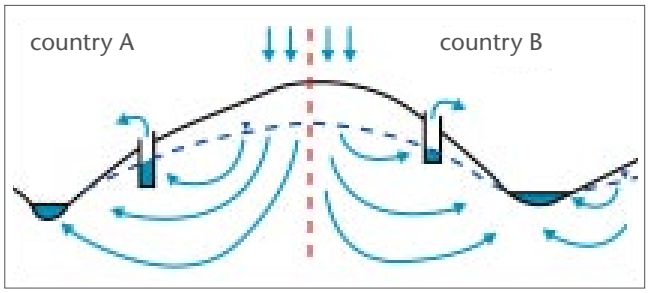
The assessment of the status of transboundary groundwaters sets out the scale and scope of the transboundary groundwaters in two sub-regions: Caucasus and Central Asia (see Section I) and South-Eastern Europe (see Section II). It describes the importance of transboundary groundwaters in supporting human uses; examines the pressure factors on these groundwater bodies; and provides information on status, trends and impacts in relation to both water quantity and quality. The Assessment also provides information about the management measures being taken, planned or needed to prevent, control or reduce transboundary impacts in groundwaters.

The methodology for the assessment of groundwaters broadly follows the guidance provided by UNECE in using the DPSIR framework (see Chapter 2 in Section I of Part 2) to describe: the pressures acting on groundwaters resulting from human activities; the status in terms of both quantity and quality of groundwaters and the impacts resulting from any deterioration in status; and the responses in terms of management measures that have already been introduced and applied, need to be applied, or are currently planned.

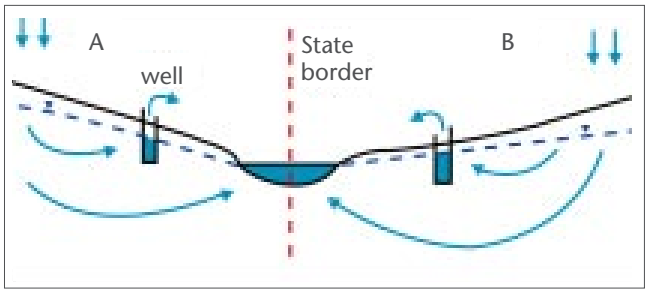
In the following sections, transboundary groundwaters have been classified according to general conceptual models (types) shown in the figure below.

PART 3
TRANSBOUNDARY GROUNDWATERS

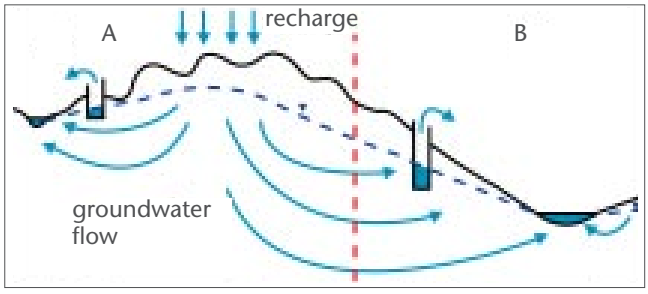
Introduction



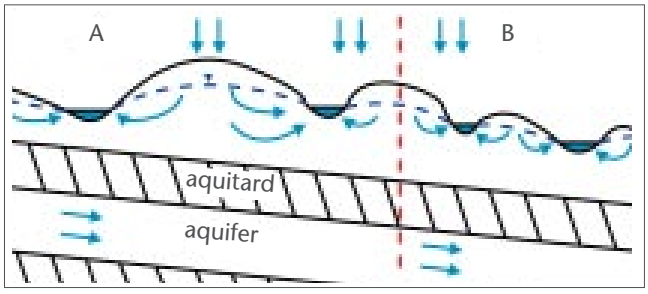
(1) State border follows surface water catchment and groundwater divide, little transboundary groundwater flow.



(3) State border follows major river or lake, alluvial aquifer connected to river, little transboundary flow.



(2) Surface water and groundwater divides separate from state border, recharge in one country, discharge in adjacent.



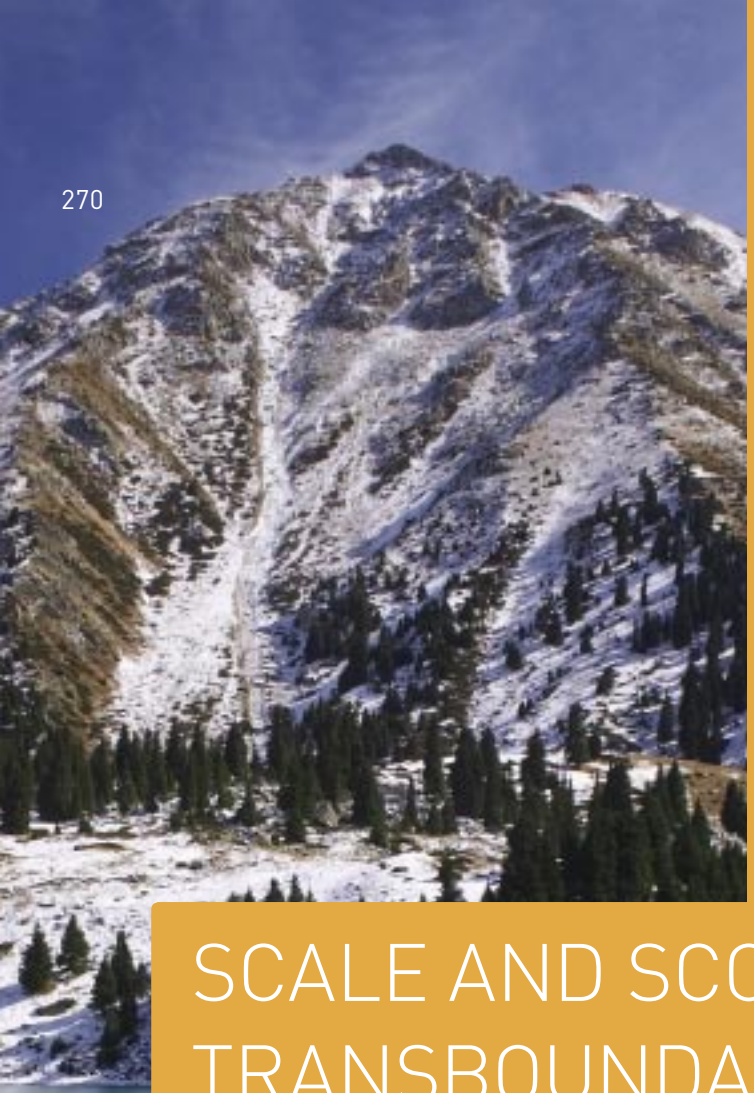
(4) Large deep aquifer, recharged far from border, not connected to local surface water and groundwater.

PART 3
TRANSBOUNDARY GROUNDWATERS

SECTION I

Transboundary Groundwaters in Caucasus and Central Asia

270	Chapter 1	SCALE AND SCOPE OF TRANSBOUNDARY GROUNDWATERS IN CAUCASUS AND CENTRAL ASIA
274	Chapter 2	PRESSURE FACTORS
276	Chapter 3	STATUS, TRENDS AND IMPACTS
279	Chapter 4	MANAGEMENT RESPONSES
281	Chapter 5	CONCLUSIONS
282	Chapter 6	FACTS AND FIGURES ON TRANSBOUNDARY GROUNDWATERS IN CAUCASUS AND CENTRAL ASIA



273 GROUNDWATER USES AND FUNCTIONS

SCALE AND SCOPE OF TRANSBOUNDARY GROUNDWATERS IN CAUCASUS AND CENTRAL ASIA

For transboundary basins in Caucasus and Central Asia during the Soviet Union era, basin plans were developed by regional institutions and included inter-republic and multi-sectoral aspects, as well as allocation of water for various uses. Since independence more than a decade ago, Armenia, Azerbaijan and Georgia, Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan (the countries of the CACENA region) have been striving to develop fair and rational bases for sharing and using their water resources. These countries have faced extreme economic inefficiencies and ecological damage in their efforts to transition to market economies. In the whole region, one can recognize improving water quality and increasing water quantity to meet basic human needs in these environmentally damaged and economically depressed areas as an urgent and priority task. Agricultural expansion and population growth over the past three decades have placed a great strain on the water resources of the region.

This regional assessment covers transboundary groundwater aquifers from the eight CACENA countries. The assessment is based on current knowledge. Such knowledge is still incomplete and will need to be confirmed and completed by further studies.

All together, 18 aquifers with significant resources were reported as transboundary, bordering or shared by two or more countries. However, only 16 of them were reported by two countries sharing them. The assessment has shown that transboundary groundwaters play a significant role in the CACENA region.

Different types, functions and uses can characterize aquifers. In general, all types of groundwaters can be found in the CACENA countries. However, there are young sediments in river basins as it was found from the available information.

General information on the types, connection with surface water resources and geology of the aquifers is summarized in the following table.

Identified transboundary aquifers						
No[1]	**Aquifer Name**	**Countries**	**Type/link with surface water**	**Lithology/age**	**Thickness mean-max (m)**	**Extent (km^2)**
1	Osh Aravoij	UZ/KG	n.a./shallow/deep /medium	Sandy gravel		
2	Almoe-Vorzin	UZ/KG	n.a./medium			
3	Moiansuv	UZ/KG	n.a./shallow-deep /strong-medium	Boulders pebble, loams, sandy, loams	150 -300	1,760
4	Sokh	UZ/KG	n.a./probably shallow /strong			
5	Alazan-Agrichay	AZ/GE	3/shallow/medium	Gravel-pebble, sand, boulder	150 -320	3,050
6	Samur	AZ/RU	3/shallow/strong	Gravel-pebble, sand, boulder	50 -100	2,900
7	Middle and Lower Araks	AZ/IR	3/shallow/strong	Gravel-pebble, sand, boulder	60 -150	1,480
8	Pretashkent	KZ/UZ	4/deep/weak	Sand, clay	200 -320	20,000
9	Chu Basin	KG/KZ	4/deep/weak	Sand, clay, loams	200 -350	
10	Pambak-Debet	GE/AM	3/shallow strong	Sand, clay, loams		
11	Agstev-Tabuch	AM/AZ	1/2/shallow/moderate			500
12	Birata-Urgench	TM/UZ	3/shallow/strong	Sand, loams	10 -50	60,000
13	Karotog	TJ/UZ	2/shallow/moderate			328
14	Dalverzin	UZ/TJ	2/shallow/moderate			
15	Zaforoboi	TJ/UZ	2/shallow/moderate			
16	Zeravshan	TJ/UZ	2/shallow/moderate			88
17	Selepta-Batkin – Nai- Icfor	KG/TJ	2/shallow/moderate			891
18	Chatkal-Kurman	KZ/UZ	4/ deep/weak	Sand, clay		20,000

[1] Aquifers numbered on map below.

Quaternary or neocene sediments form all identified transboundary aquifers. Predominant lithological types are gravel, sand, clay, and loams. Areal extent of the water bodies (in one country) varies greatly and reaches up to 60,000 km^2 (Turkmenistan). Mean thickness of aquifers ranges between 8 and 200 m and maximum thickness ranges between 20 and 350 m depending mainly on stratigraphy and age. Identified aquifers represent large water reservoirs with significant groundwater resources, which can play an important role in the region.

According to the simplified conceptual sketches provided it may be concluded that identified aquifers can be divided into two groups. The first group represents deeper groundwater aquifers with weak or medium link with local surface water systems recharged far from the border (type 4). Only in one case is the State border, which is situated on watershed divided line, identical with the recharge zone. The second group represents shallow groundwater flowing from the neighbouring countries towards the transboundary rivers (type 3). State border follows major rivers and aquifers are connected with the surface waters. From the information available it may be indicated that the degree of connection of groundwater flow to surface waters is an important consideration for their integrated management, and the assessment confirms these strong linkages for many of the transboundary groundwaters.

In the map below, the locations of the groundwaters covered by this assessment are shown. From this map, it can be seen that several of the countries of the region have their national borders traversed by transboundary groundwaters.

Distribution of transboundary groundwaters in Caucasus and Central Asia

GROUNDWATER USES AND FUNCTIONS

It was recognized during the assessment that groundwater resources are important in total water usage, and direct water abstraction for water supply is the main use of groundwater in all countries. In Georgia, 100% of total water consumption is used from groundwater abstraction. Azerbaijan and Armenia reported that portion of groundwater on total water consumption is 50% from its transboundary aquifers (aquifers No. 5, 6 and 7) and the same data were reported by Turkmenistan (aquifer No. 12). Such use is not surprising, due to the alluvial settings of aquifers, in comparison with the surface water resources.

In all cases the most frequent type of groundwater utilization is drinking water. The assessment has shown that all identified aquifers are utilized for drinking water purposes. But this type of groundwater use compared to the total groundwater abstraction varies to a large extent, from 10% (Azerbaijan, Turkmenistan) to 100% (Kazakhstan). In nine transboundary aquifers (aquifers No. 1, 3, 4, 5, 7, 9, 12, 14 and 17) the percentage of drinking water use on total groundwater abstraction is less than 50%; in seven cases (aquifers No. 6, 8, 10, 11, 13, 16 and 18) it achieves more than 75%. However, there are differences of the groundwater use even between the neighbouring countries (for instance, while in Kazakhstan the groundwater from Pre-Tashkent aquifer was reported to be used predominantly for drinking water purposes, in Uzbekistan it was reported to be used just as a source of mineral water).

Other possible uses indicated the significance of groundwater for agriculture support, reported in five aquifers (aquifers No. 1, 2, 3, 9 and 10) and for maintaining base flow and springs marked in four aquifers (aquifers No. 1, 2, 3 and 11). Other widely reported regional uses include small amounts for industry and spas. The strong linkages to rivers and lakes were confirmed, due to the alluvial aquifers and the consequent need to protect the ecosystems of these associated surface waters was emphasized in the case of Kyrgyzstan (Chu basin).