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On the Nature of Global Projects: Engineering, Politics, Philosophy etc.[1]

The more deserts we turn into gardens in blossom,
the more gardens in blossom will turn into deserts.
Nikolai Fedorovich Reimers, a zoologist

Introduction

In recent years, science and technology studies have been increasingly reproached for their neglect of philosophy and focus on historical and sociological case studies (see [Fuller, Lepinski 2014]). Can we consider science and technology in complete isolation from the philosophy of nature and social philosophy? Perhaps we can, but then the idea of science becomes expressly earthbound. Science as a social institution and a research method loses its specific epistemological status and becomes the business of a sect of eccentric persons, who claim generous state financing and honest taxpayers' blind trust for no good reason.

In this case, noteworthy is the fork that has become visible in STS. Two approaches to science and technology and, respectively, two concepts of STS themselves are becoming increasingly diverged. In the first, dominant form, STS appear primarily to be case studies of science and technology by historico-sociological methods, in which philosophy as a subject of research and a method finds itself in the periphery. Characteristic examples are the influential studies by David Bloor [Bloor 2011] or be Steven Shapin and Simon Schaffer [1985]. The second strategy proposes an analysis of epistemic, ontological, social and ethical problems of science being targeted particularly at finding a new STS philosophy. This line was represented, among other things, in the textbook by Sergio Sismondo [Sismondo 2010] as well as at the international conference *Social Philosophy of Science: Russian Prospects* (2014, Moscow) in the papers by S. Fuller, I. Hamati-Ataya, R. Harre, and the writer of these words [Kasavin (Ed.) 2014]. In this context, the question was posed whether the holistic ontology of science and philosophy of nature (from naturalistic pantheism to Russian cosmism, Marxism, and A.N. Whitehead) were relevant for STS.

It is quite probable that the opposition of technocratic and humanist or naturalistic and sociocultural trends reflects the polarization of STS concepts on philosophical grounds. Which understanding of nature does one assume within STS: mechanicism or organicism, materialism or vitalism, atomism or holism, self-organization or an externally controlled system (creationism), etc.? How is sociality understood within a

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given STS concept? How do sociality and culture, the social and the natural, the collective and the individual, the spontaneous and the conscious, and history and the present correlate in social development? These questions actualize the widely known ontological turn, and the answers to them bring to light explicit and implicit prerequisites of research, making it possible to grope points of crisis and growth.

Reportedly, Thales stated that water was the ultimate underlying substance of creation, the universal substance of things. If we recall the significance that space science ascribes to the search for water on the Moon and Mars, we will see that water, if not a universal substance, is at least an inevitable condition of (organic) life. Water has always been the unique factor that both creates and resolves the most urgent problems of humankind. The Roman aqueduct is far from being the first hydraulic engineering facility known from history. For example, the Jawa dam, the remains of which British archaeologists discovered in Jordan in the 1970s, had been built to cope with unpredictable freshets of the Tigris and Euphrates rivers before the arrival of ancient Ammonites and is dated to 3000 BC (see [Helms 1977, 21–35]). Water as a threat, as a transport channel, as an agricultural and energy resource, and as a condition for nutrition and hygiene has at all times made the regulation of water flows perhaps an even more urgent engineering task than the regulation of financial flows in the modern economy. Just like D. Mackenzie [Mackenzie 2006] made financial markets an STS subject, hydraulic engineering and hydraulic melioration can exhibit unexpected contexts in interaction between science, technology, and society.

In this respect, the important role of philosophy in STS does not cancel the necessity of case studies. Especially importantly, however, the researcher should focus on a paradigm case when choosing the subject of a case study. If it can be represented as a crossroads of mainstream social interests, it can be elevated to the scale of a historic event the social and worldview effect of which cannot be overstated [Kasavin 2014b]. In our case, this is a phenomenon affecting the deepest layers of Russian reality; hence, we can call it global. We mean projects of high technical complexity and political–economic significance. Equally important is their relation to worldview programs and universals and to national self-awareness. The totality of these aspects largely characterizes great hydraulic-engineering projects of Peter the Great's epoch. The complexity of such projects requires not so much mathematical calculation as the intensification of the philosophical, critical–reflective component in analyzing interrelations between science, technology, and society.

Megaprojects of Peter the Great

"A rabid projector," a historical figure whose imagination stirs him into undertaking the most unbelievable projects, is the image often associated with Peter the Great. Indeed, in his autocratic delirium, he would rear Russia, "cutting windows" outward from the already large country. In reality, however, his projective activity combined a large-scale utopia with a specific practical goal. Peter was always inspired, among other things, by what we could call today “geopolitical infrastructure project planning.”

In the Petrine Russia at the turn of the 17th–18th centuries, hydraulic engineering was inspired by two major factors. Peter the Great proclaimed the development of science and technology a state priority, created educational establishments, and stimulated printing. In 1714, he established the Kunstkamera (a museum of natural history and engineering) and the State Library, which became the basis for the future Library of the Russian Academy of Sciences. The image of Holland with its endless water arteries (Peter had begun his foreign education there) flew in his head. This was oppressed by his initial defeats in wars designed to solve the most important economic tasks, to obtain free access to the Black and Baltic seas (see [Smirnov 1946; Pokrovsky 1911]). For example, the Russo-Turkish wars of the late 17th and the early 18th centuries, which resulted in surrendering previously seized Azov (the Treaty of the Pruth, 1711), not only failed to ensure access to the Black Sea for Russia. That defeat also did not allow Peter to secure a footing even on the Sea of Azov and to create conditions for trade in the south of Russia. Experiencing simultaneous failures in the Northern War with the Swedish, Peter saw the necessity to organize regular transportation traffic between Russia’s southern regions, as well as between its south and north, the Baltic Sea (access to which was officially secured as late as 1721 by the Treaty of Nystad with Sweden).

Difficulties in foreign trade could partly be compensated for through activating the domestic trade turnover. The main “logistic structures” of that time were seas and rivers, because the risks and costs of land transportation were too high. This made Peter investigate the potentialities of internal river communications more thoroughly. The Russian writer Andrej Platonov (1999–1951) in his short novel *The Epifan Locks* described Peter’s plan in the following way:

> “The Tsar wants to create a solid water track between the Baltic Sea and the Black and Caspian seas to overcome the vast spaces of the continent to India, the Mediterranean kingdoms, and Europe. The Tsar plans this firmly. The insight for this comes from trade and the merchant estate, which nearly in full trades in Moscow and adjacent towns; and the country’s wealth is also in the interior of the continent, from where there is no way out except for through linking the great rivers by canals and sailing by them solidly from the Persians to St. Petersburg and from Athens to Moscow, as well as toward the Urals, to Lake Ladoga, to the Kalmuk Steppes, and farther” [Platonov 1966, 107–108].

This general idea envisaged two ways of its implementation. In his mind’s eye, Peter saw two possible projects: European and Asian. The former was to unite the Don and Volga basins and, thus, the Caspian and Black seas. This would make it possible to create transport arteries connecting southern, northern, western, and central parts of Russia. Later, upon conquering access to the Black and Baltic seas, Russia would become a unique intermediary for all surrounding countries: it would become more profitable to trade *through* Russia than *by circumventing* it. Peter decided to implement the idea of the Volga–Don Canal when wised up by the failed attempt of the Turks near today’s Volgograd. He shifted the construction site northward, to a place between the

Kamyshinka and Ilovlya, tributaries of the Volga and Don rivers. The work commenced in 1697. The contractor, to all appearances, was Colonel Johann van den Brekel, a Dutch engineer, but he failed. The construction was continued by the English engineer John Perry, who shifted it farther northward, to the intersection of Tula and Ryazan' oblasts, the region of the Ivan Lake and the district town of Epifan'. Its failure was predetermined by the initial error concerning the location of the Don River's head, wrongly attributed at that time to the Ivan Lake. The Big Book of Drawings (1627), an official source of the Pos Office Department, says, "The Don River ran from the Ivan Lake, about 30 versts from Dedilov, to Epifan'. The Shat' River ran from the same Ivan Lake and fell into the Upa River eight versts or more above the city of Tula." The idea of the Ivan Lake as the head of the Don River predetermined its exalted name, Don Ivanovich, in Cossack songs [Malecha 1960, 29]. Note that the very notion of *head* underwent different interpretations. The region of the Ivan Lake had indeed once been the head of the Don River, but by Peter's times it was no longer the Don's source; in other words, although this idea preserved its historical content, it was no longer of engineering significance.

Despite all difficulties, they managed to build the Canal of Ivan, which connected the headwaters of the Oka River through its tributary Upa with the Don. Reportedly, it was even navigable to an extent. This canal is Russia's first known experience of constructing a navigable hydraulic engineering facility. This generally unsuccessful experience was at the same time useful for the subsequent construction of the Volga–Don Canal near contemporary Volgograd.

Drang nach Osten, or the Amu Dar'ya Project

The Amu Dar'ya is one of the largest rivers: "Among European rivers, only two, the Volga and the Danube, are more copious than the Amu Dar'ya. It only slightly yields to the Nile. With respect to the swiftness of its current, however, the Amu significantly surpasses them" [Rubchikov 1948, 6]. In the 18th century, the waters of the Amu Dar'ya flowed from the spurs of the Pamir Mountains along the territory of the Khanate of Khiva (which included certain territories of modern Afghanistan, Uzbekistan, Kazakhstan, and Turkmenistan) and flowed into the Aral Sea. The Amu Dar'ya River was a trade route from the East to the West: works by Herodotus, Strabo, Pliny, and Marco Polo contain indications to this. the ancient Amu Dar'ya (the Arkes or the Oxus) was divided into numerous channels and branches, only one of which flowed into the Caspian Sea. Proceeding from this, researchers used to consider the western dry bed as a possible route from the Amy Dar'ya to the Caspian Sea [The History of the Peoples of Uzbekistan 1950, 42]. Some of them used to claim that, back in the 16th century, along that old bed, known as the Uzboy, the Amu Dar'ya had flowed into the Caspian Sea as well, supplying people with water and ensuring a water route to Europe.

According to the Khwarazm scientist Abu al-Ghazi (1603–1664),

> "all the distance from Urgench to Abu'l Khan was covered with auls, because the Amu Dar'ya, after passing under the walls of Urgench, flowed to the eastern slope of the mountain, where the river turned southwest to run westward and flow at Ogurdzhi (a settlement in the eastern Caspian basin, now an island.—*I.K.*) into the Mazandaran

> (Caspian.—*I.K.*) Sea. Both banks of the river up to Ogurdhzi were entirely arable lands, vineries, and gardens. In spring, the inhabitants used to leave for the mountains; and during the season of mosquitoes and horseflies, they would drive their herds to wells at a distance of one or two days' journey from the river, which they approached only when the insects disappeared. The entire country was very densely populated and was in blossom" (cited from [Glukhovsky 1893, 34–35]).

In turn, "Soviet archaeologists, using aerial photography, saw in the Sarikamysh Depression and in the ancient Amu Dar'ya delta a giant and branched network of ancient irrigation facilities, now dry and dead. They supplied water to ancient settlements, the traces of which are still clearly visible, and to large irrigated areas" [Murzaev 1973, 28].

Peter the Great took interest in the possibilities of using the ancient bed of the Amu Dar'ya River and in 1714–1717 sent, under the pretense of embassies, three expeditions to survey the eastern shore of the Caspian Sea, as well as the territory of the Khanate of Khiva, under the leadership of Prince A. Bekovich-Cherkassky (see [Nijazmatov 2010a]). Peter's instruction, in addition to the construction of fortresses in Krasnovodsk Bay and in the Uzboi region and the exploration of the Amu Dar'ya and water routes to the Aral Sea, particularly charged him with the following:

– "to persuade the Khan of Khiva to loyalty and allegiance through promising hereditary tenure to him, for which purpose guards will be attached to him";

– to ask him to send "his men (accompanied by two of ours) by the Syr Dar'ya River upward to the town of Irket' to survey for gold"; and

– "to ask him to give us ships and to send a merchant by the Amu Dar'ya to India and to order him to travel it over as long as vessels can go and then to go to India" [Nijazmatov 2010b].

It is obvious from the above that Peter was interested not so much in the irrigation of desert lands as in solving another global problem, discovering trade routes to the south, up to India (let us recall Columbus). No doubt, the development of a water route from the Caspian basin to Khiva, which opened up a way to Persia, India, and, through Kazakh *zhuzes*, to China, was an unprecedented task in terms of the boldness of the plan and the wealth of prospects. Yet in the 19th century, when Russia expanded its influence to the Khanate of Khiva, the vector of the problem changed radically. The irrigation of the territory where four-fifths of fertile lands were not used for agriculture despite friendly climatic conditions became the priority.

This was practically the origin of the idea of the Kara-Kum Canal, which became one of the largest megaprojects of the Soviet Union and perhaps the longest water artery in the world. This project combined innovative scientific developments and original engineering solutions; conflicting ideological stereotypes and philosophical ideas; the interests of Communist Party officials, administrators of science, builders, managers, and journalists; and the hopes and fears of the local population. This project can hardly be considered in absolute isolation from similar ideas of technonatural, not least of hydraulic engineering, reorganization of Russia at large.

"Comrade Platonov, Province Meliorator"

Special interest in global projects was characteristic of Andrej Platonov, influenced by Russian cosmism, which can partially be explained by his specific attitude to nature (see [Semenov 1989]). On the one hand, this was an "alchemical" and "anthropic" approach to nature in need of the human being to get rid of the blind chance and enjoy elevating development. Nature needs the human being as a method of its self-awareness and as an engineer who imparts reason to it with the help of machines and mechanisms. On the other hand, this was a naturalistic view on nature as a "fierce and beautiful world," into which the human being can fit harmoniously for self-realization as a specific part of nature (see [Mokhnatkina 2005]).

Working as a melioration engineer in his young years, Platonov solved practical problems of irrigation and draining and, at the same time, contemplated on the worldview significance of technology for the Russian village. His early publications were dedicated to melioration, climate regulation, and electrification projects. These were the above-mentioned *The Epifan Locks*, as well as *Electrification, Light and Socialism, The Motherland of Electricity, Extinct Ilyich's Lamp, Sampo, The Juvenile Sea,* and *Man and Desert*. In his letters to his wife and son from Voronezh, Tambov, and Turkmenia, as well as in his memos and journalism, Platonov provided an unnerving analysis of the economy of the Russian up-country. In the first place, he emphasized global tasks of melioration ("On the Liquidation of Catastrophes in Agriculture"). Terming the Kara-Kum Desert "the hot Arctic," Platonov wrote:

> "The task of socialist Turkmenian culture is not to respect clay ruins of the powerful ancient world or their study (although this task is also in our focus), but to develop the Kara-Kum industrially and agriculturally, and to create a great Turkmenistan oasis in one of the most sorrowful places of our planet" [Platonov 1990, 675].

In the belletristic form, this thought is expressed in "The Juvenile Sea": "'Comrade Bostaloeva,' Vermo said, 'let us cover the entire steppe, all Central Asia with lakes of juvenile water! We will freshen up the climate and raise millions of cows on the shores of the new water! I see this clearly!'" [Platonov 1990, 326].

In 1921–1926, the "province meliorator" Platonov developed an extensive front of activities in Voronezh Province under the growing threat of drought and famine. In a memo to the People's Commissariat for Agriculture, he wrote:

> "The attitude of the population to public ameliorative activities in Voronezh Province is very sympathetic everywhere. This sympathy is not limited at all to good attitude toward meliorators but runs farther, to free participation in the activities by labor, horse carts, and materials. The reason for this positive attitude is the acute economic need of the population for melioration facilities. In Voronezh Province, situated in the Don River basin, which is moistened by its few tributaries,

> the hydrologic conditions largely predetermined the entire structure of agriculture. The moment has long been ripe for widening the natural hydrologic framework, namely, for watering the steppes and plateaus at drainage divides, ensuring thus the appropriate use of lands remote from natural surface bodies of water; it is necessary to move the economic population deep into waterless territories, dispersing riverine settlements, which suffer from the remoteness of arable lands and strip farming. The presence of natural water bodies alone and the absence of artificial ones have created a stopper and a limit to the further advance of arable farming in our province. Mandatorily, any serious measure on the development and improvement of agriculture in our province should be based on and should begin with watering. Watering is the first and, hence, most important measure to recover and develop agriculture in the province. Watering is the basis for everything else. Peasantry itself, none better, accounts for this situation and, hence, assesses melioration activities exceptionally highly. At the same time, however, peasantry sees that the network of facilities performed at the expense of the government will not cover in full the need for such facilities because this number of facilities will be unable to conquer the waterless steppes; this is why it constantly increases the number of facilities at its own expense, using only our engineering personnel and partly funds (to purchase materials) and sometimes asking for means to pay partially for on-foot labor" [Province Meliorator Comrade Platonov 1999, 496].

However, despite his awareness of the need for irrigation, we should not rank Platonov among reckless propagandists ready to reverse rivers, build huge facilities, and, in general, irrigate and drain everything indiscriminately. On the contrary, he was wiser than many of "prominent specialists" and understood the necessity to "think globally, act locally" (the formulation of the Club of Rome). Here is what Platonov wrote at the same time in an article of 1924:

> "There exists the so-called water regime of a country, i.e., a certain turnover and order of its moisture turnover of rains, rivers, and ground waters. By their agriculture, humans invade this natural order of precipitation, runoff, and water distribution. Humans deforest woods, plow fallows and steppes, and think that this will change nothing. Yet the water economy of nature is a very delicate and sensitive entity… Man is a predator and a destroyer of nature. On our way to Communism, we should now not only use nature in all possible ways but also preserve it and repair it from the consequences of our management. The restoration and repair of nature are performed through so-called meliorations (cardinal improvements of lands)" [Platonov 1990, 653–654].

Platonov makes the quite particular and not very pompous melioration technology a matter of global social and philosophical significance. He views melioration not merely as hydraulic-engineering operations but as if with account for the Latin etymology and philosophical meaning of the term *meliorism* (designating weighted progressive development). Therefore (as is noted in the introduction to the publication of the archives of the People's Commissariat for Agriculture), Platonov's melioration activity becomes an important source for the formation of his worldview and creative attitudes.

In general, interest in hydraulic engineering and, broader, in scientific ecological topics is a constant in Russia's literary–philosophical thought. Personages of K. Paustovsky propose projects in the two major lines established by Peter the Great, in the

Caspian basin and on the Black Sea (*Kara-Bugaz*, *The Black Sea*). Despite their semifantastic character, they display features of both systemic technocultural planning and concrete scientific–technological insights. In particular, the writer and the meteorologist in *The Black Sea* discuss the causes of the Black Sea Bora (the local icy storm; from *Boreas*, the north wind) and propose a method of preventing it by driving a tunnel in the Varada Range, which separates Novorossiysk from Krymsk and creates a sharp change in pressure. Is it not the clue to the catastrophic flood in Krymsk 2012 (a typhoon in the Novorossiysk Bay or a Bora-type wave in the Adagum River)?

The novel by the Soviet writer Yuri Trifonov about the Kara-Kum Canal directly points to the worldview significance of hydraulic-engineering megaprojects: they express global shifts in consciousness; “People would argue about the steepness of slopes, about dams, about phrases, and about trifles, but these were essentially debates about the time and fate” [Trifonov 1985, 449].

The Kara-Kum Canal: The Technology of a Social Leap

Kara-Kum in Turkmen means black sand. However, there is no black sand there. Most likely, this name is due to the fact that 95% of Kara-Kum territory is covered with vegetation burned to blackness in summer. Respectively, Turkmens call the remaining 5%, sand barchans, Ak-Kum (white sand). According to another hypothesis, the name of this desert is symbolic: black means heavy, unfit for life. Turkmens and other peoples of Southern Cisaralia and Southeastern Ciscaspia live only near water. Agriculture used very little the desert territories, although the soil and weather are very favorable for it. People always dreamed that the waters of the Amu Dar’ya, a powerful river carrying rich sediment rocks, would turn the territory of Turkmenistan between the Sarikamysh Depression and the foothills of the Kopet Dag into another Egypt. Prospecting expeditions worked in the Kara-Kum Desert for many years, both before and after the establishment of Soviet power. The 19th–20th centuries saw many tens of engineering projects that implied the use of the old beds of the Amu Dar’ya and the basins of the Murgab and Tejen (Hari) rivers. The scientific discussions concerning the choice of the best option were exceptionally violent.

As a result, after 1925, the construction of the pilot Bassaga-Kerkinskiy Canal started, which was continued after WWII. In 1950, J. Stalin launched the construction of the Main Turkmen Canal, which was apologetically described by V.I. Rubchikov [Rubchikov 1948]. After Stalin’s death, both the name and the route of the canal were changed. The first stage stretched 400 km from the Amu Dar’ya to the Murgab and was completed near the city of Mary (before 1937, the ancient city of Merv). This was also reflected immediately by the same author et al., as if the previous version had not existed at all [Rubchikov, Vetrov 1959]. In reality, the discussion about different routes, routing methods, excavation techniques, logistics, environmental consequences, and even ideological basics of these or those technological solutions never ceased in the course of construction.

The Kara-Kum Canal in Fiction

The fact that this hydraulic engineering undertaking was not only routine construction but also a dramatic social collision in the life of many hundred thousand people is shown by Trifonov in his first novel *Slaking Thirst.* This novel was written between 1959 and 1963 following his numerous journeys to Turkmenia and was preceded by the publication of the collection of short stories and essays *Under the Sun* (1959).

Irrespective of its artistic merits, this novel created an influential sample of the perception of the construction of the Kara-Kum Canal in the epoch of the Khrushchev Thaw, as well as reflected the writer's personal situation and bitter social confrontation. The latter is shown through conflicts between the ideology of the 20th Congress of the Communist Party of the Soviet Union and routine party practices, discrepancies between engineering developments and regulations and practical construction experience, established and innovative construction methods, and technocratic and environmental concepts of nature, as well as through axiological collisions between personal profit and the public good and personal responsibility and social timeserving.

The key moment of the novel is choosing the right method of building the canal within limited funding and time pressure against the background of extreme climatic and living conditions. The designers proposed that soil be dug by 1-m^3 excavators and scrapers. When it was found out that this was inefficient in barchans, the builders decided to use mostly bulldozers and flatten the canal's slopes accordingly. However, this contradicted the design. This was how the stands of builders and scientists, practitioners and theoreticians collided. Trifonov generalized this and other similar conflicts into confrontation between innovators and conservatives in society as a whole (in construction, in everyday and party life, and in the mass media). The line of the 20th Congress, which unmasked Stalin's cult of personality, against the background of the tenacity of Stalinism, forms the underlying worldview reason for all the conflicts. Eventually, advocates of new thinking win, while their opponents are put to shame: despite all the difficulties, the first phase of the canal was completed well ahead of time.

The Novel and Reality: On the Historiography of the Project

To understand how adequately the novel reveals the scientific–technological aspect of the project and its implementation, let us compare it with relevant scientific texts. The historiography of studies on the Kara-Kum Canal shows that publications by its witnesses covered the history of its construction most fully. For example, L.M. Grinberg notes that the original project implied the following division of labor between different mechanisms [Grinberg 1963, 44, 65]:

The project envisaged maximal mechanization for earthwork with the following load on individual types of machines:		
Bulldozers	D-157	5.184 million cubic meters, or 9.6%
Scrapers	D-147	21.797 million cubic meters, or 40.6%
1-m^3 excavators		5.092 million cubic meters, or 9.7%
Dredges		21.270 million cubic meters, or 39.6%
Manually		0.1949 million cubic meters, or 0.5%

The scanned fragment of the original text (which contains arithmetic errors: the earthwork of 5.092 million cubic meters, or 9.7% turns out to be smaller here than 9.6%, or 5.184 million cubic meters) shows that the main load in the project fell to scrapers, which shaped the project's rough bed, further improved by dredges. Clearly, the designers were guided by the known experience of canal constructions characterized by different hydrogeological conditions. As we see from the scan of Table 13, the main load in earthwork for the majority of canals in the Soviet Union before 1952 fell on excavators, scrapers, and dredging vessels, while bulldozers were engaged only in minor operations.

Table 13

Participation of different mechanisms in the construction of large canals

Name of construction project	Performance time (years)	Total earthwork (million cubic	Including percentage of total work content (%)				
			bulldozers	excavators	scrapers	Hydraulic mining means	Manually and construction aids
Kara-Kum Canal, phase 1	1954–1960	103.6	36.0	13.5	14.2	36.2*	0.1
Lenin Canal	1949–1952	55.8	7.1	44.0	36.1	11.7	1.1
Moscow Canal	1931–1937	153.7	—	35.0	0.8	5.1	58.3
Volgodonstroi	1947–1952	194.3	9.5	30.5	23.4	27.5	2.1
Kuibyshevgidrostroi	1952–1957	138.1	15.6	21.8	3.9	53.8	0.1

Therefore, the first phase of the Kara-Kum Canal really made it neceaasy to revise the project cardinally in terms of the use of excavation equipment. "Of significant interest is the use of bulldozers to excavate cuts with a depth of more than 10 m in barchan sand. With no previous experience in such bulldozer excavations, the rational method of such operations was found experimentally during the construction of the Kara-Kum Canal" [Grinberg 1963, 67]. Bulldozers proceed across and not along the track, climbing the slopes at an angle of 90° to the direction of the canal. Scrapers remove the remaining raised strips. The next table shows the actual effectiveness of bulldozers, which exceeds three to five times the productivity of other mechanisms and requires few minimal workers. At the same time, the cost of 1 m^3 of dug soil was decreased by 1.5–4.5 times.

Table 11

Productivity of mechanisms in developing cuts in sand soils with a depth of 6 m

Mechanisms	Number of workers engaged	Achieved productivity per month (thou. m^3)	Achieved monthly productivity per worker (thou. m^3)
Bulldozer D-157	2	25	12.5
Excavator E-1004	6	25	4.2
Scraper D-222	2	6	3.0
Dredge NZ-8	12	30	2.5
Dredge “Sormovskii”	32	60	1.9

Overall, as the analysis of design documentation shows, Trifonov reflected the engineering aspect of the construction project quite adequately. However, it is only the background against which the biographies of personages and, what is more important, ideological controversies develop. Here the author’s vision manifested its limited character.

The novel was written in a difficult period, when Trifonov, whose parents and relatives had been repressed before the war, agonized about the current situation (the last years of the cult of personality, the 20th Congress, and the “Thaw”). He did not continue the line of his successful novella *Students* (1951, the Stalin Prize), but, at the same time, he could not step over the bounds of schematic ideological conflicts, which are the driving forces of the novel *Slaking Thirst*. The figure of the journalist Korishev displays biographic features (the trauma associated with his repressed father, the dream about high literature, and the search for a place in life). His diffidence is emphasized by polar personages: innovators and enthusiasts, the project manager Ermasov and the engineer Karabash, stand against fogies and careerists, Khorev and Smirnov. Trifonov depicted a similar confrontation in the mass media environment as well, where discussions and compromises merely form the background for the rigid ideological line.

Under the “bulldozer breakthrough,” the builders perceive designers’ objections on slope gradients (slopes for bulldozers are flatter) as superfluous pedantry. Smirnov tries to persuade Karabash that “quality is compliance with the project,” but, for Karabash, the project design is merely a piece of paper, while deadlines are threatened. All the same, water will flood in after the bulldozers, and then dredging vessels will follow and deepen the bed. The Department of Water Resources is fulminating accusations against the builders; however, this canal is a construction project of All-Union significance and needs promotion, and the editor-in-chief of the local newspaper understands this. This is why the journalist Korishev is instructed to go to the canal route and write a favorable report. His article in support of the new construction methods will play the key role in the history of the canal's first phase.

It turns out that the voluntarism of the cult of personality is smoothly giving way to the voluntarism of the Khrushchev epoch. Distrust in intellectuals and in science (even applied, prospecting, engineering science) is characteristic of builders and party officials, of Stalinists and their opponents. Science is reserved for "men wearing hats and glasses." As for Karabash, the most important point for him is to start water running to the desert; he is obsessed with a great idea; anyway, one should be optimistic, he believes. Yet he forgets or is unable to calculate everything scientifically. Let bulldozers dig a flat profile, demonstrating their effectiveness. However, what is the use of effectiveness if the earthwork volume increases twice (Table 9) [Grinberg 1963, 51]?

Table 9

Main scope of work performed in constructing the first phase of the Kara-Kum Canal

Name of work	Unit of measurement	Scope of work	
		according to the project	actual work
Earthwork	million m^3	53.5	103.6*
Concrete and reinforced concrete work	thou. m^3	47.5	52.0
Stone paving and gabion masonry	—	71.6	63.0
Metal structures	t	1370	1410

*Including repetitive earthmoving.

This additional work goes to dredging vessels; the latter fall behind the water, which floods the banks and breaks through the dams (the novel depicts this as an emergency). High seepage and evaporation, soil salinization and bogging are among obvious consequences; in other words, the result is the inefficient use of water and environmental damage. Yet could the builders avoid this if they had observed the project? There is no unambiguous answer to this question. Note that the project was imperfect originally (the volumes of concrete and asphalt–concrete work of the first and second phases are insignificant; the slopes are not strengthened). According to the modern requirements, to exclude all negative consequences, water should go through a concrete or even plastic pipe. Note, however, that this would have required different costs and times, and, most likely, the canal would have never been completed. As a result, the Southern Kara-Kum Desert would not have had an irrigation and navigable artery with a length of 1100 km supplying water to ground waters and the basins of the Murgab and Tejen rivers. As for the dried up Aral Sea, refilling the evaporating salt lake with freshwater from the Amu-Dar'ya would have been prodigal, especially with account for the fact that the present Aral Sea is outside Turkmenia.

Notwithstanding all its negative consequences, the Kara-Kum Canal project triggered Turkmenistan's modernization, owing to which it is now a large gas producer and the world's fourth in explored natural gas reserves. Hundreds of thousands of Turkmens have turned from "hoers" into workers of different specialties. Conditions have been created to develop agriculture, navigation, fishery, and tourism. After its separation from the Soviet Union, Turkmenistan is the only country in the world that allocates funds for free electric energy, water use, and gas consumption; utility and transport costs are nominal; and by average remuneration, Turkmenia is ahead of Tajikistan, Kyrgyzstan, and Moldova and is approaching Armenia.

The Paradox of Megaprojects

Scientific–technological projects like the Kara-Kum Canal actualize the "long-term social planning–social engineering" controversy and make it possible to take a fresh look at individual developments of social engineers.

In 2003, the Danish researchers B. Flyvbjerg, N. Bruzelius, and W. Rothengatter published the book *Megaprojects and Risk: An Anatomy of Ambition* [Flyvbjerg, Bruzelius, Rothengatter 2003], which soon became widely known. They proceeded from the article by Z. Bauman [Bauman 1998, 2–3], in which he formulated the social–ontological metaphor of zero-friction society. According to Bauman, the most important feature of a megaproject is its metaphysical component, which represents it as "the great war for independence from space." In modern society, commodities, money, information, and even people move incredibly fast, covering previously inaccessible distances. The Danish authors show that all this owes to infrastructure megaprojects, the economy of which is sacrificed to politics. They also formulate the paradox of megaprojects. They always cost more than expected, and the demand for them is usually lower than planned. For all that, the practice of megaprojects continues as if nothing were wrong, as if neither the state nor private investors took any interest in the economy.

To specify these provisions, the authors together with their research team analyze thoroughly 258 transport infrastructure projects and identify the main characteristics of megaprojects. They are, first, inherent internal risks associated with a long-term planning horizon and the complexity of interfaces between the project and its contexts and various aspects. Further, planning, decision making, and management are polysubject processes against the background of conflicting interests. Third, the scope of a project, or the level of ambitions substantially changes with time, which changes the entire totality of its goals and objectives. Finally, statistical data show that such inaccurately planned events are incalculable, which results in an inadequate budget and a shortfall in profits. The authors believe that these drawbacks of megaprojects can be compensated for by more adequate information about the project environment and more advanced methods of calculation, planning, forecasting, and control.

Indeed, many large-scale projects are based not so much on thorough calculations and their scientific and humanitarian expertise as on voluntarist decisions. One can trace this over the entire history of the Kara-Kum Canal, which was launched at Stalin's pleasure in one place and then, after his death, was transferred to another. It appears that the Danish scientists reinvented the wheel! From now on, if one follows their method, the number of problems will substantially decrease. For different types of infrastructure projects, the Danish authors propose a specific cost overrun coefficient, derived from an empirical generalization. What does it mean? If today we calculate project costs as being **x**, then, for the sake of optimization, we must multiply this **x** by a certain coefficient **n**. However, if we increase the costs in this way, this will mean that we have calculated them as being **xn**. Should we further multiply this sum by another coefficient $\mathbf{n}_1$ based on the results of a subsequent cost examination by another group of experts, and so on indefinitely? Is the second calculation better than the first one because it accounts not for real current expenditures but for the activity of an additional group of experts, in this case, the statistical calculations of the Danish authors? What is the use of accounting beforehand for the imperfection of long-term planning if this imperfection is fixed purely statistically, while its causes remain in place? Would it be better to use the tactics of small steps and to abandon megaprojects whatsoever?

If we assume the idea of social engineering and adaptive management as a universal method of making and implementing decisions in the sphere of social development, we have to agree that the best results were yielded by the construction of temples and palaces in the Middle Ages, when it took decades and even centuries and people had enough time to consider and update the plan. However, today the situation is changing. Is it possible to live in risk society without risking anything but merely adapting to the current situation *post factum* by minimizing the risks? Or, on the contrary, should we face risks with our visor raised, hoping that a heroic jump will bring us to the top of Mount Olympus?

Bauman's bright space metaphor clearly recedes into the background in the Danish researchers' concept: they ignore the fact that this idea specifies a particular picture of the world for their constructs and avoid philosophical speculations whatsoever. They view a megaproject merely as a large-scale and complicated project, the drawbacks of which can be accounted for using a certain calculation method. Even if so, we should draw a distinction between *megaprojects* and *global projects*. The idea of a global project has no direct bearing on the current globalization trend, which expands a certain model of society to entire humankind and, owing to this, unites societies of different types. The global project refers to the holistic understanding of social development, within which fragments of the human world (politics, the economy, and culture) integrate with one another. Such a project intertwines science and everyday life, traditions and innovations, history and geography, the spontaneous inhomogeneity and constructive purposefulness of development, national mentality and the spirit of an epoch. Global worldview changes underlie such projects and are their consequences. A global project cannot meet the criteria of calculability and efficiency, used to assess megaprojects, because it constitutes a unique project platform: it *creates conditions* to make individual projects *possible*.

Conclusion

What are the characteristics of a global project? First, it pursues not a particular goal but a “superobjective,” a supreme, often infeasible, goal. This happens because, second, it represents an event that meets the deep aspirations of the people, creates history, and outlines the future. It is not by chance that its scientific substantiation usually includes elements of a myth, utopic ideology, and a “national idea.” Third, global projects give preference to projection rather than to prediction; the ideal dominates over knowledge. Such a project works as the condition of knowledge: once planned, it already contains prospects of various studies and requires them. Fourth, global projects rest on “dialectical” social ontology: they place emphasis on the idea of the spontaneous inhomogeneity of development, which one can use to project “a social leap.” Finally, fifth, the technical parameters of global projects are complexity, the concentration of resources, high risks, and low payback. However, they should not be viewed, as opposed to megaprojects, as capable of optimization. Engineering assessments of a global project play an insignificant role for decision making.

In general, a global project is usually shaped as what can be called the Columbus problem. As is known, the Talavera Commission, summoned by Isabella of Castile to assess the project, was sufficiently competent within the knowledge of that epoch and, hence, issued a negative opinion. Note that it is unquestionable if we consider the Columbus project as a megaproject. However, Isabella, who paid less attention to technical details, managed to see the features of a global project in it. Of course, everything needed thorough calculations, and Columbus used all available knowledge and skills. Yet, today we know that he sought a country without knowing its whereabouts, the size of the Earth, and how to navigate in the ocean (how to reckon the longitude); he did not know whether he would be able to find this country and whether this would bring profit. As a result, he found a perfectly different country and never knew about this. Nevertheless, he did discover America, and Spain jumped to rank among the world’s wealthiest powers.

Note that everything could have happened differently, but Isabella risked only three small ships and about a hundred of sailors. In addition to risk, a global project should contain a chance for a colossal gain, incomparable with the costs. Turkmens were also lucky: the first and second phases of the Kara-Kum Canal paid off in full and began to earn profit four years after their completion in 1964 [Saryev, Hodzhamuradov, Grinberg 1982, 133].

References

1. Bauman, Z. (1998) Time and Class: New Dimensions of Stratification. *Sociologisk Rapportserie. № 7.* Department of Sociology. University of Copenhagen.
2. Bloor, D. (2011) *The Enigma of the Aerofoil. Rival theories in aerodynamics, 1909–1930.* Chicago: University of Chicago Press.
3. Flyvbjerg, B., Bruzeliu,s N., and Rothengatter W. (2003) *Megaprojects and Risk. An Anatomy of Ambition*. Cambridge: CUP.
4. Fuller, S., and Lepinski, V. (2014) *The Proactionary Imperative: A Foundation for Transhumanism.* N.Y.: Palgrave Macmillan.
5. Glukhovsky, A.I. (1893) *Pass of the water of Amudarja through its old bed into the Caspian Sea*. Sankt-Petersburg. (In Russian).
6. Grinberg, L.M. (1963) *Karakum Canal.* Aschhabad. (In Russian).
7. Helms, S.W. (1977) Jawa, Excavations 1975. Third Preliminary Repor. *Levant* 9. P. 21–35.
8. Kasavin, I., Ed. (2014a) Plenary Session. *Proceedings of International Conference "Social Philosophy of Science: Russian Prospects"*. Moscow November 18–19. Moscow.
9. Kasavin, I. (2014b) Interactive Zones: On the Prehistory of the Scientific Laboratory. *Herald of the Russian Academy of Sciences,* Vol. 84, No. 6. Pp. 456–464.
10. Mackenzie, D. (2006) *An Engine, Not a Camera: How Financial Models Shape Markets.* Cambridge: MIT Press.
11. Malecha, N.M. (1960) *The collection of vocabulary papers of the territory dialects of Ural kasaks.* Uralsk. (In Russian).
12. Mokhnatkina, Y.S. (2005) *The Philosophy of Nature in the works of M.M. Prishvin and A.P. Platonov.* Referat of the PhD dissertation, discipline VAK RF 10.01.01. Vladimir, Vladimir State University. (In Russian).
13. Murzaev, E.M. (1973) *The Years of Quest in Asia*. Moscow, Misl. (In Russian).
14. Nijazmatov, M. (2010a) A Quest for Consensus. Russian-hkhivin geopolitical relations in the XVIth – begin of the XXth century. Sankt-Peterburg, *Peterburgskoje Vostokovedenie.* (In Russian).
15. Nijazmatov, M. (2010b) *Russia and Central Asia. Politics and Practice of geopolitical relations (http://www.apn.su/publications/article22418.htm)*. (In Russian).
16. Platonov, A. (1966) *Selected Papers.* Moscow. (In Russian).
17. Platonov, A. (1990) *State resident.* Minsk. (In Russian).
18. Pokrovsky, M. (1911) *Russian History from Ancient Times.* Under the Participance of N.Nikolskij and V. Storozhev. V. III. Moscow (In Russian).
19. "Province Meliorator com. Platonov" (1999) According to the papers of the Ministry of Agriculture 1921–1926 гг. *"The State of Philosophers" of Andrej Platonov: problems of creativity*. Issue 3. Moscow, IMLI, «Nasledie» (In Russian).
20. Rubchikov, V., Vetrov, An. (1959) Water Highway in Karakums. *Ogonek.* Vol. 8. (In Russian).
21. Rubchikov, V.I. (1948) *Karakum Canal [Turkm. SSR] (The Buildings of new Stalin's five-year plan)*. Ashhabad, Turkmengosizdat (In Russian).
22. Sariyev, D., Hodzhamuradov A., Grinberg, A. (1982) *Karakum Canal.* Ashhabad (In Russian)
23. Semenova, S. (1989) *Overcoming of tragedy: "Eternal Questions" in literature.* M., P. 318–360. (In Russian).
24. Shapin, S., Schaffer, S. (1985) Leviathan and the air-pump : Hobbes, Boyle, and the experimental life. Princeton, N.J. : Princeton University Press.
25. Sismondo, S. (2010) *An Introduction to Science and Technology Studies.* Chichester, West Sussex: Wiley-Blackwell.
26. Smirnov, N.A. (1946) *Russia and Turkey in the XVI–XVIIth centuries.* V. 1, M. (In Russian).
27. *The History of people of Uzbekistan* (1950). L.: AN UzSSR. (In Russian).
28. Trifonov, Y.V. (1985) *Collected Works.* V. 1. M. (In Russian).