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Kazakh national pedagogical university named after Abai

# ХАБАРШЫ

Серия «Международная жизнь и политика»  
«Халықаралық өмір және саясат» сериясы  
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№4(59), 2019

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**UNDERSTANDING THE WATER-ENERGY-FOOD NEXUS  
FOR SUSTAINABLE WATER GOVERNANCE**

*Abstract*

The article introduces the concept of the Water-Energy-Food nexus to analyze its potential to inform the sustainable water governance. Two cases are analyzed with respect to the integrative cross-sectoral approach of the WEF nexus; followed by the assessment of the policy tasks in transforming the WEF nexus concept into an actionable policy framework.

**Keywords:** WEF nexus, water governance, sustainable development, case studies.

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**СУ РЕСУРСТАРЫН ОРНЫҚТЫ БАСҚАРУ ҮШИН  
СУ-ЭНЕРГЕТИКА-АЗЫҚТЫҚ БІРЛІГІНІҢ МАҢЫЗЫ**

*Аннотация*

Мақалада Нексус – су ресурстарын, энергетиканы және азық-түлікті басқару бойынша секторалық тәсіл тұжырымдамасы берілген. Екі кейс стади мысалында мақала су ресурстарын тұрақты басқаруга қол жеткізу үшін нексустың әлеуетін талдайды.

**Тұйин сөздер:** WEF nexus әдісі, су ресурстарын басқару, тұрақты даму, кейс-стади.

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**ПОНИМАНИЕ ВЗАИМОСВЯЗИ МЕЖДУ ВОДОЙ,  
ЭНЕРГИЕЙ И ПРОДОВОЛЬСТВИЕМ ДЛЯ УСТОЙЧИВОГО  
УПРАВЛЕНИЯ ВОДНЫМИ РЕСУРСАМИ**

*Аннотация*

В статье представлена концепция Нексус – межсекторальный подход по управлению водными ресурсами, энергетикой и продовольствием. На примере двух кейс стади статья анализирует потенциал нексуса для достижения устойчивого управления водными ресурсами.

**Ключевые слова:** подход нексус ВЭП, управление водными ресурсами, устойчивое развитие, кейс-стади.

## **Introduction.**

Water is indispensable for a human living, socio-economic development and peace. According to UN Water (2019) demand for water will increase up to 20-30% above current level, driven by socio-economic development, population growth and climate change. In 2015, UN member-countries committed to pursuing global sustainable development goals, of which the efficient and equitable water uses had been set as one of the top priorities. Progress to date makes it apparent that achieving sustainable water use requires essential transformation of production and consumption patterns, which too calls for corresponding change in people's mindset and water governance. Weitz et al (2014), Nilson et al (2016) pinpoint that sustainability efforts are to be carried out synergistically with the special account for possible effects of an action taken on one issue on the others. In August 2015 in Bonn, Germany, the 'Sustainable Development Goals: A Water Perspective' conference by Water Future convened hundreds of leading scientists, policy makers, and other stakeholders to analyze interlinkage of water issues across industrial, agricultural, urban and domestic, health, and energy sectors. Furthermore, complexity in aligning specifics of local and national contexts, including needs of households and communities, - and global sustainability targets was recognized (Bhaduri et al, 2015). This article introduces nexus as an integrate/d approach to deliver sustainable development agenda by leveraging trade-offs and maximizing synergies.

## **The Water-Energy-Food nexus.**

Although the concept of sustainable development has always relied on integrated view on human interactions with planet, the nexus as a framework for actions has gained attention after another Bonn conference in 2011 specifically dedicated to the water, energy and food security nexus. The conceptual discourse on intersections of water, energy and agriculture had noticeably gained momentum in the early 1980s. WEF nexus conceptualization and implementation evolve with growing rigour and intensity, yet untapped research areas evolve too. Known as Water-Energy-Food (WEF) nexus, the framework aims to integrate engineering, economic, environmental, political and social knowledge in order to help develop coherent cross-sectoral efforts.

Kurian (2017), Ringler et al (2013) note that the nexus approach, being an important extension and improvement of the Integrated Water Resource Management (Agenda 21, Rio World Summit, 1992) - considers administrative boundaries of a basin and transboundary nature of many watercourses. Both approaches emphasize the role of actors and their rationales, institutional capacities and adoption of technological innovations. Both approaches develop on the premise that environmental sustainability and human security are deeply intertwined. According to UNSGAB<sup>1</sup> however, while IWRM is explicitly water-centric, nexus allows to tailor varied cross-sectoral and institutional configurations depending on the specifics of an issue to be addressed. Nexus approach aim to facilitate more intensive dialogue among stakeholders across multiple sectors, rather than stakeholders within mainly the water sector. In this way, the nexus dialogue is seen as a remedy from a silo-thinking: it facilitates intersectoral or cross-sectoral governance processes where a) the effects of sectoral policies are checked and evaluated against each other; b) cross-sectoral policies, including shared financing and risk-sharing, take place.

Bazilian et al (2011), Hague (2010) strongly emphasized that despite of nexus flexibility, any chosen configuration shall not impose adverse effects on any of its dimension. Varis and Keskinen (2018) draw attention that WEF nexus is essential to human security in its entirety, and prevent researchers from conceptualizing nexus solely from resource management perspective. Keskinen et al (2016) asserts that a well-thought nexus approach has to be analyzed as a system of societal values, coupled with the analyses of normative and regulatory frameworks, policies, and concrete instances from the biophysical and social world. Kurian (2017) resonates that scientific inquiry on WEF nexus is to produce more holistic evidence base, containing answers as for the governance dimension, normative and institutional terms, nexus implementation and tools that will enable results of multidisciplinary scientific research into practical knowledge.

## **Aral Sea Basin**

The Aral Sea (endorheic lake) is located in the northern desert part of the Central Asian countries of Uzbekistan and Kazakhstan. The Aral Sea basin is mainly formed by the basins of two large rivers: the Amu Darya and the Syr Darya. Both rivers are transboundary, whereas the Aral Sea basin contains territories of the countries Kyrgyzstan, Tajikistan, Uzbekistan, Kazakhstan, Turkmenistan and Afghanistan. The Amu

<sup>1</sup> UNSGAB - United Nations General Secretary's Advisory Board; policy paper "The Nexus Approach vs IWRM - Gaining Conceptual Clarity", 2014, <https://www.water-energy-food.org/news/nexus-concept-the-nexus-approach-vs-iwrm-gaining-conceptual-clarity/>

Darya originating in Tajikistan and Afghanistan runs in Turkmenistan and Uzbekistan into Southern Aral Sea. The Syr Darya originates in Tien Shan mountains into Aral Sea through upstream countries Kyrgyzstan and Tajikistan and downstream countries Uzbekistan and Kazakhstan. The demand for water, energy and land varies greatly across countries, as well as the strategic importance of each resource for socio-economic development of a country. Water abundant Kyrgyzstan and Tajikistan lack energy, whereas energy abundant downstream countries rely on the agricultural uses of water. One peculiarity of the Aral Sea Basin is that, in fact, some sort of the nexus had been established at times when now-sovereign independent states were parts of the USSR (Pohl et al., 2017). Based on centrally planned quotas, upstream countries stored and release water to downstream during irrigation period in exchange of energy during winters. In 1991-1992, the newly independent states started devising own national development plans and own international agendas. The water-energy trade-off scheme remained in place, although does not deem satisfactory in light of each country priorities. A specific condition has been inherited that require solution simultaneously at national and interstate level: The scheme involved construction of the very extensive and costly infrastructure, which is also too vital to abandon: more than 80 constructed water reservoirs and more than 45 hydro-energy stations of various calibres. According Horsman (2008) by 2008, more than 90 percent of the Aral Sea agricultural crops were cultivated on irrigated land, which put in place a very extensive network of irrigation channels. Another peculiarity of the Aral Sea Basin relates to the desiccation of the Aral Sea and its adverse socio-environmental effects. As a result of intensive irrigation starting 1960s, the sea shrunk by two thirds in volume and surface are in less than 60 years (Kosarev and Kostianov, 2010). The measures taken by the countries in order to mitigate the desiccation effects and restore the socio-environmental well-being in the region comprise third peculiarity for the nexus in the Aral Sea basin. In 1993, Presidents of Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan and Turkmenistan established a transnational governance structure - the International Fund for Saving the Aral Sea (IFAS). With an executive direction in each country and a rotating chairmanship, the IFAS has become a collaborative platformed institution with quite a unique structure and mandate. IFAS's structures are responsible for funding and operating the development programs, seeking and supporting the work of international and national donors, facilitating research and capacity development of water and cross-sectoral actors, invigorating the national and regional dialogue on matters related to the Aral Sea basin. IFAS had been mandated by the states, to facilitate three umbrella Aral Sea Basin regional development programs ASBP 1, 2, 3 and starting respectively in 1994, 1997 and 2010. The range of goals vary from technical modernization, socio-economic development, environmental protection and institutional reform. In 2008 the IFAS received an observer status in the UN. Overall, programs involved hundreds of participating institutions, vast investments and multi-partner projects.

### **Mekong River Basin.**

Geographically, the 4,800 kilometres-long Mekong River interlinks major East and Southeast Asian countries including China (20%) and several ASEAN member countries, namely Myanmar (3%), Laos (25%), Thailand (20%), Cambodia (19%), and Vietnam (8%), with its basin encompassing an area of 795,000 square kilometres (Kinna and Alistar, 2019). Hydrologically, the River is divided into two sub-basins: the Upper Mekong Basin (UMRB) (China and Myanmar) and the Lower Mekong Basin (LMRB) consisting of three quarters of its lowland catchment area across

Laos, Thailand, Cambodia, and Vietnam.<sup>2</sup> About 60 million people rely upon water resources from the Mekong River for fresh water, fisheries, and agricultural lands (Contreras, 2007). The Mekong River basin does not experience water scarcity, but is subject to high dependency of large number of livelihoods on the river. Since 1990s extensive and intensive urbanization, population growth, agriculture and hydro-energy infrastructure development induced relative stress on food and livelihood security. According to Winemiller et al. as of 2016 there were 371 dams in operation or under construction, while another 98 were proposed. Hydrological peculiarity of the Mekong River are seasonal flow fluctuations, which also affect organization of socio-economic ecosystems in the basin. Lower Mekong basin areas especially depend on annual floods which ensure influx of the fish for nutrition and moisture and sediments for the rice farming. Under normal conditions farming result in one crop per year, whereas local infrastructure for flood storage and water control have been attempted since the 1960s.

The socio-economic peculiarities of the basin are conditioned by the high extent and dynamism of the interconnectivity across the countries (Contreras, 2007; Smajgl and Ward, 2013). Inter-flows of people,

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<sup>2</sup> The UMRB and LMRB are divided into six geomorphic zones: the Lancang River Basin (UMRB in China), the Northern Highlands, the Korat-Sakon Plateau, the Eastern Highlands, the Southern Highlands and the

resources and capital are driven by the geographical specialties of the resource endowments, rate of urbanization, industrialization and population growth. The developmental and security priorities of each country in the area play a role too. Smajgl and Ward (2013) observe that increasingly the investments into water, energy and food sector development are carried out in the form of foreign direct investment by both state and private entities of the basin countries. According to Middleton et al (2009) China, Thailand and Vietnam have become active investors to the neighboring basin countries. Last, the peculiarity can be observed in terms of complex dynamism of the basin water governance - despite internal (civil wars) and interstate political tensions, the lower basin countries formed coordinating interstate governance body. It, after a series of transformations, now operates as the Mekong River commission. The history of attempts to an integrated basin development approach can be traced to joint declarations of four lower basin states in 1957, 1975, following periods of stagnation and amplification of the cooperation in the post-Cold War era, around 1990s. Despite undertaking active basin development in multiple sectors, the Upper Mekong basin states are neither members of the Mekong Agreement nor the Mekong River Commission. In 1996 China and Myanmar involved in exchange of information and discussion of joint basin development plan by becoming official ‘dialogue partners’<sup>3</sup>. Today, a clear trend is that the main stakeholders of Mekong River Basin have agreed to shift their focus of management and cooperation to multidimensional aspects, such as navigation rights, pollution control, agricultural water use (e.g. irrigation), sustainable dam construction for equitable hydro-power use, climate adaptation (e.g. flood control), sustainable fisheries, and tourism.

#### **Implications for water governance: from concept to implementation.**

We define water governance as establishment of policies and their implementation, entailing certain decision-making, regulating and operating frameworks to capacitate governing processes. This section draws implications from the analysis of two cases in order to understand the maturity of the WEF-nexus as a policy framework. The section also aims to synthesize what needs to be addressed to bring nexus out of conceptual realm to a set of unambiguous policy guidelines.

In the first place, the WEF solutions would have to be contextualized to reflect the peculiarity of the socio-environmental system where the nexus policies intend to be applied. It is at this point, where the WEF nexus induce an elaborate, and might be a fresh, thinking about defining the scale - not only the scope - of the issue to be fixed by the nexus. Two cases were illustrative about existence of interdependencies between national and international courses of actions, with possibility of contradicting needs across a locality, national, regional, etc. scales. The WEF-nexus approach to policy formulation in the first place should answer questions ‘Who does what and why?’ and then develop policy instruments to anticipate and conciliate potentially transverse objectives toward benefit of all. The coherence across scales is especially important in lieu that water issues directly affect human and environmental security, and besides that, are capital intensive. Second, scoping the WEF-nexus, is another policy task, that needs careful consideration. Endo et al (2017) prevent from making ‘nexus’ a buzz word with no effective method of identifying and assessing of cross-sectoral interlinkages. Lessons from the case studies suggest that WEF nexus demands highly robust methodology and that any effective nexus based policy will have robust and interdisciplinary knowledge bases. Sustainable Development goals can serve some guidance, especially in assessing the environmental sustainability, socio-economic equity and effects on peace. The solid foundations for a nexus policy shall be derived from social science research, which too have to adopt more integrated approach and overcome disciplinary boundaries when needed.

#### **Conclusion.**

The Water-Energy-Nexus is a developing concept, which has yet to find a consistent and effective guidance for the sustainable development. The analyses of cases confirmed that the WEF nexus approach induce comprehensive view on the existing sustainability issues in Aral Sea basin and Mekong River basin. Implementation of the nexus will require a willingness to collaborate at national and international level and a rigorous policy framework.

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