Some challenges in applying the SDG indicator 6.5.2 methodology to transboundary aquifers in Central Asia

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Central Asia is central region of Asia, extending from the Caspian Sea in the west to the border of western China in the east. It is bounded on the north by Russia and on the south by Iran, Afghanistan, and China.

The region consists of the former Soviet republics of Kazakhstan, Uzbekistan, Tajikistan, Kyrgyzstan, and Turkmenistan, became independent in 1991.

Central Asia is a water scarcity region. And this problem is known for a long time. Mostly the water problem relates to surface water, and it has to be solving by the equitable distribution of river runoff between consumers and natural ecosystems.

The issue escalated after the formation of independent states. However, The countries, especially downstream, quickly realized that the lack of any arrangements on transboundary rivers is fraught with much losses, and began making agreements.

Currently, there are interstate agreements on transboundary river basins in Central Asia. For example, there are agreements on the Ile and Ertys rivers between Kazakhstan and China, on the Chu and Talas rivers between Kazakhstan and Kyrgyzstan, and others. The Interstate Coordinating Water Commission of Central Asia (Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan) has been established to jointly address issues of management, rational use and protection of water resources of interstate sources in the Aral Sea basin [1].

The length of the state border of the former USSR in Central Asia was 7.1 thousand km. There were 8 TBAs that were shared with China (4), Iran (1) and Afghanistan. And transboundary problems associated with TBAs requiring efforts at the interstate level did not exist.

In 1991, the overall length of state borders of 5 new independent states in Central Asia, increased 4.4 times to 31.5 thousand km. Accordingly, the amount of TBA has increased to 45. Of them 41 TBAs are shared with 2 countries and 4 TBA - with 3 countries. Most of all is allocated in Uzbekistan - 32 TBAs.

All of them were identified in the first and the second assessments of transboundary aquifers in Central Asia [2,3] and they all were included in the list of those for which the SDGs are defined.

Approaches to assessing the achievement of the SDGs for indicator 6.5.2 for TBA needs to be further clarified.

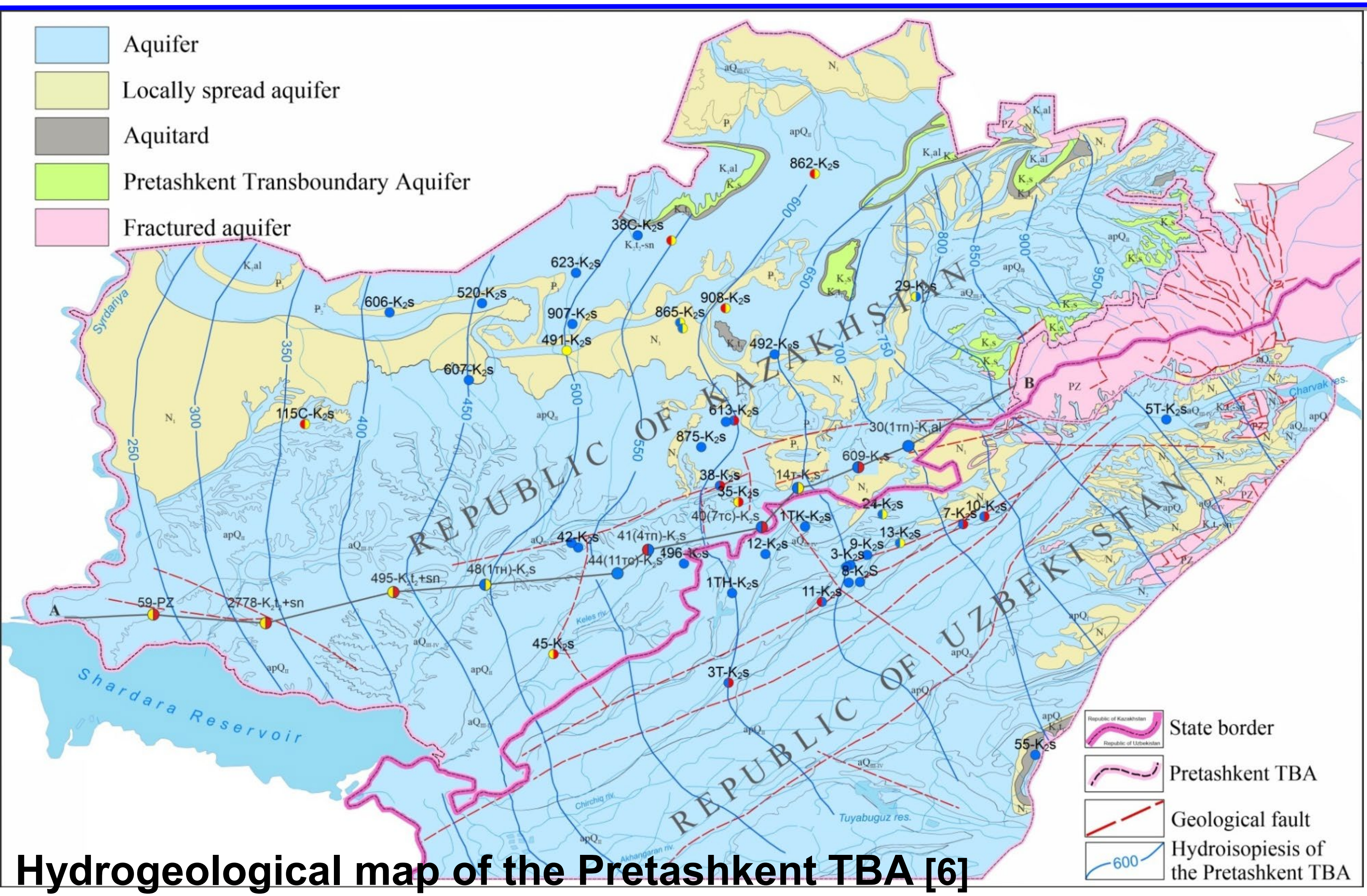
Transboundary aquifers of Kazakhstan [4,5]

Transboundary problems related to the depletion of groundwater recourses are identified only in 2 TBAs:

1 - Preertys

2 - Pretashkent

1- North-Kazakhstan; 2-Preertys; 3-Zaisan; 4- Alakol; 5 -Zharkent; 6-Tekes, 7-Shu; 8-North-Talas; 9-South-Talas; 10-Pretashkent; 11-Syr-Darya; 12-Amu-Darya; 13-Precaspian; 14-Syrt; 15-South-Pred-Ural



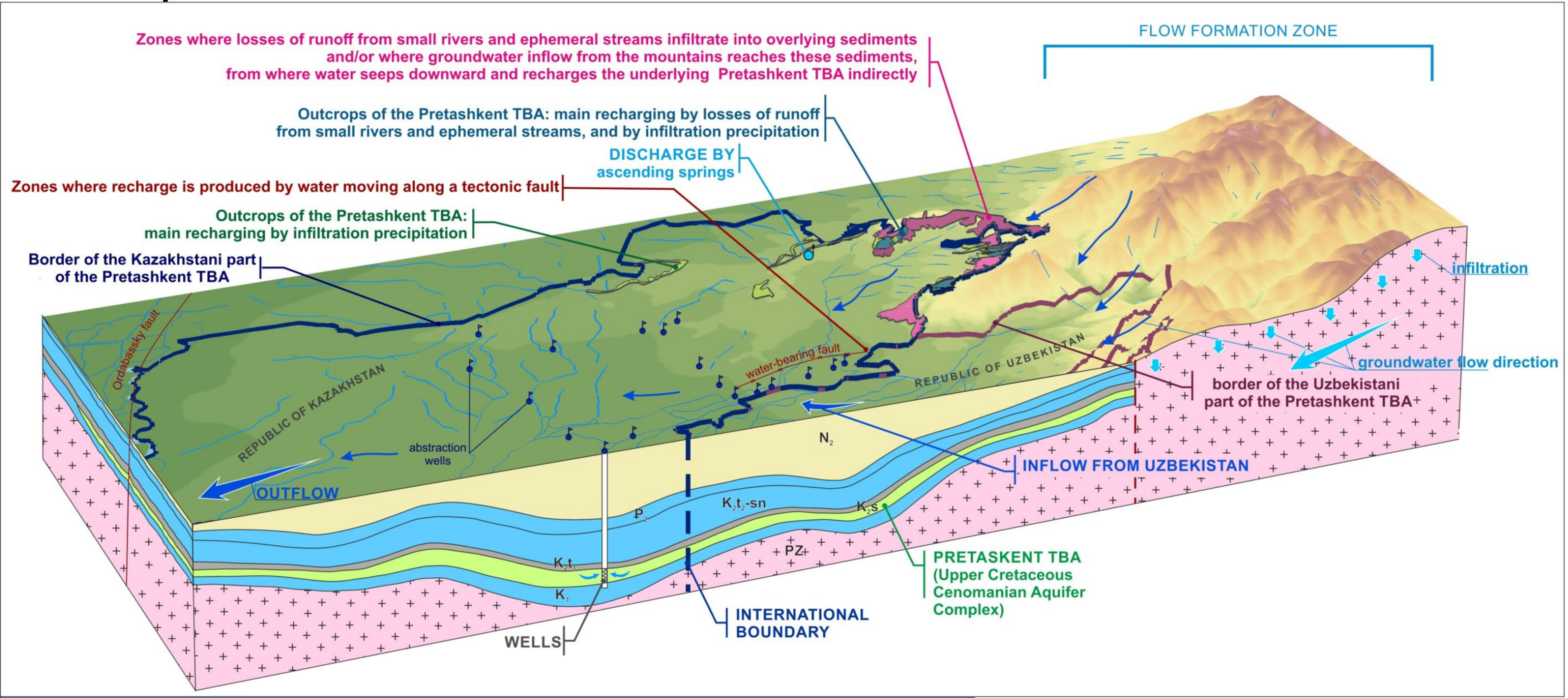
Hydrogeological map of the Pretashkent TBA [6]

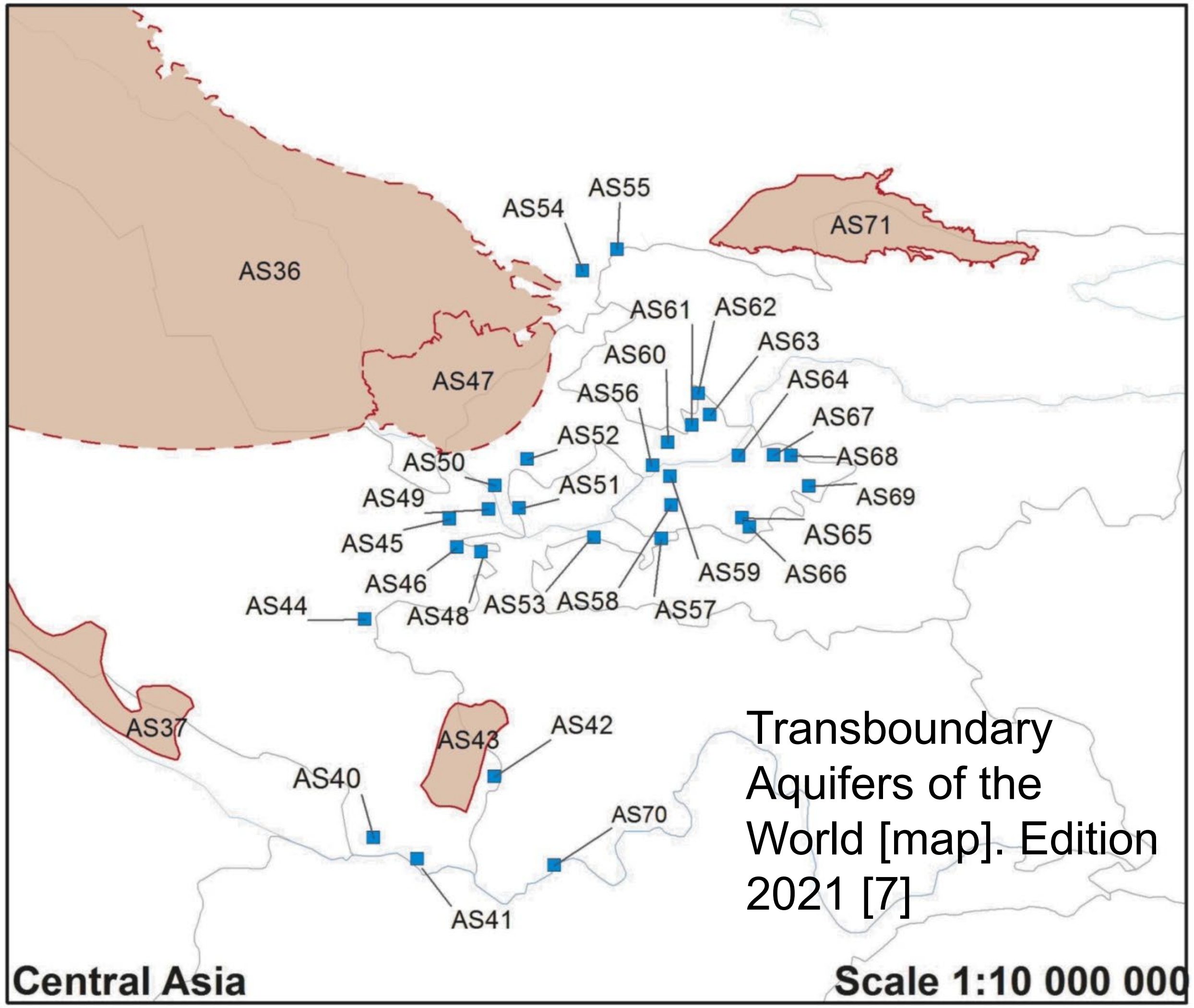
The Pretashkent TBA is a unique source of deep fresh groundwater in Central Asia. The exploitable resources of the Pretashkent TBA were approved and then divided between the countries (Republics of former USSR) in the following volumes:

Kazakhstan - 1,464 m^3/day

Uzbekistan - 2,044 m^3/day

Conceptual model of the Pretashkent TBA



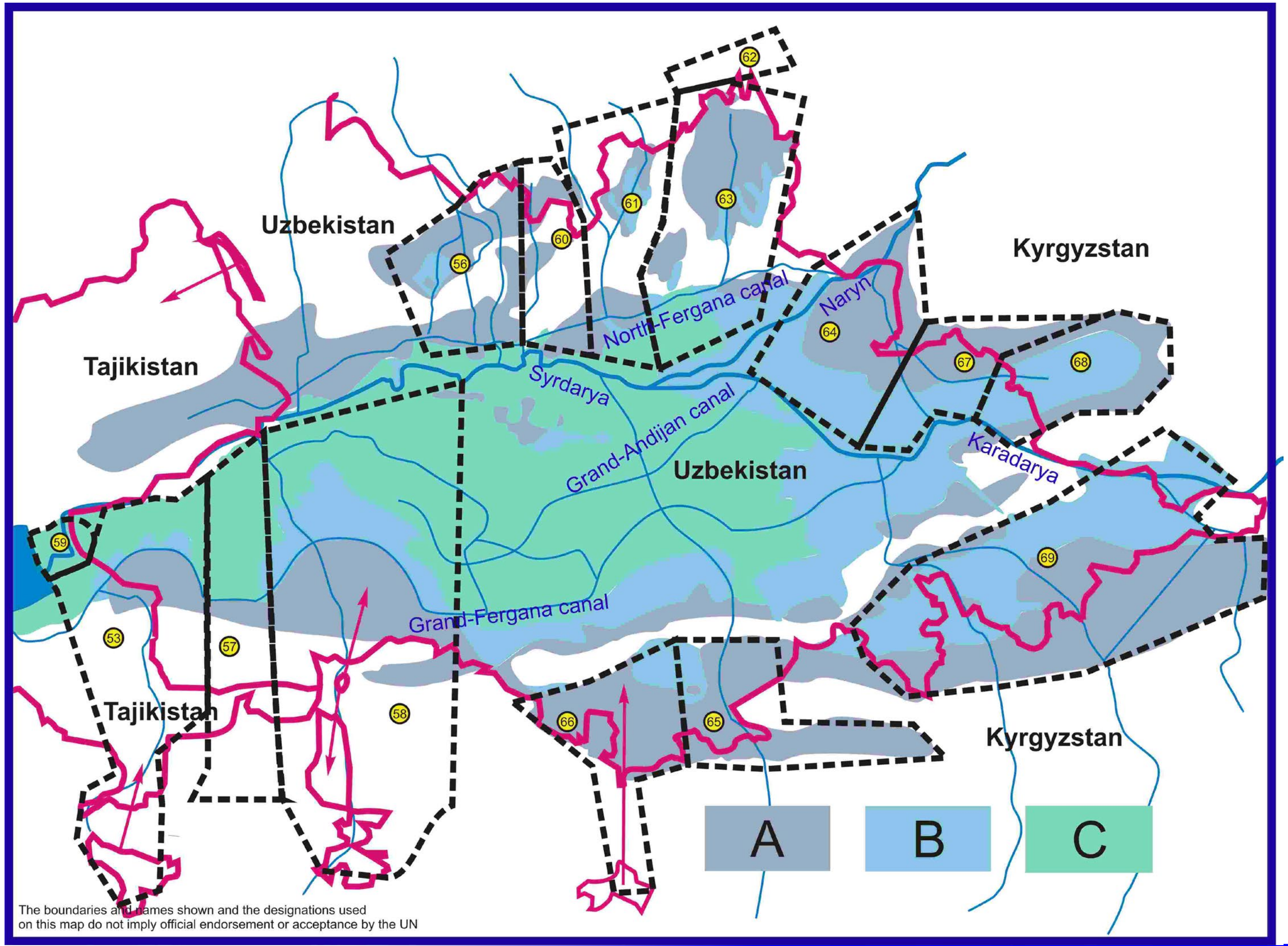


The total number of TBAs in Central Asia in 1991 has increased by 37 units [7].

From the total state boundary length of about 31.5 thousand km a number of countries are still struggling to divide some sections of their borders. There are problems of several enclaves.

Within the Fergana Valley, with an area of 22,000 km^2 and a population of 15 million people, 15 new TBAs were identified.
All these TBAs have a similar hydrogeological structure with high rates of groundwater exchange, typical for intermountain depressions.

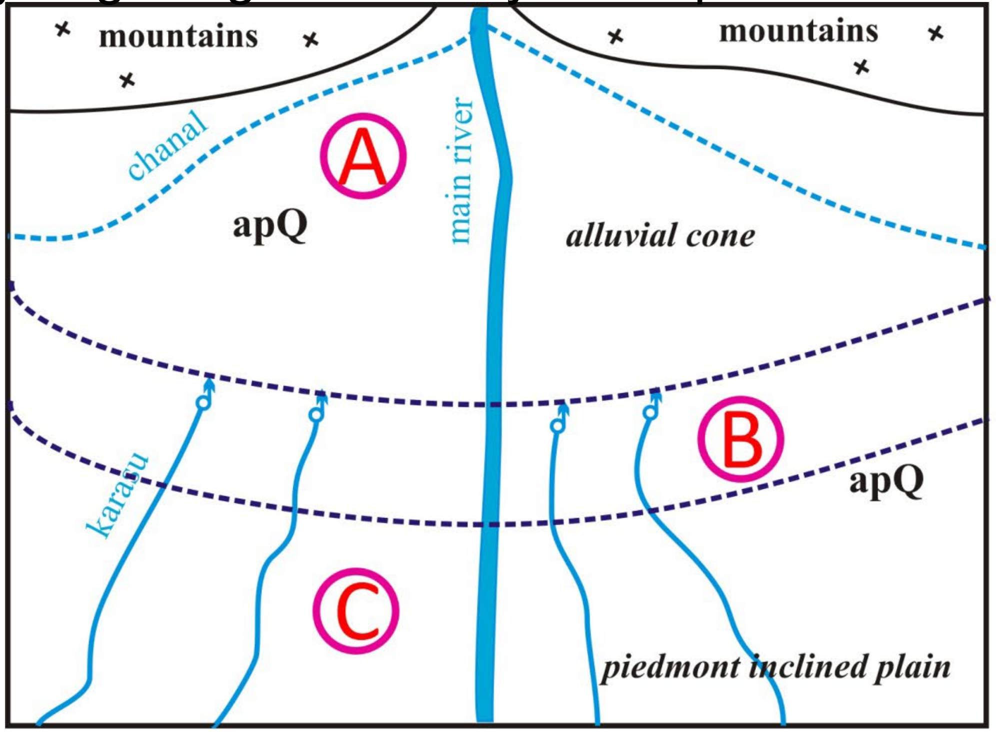
Transboundary aquifers of Fergana valley [2,3,10]

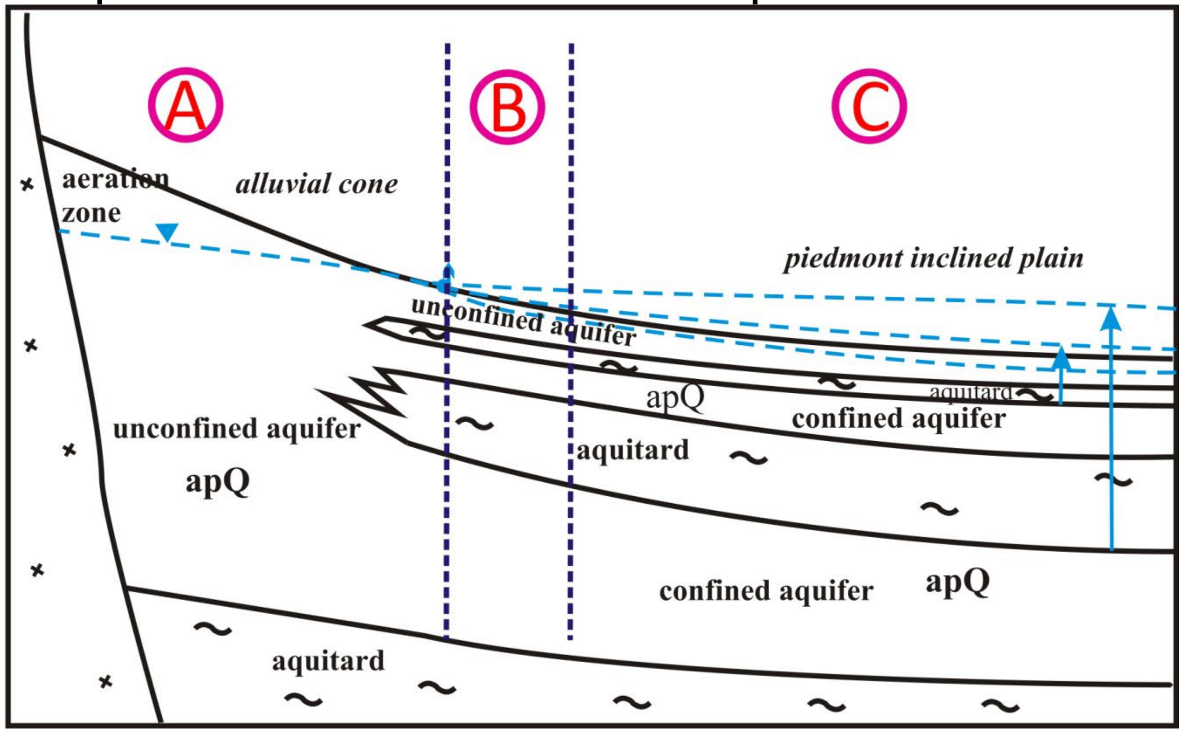


A, B, C - Hydrogeological zones

Transboundary aquifers:
53 - Isfara Aquifer
56 - Chust-Pap Aquifer
57 - Shorsu Aquifer
58 - Sokh Aquifer
59 - Syr Darya 2
60 - Almos-Vorzik Aquifer
61 - Kasansay Aquifer
62 - Nanay Aquifer
63 - Iskovat-Pishkaran Aquifer
64 - Naryn Aquifer
65 - Yarmazar Aquifer
66 - Chimon-Aval Aquifer
67 - Maylusu Aquifer
68 - Karaungur Aquifer
69 - Osh-Aravan Aquifer

Hydrogeological zonality of the piedmont inclined plains and intermountain depressions of Central Asia





[8-10]

A - The main groundwater recharge zone in the upper reaches of the alluvial fans (zone of filtration losses of a surface' water flow)

B - The groundwater runoff discharge zone by springs forming wetlands and, giving rise to rivers and creeks the flow of which is formed of groundwater

C - Groundwater runoff dispersion zone of unconfined and confined aquifers

The aquifers of the Fergana Valley are confluent cones of rivers flowing down from high mountain ranges. The scheme of formation and transformation of the groundwater runoff of such aquifers is well studied [8,9,10] and has become a classical for understanding these processes in similar hydrogeological structures.

There is a main groundwater recharge zone at the top of the alluvial fans (A). The discharge zone of part of the groundwater runoff in the form of swamps and springs, giving rise to rivers and creeks, the flow of which is formed by groundwater (B). And the zone of dispersion of groundwater runoff (C).

There are well known fundamental approaches to the management of groundwater resources in such aquifer systems and the experience of their implementation on numerical models of groundwater intakes and artificial groundwater recharge [11,12 et al.].

All these TBAs require interstate agreements on the rational management of their resources. However, even under favorable conditions, it will take a lot of time and effort to negotiate on each TBA. It would be more promising to make efforts on TBA agreements not for a specific one, but for the whole Fergana Valley as the hydrogeological region integrated into a transboundary aquifer system.

Thus, the rationale for applying SDG indicator 6.5.2 to transboundary aquifers requires careful consideration of the results of the performed TBA assessments. And the applicability of this indicator should be justified in each specific case.

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Thanks a lot for your attention!