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TITLE: SOVIET RIVER DIVERSION PROJECTS:  
PROBLEMS AND PROSPECTS

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## Soviet River Diversion Projects: Problems and Prospects

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### ABSTRACT

Transfer of water from north to south of the Soviet Union has been proposed for over 100 years. During the 1970s, designs were worked out for diversions in both the European and Siberian parts of the USSR. Construction on the European project began in 1985. All implementation work on water transfers was halted in 1986. The Gorbachev regime considers the projects a poor investment and believes other means are available to resolve southern water problems. Basic economic and ecological research on the transfer schemes has been directed to continue. Southern water supply problems are serious, particularly in Central Asia where the Aral Sea is drying rapidly. If alternative means of resolving the water situation do not meet expectations, a strong possibility, north-south diversion schemes may be resurrected before 2000.

### INTRODUCTION

Average annual river flow on the territory of the Soviet Union is estimated at over 4700 km<sup>3</sup>, second after Brazil. Unfortunately, distribution of the resource does not correspond with the distribution of population, agriculture, and industry (Fig. 1). Eighty four percent of river flow crosses sparsely inhabited, economically underdeveloped, and agriculturally limited northern and eastern regions. Only 16% is found in southern and western portions of the country, accounting for 75% of the population, 80% of economic activity, and over 80% of cropland (Micklin, 1987a). Thus, there has been long-standing interest in diverting a portion of river flow from the arctic drainage basin to the arid south.

Several other features make such a redistribution of water resources attractive. The headwaters of major northern and

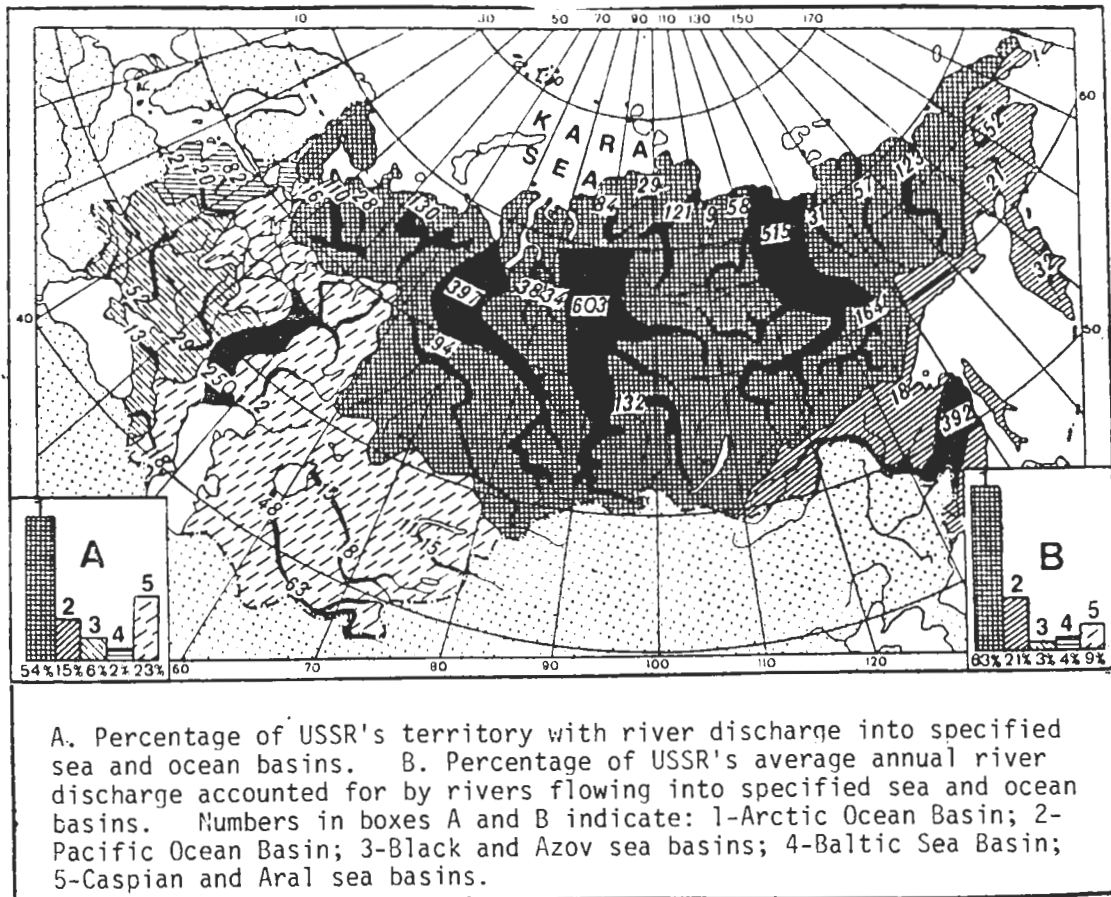


Figure 1. Mean annual flow of USSR rivers ( $\text{km}^3$ )

southern flowing rivers in European Russia are proximate and separated by a water divide of no more than 160 m. In Western Siberia, a structural trough with a maximum elevation of 120 m links the arctic and Aral Sea drainage basins. These favorable natural conditions simplify the engineering and improve the economics of interbasin water transfers. Finally, diversions would be intranational as opposed to international, easing but certainly not eliminating political problems.

#### DIVERSION SCHEMES

Large-scale redistribution of water resources from the north to the south of Russia was proposed as early as 1871 (Micklin, 1987a). Since the 1930s, Soviet engineers and water development planners have formulated detailed schemes for this purpose (Micklin, 1986). In the late 1950s and early 1960s, a proposal to channel  $40 \text{ km}^3/\text{yr}$  from northern European Russia into the Caspian Sea drainage basin was seriously contemplated. However, opposition to this scheme by water management and resource analysis experts on the grounds that it would do great ecological and economic damage to regions of water export led to its reappraisal and abandonment.

however, research and design work on north-south water transfers continued. The water supply situation in the south was worsening. Rapid expansion of irrigation and the filling of giant reservoirs substantially reduced river flow, inducing environmental degradation, particularly in the large southern seas of the USSR (Caspian, Aral, and Azov). Interbasin diversions were viewed as a primary means of alleviating these problems. In designing water transfer plans greater stress was to be placed on minimizing associated environmental damage.

The 1970s was a period of intensive development of water redistribution plans (Micklin, 1986). By the end of the decade, detailed designs had been formulated for both the European and Siberian parts of the country (Fig. 2; Table 1). The lead design agency (Soyuzgiprovdokhoz = All-union institute for water management planning and design for diversion and redistribution of the waters of northern and Siberian Rivers) and head organization for environmental validation (the Institute of Water Problems) contended that the schemes would not cause unacceptable environmental harm. This claim was largely based on the results of impact assessment studies conducted between 1976-80 by more than 120 agencies. The basic designs underwent scrutiny by a Government commission during the early 1980s and this resulted in some minor revisions. By the end of 1984, construction on the first stage of first phase European diversions (5.8 km<sup>3</sup>/yr) received governmental approval and work began on infrastructure facilities (access roads, concrete plants, workers' housing, etc.). First phase Siberian transfers (27.2 km<sup>3</sup>/yr) were undergoing detailed engineering design; their implementation appeared but a few years away.

#### CANCELLATION AND ITS AFTERMATH

However, after Michael Gorbachev assumed Soviet leadership in early 1985, the fortunes of the diversion projects waned rapidly. The transfers had been periodically attacked during the 1970s and early 1980s by scientists, writers, and others from northern areas of proposed water export who alleged they would cause severe ecological, economic, and socio-cultural damage to their regions (Micklin, 1986, 1987a). But expressions of public doubt had been discouraged for several years as the projects moved closer to implementation. By summer 1985, public criticism was again permissible and probably officially encouraged.

Subsequently, the schemes were bitterly attacked in the Soviet popular media by a group of Russian national writers and a number of prominent scientists, including several academicians (Zaligin, 1985; Lemeshev, 1985; Aganbegyan et al., 1986). In August 1986, a decree of the Communist Party and Soviet Government ordered a cessation of planning

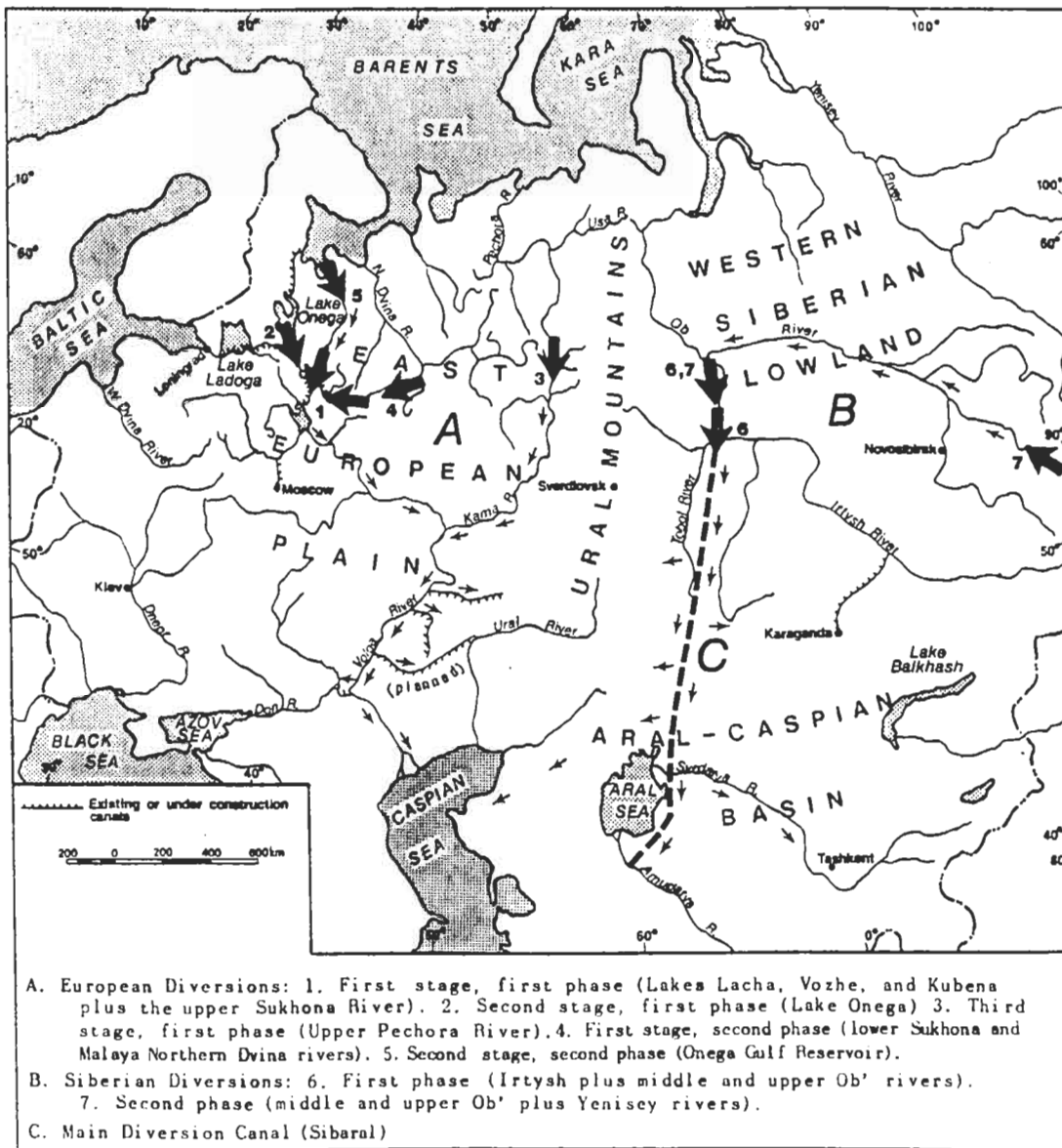


Figure 2. USSR river diversion projects

and construction on the European project and a halt to further design refinement for the Siberian undertaking ("V tsentral'nom...", 1986; Pravda, 1986). However, research on the scientific problems associated with interbasin water redistribution, stressing ecological and economic concerns, the employment of contemporary economic-mathematical methods, and the analysis of both domestic and foreign experience in the water transfer field, was directed to continue.

Why the sudden reversal of policy? Excessive costs compared to expected benefits was the dominant factor (Micklin, 1987a). Gorbachev and his advisors, with their strong orientation to efficiency, view the projects as a misuse of scarce resources. In their view, cheaper, sim-

Table 1. Characteristics of Soviet river diversion projects

Stage/phase (numbers refer to Figure 2)	Water source	Average annual diversion (cubic-km.)	Notes
EUROPEAN SCHEMES			
1st stage, 1st phase (1)	a. lakes Lacha & Vozhe	1.8	1. Construction begun on 1st phase in 1985 with completion by 2005. Project halted in 1986. Further design and construc- tion postponed indef- initely. Ecological and economic re-evalu- ation ordered. Project and proponents bit- terly denounced in popular media.
	b. Lake Kubena & upper Sukhona R.	4.0	
1st stage total		5.8	
2nd stage, 1st phase (2)	Lake Onega	3.5	2. Construction orig- inally set for early 21st century. Post- poned (note 1).
3rd stage, 1st phase (3)	upper Pechora R.	9.8	
2nd and 3rd stage total		13.3	
First phase total		19.1	
1st stage, 2nd phase (4)	Lower Sukhona & Malaya Northern Dvina rivers	10.2	3. Construction poss- ible in 21st century (note 1).
2nd stage, 2nd phase (5)	Onega Gulf reservoir	37.7	
Second phase total		47.9	
European diversions total		67.0	
SIBERIAN SCHEMES			
1st phase (6)	a. Irtysh River at Tobol'sk	17.0	4. Design work on 1st phase nearly com- pleted by 1986. Con- struction seemed im- minent. Project halted in 1986 for re-evalu- ation (note 1). Owing to severe water prob- lems in Central Asia, local people are plea- ing for its restor- ation. 2nd phase per- haps for next century.
	b. Ob' River at Belogor'ye	10.2	
First phase total		27.2	
2nd phase (7)	Ob' River at Belogor'ye (with possible compensation from Yenisey River)	32.8	
Siberian diversions total		60.0	

pler, and shorter term measures are available to reach the goal of diversions: improvement of water supplies and agricultural production in southern regions. A major campaign to reduce water waste, primarily in irrigated agriculture but also in industry and the municipal sector, is underway ("V tsentral'nom...", 1986). It is contended that water use efficiency can be raised sufficiently, for example through reconstruction of irrigation facilities, more finely tuned applications of water to crops, and institution of a meaningful water pricing structure, to "free" sufficient water to meet legitimate needs (Micklin 1987b; Lemeshev 1985). Dry farming techniques (e.g. fertility enhancement, erosion control, snow retention, crop rotation, and shelterbelt planting) are also being promoted as

means of improving agriculture in the arid south without irrigation (Aganbegyan et al., 1986).

Another argument against the projects is the allegation that Soyuzqprovodkhoz and the Institute of Water Problems were thoroughly biased toward implementation and even engaged in collusion and falsification of data to promote the projects (Leybovskiy, 1987; "Ecology. Economics. Morality," 1987). Purportedly, costs were underestimated and benefits exaggerated, criticism from outside experts ignored, and efforts made to prevent outside review and to stifle public debate. For example, cost of the first phase of the larger Siberian transfer, was estimated by Soyuzqprovodkhoz at 31 billion rubles (Micklin, 1987a). Critics claim it would be at least 45 and likely closer to 100 billion rubles (Reymers, 1987). Although such procedures were standard practice in the past, in the era of glasnost' (openness), they have become unacceptable.

Concern that the potential negative environmental, economic, and socio-cultural consequences of the projects have not been adequately studied has also been given as a major reason for stopping implementation (Micklin, 1987a; "Ecology. Economics. Morality," 1987). The August 1986 decree cited the need for further study of the economic and ecological consequences of the projects as a prime reason for their suspension ("V tsentral'nom...", 1986). However, it must be remembered that a major research effort was made between 1976-80 to forecast potential significant environmental impacts. Apparently serious and credible studies revealed that there would be perceptible negative consequences from first phase European and Siberian diversions, mainly confined to northern regions of water export (Micklin, 1986). The contention was that these effects, overwhelmingly, would be of a local or regional nature and that national or international consequences would be non-existent or trivial. There would, of course, be substantial positive effects in southern regions of water import. Table 2 provides a listing and classification of major potential impacts.

The "official" public position of the Soviet government until the policy reversal was that potential negative consequences were not of sufficient magnitude to forego implementation of the projects. Indeed, specters of diversions causing global weather changes invoked by Western writers were rejected by Soviet experts as absurd. Recently, the very same contention has been made by commentators in the popular Soviet media as a primary reason for the projects' cancellation (Micklin, 1987a)!. Certainly, the potential adverse consequences are not inconsequential and deserve careful attention. A case can be made that the seriousness of environmental concerns was earlier understated whereas some key economic and socio-cultural prob-



Table 2: Potential impacts of Soviet river diversion projects

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- A. NORTHERN REGIONS OF WATER EXPORT (mainly negative effects) <1>
1. Flooding of, and raising of groundwater levels under, agricultural lands and forests by reservoirs {N,MI,L}
  2. Flooding of areas with fossil fuel extraction potential {N,I}
  3. Fishery damage from hydrobiologic alteration of rivers and their estuaries downstream from points of diversion {N,MI,L}
  4. Alterations in permafrost (mainly in Siberia) {IM,L}
  5. Improved drainage leading to reduction of swamps and waterlogging (chiefly in Western Siberia) {P,I,L}
  6. Damage to archeological, historical, and cultural resources from construction, flooding, and raising of groundwater levels (chiefly in European north) {N,I,L,C}
  7. Disruption of traditional ways of life and cultures because of influx of tens-of-thousands of construction workers into lightly populated areas {N,MI,S}
  8. New employment opportunities for local residents during construction phase {P,MI,S}
  9. Climatic changes in coastal zones of large reservoirs {N,I,L}
  10. Ice cover and associated climatic changes in estuaries of large arctic rivers affected by diversions (from reduced liquid and thermal inflow and altered flow regimes) {N,I,L}
- B. SOUTHERN REGIONS OF WATER IMPORT (mainly positive effects) <1>
1. Improved water supplies for irrigated agriculture, industry, and urban centers (particularly in Central Asia) {P,MI,L}
  2. Improvement of water and salt balance and biological condition of large southern seas (Aral, Caspian, Azov) {P,MI,L}
  3. Potential introduction of harmful aquatic species and diseases owing to connection of northern and southern drainage basins {N,MI,L}
  4. Preservation of traditional lifestyles among native Central Asians (rural, agricultural, large families) {P,MI,L}
  5. Net stimulus to economic development and growth {P,MI,L}
- C. NATIONAL CONSIDERATIONS <1>
1. Projects would require huge capital investment (minimum 50-60 billion rubles?) which might be used more productively elsewhere {IM,MI,L,C}
  2. Improvement of water and salt balance and biological condition of southern seas (particularly Aral) which could outweigh ecological damage from projects in northern regions {P,MI,L,C}
  3. Preservation of Central Asian political, economic, social, and cultural stability, much more likely with than without diversions, may outweigh damage from Siberian project {P,MI,L,C}
- D. INTERNATIONAL EFFECTS
1. Degradation of some fish species with international significance (e.g. Atlantic salmon) {N,I,L} <1>
  2. Effect on Caspian hydrology, salinity, and biology from European diversions has implications for Iran {U,L} <1>
  3. Very large diversions (200-300 km<sup>3</sup>/yr), discussed for next century, from arctic draining rivers could alter the ice pack in the marginal arctic seas (especially the Kara Sea) sufficiently to induce climatic changes that would reach beyond Soviet borders {N,MI,L,C}
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<1> Assumes implementation of only first phase European (19.1 km<sup>3</sup>/yr) and Siberian (27.1 km<sup>3</sup>/yr) transfers.

N = negative impact; P = positive impact; MI = major impact; I = impact;  
IM = indeterminate or mixed impact (i.e. both positive and negative);  
C = controversial impact (i.e. major dispute as to severity); L = long term impact; S = short-term impact

lems were largely ignored. However, it now appears environmental and other potential difficulties are being exaggerated, perhaps to lend further credence to the fundamentally investment based decision to stop implementation.

The campaign against river diversion schemes and did not end with their official suspension in August 1986. Indeed, attacks in the press and other popular media intensified

during 1987 ("Ecology. Economics. Morality," 1987; Leybovskiy, 1987; Zalignin, 1987). The Institute of Water Problems, its director G.V. Voropayev, and staff scientists directly and indirectly connected with the proposed diversions were particularly singled-out for criticism. The most vociferous "anti-diversionists" have attempted to force the Soviet Academy of Sciences to replace Voropayev, accusing him and other scientists at the Institute of incompetence, willful misrepresentation, and even of attempting to perpetrate "ecological crimes." The leaders of these efforts are the Russian national writers (e.g. Zalignin, Bondarev, Belov) and some highly placed scientists (e.g. Lemeshev; Academicians Yanshin and Golitsyn). The writers are adamantly opposed to the projects primarily because of the damage they foresee to the churches, cathedrals, monasteries, and medieval towns of the European north, the hearth of Russian culture. Clearly, opponents of the schemes fear they could be revived and are striving to put an end to even the modest basic research effort that is permitted under the 1986 decree. Their views, interpretations, and opinions related to the water transfer controversy are presented as the Gospel truth in the popular media.

Sadly, these critics have engaged in insulting personal attacks, gross exaggeration and misrepresentation, and the use of highly misleading and inaccurate information. The leading spokesman of the group opposed to water transfers is the reclamatonist-turned-writer Sergey Zalignin, editor of the widely read literary journal Novyy mir. He has played particularly fast and loose with the truth in order to strengthen the opposition's case (Zalignin, 1987). Among other errors, he grossly overstated the size of the planned first stage of European diversions, made completely unfounded accusations as to the mathematical validity of forecasts of the Caspian Sea's level made by experts at the Institute of Water Problems, and cited figures on the availability of water resources in a certain region of southern European Russia (Kuban river basin) that are physically impossible. Voropayev and others have attempted to set the record straight on these obvious distortions of fact but have had no success in obtaining corrections or retractions and little impact on the general public's perception of the situation (Voropayev, 1987; "Who made...", 1987).

#### THE FUTURE

Currently, Soviet river diversion projects are suspended with no plans for implementation in the foreseeable future. The continuing campaign against them, however, attest to the fear of opponents that they may well be revived. This concern is justified. Although too early to draw defin-

itive conclusions, various water efficiency measures being instituted in the southern portion of the USSR will probably fall well short of their goals (savings of 15-20% of withdrawals during the current 5-Year plan and more over the longer term)("V tsentral'nom...", 1986; Micklin 1987b; 1988). Additionally, a comprehensive program will be very costly; modernization of irrigation systems alone may easily run 95 billion rubles (Reymers, 1987).

Furthermore, the Soviet Union is facing a desperate water crisis in Central Asia (Micklin, 1987b; 1988). Largely desert but with a rapidly growing population (around 40 million in 1988), the region has an economy dependent on irrigated agriculture. However, huge consumptive withdrawals have exhausted local water resources. To make matters worse, the Aral Sea, a giant saline lake, is drying at a rapid pace owing to anthropogenic reduction of its inflow to near zero. The negative environmental impacts of this desiccation are numerous and severe. There is much local water waste and attempts are underway to correct this. But it is extremely doubtful regional water resources are sufficient to meet future economic and social needs and preserve the Aral Sea, no matter how carefully used. Central Asian writers and water management experts, silent for several years after the suspension of diversions, are again claiming the Siberian project is an absolute necessity to "save" the region from a catastrophe. Thus, the Soviet government may be forced to resurrect the scheme in the 1990s not only for water management but political and social reasons.

Even in the European USSR, where the water situation is much less strained, diversions again may be looked upon favorably. The Caspian sea, which consistently declined between the 1930s and late 1970s, has risen over a meter since, removing a primary argument for water transfers. However, the inevitable return of the Caspian to a recessionary phase could renew calls for supplementation of its water balance from northern rivers.

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