate change in cities." Environment, Development and Sustainability 19(2): 385-418.
3. E-Brochure City Blueprint Approach (v10-April 2018)
4. Introduction - City Blueprint Framework
5. Introduction - Trends and Pressures Framework
6. Introduction - Water Governance Capacity Framework
7. Koop, S. H. A. and C. J. van Leeuwen "Assessment of the Sustainability of Water Resources Management: A Critical Review of the City Blueprint Approach." Water Resources Management 29(15): 5649-5670.
8. Koop, S. H. A., L. Koetsier, et al. "Assessing the Governance Capacity of Cities to Address Challenges of Water, Waste, and Climate Change." Water Resources Management 31(11): 3427-3443.
9. van Leeuwen, C. J., J. Frijns, et al. "City Blueprints: 24 Indicators to Assess the Sustainability of the Urban Water Cycle." Water Resources Management 26(8): 2177-2197.

Recommended:

10. Koop, S. H. A. and C. J. van Leeuwen "Application of the Improved City Blueprint Framework in 45 Municipalities and Regions." Water Resources Management 29(13): 4629-4647.
11. Kim, H., J. Son, et al. "Assessing Urban Water Management Sustainability of a Megacity: Case Study of Seoul, South Korea." Water 10(6): 682.
12. Feingold, D., S. Koop, et al. The City Blueprint Approach: Urban Water Management and Governance in Cities in the U.S.
13. Aartsen, M., S. Koop, et al. "Connecting water science and policy in India: lessons from a systematic water governance assessment in the city of Ahmedabad." Regional Environmental Change 18(8): 2445-2457.
14. Koop, S., F. Monteiro Gomes, et al. "Assessing the Capacity to Govern Flood Risk in Cities and the Role of Contextual Factors." Sustainability 10(8): 2869.
15. Madonsela, B., S. Koop, et al. "Evaluation of Water Governance Processes Required to Transition towards Water Sensitive Urban Design"An Indicator Assessment Approach for the City of Cape Town." Water 11(2): 292.
16. Rahmasary, A. N., S. Robert, et al. "Overcoming the Challenges of Water, Waste and Climate Change in Asian Cities." Environmental Management 63(4): 520-535.
17. Sarensen, J., A. Persson, et al. "Re-Thinking Urban Flood Management: Time for a Regime Shift." Water 8(8): 332.
18. Schreurs, E., S. Koop, et al. "Application of the City Blueprint Approach to assess the challenges of water management and governance in Quito (Ecuador)." Environment, Development and Sustainability 20(2): 509-525.
19. Steflova, M., S. Koop, et al. Governing Non-Potable Water-Reuse to Alleviate Water Stress: The Case of Sabadell, Spain.