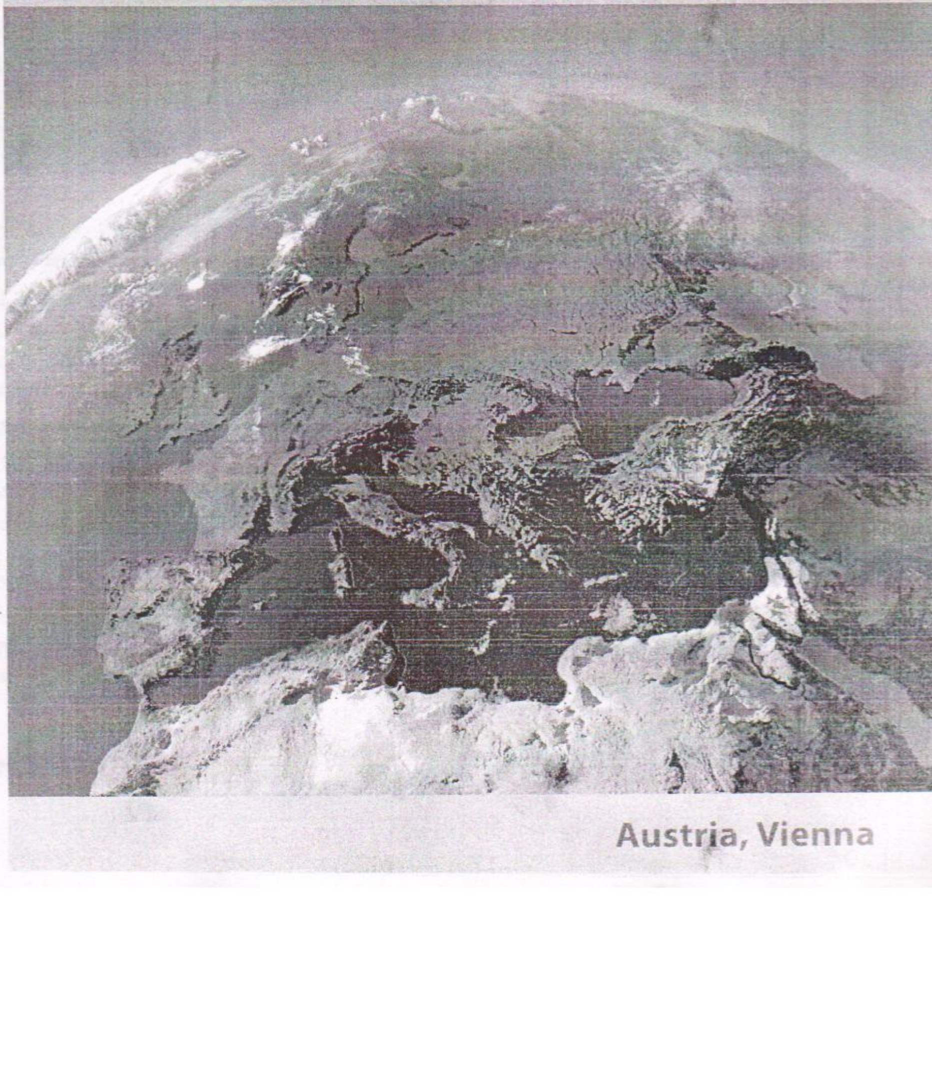
March–April
2017

European Science Review



EASTWEST
SCIENCE UNITES

ISSN 2310-5577

Austria, Vienna

– load factor from I_r;

– total power factor cos φ. And with block Micro logic H further available:

– total value of the phase and power factor cos φ;

– the harmonic distortion on current and voltage;

– coefficient of current K and average to K;

– intensified coefficients of current and voltage;

– all basic components of harmonics on each phase;

– phase shift the main components of the current and voltage harmonics;

– power and distortion coefficients on each phase;

– amplitude and phase shift 3–51 order harmonics current and voltage.

Access to all counters for the maximum and minimum values is provided if there are additional data transfer functions for COM dispatch system.

The Master pact circuit (2, 5, 6, 7-performances) to protect the mains leads are implemented:

– protection against overloading, triggered by the current value of the current. Thermal memory: thermal "image» before and after the trip.

– Protection against short circuits – selective circuits (MCP) and the instantaneous current cutoff. Select the state function I^2t (enabled or disabled) in setting time protection with low exposure time.

Blocks of the control and management Micro logic 6, 7th performance also include:

– protection against short-circuits- protection type "No balance" or "return of current in accordance with current earth lead" (fig.2). Select the State function I^2t (enabled or disabled) in the setting time;

– but block of the control and management Micro logic 7th performances:

– differential current protection of zero sequence (Vigi).

References:

1. The Rules of the device of electrical installations. The seventh edition. Section 1. Chapter 1.7. // – Moscow: Power Service, – 2006. – P. 439.
2. Solovyov A. L. Guidelines on choice of features and setting protection of electrical equipment with the use of microprocessor terminal to series Sepam manufactured by Schneider Electric. // St. Petersburg Institute of energy development of management and specialists of the Ministry of the Russian Federation, – 2005. – P. 69.
3. Zhalilov R. B. Digital relays: regulatory framework application, brief description // Chief power engineer, – 2007. – P. 14–17. April.
4. Merlin Gerin. Circuit breakers and disconnectors for power transfer in low voltage networks. – 2007 catalog. – Moscow. Informational support center.
5. Zhalilov R. B. About one way of protecting consumers of electricity in the networks of 0.4 кV // Electrical equipment, – 2008. – P. 29–35, February.

DOI: http://dx.doi.org/10.20534/ESR-17-3.4-99-102

Ikramova Malika,
Scientific Research Institute of Irrigation and Water Problems
Akhmedkhodjaeva Ifoda,
Khodjiev Alisher,
Tashkent Institute of Irrigation and Melioration
E-mail: malika.ikramova56@gmail.com

The Amudarya river basin water resources management issues: case study

Abstract: The Amudarya is one of the main water resources involving all Central Asian countries and playing a key role in their development. The most recent period of water scarcity is impacting negatively on the socio-economics of the region. Water deficit is bound to increase, especially in the light of climate change and by increases in the demand for food production. In the paper currant water availability state is analyzed.

Keywords: River basin, water resources management, reservoir sedimentation, water loss

Introduction

The Amudarya runoff is mainly generated within Tajikistan (72,8%) and partly in Afghanistan and Uzbekistan (Fig.1). However, water consumption by the riparians is not divided according to their share of generation which is a potential cause of conflict of interests for these countries.

The fate of the river runoff depends on human demands. In reality the entire hydrological cycle and water quality have been changed due to interaction between the river and the territories which is characterized, on the one hand, by water withdrawal for human consumption, industrial and irrigation water requirements all of which have a rising trend and, on the other, by the return of water to the river containing pollutants.

At the present time the runoff is controlled by two main reservoirs (the Nurek and the Tuyamuyun) and by several intersystem reservoirs which play an important role in seasonal water storage.

The problems arising in the basin are connected to the development of hydropower in the upper region, increasing water demands, pollution and water losses. The ecological crisis in the region is intensifying and increasing social problems in the Aral Sea region, mainly due to the imperfect water management.

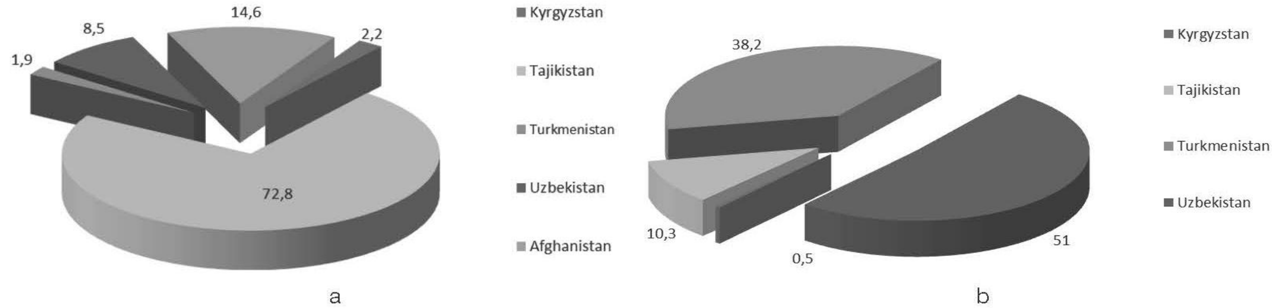


Figure 1. The division of Amudarya runoff (a) and water consumption by the riparian countries (b)

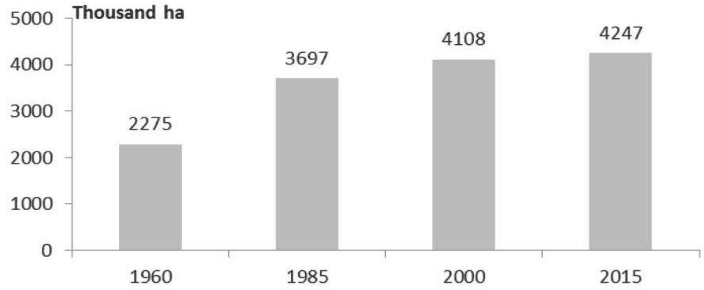


Figure 2. Increased irrigation in the basin

Water loss and pollution. Irrigation in the basin, based on well-developed irrigation and drainage systems with its inevitable return flows, is the main source of ecological pollution and water losses in the basin. Evaporation and seepage losses from the Amudarya and reservoirs also represent a significant contribution to losses. At present it is very difficult to identify these contributions. Estimated water losses in sections of the river can be accounted for as follows: upper stream to Kerki – 1,2 km^3 a year; middle stream from Kerki to Tuyamuyun – 3,6 km^3 a year; lower stream – 1,4 km^3 a year. The most up to date investigations indicate that the losses vary between 7 and 13 km^3 a year which amounts to 20–40% of the total water withdrawal, i. e. there is a significant imbalance. Technical water loss in the system and on the irrigated fields is also significant due to low efficiency of the irrigation systems and technology. Annual average water delivered to the fields and consumed water amount is presented in Fig. 3.

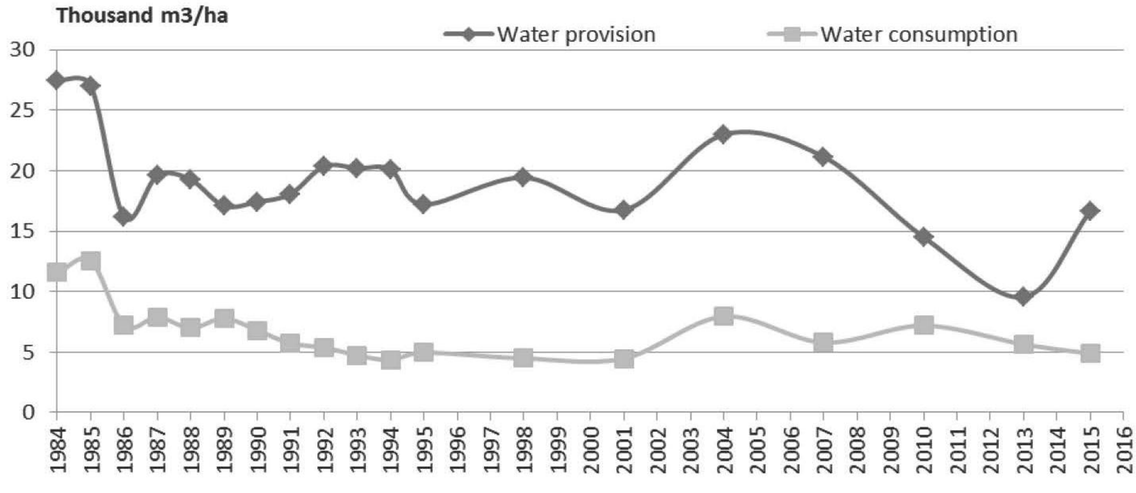


Figure 3. Comparison between the irrigation water delivered and actual consumption in the lower reaches of the Amudarya River

The total volume of salt transported by the river reaches is about 30–40 Million tons a year which negatively influences crop production as well as the environment. In the Vakhsh-Pyanj section of the river 7–9 Million Tons enter, whilst in the Kerki-Tuyamuyun section – 13–16.5 Million Tons of salt inflow to the river from the drain-collectors. Cotton loss due to this case varies from 20% to 60% depending on soil salinity. Due to this situation, the irrigated lands are in a poor condition. Over 20% of them are rated as being in a very bad condition due to high salinity and high levels of ground water. Crop productivity in Karakalpakstan is 4–5 times lower than it is in the other regions; crop losses account for 15–20% of the productive capacity and, moreover, has a decreasing trend (Fig.4).

Water scarcity and pollution impact negatively on human activity, particularly in the lower reaches of the river where the main occupations are cropping and processing (40%). Ecological issues have brought to and social issues as unemployment and diseases, poverty and migration.

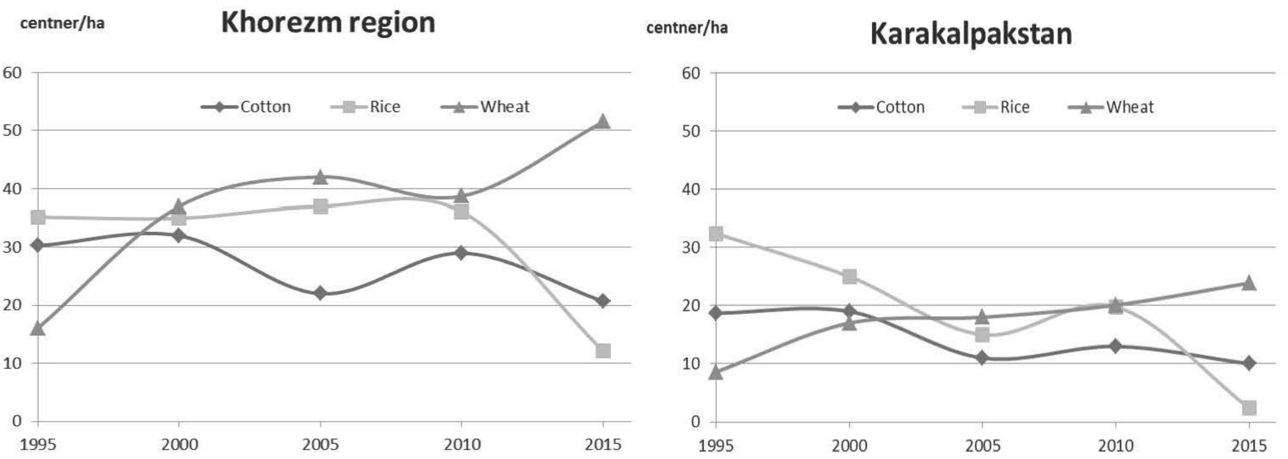


Figure 4. Crop productivity trends in Khorezm and Karakalpakstan regions

Water accumulation capacity of THC reservoirs. Irrigated agriculture in the Lower reaches of the Amudarya depends on reducing due to siltation capacity of the 4 reservoirs (Channel, Kaparas, Koshbulak and Sultansanjar) of the Tuyamuyun Hydro Complex (THC). The reservoirs filling was started in 1981. During 35 years' operation period the reservoirs have been deformed significantly and lost almost 40% of operational capacity. The field investigations of the reservoirs have been carried out regularly by Scientific Research Institute of Irrigation and Water Problems (ex.SANIIRI) and the last by the Bathometric Center of the MAWR in 2008. The field investigations and data provided by the THC Management Unit allowed analyzing of accumulation and removal processes in the Channel reservoir. Analysis of the measurement data has resulted that the total designed reservoir capacity loss dynamics for the period 1995–2015 show that average annual sedimentation volume for operation period consists of average 22.0 Mio m^3 a year. The most intensive accumulation of sediments took place in 1991–1992 (222 Mio m^3) and in 1998 (108 Mio m^3). Maximum removal of sediments has been observed in 1986 (135 Mio m^3) at the 20,8km3 runoff, 1997 (56 Mio m^3) at the runoff of 18,3 km3 and 2000–2001 (110 Mio m^3) at the runoff of 18,7.

Conclusion

The above-mentioned issues are caused by major disadvantages in the system of management. Despite significant progress in the management of water resources, leading to positive experiences of economic cooperation, many organizational regulations still need to be improved in the basin. The following **technical issues** such as low data reliability and available water resources assessment, drought damage, inexact information about actual water withdrawal and water deficits, ineffective irrigation systems all contribute to a decline in the effective use of water resources.

The following actions must be taken to address these problems: introduce a reliable forecasting system; improve water accounting systems and the water metering status of the hydrological services; increase the efficiency of the irrigation systems and improve watering techniques and technologies.

Investigations, carried out by researchers of the Scientific Research Institute of Irrigation and Water Problems, present that the above-mentioned actions will provide significant positive economic, social and ecological benefits. The urgent and long-term actions list and expected efficiency of its application at the lower reaches of the Amudarya River is indicated in Table 1.

Table 1. – Expected efficiency gains and recoupment due to water loss reductions

Expected efficiency	Khorezm	Karakalpakstan
Irrigated land productivity increase due to a reduction of water salinity, USD/ha a year	56.33	49.40
Productivity increases due to the elimination of waterlogging: % of gross output	12	15
USD/ha a year	169.00	148,13
Collector-drainage system: operational cost reduction, USD/ha a year	12.50	12.50
Reduction in the costs of drinking and industrial water supply, USD/ha a year	24.46	31.02
Reduction in the cost of ecological and natural protection would be applied to the irrigated lands, water bodies and adjacent territories in the basin, USD/ha a year	10.19	10.34
Expected profit for an irrigation systems efficiency increase to 90%, USD/ha a year	589.17	502.02

The estimated benefit of the long-term actions fluctuates around 464 USD/ha in all the irrigated lands of the Amudarya Basin. Improvement of the existing water resources management system of the Amudarya Basin must be directed towards optimal satisfaction of the needs of providing high quality water to all consumers. This must consider the situation existing at the present and likely to exist in the future. To achieve this situation, the affected entities need to coordinate their actions for the benefit of the economy of the nations will be required.

References:

1. Ikramova, at all. Water-land resources use efficiency increase in the Lowers of Amudarya. Research report, – Tashkent, Saniiri, – 2008, – 197 p.
2. Kambarov F.at all. Water use analyses in Khorezm region and crop watering estimation. Saniiri, – Tashkent, – 2003, – 203p.
3. Resolution of the Cabinet of the Ministry of UZB "Irrigated lands reclamation program for – 2001–2010", – Tashkent, – 2001, – 15 p.