Regional definition

This section describes the boundaries and the main physical and socio-economic characteristics of the region in order to define the area considered in the regional GIWA Assessment and to provide sufficient background information to establish the context within which the assessment was conducted.

Boundaries of the region

According to the GIWA regional boundaries, the Aral Sea region includes the territory of three closed water basins - the Aral Sea, Lake Balkhash and Lake Issyk Kul. Each of these basins has specific natural and socio-economic features which should be evaluated separately. This report focuses on the Aral Sea Basin exclusively, which is situated between 55°00' E and 78°20' E and 33°45' N and 51°45' N and has a total area of 2.7 million km² (2.4 million km² within the border of five former republics of the USSR) (Bortnik & Chistijaeva 1990) (Figure 1).

The Aral Sea Basin includes the basins of the Syrdarya and Amudarya rivers which flow into the Sea, and the Tedzhen and Murgabi rivers, the Karakum canal, and shallow rivers flowing from Kopet Dag and western Tien-Shan, as well as closed areas near these rivers and the Aral Sea (Figure 1). Administratively, the region entirely covers Uzbekistan and Tajikistan, some parts of Kazakhstan (the Kyzylorda and Shimkent regions and the southern part of the Aktyubinsk region), Kyrgyzstan (the Osh and Naryn regions), Turkmenistan (excluding the Krasnovodsk region), and part of northern Afghanistan and northeastern Iran. This assessment does not focus on the latter two countries and when the report discusses ‘the five countries of the region’ it does not include these, but is referring rather to the five former Soviet countries of the region.

Figure 1  Boundaries of the Aral Sea region.
Physical characteristics

Geological composition and relief
The geological composition and relief form the lithogenic background of the geographical landscape. Figure 1 shows the main physiogeographical features of the Aral Sea region. The territory is heterogeneous in terms of its geology. The plain-lands belong to the Turanian plate of the Gercian platform, where a deep covering layer (more than 10 km thick) of Mesozoic and Cenozoic sediments lies upon highly rugose Paleozoic sediments.

The mountainous areas of the region (the Pamirs, Tien-Shan, Pamiro-Alay) comprise of newly formed rugose geological structures, which originate from the same plate formed in the Neogene period of the Cenozoic aeon. Continental neogene-quaternary sediments are found above this layer, which were formed by river processes and temporary water flows, as well as sea transgressions and aeolic (dust) processes.

The geological constitution has a significant impact on the relief and landscape of the territory. The relief of the territory can be divided into two types: plain and mountainous.

The plain relief is found in the Kazakh tableland (nipple-land) and Turanian lowland. The Kazakh nipple-land covers the northern part of the plain and is actually a peneplain (hilly, elevated plain), which in some places is occupied by low-lying residual mountains. It is generally 200-500 m high, but the residual mountains of Ulu-Tau are over 1100 m in height.

The Turanian lowland is situated on the Turanian plateau, which has predominantly flat monotonous relief (-43 m in Sary-Kamysch depression), which rises to about 200 m above sea level (Sultan-Wis-Dag). This area contains alluvial and sea formed lowland plains, with benches and dry seaboards. It encompasses the southern areas of the plain territory. The arenaceous deserts Karakum, Kyzilkum and Muyunkum are characterised by aeolic sandhills and ridges. The elevated plateau of Usturt is located in the south of the region.

The Turanian lowland is bordered by the foothills of the Kopet-Dag mountains and Parapamize (in Turkmenistan). To the southeast of the territory, the catchment area is partially occupied by foothills and the high mountains of Pamirs, Pamiro-Alai and Tien Shan, which are covered by more than 800 mountain glaciers.

Soil and vegetation
The region is dominated by zonal semi-desert, semi-bush and desert dispersed bush and graminaceous vegetation (Figure 2). Semi-deserts and deserts cover approximately one third of the regions’ surface.

The region contains the following soil and vegetation zones:
- Dry steppe with feather grass and tipchack vegetation, found upon the chestnut (brown) soils, which cover approximately one quarter of the territory (northern part);
- Semi-deserts with grass and shrubby vegetation, situated on lurid (dark brown) semi-desert soils;
- Deserts of the temperate climatic belt with grey and brown soils;
- Sands of semi-deserts and deserts with sporadic vegetation cover, which support a high diversity of plant species, but with limited soil cover. For example the Karakum desert hosts 827 species of higher plants. The area is characterised by the anthropogenic degradation of forests;
- Grey soils of semi-deserts where trees and perennial vegetation prevail. Desertification is observed and there has been degradation of steppes (grassy communities) as a result of agricultural activities, and the savannahs (complexes of trees and grassy vegetation) due to the salinisation of soils;
- Xerophytic forests and bushes of the foothills and low mountains, found upon brown and grey-brown soils;
- Wide-leaf forests situated upon mountainous grey and dark brown soils.

Figure 2 Vegetation types in the Aral Sea region.
Intrazonal soils are formed locally in river valleys and especially along broad deltas, and under "tugays" (periodically inundated forested areas). Permanent or periodically excessive humidification results in the growth of tugay forests and bushes on alluvial soils.

**Land use**

Central Asia's prosperity is strongly linked with the patterns of land use development. At present, the total area of potential arable land is 59 million ha, of which only 10 million ha are actually being cultivated (Table 1).

### Table 1  Land resources of the Aral Sea Basin.

<table>
<thead>
<tr>
<th>Country</th>
<th>Total area (ha)</th>
<th>Potential arable area (ha)</th>
<th>Arable area (ha)</th>
<th>Irrigated area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan*</td>
<td>34 440 000</td>
<td>23 872 400</td>
<td>1 658 800</td>
<td>786 200</td>
</tr>
<tr>
<td>Kyrgyzstan*</td>
<td>12 400 000</td>
<td>1 570 000</td>
<td>595 000</td>
<td>422 000</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>14 310 000</td>
<td>1 571 000**</td>
<td>874 000</td>
<td>719 000</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>48 810 000</td>
<td>7 013 000</td>
<td>1 805 300</td>
<td>1 735 000</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>44 884 000</td>
<td>25 447 700</td>
<td>5 207 800</td>
<td>4 233 400</td>
</tr>
<tr>
<td>Aral Sea Basin</td>
<td>154 934 000</td>
<td>59 474 100</td>
<td>10 140 900</td>
<td>7 895 600</td>
</tr>
</tbody>
</table>

Notes: *Territories within the Aral Sea Basin. ** Areas suitable for irrigation. (Source: FAO 1997)

Half of the cultivated land belongs to the oasis, where it is naturally drained and the soil is fertile. The rest of the potential arable land would require complex and costly development, including drainage, landscape modification and improvements in soil structure (SPECA 2004).

### Biodiversity

Biodiversity in the region is determined by the plain, sub-mountain and mountain landscapes, as well as the considerable latitudinal extension of the region (almost 20° latitude). Mountain regions are characterised by altitudinal and horizontal zoning with a high level of heterogeneity caused by relief peculiarities. The highest numbers of endemic species are observed in the isolated habitats. The relatively homogeneous structure of the flat landscapes of the region becomes more complex closer towards the mountain areas. The regional flora includes 1200 species of anthophyta (flowering plants) and 560 species of woody vegetation, including 29 endemic species of Central Asia. The flora of the Aral Sea coast includes 423 species of plant (Novikova 2001).

### Climate and climatic variability

Owing to the extreme remoteness of the region from the oceans, it has a distinct continental climate. It is not subject to the monsoons of Southern Asia as it is separated by high mountains, and it is seldom subject to cyclones from the west.

The radiation balance (kкал/ cm² annually) in the marine area of the Aral Sea averages as R=55.7. It is characterised in this region by an absolute predominance of turbulent flows of heat compared with the expenditures of heat from the transpiration of moisture, whereas on the majority of the earth’s surface there is a reverse interrelationship between these two parameters.
The region is characterised by large variations in temperature and precipitation (Figure 3 and 4). The aridity of the climate increases in the centre of the region. Annual precipitation ranges from 1 500-2 500 mm at the glacier belts of West Tien Shan and West Pamir, to 500-600 mm at the foothills, and to 150 mm at the latitude of the Aral Sea. To the north of this latitude, in Northern Kazakhstan, annual precipitation increases to between 250 and 350 mm.

Hydrological characteristics

The term “water resources” in this region refers to the annual volume of river flow measured where headwaters leave the mountains for the lowlands and upstream of water intake structures used for irrigation. Table 2 shows the mean annual surface river run-off in the Aral Sea Basin. The Amudarya Basin receives far greater water in the area of run-off formation (0.256 km³/km² per year compared to 0.170 km³/km² per year in the Syrdarya Basin), with 62% of its annual river run-off formed on the territory of Tajikistan. The Aral Sea is supplied with 68% of its renewable water resources by the Amudarya Basin. It should be noted that table 2 does not take into account the run-off from the Chu and Talas rivers, which orographically belong to the Aral Sea Basin. Taking these waters into account, the total water resources in the Aral Sea Basin is 123.6 km³ (Chub 2000).

The mountainous areas play an important role in maintaining the ecological integrity and food security for the entire region. They only occupy about 20% of the total area of the Aral Sea Basin but are the source of approximately 75% of renewable water resources and contain freshwater resources within glaciers and underground ice; a reliable guarantee of stable river flow for the future.

The Aral Sea

Origins of civilisation and farming in the Aral Sea Basin can be traced back 2 000 years. Natural environmental variance and human activity have led to significant ecological changes in the Aral Sea Basin.
Prior to the 1960s, the Aral Sea comprised an area of 68 300 km², including a water surface area of 66 100 km² and islands of 2 200 km². The volume of seawater amounted to 1 066 km³ (Humi et al. 2004, Bortnik & Chistjaeva 1990). The maximum depth of the Sea is 69 m, but depths of less than 30 m are common in a large proportion of the sea. The average sea level, meanwhile, fluctuates between 52 to 53 m. Mineralisation of the Aral Sea waters over the past 100 years of instrumental observations has varied within a range of 10-12 g/l (Glazovsky 1990 and 1995, Amirgaliev & Ismuchanov 2002).

Historically, the Sea has risen and fallen considerably. During the Quaternary period, variations in the level of the Aral Sea were as much as 36 m. In the first half of the twentieth century the variance in sea level did not exceed 1 m, and the ecological situation was quite stable up to the end of the 1950s. However, substantial variations have taken place during the last 40 years, and this report focuses on this time period.

Decreased river inflow since the early 1960s has changed the water budget of the Aral Sea. By 1990, the area of the Sea had decreased to 34 800 km² and its volume to 304 km³ (Glazovsky 1995), and since the end of the 1950s the level of the Sea had fallen by more than 22 m (Amirgaliev & Ismuchanov 2002). A significant proportion (about 33 000 km²) of the sea floor has dried up, the configuration of the shoreline has changed, and water mineralisation has increased from 10-12% in the 1990-1960s to 83-85% in 2002 (Amirgaliev & Ismuchanov 2002). Today the inland sea covers about half of its former area and its water volume has decreased by about 75%. As water mineralisation increased, the spawning sites of fish disappeared and the forage reserve depleted, which led to a decline in fish resources. Only five species of fish remain and nearly all limnoplankton and numerous haloplankton became extinct (Aladin 1999, Aladin & Kotov 1989, Aladin et al. 2001, Treshkin 2001).

Lakes

There are more than 5 000 lakes in the Aral Sea Basin, of which more than 4 000 are situated in the Amudarya and Syrdarya basins. Most of the lake water reserves are concentrated in the Amudarya Basin (46 km³), whereas water reserves in the Syrdarya Basin only amount to 4 km³ (Chub 2000&2002, Chub & Myagkov 2002). The majority of these lakes are of small area and limited volume, with many low-lying plain lakes drying out in extremely dry years.

Lake Karakul, a high-mountainous closed lake located in the Eastern Pamirs, is the largest lake in the region with a water volume of more than 26 km³. Lake Sarez was formed as the result of a tremendous landslide during an earthquake in 1911 and is also located in the Pamirs Mountains. The total lake volume is 17 km³. Lake Sarez is under constant observation by the government of Tajikistan and the international community due to the possibility that the lake’s dam could burst, putting an area of more than 5 000 km² and over 5 million people at risk (Olimov 2001).

The largest lakes in the low-lying areas of the Aral Sea Basin are situated in Uzbekistan and partially in Kazakhstan, in the lower and middle reaches of the Amudarya and Syrdarya. The largest of them were formed by drainage waters, which today consist predominantly of drainage effluent from irrigated areas. The largest of these lakes are Aydarkul (surface area of 30 km²), Sarykamysh (8 km²), Sudochye and Parsankul (2 km² each). The first of the above-mentioned lakes is situated in the Arnarsay depression at the boundary between Kazakhstan and Uzbekistan; its total volume is about 30 km³. It was formed by the discharge of excess water from Chardarya water reservoir (mainly due to winter water discharges from Tokhtogul water reservoir) and drainage waters from the irrigated fields of the Golodnaya steppe in Uzbekistan and Kazakhstan.

The majority of the once numerous and biologically productive freshwater lakes in the delta of the Amudarya and Syrdarya have completely dried up or lost their economic value, constituting one of the most important and dramatic consequences of the irrational use of water resources in the Aral Sea Basin. It has caused the rapid degradation of the delta landscapes and an abrupt reduction in the biodiversity of aquatic and terrestrial ecosystems.

Water reservoirs

The total volume of water reservoirs in the Aral Sea Basin is over 74 km³ (Table 3). The largest is Tokhtogul reservoir, which has a total volume of 19.5 km³ and a useful volume of more than 14 km³. All of the large water reservoirs have multi-purposes, but are mainly used for power generation and irrigation. On the territory of Uzbekistan, in addition to numerous ponds and small-capacity water reservoirs used for irrigation, 50 relatively large reservoirs with a total volume of 19 km³ have been constructed.

A total of 45 hydropower plants with a total capacity of 34.5 GWh/year were constructed on the largest reservoirs. The Nurek hydropower station on the Vakhsh River in Tajikistan (2 700 MWh/year) and the Tokhtogul hydropower station (1 200 MWh/year) on the Naryn River in Kyrgyzstan are the largest (Kipshkbayev & Sokolov 2002, Duskayev 2000, Burlibayev et al. 2002, Mamatakanov 2001). Of all the countries of the Aral Sea Basin Tajikistan has the greatest hydroelectric potential of all the countries in the Aral Sea Basin - more than 52 000 GWh/year.
According to estimations it is technically feasible to harness about half of this potential energy. Until now only about 4 GWh/year have been utilised.

**Socio-economic characteristics**

**Demographic characteristics**

Recent population growth figures may not be representative of future trends. There is likely to be a decline in population growth rates, but it is not known by how much and when this is to occur. In principle, smaller families will be desirable for the urban population, but for subsistence farmers it will remain attractive to have larger families, with more than 4 children. In any case, in the next 25 years the population of the region is predicted to grow due to the age structure of the present population.

Table 4 shows the ethnic breakdown of the population of each country in the Aral Sea Basin, excluding Afghanistan. There are three dominant ethnic groups in the region: Uzbeks, who account for more than 40% of the population, Kazakhs (16.8%) and Russians (13.4%). In the five countries of the region the indigenous population dominate, especially in Uzbekistan (80%) and Turkmenistan (77%). The highest percentage of small ethnic groups united in the table under the heading “Other” is registered in Kyrgyzstan (11.8%) and Kazakhstan (8%). These are the most ethnically diverse countries.

In general, the region is characterised by high population growth rates (except in Kazakhstan), a negative balance of migration and a high infant mortality rate. The demography of Kazakhstan differs from the other countries due to its low rate of population growth (0.1), the greatest negative balance of migration (-6.16 migrants/1 000 population) and the smallest percentage of the population living below the poverty line (26% as compared with 34-80% in other countries of the region).

Kazakhstan has the smallest percentage of young people (under 15 years old) in the region, accounting for only 26% of the population, whereas in the other countries of the region this figure ranges from 34 to 40%. Kazakhstan also has the highest proportion of the population that are older than 65 (7.5%) (Table 5). These factors combined with the lowest birth rate (17.83 births/1 000 population as compared with 26-32/1 000 in other countries) and the highest death rate in the region (10.69/1000 population in 2002) may induce social and economic problems in the near future. It is also worth noting that Kazakhstan

**Table 4**

<table>
<thead>
<tr>
<th>State</th>
<th>Kazakh</th>
<th>Kyrgyz</th>
<th>Uzbek</th>
<th>Tajik</th>
<th>Turkmen</th>
<th>Russian</th>
<th>Ukrainian</th>
<th>German</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>53.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>30.0</td>
<td>3.7</td>
<td>2.4</td>
<td>8.0</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>-</td>
<td>52.4</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>18.0</td>
<td>2.5</td>
<td>2.4</td>
<td>11.8</td>
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<tr>
<td>Uzbekistan</td>
<td>3.0</td>
<td>-</td>
<td>80.0</td>
<td>5.0</td>
<td>-</td>
<td>5.5</td>
<td>-</td>
<td>-</td>
<td>6.5</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>-</td>
<td>-</td>
<td>64.9</td>
<td>3.5</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>6.6</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>2.0</td>
<td>9.2</td>
<td>-</td>
<td>77.0</td>
<td>6.7</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>5.1</td>
</tr>
<tr>
<td>Total</td>
<td>16.80</td>
<td>4.31</td>
<td>40.3</td>
<td>9.63</td>
<td>6.17</td>
<td>13.40</td>
<td>2.26</td>
<td>0.88</td>
<td>7.26</td>
</tr>
</tbody>
</table>

(Source: CIA 2002)

**Table 5**

<table>
<thead>
<tr>
<th>Country</th>
<th>Population</th>
<th>Growth rate (%)</th>
<th>Migration rate (migrate/1 000)</th>
<th>Infant mortality rate (deaths/1 000)</th>
<th>Life expectancy at birth</th>
<th>Total health expenditure</th>
<th>Birth rate (births/1 000)</th>
<th>Death rate (deaths/1 000)</th>
<th>Age structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>16 741 519</td>
<td>0.1</td>
<td>-16.6</td>
<td>58.95</td>
<td>60.01</td>
<td>58.02</td>
<td>211</td>
<td>3.7</td>
<td>26.0</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>4 822 166</td>
<td>1.45</td>
<td>-2.51</td>
<td>75.92</td>
<td>67.98</td>
<td>59.35</td>
<td>145</td>
<td>6.0</td>
<td>26.11</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>25 563 441</td>
<td>1.62</td>
<td>-1.94</td>
<td>71.72</td>
<td>67.68</td>
<td>60.38</td>
<td>86</td>
<td>3.7</td>
<td>26.09</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>6 719 567</td>
<td>2.12</td>
<td>-3.27</td>
<td>114.77</td>
<td>67.46</td>
<td>61.24</td>
<td>29</td>
<td>2.5</td>
<td>32.99</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>4 688 963</td>
<td>1.84</td>
<td>-0.98</td>
<td>71.21</td>
<td>64.80</td>
<td>57.57</td>
<td>286</td>
<td>5.4</td>
<td>28.27</td>
</tr>
<tr>
<td>Total</td>
<td>53 415 656</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

has a relatively high level of social welfare for its population, which is explained by the country having the greatest GDP/per capita ($5,900 USD) in the region, the highest percentage of elderly people, and relatively high expenditure on health care ($211 USD per capita) (Table 5). In contrast, Kyrgyzstan has the lowest percentage of elderly people in the region (less than 1%), which relates to the low level of social welfare. Tajikistan has the highest level of infant mortality (114.7 deaths/1,000 live births), the highest birth rate (33.0/1,000 population), the lowest GDP ($1,140 USD per capita), the greatest percentage of the population living below the poverty line and the highest unemployment rate (20%) compared with 7-10% in the other countries (Table 5).

**Economic characteristics**

Table 6 outlines the economic characteristics of the countries in the region. Unfortunately, the data for Turkmenistan is not complete. Kazakhstan has undergone the most successful economic development; it has the highest GDP ($98 billion USD), which is almost one third higher than that of Uzbekistan and more than ten times that of Tajikistan. The poorest economic situation can be found in Tajikistan. In general, the region has experienced positive economic tendencies in recent years. In Kazakhstan GDP growth has exceeded 6-7% over the last five years.

**Kazakhstan**

Kazakhstan, the largest of the former Soviet republics excluding Russia, is rich in fossil fuel resources and has plentiful supplies of other minerals and metals, including gold, iron ore, coal, chrome and zinc. It also has a thriving agricultural sector in the areas of livestock and grain production. There are vast areas of arable land. The agricultural and the industrial sectors’ share of GDP is estimated at 15% and 30%, respectively. Kazakhstan’s industrial sector relies on the extraction and processing of natural resources and also on a growing sector specialising in the construction of equipment, agricultural machinery and defence technology.

Kazakhstan has a relatively high standard of infrastructure and the contribution of the services sector to the GDP is 60%. The economy of Kazakhstan also has the highest real growth of GDP in the region (12.2% as compared with 3.10% in other countries), a positive export and import balance ($2.3 billion USD), relatively low inflation (8.5%) and low unemployment (Table 6). Kazakhstan also has the lowest percentage population living below the poverty line. The ratio of the contribution of the industrial sector in comparison to the agricultural sector towards the formation of GDP is 3.0, which is 1.8-4.6 times higher than the corresponding ratio for the other countries in the region. In 2003 GDP increased by 9.2%, the share of industrial output increased by 8.7%, foreign trade by 8.3%, and investments into fixed assets by 17.2%. Deficiency of the budget in 2003 was less than 1% of GDP and real wages increased by 8.3%. The general five year growth of GDP in Kazakhstan meant that in 2003, GDP had increased by 6.3% compared to 1991.

The break-up of the USSR and the severe decline in demand for heavy industrial products from Kazakhstan resulted in the short-term collapse of the economy, with the steepest annual decline recorded in 1994. Between 1995 and 1997, the pace of economic reform and privatisation quickened, resulting in a substantial shifting of assets to the private sector. In 1993, Kazakhstan began a comprehensive structural reform programme aimed at moving towards a market economy which was internationally supported by bilateral and multilateral donors, including the World Bank and the International Monetary Fund (IMF).

Today, poverty in the country persists. In 2001, approximately 28% of the population were earning below the minimum subsistence level. A considerable proportion of the population has no access to potable water and suffers from the effects of pollution and environmental degradation.

In 2000 and 2001, Kazakhstan experienced economic growth due to its booming energy sector, economic reform, good harvests, and foreign investment. The opening of the Caspian Consortium pipeline in 2001, from western Kazakhstan’s Tengiz oilfield to the Black Sea, substantially raised export capacity. The industrial policy in Kazakhstan is designed

<table>
<thead>
<tr>
<th>State</th>
<th>Budget (million USD)</th>
<th>GDP</th>
<th>Population below poverty line (%)</th>
<th>Industrial production growth rate (%)</th>
<th>Export (million USD)</th>
<th>Import (million USD)</th>
<th>Inflation rate (%)</th>
<th>Unemployment rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kazakhstan</td>
<td>4,200</td>
<td>98.1</td>
<td>12.2</td>
<td>5,900</td>
<td>10</td>
<td>26.0</td>
<td>11.4</td>
<td>10,500</td>
</tr>
<tr>
<td>Kyrgyzstan</td>
<td>207</td>
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<td>5.0</td>
<td>2,800</td>
<td>38</td>
<td>55.0</td>
<td>6.0</td>
<td>475</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>4,000</td>
<td>62.0</td>
<td>3.0</td>
<td>2,500</td>
<td>33</td>
<td>24</td>
<td>3.5</td>
<td>2,800</td>
</tr>
<tr>
<td>Tajikistan</td>
<td>-</td>
<td>7.5</td>
<td>8.3</td>
<td>1,140</td>
<td>19</td>
<td>80.0</td>
<td>10.3</td>
<td>640</td>
</tr>
<tr>
<td>Turkmenistan</td>
<td>589</td>
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<td>10.0</td>
<td>4,700</td>
<td>27</td>
<td>45</td>
<td>34.4</td>
<td>-</td>
</tr>
</tbody>
</table>

to direct the economy away from overdependence on the oil sector by developing light industry (CIA 2002). Inflation decreased from an annual rate of 29% in 1996 to only 6.4% in 2003. In 1996, GDP growth was estimated at 0.5%, compared to 9.2% in 2003.

Kyrgyzstan

Kyrgyzstan is a small mountainous country with an economy predominantly based on agriculture. The country has undergone an economic transformation following the dissolution of the Soviet Union. Cotton and wool constitute the main agricultural products and exports. Industrial exports include gold, mercury, uranium, and electricity. Kyrgyzstan has been one of the most progressive countries of the former Soviet Union in carrying out market reforms.

Policymakers have had difficulties dealing with the termination of budgetary support from Moscow, the disruption of the former Soviet Union’s trade system and a large deterioration in the Kyrgyzstan Republic’s terms of trade, primarily owing to large increases in import prices of oil and natural gas. By 1999, GNP had declined to 260 USD per capita, with severe declines in living standards.

Early reforms by the Government included the liberalisation of most prices, the creation of a national currency, the introduction of a liberal trade regime, and the elimination of most capital flows. Substantive progress in tightening fiscal policies followed in parallel with a successful reform of the financial sector, and monetary policy framework and instruments. In 1994, deposit and interest rates were liberalised, directed credits were discontinued, and domestic financing of the budget deficit was sharply curtailed.

On July 17, 1998, the Kyrgyz Republic successfully concluded World Trade Organization (WTO) accession negotiations, paving the way for the Kyrgyz Republic to become the 133rd and the first Commonwealth of Independent States member to join the WTO.

In 2001 inflation was lowered to an estimated 7%. Much of the government’s stock enterprises have been sold. Production had severely declined since the break-up of the Soviet Union, but by 1995 production had begun to recover and increase. Growth increased from 2.1% in 1998 to 5% in 2000, and again 5% in 2001. Nevertheless, poverty remains acute: approximately 40% of the Kyrgyz population lives in poverty, with 51% and 41% of the population in 2001 living in poverty in rural and urban areas, respectively. In September 2002, the Government released the National Poverty Reduction Strategy (NPRS): 2003-2005, one element of the Comprehensive Development Framework (CDF) of the Kyrgyz Republic to the year 2010. Despite substantial international aid for development programmes in Kyrgyzstan over the past five years, poverty remains a significant issue in the country (UNDP 2003).

Recent economic development is beginning to show as a result of these measures. The rate of inflation declined from 1 000% in 1993 to 15% in 1997. Following a cumulative decline of approximately 51% in 1991-1995, GDP grew by 7% in 1996 and 1997, by 6.7% in 2003 and 7.1% in 2004 (ICWC 2004). After concerted efforts to attract private capital and interest to the mining sector, the Kumtor gold mine, the eighth largest in the world, began production in 1997 and achieved commercial levels in May 1997, adding 4% to GDP. Agriculture, the largest sector in the economy of Kyrgyzstan, accounted for 45% of GDP and for half of the total employment in 1997 (UNESCO 2000).

The production of most crops declined considerably between 1990 and 1995 but has begun to recover more recently. Livestock and wool production however, two of the mainstays of the rural economy, have declined severely and still remain depressed. Agro-industry faced crisis between 1990 and 1996, with annual production declining by over 90% for most commodities. In recent years state support has stimulated growth in the agrarian sector.

Government intervention in agricultural marketing has largely disappeared. The foreign trade regime and prices have been liberalised. Over 65% of the agro-business has been privatised and demonopolised.

However, the government and the international financial institutions have embarked on a comprehensive medium-term poverty reduction and economic growth strategy. In November 2001, with financial assurance from the Paris Club, the IMF Board approved a three-year 93 million USD Poverty Reduction and Growth Facility (CIA 2002).

Uzbekistan

Uzbekistan is a dry, landlocked country of which 11% of the territory consists of intensely cultivated, irrigated river valleys. More than 60% of its population live in densely populated rural communities. The country possesses significant economic potential with a well educated population and qualified labour force. Uzbekistan is rich in natural resources such as gold, natural gas, oil, coal and copper. It is the world’s ninth largest producer of gold (with an annual output of approximately 60 tonnes) and is among the largest suppliers of natural gas (with an annual production of more than 50 billion m³). In spite of its potential, Uzbekistan presently remains an underdeveloped country. Its GNP per capita was estimated at 350 USD in 1999.
More than 20% of Uzbekistan’s GDP is generated in agriculture, which employs about 49% of the country’s labour force. Primary commodities, such as cotton fibre, mining and energy products, account for about 75% of its merchandise exports; cotton alone accounts for 40% of exports. The cautious approach to reform, combined with a focus on developing self-reliance in energy and improving the mining and agricultural sectors including trade diversification (especially of cotton export), allowed Uzbekistan to avoid an output collapse recorded in many other former Soviet Union countries during the first years of independence. Uzbekistan’s GDP declined by less than 145 USD in 1991-1993, compared with a former Soviet Union average of almost 40% (UNESCO 2000).

Uzbekistan has introduced some elements of a market system over the past decade (for example privatisation and capital markets). However, the government has opposed, to varying degrees, the following: trade liberalisation; currency convertibility and a unified exchange rate; full price liberalisation; the elimination of government interference into the key sectors of the economy (e.g. cotton production); and central bank independence.

In 1997 and during the first half of 1998 economic trends were mixed. In an effort to curb accelerating inflation and a widening current account deficit, the authorities started tightening fiscal policies at the beginning of 1997. As a result, macroeconomic performance began to improve again. According to official statistics, real GDP grew by 5.2% in 1997 and by 4.0% in the first half of 1998, while average monthly consumer price inflation fell to 2.1% in 1997 and to 1.7% in the first half of 1998. The IMF’s estimates suggest that the GDP growth in 1997 may have been only 2.4%, while average monthly inflation was estimated at about 3.5%.

Uzbekistan is now the second largest cotton exporter, a large producer of gold and oil, and a regionally significant producer of chemicals and machinery. Following independence in 1991, the government sought to support its Soviet-like command economy with subsidies and tight controls on production and prices. The state continues to be a dominating influence in the economy and has so far failed to bring about necessary structural changes. The IMF suspended Uzbekistan’s 185 million USD standby arrangement in late 1996 because of governmental steps that made impossible the fulfilment
of a Fund contribution. Uzbekistan has responded to the negative external conditions generated by the Asian and Russian financial crises by emphasising import substitute industrialisation and tightening export and currency within its already closed economy. Economic policies that have repelled foreign investment are a major factor in the economy’s stagnation. A growing debt burden, persistent inflation, and a poor business climate led to disappointing growth in 2001. However, in December 2001 the government voiced a renewed interest in economic reform, seeking advice from the IMF and other financial institutions (CIA 2002).

**Tajikistan**

The Republic of Tajikistan has inherited a developed infrastructure and a well-organised and varied industrial and agricultural basis from its former Soviet period. However, transition to the market type of economy has led to serious changes in the economic system and in the economic links between the countries of the region. As a result of conflict, economic stagnation, and changes in the structure of export and import, the level of industrial output dropped by 60%, a figure which only started recovering at the end of the 1990s. The agrarian sector plays a major role in the modern economy of Tajikistan, but the industrial sector is less significant. To stop the deterioration in economic conditions, the government introduced several reform measures in 1995, including fiscal retrenchment and price liberalisation, supported by an IMF Stand-by arrangement and an IDA rehabilitation credit in 1996. In the following two years the policy performance of Tajikistan was mixed, largely because of the renewed conflict and weak institutional capacity. Much of the reform agenda contained in the above credit was eroded or even reversed because of the conflict and the reform programme had been disrupted by mid-1997. The civil conflict diverted resources to defence and security purposes to the detriment of other essential needs, and at the same time revenues declined. As of June 1997, the fiscal deficit reached 10% of GDP, social safety net payments were eight months in arrears, inflation exceeded 60% and the currency depreciated rapidly. Recognising that the reversal of this situation required dramatic action in the areas of political and macroeconomic stability and structural reform, the government and the United Tajik Opposition (UTO) signed a Peace Agreement in July 1997. The Commission for National Reconciliation (CNR) was created as the focal point to foster national reconciliation.

The government, in consultation with the IMF and the World Bank, also moved quickly on the stabilisation and structural reform fronts and has made significant progress in achieving macroeconomic stability. Average monthly inflation for the first four months of 1998 was brought down to 1.3%, compared with over 20% per month in July 1997. Recent fiscal performance has also been impressive, with the fiscal deficit (on a cash basis) in the last quarter of 1997 narrowing to only 0.2% of GDP. During the first quarter of 1998, the deficit was 1.6% of GDP. Owing to the restored macroeconomic stability and the availability of external financing for cotton production, GDP grew by 1.7% in 1997; the first real growth since independence in 1991. The recovery has continued, with real GDP in the first quarter of 1998 estimated to be 1.3% over the corresponding period in 1997.

Tajikistan has the lowest GDP per capita among the 15 former Soviet republics, the highest unemployment in the region and 80% of the population lives below the poverty line. Tajikistan has a negative export-import balance and the highest inflation level. At the same time Tajikistan has one of the highest rates of GDP growth in the region (only Kazakhstan has greater GDP growth).

Cotton is the most important crop. Mineral resources, varied but limited, include silver, gold, uranium, and tungsten. Industry consists of a large aluminium plant, hydropower facilities, and small obsolete factories, mostly in light industry and food processing. The availability of hydroelectric power has influenced the pattern and structure of the industrial sector, with aluminium, chemicals and other energy-intensive industries as the sector’s mainstays. The civil war (1992-1997) severely damaged the already weak economic infrastructure and caused a sharp decline in industrial and agricultural production. On independence in 1991, the collapse of the trade and payments system among former Soviet Union countries triggered a precipitous decline in output. As a result, national poverty increased, particularly in the more remote and war affected areas, with as much as 85% of the population considered poor. A large proportion of the labour force in Tajikistan (as high as 25%) and Kyrgyzstan depends on work abroad (particularly in Russia), remitting a significant volume of income to their home countries.

Tajikistan has experienced strong economic growth since 1997. Continued privatisation of medium and large state-owned enterprises will further increase productivity. Tajikistan’s economic situation, however, remains fragile due to the uneven implementation of structural reforms, weak governance, and the burden of external debt. Servicing of the debt, owed principally to Russia and Uzbekistan, required as much as 50% of government revenues in 2002, thus limiting the nation’s ability to address pressing development issues (CIA 2002).

Despite Tajikistan’s current economic problems, the country has considerable potential for development. The population is well educated, the land is very fertile and the country has demonstrated a capacity to produce competitively for international markets. The
country also has an established but idle industrial base with assets that can be deployed more efficiently and productively. This industrial base can serve as the basis for economic growth especially in the agriculture sector. The development of this potential will, however, depend on whether peace and security can be maintained throughout the country.

Turkmenistan

Turkmenistan is a largely desert country with intensive agriculture in irrigated oasis and huge hydrocarbon resources; the country has the fifth largest gas reserves in the world. The cornerstone of the Turkmenistan economy is energy. With 2.7 trillion m³ in proven and probable gas reserves and additional indicative reserves estimated at 14 trillion m³, Turkmenistan is the second largest natural gas producer in the former Soviet Union after the Russian Federation, and the fourth largest producer in the world. The country also has an estimated 1.1 billion tonnes of oil reserves (UNESCO 2000).

Turkmenistan has considerable potential for diversification into mineral resource-based industries. However, agriculture still predominates, accounting for 10% of GDP and 44% of employment. Turkmenistan is among the top 10 cotton producers in the world. Other major crops include grains, vegetables, and fruits. Natural gas, oil products and cotton account for 84% of exports. The main imports in 1997 were machinery and metalwork (43%), processed food (19%), industrial chemicals (11%) and non-food consumer products (11%). Real GDP declined by 30% in 1993-1995 and by 3% in 1996. In 1997, GDP fell further 26%, reflecting the combined effect of deep declines in exports of gas (73%) and cotton fibre (52%), tempered by a 34% growth in the domestic sector buoyed by the increase in cotton and wheat production and a boom in the construction industry.

The underlying fiscal position has weakened markedly over the years, as budget deficits were avoided mainly through expenditure compression, implicit taxes and subsidies. Credit policy has been expansionary, with large directed credit programmes and enterprises facing lax budget constraints. Inflation averaged roughly 1,800% in 1994, 1,000% in 1995, 450% in 1996, and 20% in 1997. From 1993 to 1995, wage adjustments lagged far behind inflation, and real minimum monthly wages declined by an estimated 80%. During 1996-1997, a series of wage increases raised average real wages by 84%, but only to two-thirds of their 1994 levels. Per capita income (970 USD in 1995, 870 USD in 1996, 630 USD in 1997, and 690 USD in 1999) is now significantly below the Former Soviet Union (FSU) average.

Economic reforms have lagged in Turkmenistan compared to other FSU countries. In November 1993, Turkmenistan introduced its own currency, the manat, and established a dual exchange rate system with an official rate used for all transactions related to gas exports, and a commercial rate which was substantially higher. From 1995-1998, the government took some steps towards a market economy. It removed price controls on most consumer goods, privatised most micro or small enterprises and trade and catering establishments, and initiated a leasehold programme to transfer agricultural land to private farmers. It also made several attempts at unifying the exchange rate, the last in April 1998. However, little progress was made in macroeconomic stabilisation or structural reforms. The government has recently formulated a ten-year production and investment plan that includes large investments in infrastructure and energy financed by foreign direct investment and the fiscal budget.

One half of its irrigated land is used for cotton production, making it the world’s tenth largest producer. Until the end of 1993, Turkmenistan had experienced less economic disruption than other former Soviet states because its economy received a boost from higher prices for oil and gas and a sharp increase in hard currency earnings. With an authoritarian ex-Communist regime in power and a tribally based social structure, Turkmenistan has taken a cautious approach to economic reform, hoping to use gas and cotton sales to sustain its inefficient economy. Privatisation goals remain limited. In 1998-2001, Turkmenistan suffered from the continued lack of adequate export routes for natural gas and from obligations on extensive short-term external debt. At the same time, total exports have risen sharply because of higher international oil and gas prices. Turkmenistan is the most closed, inward-oriented country in the region, relying heavily on its rich natural gas deposits. Turkmenistan economic statistics are state secrets, and other GDP and figures are subject to wide margins of error (CIA 2002). Turkmenistan has good long-term potential for development given its natural resource base. The large share of the gas sector in the country’s GDP indicates that even a modest upturn in gas output would imply growth in GDP.

International programmes and agreements related to water

The sharing of transboundary water resources in Central Asia has become one of the main problems regarding the relations between the countries of the region since gaining independence. Acknowledging that regional water resources management is one of the most important issues for sustainable development, in 1992 Water Management bodies of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan signed an agreement on cooperation in the joint usage and protection of transboundary water resources. The parties agreed
to coordinate their actions establish rules of water resources usage, to find joint solutions to ecological problems, and determined minimum sanitary conditions downstream. It was agreed not to alter the order of interstate water division and water quotas which existed under the USSR. In order to take coordinated decisions, the Interstate Coordination Water management Commission (ICWC) was established.

In March 1993, at the Kyzylorda conference on the Aral Sea, the heads of the states took the decision to organise the Interstate Council on the problems of the Aral Sea Basin. The ICWC with its associated divisions; the Center of Scientific Information (SIC) and the Basin's administration along the Amudarya and Syrdarya rivers, got the rank of organisations subordinate to the International Fund for saving the Aral Sea (IFAS) (Vel'muradov 2003, Kipshakbaev 2004, Sarsembekov at al. 2004).

The International Commission on Sustainable Development (ICSD), organised under the IFAS, became responsible for the coordination and control of regional cooperation regarding environmental protection and sustainable development of Central Asian countries. This included the development of the main principles and criteria for passing legislative acts concerning the problems of the stabilisation and improvement of the environment (Esenov & Mamieva 2003, Dzhalavov 2003, Aslov 2003).

A conceptual base for the improvement of water management and the ecological situation in the Aral Sea Basin was formulated in the joint declarations on the Aral Sea problems signed by the heads of Central Asian states in Kzyl Orda (1993), Nukus (1995), Almaty (1997), Ashgabat (1999), and Dushanbe (2002). These documents stress the necessity of normative-legal regulation of regional water resources management. These agreements became central to large-scale international programmes and projects on the Aral Sea problems, including those fulfilled with financial support of international funds and organisations. The most important projects include:

- A programme of concrete actions on the improvement of the ecological situation of the Aral Sea Basin (ASBP-1). The main priorities include the development of sustainable strategies of water resources management and the improvement of the methods of regional water resources management (Ryabtsev 2003, Aslov 2003).

- A GEF project entitled "Water and environmental management in the Aral Sea Basin", financed by the World Bank, and governments of the Netherlands, Sweden and Central Asian countries which focussed on the development of a national and regional water strategy, the improvement of dam safety, the monitoring of transboundary waters and the formation of public opinion promoting stability in Central Asia (Aslov 2003).

- Special United Nations programme on rational and effective use of energy and water resources of Central Asia (SPECIA). Within the framework of this, a diagnostic report was developed on the concepts of strategy and regional cooperation on rational and effective usage of regional water and energy resources. These documents are oriented around the improvement of a normative-legal base, the creation of an economic mechanism of water usage, and cooperation in achieving stable development of Central Asian countries (Koimdodov 2003).

- "Programme on concrete actions on improvement of ecological and socio-economic situation in the Aral Sea Basin for the years 2003-2010" (ASBP-2). The priority issues of the programme were approved by the regional heads of states at the meeting in Dushanbe in October, 2002. The programme guides the countries on the: continual coordination of the mechanisms of water resources management; rehabilitation of water resources objects; improvement of the use of water and land resources; struggle against desertification and natural disasters; implementation of water saving measures; strengthening of the legal base of cooperation in the context of sustainable development; and the improvement of socio-economic conditions for the population of the Aral Sea Basin (Koimdodov 2003, Esenov & Mamieva 2003).

The governments of the Central Asian countries, IFAS, and its institutions ICWC and ICSD, and with the help of international aid, are taking steps to resolve the priority issues of water distribution, ecological safety and economic development, taking into account the interests of each country. The creation of water-energy, transport and food consortiums, a concept which was approved by the presidents of states and members of the organisation "the Central - Asian Cooperation" in the summer of 2004, aims to develop integration processes (ICWC 2004).