THE CONQUEST OF NATURE

> [The Indian people] have to choose whether they will be educated or remain ignorant; whether they will come into closer contact with the outer world and become responsive to its influences, or remain secluded and indifferent; whether they will be organized or disunited, bold or timid, enterprising or passive; an industrial or an agricultural nation, rich or poor; strong and respected or weak and dominated by forward nations. Action, not sentiment, will be the determining factor.
>
> M. VISVESWARAYA, engineer, 1920

> The Indian commitment to the semantics of socialism is at least as deep as ours to the semantics of free enterprise . . . Even the most intransigent Indian capitalist may observe on occasion that he is really a socialist at heart.
>
> J. K. GALBRAITH, economist, 1958

I

MAHATMA GANDHI LIKED TO say that 'India lives in her villages'. At Independence, this was overwhelmingly a country of cultivators and labourers. Nearly three-quarters of the workforce was in agriculture, a sector which also contributed close to 60 per cent of India's gross domestic product. There was a small but growing industrial sector, which accounted for about 12 per cent of the workforce, and 25 per cent of GDP.

The peasant was the backbone of the Indian nation, and of the Indian economy. There existed enormous variations in agricultural practices across the subcontinent. There was, for instance, a broad division between the wheat regions of the north and west, where women generally did not participate in cultivation, and the rice regions of the south and east, where women's work was critical to the raising of seedlings. Large parts of peninsular India grew neither rice nor wheat: here, the chief cereals were an array of drought-resistant millets. Besides grain, peasants grew a wide range of fruit crops, as well as market-oriented produce such as cotton and sugar cane.

These variations notwithstanding, everywhere in India agriculture was largely empirical, based on knowledge and traditions passed down over the generations, rather than on ideas from books. Everywhere it was chiefly based on local inputs. The water, the fuel, the fodder, the fertilizer; these were all gathered in the vicinity of the village. The land was tilled with a plough pulled by a pair of bullocks. The homes were built of wood and thatch fetched by hand from the nearby forests.

Everywhere, those who worked on the land lived cheek-by-jowl with those who didn't. The agriculturists who made up perhaps two-thirds of the rural population depended crucially on the service and artisanal castes: on blacksmiths, barbers, scavengers and the like. In many parts there were vibrant communities of weavers. In some parts there were large populations of nomadic pastoralists.

On the social side, too, there were similarities in the way in which life was lived across the subcontinent. Levels of literacy were very low. Caste feelings were very strong, with villages

divided into half a dozen or more endogamous *jatis*. And religious sentiments ran deep.

Rural India was pervaded by an air of timelessness. Peasants, shepherds, carpenters, weavers, all lived and worked as their forefathers had done. As a survey of the 1940s putit, 'there is the same plainness of life, the same wrestling with uncertainties of climate (except in favoured areas), the same love of simple games, sport and songs, the same neighbourly helpfulness, and the same financial indebtedness'.[1]

To the Indian nationalist, however, continuity was merely a euphemism for stagnation. Agricultural productivity was low; hence also levels of nutrition and health. About the only thing that was rising was population growth. From the late nineteenth century, as medical services expanded, the death rate rapidly fell. Consequently, since the birth rate remained constant, there was a steady rise in population. Between 1881 and 1941 the population of British India rose from 257 to 389 million. But (or hence) the per capita availability of food grains declined from an already low level of200 kilograms per person per year to a mere 150.

Almost from the time the Congress was founded in 1885, Indian nationalists had charged the British with exploitation of the peasantry. They resolved that when power came to them, agrarian reform would be at the top of their agenda. Three programmes seemed critical. The first was the abolition of land revenue. The second was the massive expansion of irrigation, both to augment productivity and reduce dependence on the monsoon. The third was the reform of the system of land tenure. Particularly in north and east India, the British had encouraged a system of absentee landlordism. In many other districts too, those who tilled the land usually did not own it.

While tenants did not have security of tenure, agricultural labourers had no land to till in the first place. Inequalities in the agrarian economy could be very sharp indeed. The forms of exploitation were manifold and highly innovative. Thus, apart from land tax, zamindars (landowners) in the United Provinces levied an array of additional cesses on their peasants such as *motorana* (to pay for the zamindar's new car) and *hathiana* (to pay for his elephants).[2] The landlord was prone to treat his animals and his vehicles far better than he did his labourers. Two weeks before Independence a progressive weekly from Madras ran a story about distress in rural Malabar. This profiled a large landlord who owned seven elephants, for which he needed some 25,000 kilograms of paddy. His own tenants, meanwhile, were given three days' ration for the whole week.[3]

The socialist elements in the Indian National Congress pushed the organization to commit itself to thoroughgoing land reform, as in the abolition of large holdings, the promotion of the security of tenants and the redistribution of surplus land. They also advocated an expansion in the provision of credit to overcome the widespread problem of rural indebtedness.[4]

But, as the nationalists also recognized, agrarian reform had to be accompanied by a spurt in industrial growth. The nation needed more factories to absorb the surplus of underemployed labourers in the countryside. It also needed factories to prove to itself that it was modern. To enter the comity of nations, India had to be educated, united, outward looking and, above all, industrialized.

In colonial times there had existed a sharp divide between factories owned by British firms and those owned by Indians. Jute, for instance, was largely in the hands of the foreigner; cotton textiles in the hands of the native. The Raj was frequently (and for the most part, justly) accused of deliberately discouraging Indian enterprise, and of distorting the tariff and trade structure to favour British firms. While some Indian capitalists were studiously apolitical, others had been vigorous supporters of the Congress. They naturally hoped that when freedom came, the biases would be reversed, placing foreign capitalists at a disadvantage.[5]

If India had to be industrialized, which model should it follow? To the leaders of the national

movement, 'imperialism' and 'capitalism' were both dirty words. As John Kenneth Galbraith pointed out, 'until recent times a good deal of capitalist enterprise in India was an extension of the arm of the imperial power – indeed, in part its confessed *raison d'être*. As a result, free enterprise in Asia bears the added stigmata of colonialism, and this is a formidable burden.'[6]

What, then, were the alternatives? Some nationalists wrote admiringly of the Soviet Union, and of 'the extraordinary use they have made of modern scientific knowledge in solving their problems of poverty and want', thus passing in a mere two decades 'from a community of half-starved peasants to well-fed and well-clad industrial workers'. This had been accomplished by 'eliminating the profit motive from her industries which belong to and are being developed in the interest of the nation'; by feats of engineering that had made rivers into 'mighty sources of electric power'; and by a system of planning by disinterested experts which had increased production nine-fold and where 'unemployment and anarchy of production are unknown'.[7]

Another much admired model was Japan. Visiting that country during the First World War, the prominent Congress politician Lala Lajpat Rai marvelled at the transformation it had undergone, moving from (agrarian) primitivism to (industrial) civilization in a mere fifty years. Japan, he found, had built its factories and banks by schooling its workers and keeping out foreign competition. The role of the state was crucial – thus 'Japan owes its present and industrial prosperity to the foresight, sagacity and patriotism of her Government'. Once as backward as India, Japan had 'grown into a teacher of the Orient and a supplier of all the necessaries and luxuries of life which the latter used to get from the Occident'.[8]

II

In 1938 the Congress setup a National Planning Committee (NPC), charged with prescribing a policy for economic development in a soon- to-be-free India. Chaired by Jawaharlal Nehru, the committee had some thirty members in all – these divided almost equally between the worlds of science, industry and politics. Sub-committees were allotted specific subjects: such as agriculture, industry, power and fuel, finance, social services and even 'women's role in planned economy'. The NPC outlined 'national self-sufficiency' and the doubling of living standards in ten years as the main goals. Planning itself was defined as 'the technical co-ordination, by disinterested experts, of consumption, production, investment, trade, and income distribution, in accordance with social objectives set by bodies representative of the nation'.[9]

From Japan and Russia the NPC took the lesson that countries that industrialized late had to depend crucially on state intervention. This applied with even more force to India, whose economy had been distorted by two centuries of colonial rule. As one NPC report put it, planned development upheld the principle of 'service before profit'. There were large areas of the economy where the private sector could not be trusted, where the aims of planning could be realized only 'if the matter is handled as a collective Public Enterprise'.[10]

Notably, the private sector concurred. In 1944 a group of leading industrialists issued what they called *A Plan of Economic Development for India* (more commonly known as the Bombay Plan). This conceded that 'the existing economic organization, based on private enterprise and ownership, has failed to bring about a satisfactory distribution of the national income'. Only the state could help 'diminish inequalities of income'. But the state was necessary for augmenting production too. Energy, infrastructure and transport were sectors where the Indian capitalists themselves felt the need for a

government monopoly. In the early stages of industrialization, they argued, it was necessary that 'the State should exercise in the interests of the community a considerable measure of intervention and control'. Indeed, 'an *enlargement* of the positive as well as preventative functions of the State is *essential* to any large-scale economic planning'.[11]

Now largely forgotten, the Bombay Plan gives the lie to the claim that Jawaharlal Nehru imposed a model of centralized economic development on an unwilling capitalist class. One wonders what free-market pundits would make of it now. They would probably see it as a *dirigiste* tract, unworthy of capitalism and capitalists. In truth, it should be seen simply as symptomatic of the *Zeitgeist*, of the spirit of the times.[12]

That spirit was all in favour of centralized planning, of the state occupying what was called the 'commanding heights' of the economy. Thus the Constitution of India directed the government to ensure that 'the ownership and control of the material resources of the community are so distributed as best to subserve the common good'; and that 'the operation of the economic system does not result in the concentration of wealth and means of production to the common predicament'. Within a month of the adoption of the constitution, the government set up a Planning Commission to carry out these 'directive principles'. Chaired by Nehru, the Commission included high Cabinet ministers as well as experienced members of the Indian Civil Service.

In the summer of 1951 the Planning Commission issued a draft of the first five-year plan. This focused on agriculture, the sector hardest hit by Partition. Besides increasing food production, the other major emphases of the plan were on the development of transport and communications, and the provision of social services. Introducing the proposals in Parliament, Jawaharla Nehru praised the plan as the first of its kind to 'bring the whole of India – agricultural, industrial, social and economic – into one framework of thinking'. The work of the Commission, he said, had 'made the whole country "planning conscious"'.[13]

The expectations of the Planning Commission ran high. As one columnist wrote, 'one drawback of democracy is that it works slower than other political systems. But the people of India will not tolerate undue delay in their economic advancement.'[14] After the first general election the urgency intensified. Critics from left and right lambasted the first five-year plan as lacking in vision and ambition. True, food-grain production increased substantially, but output in other sectors failed to reach their targets.[15]

While introducing the first plan, Nehru had said that 'it was obvious to me that we have to industrialise India, and as rapidly as possible'. That objective was given pride of place in the second five-year plan. Its drafting was the handiwork of Prasanta Chandra Mahalanobis, a Cambridge-trained physicist and statistician who was steeped in Sanskrit philosophy and Bengali literature – in sum, 'an awesome polyglot, the kind of man for whom Nehru was guaranteed to fall'.[16]

Mahalanobis was, among other things, the man who brought modern statistics to India. In 1931 he setup the Indian Statistical Institute (ISI) in Calcutta. Within a decade, he had made the ISI a world-class centre of training and research. He was also a pioneer of inter-disciplinary research, innovatively applying his statistical techniques in the fields of anthropology, agronomy and meteorology.

In February 1949, Mahalanobis was appointed honorary statistical adviser to the Union Cabinet. The next year he helped establish the National Sample Survey (NSS) and the year following, the Central Statistical Organization (CSO). These were setup to collect reliable data on changing living standards in India – on wages, employment, consumption and the like. The NSS and the CSO are two reasons why India has a set of official statistics more reliable than those found anywhere else in the

non-Western world.[17]

Such are the uncontentious aspects of Mahalanobis's legacy. Perhaps more important, and certainly more controversial, are his contributions to the theory and practice of planning. In 1954 Nehru committed his party, and by extension his country, to the creation of a 'socialistic pattern of society'. The same year, the ISI was asked by the government to study the problem of unemployment. Mahalanobis wrote a note on the subject, which seems to have impressed Nehru enough for him to assign the ISI responsibility for drafting the second five-year plan itself.

Mahalanobis took the task very seriously indeed. In the late summer of 1954, he set off for a long tour of Europe and North America. He had, he confessed, an 'inferiority complex about economic matters'. This trip abroad was thus educational – to improve his own knowledge about the subject – but also frankly propagandist. By cultivating foreign economists, he hoped to bring their Indian counterparts around to his own point of view. As he told a friend, 'at the back of everything is one single aim in my own mind – what effective help can we secure in making our own plans and in implementing them'.[18]

Mahalanobis first went to the United States of America, where he collected information on input–output coefficients, these maintained in a deck of 40,000 Hollerith punched cards. He talked to the man who had done the work (Wassily Leontief, a future Nobellaureate), before crossing the Atlantic to meet the dons of Cambridge. The 'most brilliant' of these was Joan Robinson, then just back from a trip to China (where she was 'much impressed by the progress they are making'.) She thought that the export–import sector in India needed more government control. Mahalanobis agreed, and in turn asked Joan Robinson to visit India as a guest of the ISI. This, he told her, 'might be of very great help to us because her support may carry conviction that our approach to Development planning is not foolish. She smiled and said – "Yes, I think I would be able to knock some sense into the heads of the economists in your country."'

Mahalanobis now crossed the Channel, to converse with the French Marxists. Then it was time to shift to the other side of the Iron Curtain. He reached Moscow via Prague, and was at once impressed by the 'amazing' pace of construction work: buildings far bigger, and built much faster, than any he had ever seen. He had long talks with Soviet academicians, who said that if India wanted 'to do any serious planning we must have the active help of, not scores, but hundreds of technologists and scientists and engineers'. Mahalanobis agreed, and invited them to visit his country, so urgently in need of 'specialists and experts in the economics of planning'.[19]

These travels and talks finally bore fruit in a long paper presented to the Planning Commission in March 1954. Here Mahalanobis outlined eight objectives for the second five-year plan. The first of these was 'to attain a rapid growth of the national economy by increasing the scope and importance of the public sector and in this way to advance to a socialistic pattern of society'; the second, 'to develop basic heavy industries for the manufacture of producer goods to strengthen the foundation of economic independence'. Other (and we may presume lesser) objectives included the production of consumer goods by both the factory and household sector, the increasing of agricultural productivity and the provision of better housing, health and education facilities.

The emphasis on capital goods was justified in two principal ways. The first was that it would safeguard this former colony's economic, and hence political, independence. The second was that it would help solve the pressing problem of unemployment. 'Unemployment is chronic because of [the unavailability of] capital goods', argued Mahalanobis; it occurs 'only when means of production become idle'. The quickest way to create jobs was to build dams and factories.[20]

Mahalanobis's draft plan was submitted to a panel of expert economists. With one exception, all

endorsed the emphasis on capital goods and the role of the public sector. To be sure, there were a number of specific caveats. Some economists urged a greater complementarity of agricultural and industrial production; others worried about where the funds for the plan would come from. Increasing taxes would not by themselves suffice, while deficit financing might lead to high inflation.

Table 10.1 – Sectoral outlays in the first two five-year plans

	Outlay in first plan		*Outlay in second plan*	
Sector	*Total**	*%*	*Total**	*%*
Agriculture and community development	372	16	530	11
Irrigation	395	17	420	9
Power	266	11	445	10
Industries and minerals	179	7	1075	24
Transport and communications	556	24	1300	28
Social services, housing, etc.	547	25	830	18

* In crores of rupees (1 crore = 10 million).

SOURCE: Compiled from A. H. Hanson, *The Process of Planning: A Study of India's Five-Year Plans, 1950–1964* (London: Oxford University Press, 1966), table 7, p. 134.

But, on the whole, the leading economists of India were behind what was already being called 'the Mahalanobis Model of Planning'.[21]

This model was, among other things, an evocation of the old nationalist model of *swadeshi*, or self-reliance. Once, Gandhian protesters had burnt foreign cloth to encourage the growth of indigenous textiles; now, Nehruvian technocrats would make their own steel and machine tools rather than buy them from outside. As the second plan argued, underdevelopment was 'essentially a consequence of insufficient technological progress'.[22] Self-reliance, from this perspective, became *the* index of development and progress. From soap to steel, cashew to cars, Indians would meet their material requirements by using Indian land, Indian labour, Indian materials and, above all, Indian technology.

Table 10.1 compares the sectoral outlays for the first and second plans. In proportional terms the sectors of power, transport and communications, and social services, retained broadly the same importance. The decisive shift was from agriculture to industry, this compounded by a decline in the importance of irrigation.

While the heavy industries would be owned by the state, there was still plenty of room for private enterprise. For in 'an expanding economy the private sector would have an assured market'. Their main contribution would come in the form of consumer goods, these to be produced by units large as well as small.[23]

A government resolution of 1956 classified new industries into three categories. Class I would

be the ‘exclusive responsibility of the state; these included atomic energy, defence-related industries, aircraft, iron and steel, electricity generation and transmission, heavy electricals, telephones, and coal and other key minerals. Class II would witness both public and private sector participation; here fell the lesser minerals, chemicals, pharmaceuticals, fertilizers, pulp and paper, and road transport. Class III consisted of all the remaining industries, to be undertaken ‘ordinarily through the initiative and enterprise of the private sector’.[24]

Would the Mahalanobis model succeed? Many Indians thought so, most Indians certainly hoped so. So did their sympathizers worldwide. Representative here are the views of J. B. S. Haldane, the great British biologist who was then planning to move to India and the ISI. When shown the draft plan by Mahalanobis, Haldane commented that

> Even if one is pessimistic, and allows a 15 per cent chance of failure through interference by the United States (via Pakistan or otherwise), a 10 per cent chance of interference by the Soviet Union and China, a 20 per cent chance of interference with civil service traditionalism and political obstruction, and a 5 percent chance of interference by Hindu traditionalism, that leaves a 50 per cent chance for a success which will alter the whole history of the world for the better.[25]

III

If Mahalanobis was the chief technician of Indian planning, then Nehru was its chief missionary. The prime minister believed that, in the Indian context, planning was much more than rational economics. It was good politics as well. While the plan was based on the work of economists and statisticians, to realize its goal the ‘people must have the sensation of partnership in a mighty enterprise, of being fellow-travellers towards the next goal that they and we have set before us’. Popular participation was the only way to make ‘this Plan, which is enshrined in cold print, something living, vital and dynamic, which captures the imagination of our people’.[26]

Planning was thus a ‘mighty co-operative effort of all the people of India’. Nehru hoped that the new projects would be a solvent to dissolve the schisms of caste and religion, community and region. Introducing the first plan to his chief ministers, he wrote that ‘the more we think of this balanced picture of the whole of India and of its many-sided activities, which are so interrelated with one another, the less we are likely to go astray in the crooked paths of provincialism, communalism, casteism and all other disruptive and disintegrating tendencies’. Introducing the second plan, he called it a ‘brave effort to fashion our future’, that will ‘require all the strength and energy that we possess’. He believed that ‘ultimately this is the only way to deal with the separatism, provincialism and sectarianism that we have to combat’.[27]

On the economic side, Nehru singled out two activities as providing the ‘essential bases’ for planning: the production of power and the production of steel.[28] At Independence, India had only two steel plants, both privately owned, which produced just over a million tones a year. This was inadequate for an expanding economy, more so one that had committed itself to the building of heavy industries.

The private sector was barred from starting new enterprises in steel, which, along with coal, shipbuilding, atomic energy and aircraft production, was deemed too important to be subject to the

profit motive. The forest belt that runs across central India was rich in iron ore and coal, and it had plenty of rivers too. At once a lively competition began between the states that comprised this belt, each seeking to have the first public-sector steel plant with in its borders. This was paralleled by a competition between the industrialized countries of the West, each of whom wanted the contract to build the first plant.[29]

The second plan had set a target of 6 million tonnes of steel. The output was needed to provide inputs to other planned industries. But it was also a way of promoting forced savings. As one economist famously put it, 'you can't eat steel'. While the second plan was being finalized, the Indian government signed three separate agreements for the construction of steel plants. The Germans would build one in Rourkela in Orissa, the Russians one in Bhilai in Madhya Pradesh, the British one in Durgapur in West Bengal. The Americans, much to their sorrow, had lost out. That the war-ravaged countries of Europe had grabbed two contracts was bad enough, that their hated Cold War rivals had taken the third was worse. Years later an American friend remembered how the decision that Bhilai was going to the Russians was communicated over the radio in tones of palpable sadness by the fabled broadcaster Ed Murrow.[30]

The Russians, of course, were delighted. Nikita Khrushchev visited Bhilai and called it the 'Magnitogorsk of India'. *Pravda* ran lavish photo features hailing Bhilai as a symbol of Indo-Soviet co-operation.[31] The Indians were more enthusiastic still. A Bengali chemist who worked in Bhilai recalled how his Russian boss had, over the years, become an intimate friend as well. When the time came for the foreign expert to leave, the Indian could not contain his tears. The Russian was stoic, but his wife had sympathetic drops tricking down her cheeks. For the bereft Bengali, those tears 'were nothing to me but the drops of the holy water of the Volga, which pervasively mingled with the stream of our Ganges, and inundated our fraternity and imperishable friendship'.

In Bhilai, Russian and Indian worked shoulder to shoulder, clearing the land, building the roads and houses, erecting the plant. Those who were part of this effort remembered it with warm affection. It was, recalled one participant, 'a frenzy without panic, a tempo with a plan. The construction team glowed with pride and satisfaction at the newborn plant they had brought to life, the operation team was anxiously eager to nurture it to its full stature . . . Each of us were helping build the future – a future one could almost see, touch, and feel.' Finally, in February 1959, under the benign eyes of the president of India, the first flush of molten iron came out of a blast furnace in Bhilai. All around there were tears of joy and rejoicing. Those who were there long remembered them as 'the most exciting moments of [their] life'.[32]

The Indian steel industry was described by a senior official as 'at once a school of technique and the mainspring of other industrial activities'.[33] In fact it was more. The steel factory was a living refutation of the belief that Indians were non-productive and pre-scientific – in a word, *backward*.

IV

In the economic modernization of India, large dams occupied a rather special place. They would, on the one hand, emancipate agriculture from the tyranny of the monsoon and, on the other, provide the electric power to run the new industries mandated by the five-year plans. Jawaharlal Nehru was enchanted by dams, which he called 'the temples of modern India'. His fascination was shared by millions of his country-men, who too came to venerate these towering new monuments built in mud and concrete.

Indian intellectuals greatly admired the Tennessee Valley Authority, the integrated project that was a cornerstone of Franklin Roosevelt's New Deal. But they also admired the massive multipurpose projects undertaken in the Soviet Union. In the 1940s, anticipating Independence, scientists and engineers made trips to America and Russia to acquaint themselves at first hand with how dams were built. They were deeply impressed with what they saw.[34] On either side of the Iron Curtain, these projects represented 'the triumph of science, technology, foresight and centralized government over politics, petty local authorities and powers, ignorance, superstition, and backwardness'. They represented, indeed, 'the salvation of the nation through rationality and strength'.[35]

Like North America and Russia, the subcontinent had numerous large rivers. Damming and taming these rivers would kill three birds with one stone; generating electricity, providing water for irrigation and preventing flooding. After a particularly lethal bout of flooding on the Godavari in the monsoon of 1953, a leading engineer wrote to a leading politician that this was a river

> with enormous potential for good. The destruction caused by floods of this year has, however, demonstrated that if these flood waters are not harnessed for beneficial use, they will constitute a potential threat to the well-being of the people. Properly conserved, these flood waters will satisfy all the needs of the Godavari basin and leave ample reserves, which integrated with the Krishna waters will enable irrigation and power benefits to be extended right down to Madras and further south . . . No effort should therefore be spared in harnessing of the Godavari waters, in optimum integration with the Krishna, nor extraneous reasons permitted to delay or jeopardise their consummation.[36]

Here was a proselytizing technocrat speaking to the already converted. For while the Godavari was still undammed, most of the other major rivers had already come under the hand of man. Among the massive dam projects under way were those on the Mahanadi, Rihand, Tungabhadra, Damodar and Sutlej rivers.

In the mid-1950s the political scientist Henry Hart wrote a lyrical account of the transformation of 'New India's Rivers'. For Hart, these projects were 'the greatest of the monuments of free India'; to them 'men and women come, in a pilgrimage growing season by season, to see for themselves the dams and canals and power stations'.

In the book, there is a particularly fine description of the construction of the Tungabhadra dam. When finished, the dam would embody 32 million cubic feet of masonry; these laid at the rate of 40,000 cubic feet a day, every day for five years. The sheer scale could properly be conveyed only by means of analogy. 'Imagine the masonry in Tungabhadra Dam', wrote Hart, 'being laid as a highway, 20 feet wide, 6 inches thick. It would extend from Luck now to Calcutta, or from Bombay to Madras.'[37]

Without question the most prestigious of all these schemes was the Bhakra–Nangal project in northern India. Again, its scale is best narrated in numbers. At 680 feet, the Bhakra dam was the second highest in the world; only the Grand Coulee Dam, on the Colorado river, was higher. The concrete and masonry that would finally go into it was estimated at 500 million cubic feet, 'more than twice the cubic contents of the seven great pyramids of Egypt'. The project would generate nearly a million kilowatts of electricity, while the water from the reservoir would irrigate 7.4 million acres of land, this carried in canals for whose excavation 30 million cubic yards of mud and stone had to be removed.[38]

This project was a form of compensation for the refugee farmers from West Punjab, a substitute for the canal colonies they had left behind on the other side of the border. These peasants, predominantly Sikh, had 'a martyr-like yearning to recreate within their own lifetimes the prosperity of which they have been cruelly deprived'. Bhakra-Nangal gave them 'the field and the resources from which they can rebuild and resettle themselves'. In fact, it gave them more – for in addition to the water there was power, from which the Punjabis could, if they so chose, for the first time build an industrial future for themselves.

The Bhakra–Nangal project was described in minute detail in a special issue of the *Indian Journal of Power and River Valley Development*. The issue opened with a set off our most revealing photographs. The first showed the densely wooded site before work began – it carried the caption, 'River Sutlej at Bhakra in its primeval splendour – the site as it was'. The second showed crane-like structures in the water and a low bridge slung across the gorge: this was 'Exploratory drilling in river bed with drills mounted on pontoons – the first invasion'. The third photo, taken apparently in the dry season, showed hillsides by now quite bare, with trucks and bulldozers on the riverbed. Thus 'Concreting of the Dam begins – man lays the foundation for changing nature'. In the last photo, the dam had begun to rise, aided by machines of a shape and size never before seen in India. This was 'Excavation with heavy machines in progress in pit-area – the struggle with nature'.[39]

The men and women who worked at Bhakra were all Indian, with one exception. This was an American, Harvey Slocum. Slocum had little formal education; starting out as a labourer in a steel mill, he had risen to the position of construction superintendent on the Grand Coulee dam. Slocum joined the Bhakra team as chief engineer in 1952 and imprinted upon it his own distinctive style of working. Officers and workers of all levels were mandated to dress uniformly. Slocum himself was at the site at 8 a.m. sharp, staying there until late evening. A stern disciplinarian, he could not abide the sloth and inefficiency that was rampant around him. Once, when the telephone system broke down, he wrote to the prime minister informing him that 'only God, not Slocum, could build the Bhakra Dam on schedule'.[40]

In the first week of July 1954 Nehru visited Bhakra to formally inaugurate the project. As he flicked on the switch of the power house, Dakotas of the Indian air force dipped their wings overhead. Next he opened the sluice gates of the dam. Seeing the water coming towards them, the villagers downstream set off hundreds of home-made crackers. As one eyewitness wrote, 'For 150 miles the boisterous celebration spread like a chain reaction along the great canal and the branches and distributaries to the edges of the Rajasthan Desert, long before the water got there.'[41]

V

In the push to industrialize India, a key role had to be played by technology and technologists. Since his days as a student at Cambridge, Jawaharlal Nehru had been fascinated by modern science. 'Science is the spirit of the age and the dominating factor of the modern world', he wrote. Nehru wished that what he called 'the scientific temper' should inform all spheres of human activity, including politics. More specifically, in an underdeveloped country like India, science must be made the handmaiden of economic progress, with scientists devoting their work to augmenting productivity and ending poverty.[42]

At the time of Indian independence a mere 0.1 per cent of GNP was spent on scientific research. Within a decade the figure had jumped to 0.5 per cent; later, it was to exceed 1percent. Under

Nehru's active direction, a chain of new research laboratories was set up. These, following the French model, were established independently, outside of the existing universities. Within the ambit of the Council for Scientific and Industrial Research were some two dozen individual institutes. There was a strong utilitarian agenda at work, with scientists in these laboratories encouraged to develop new products for Indians rather than publish academic papers in foreign journals.[43]

An Indian scientist whom Nehru patronized early and consistently was the brilliant Cambridge-educated physicist Homi Bhabha. Bhabha founded and directed two major scientific institutions. The first was the Tata Institute of Fundamental Research in Bombay whose work, as its name implies, was aimed mostly at basic research. It had world-class departments of physics and mathematics and also, in time, housed India's first mainframe computer. The second was the Atomic Energy Commission, mandated to build and run India's nuclear power plants. This was handsomely funded by the government with an annual budget, in 1964, of about Rs100 million.[44]

Many new engineering schools were also started. These included the flagship Indian Institutes of Technology (IITs), five of which were inaugurated between 1954 and 1964. Like the new laboratories, the new colleges were intended to augment indigenous technical capability. Both Nehru and Bhabha were determined to lessen India's dependence on the West for scientific materials and know-how. They believed that 'if an item of equipment was imported from abroad, all one got was that particular instrument. But if one built it oneself, an all-important lesson in expertise was learnt as well'.[45]

VI

The industrial bias of Indian planning was tempered by a range of programmes promoting agrarian uplift. On the morning of 2 October 1952 (Mahatma Gandhi's birthday), the president of India inaugurated a nationwide series of community development programmes with abroad-cast over the radio. Fifty-five projects were launched across India that day, these funded jointly by the governments of India and the United States. Among the schemes to be promoted by community development were roads and wells, cattle welfare and improved methods of cultivation.

The projects were launched by ministers, chief ministers, and commissioners. These dignitaries helped remove earth for building roads and laid foundation stones for schools and hospitals. In Alipur village, twelve miles out of Delhi on the road to Karnal, Jawaharlal Nehru dug into the earth to help prepare a road. 'With verve and vigour he plunged into the work, having taken his jacket off.' His companion, the American ambassador, also carried some baskets of earth. Not everyone was as agile as these two. When a well-dressed official attempted to emulate the prime minister the villagers shouted '*Sar parl! Sar parl*' – meaning, 'Carry the baskets on your head, you fool, not with your hands!' Speaking to the villagers, Nehru said that community development would bring about a rural revolution by peaceful means, not, as in other places, by the breaking of heads.[46]

How did these schemes work in practice? Two years after they began, the anthropologist S. C. Dube studied a community development project in western Uttar Pradesh. He looked at the project from the viewpoint of the village-level worker (VLW), the government functionary mandated with taking new ideas to the peasants.

By Dube's account, these 'agents of change' certainly had energy and enterprise. They got up at the crack of dawn, and worked all day. Among their duties were the demonstration to the villagers of the merits of new seeds and chemical fertilizers. These were tried on sample plots, the peasants

looking on as the VLW explained scientific methods of dibbling. Different crops were sown, and different combinations of fertilizers used. The VLW also offered the villagers free *angrezi khad* (English manure) for use on their fields.

It appears that the peasants of the UP were somewhat ambivalent about the new techniques. Here is a conversation between the VLW and a farmer known only by his initials, 'MS':

VLW: What do you think of the new seed?

MS: What can I think? If the government thinks it is good, it must be good.

VLW: Do you think it is better than the local variety?

MS: Yes. It resists disease much better. It can stand frost and rain, and there is more demand for it in the market.

VLW: What about yield?

MS: I cannot say. Some people say it is more, others say it is not.

VLW: Some people say it is not as good in taste.

MS: They are right. It is not half as good. If the *roti* [bread] is served hot it is more or less the same, but if we keep it for an hour or so it gets as tough as hide. No, it is not as good in taste. People say that we all get very weak if we eat this wheat.

VLW: What is your experience?

MS: Many more people suffer from digestive disorders these days. Our children have coughs and colds. Perhaps it is because of the new seed and sugar cane. It may be that the air has been spoilt by the wars.

VLW: And what about the new fertilizer?

MS: They increase the yield; there is no doubt about it. But they probably destroy the vitality of the land and also of the grain.[47]

Indian peasants had mixed feelings about the new seeds and fertilizers. But they unambiguously welcomed fresh supplies of water. At the same time as S. C. Dube was studying community development in the UP, the British anthropologist Scarlett Epstein was living in Wangala, a village in southern Mysore lately the beneficiary of canal irrigation. Till the water came, this was like any other hamlet in the interior Deccan, growing millet for its own consumption. With irrigation came new crops such as paddy and sugar cane. These were sold outside the village for a handsome return. Paddy gave a profit after expenses of Rs136 per acre; sugar cane as much as Rs980 per acre. These changes in local economics fostered changes in lifestyle as well. Before the canals arrived, the residents of Wangala wore scruffy clothes and rarely ventured outside the village. But 'Wangala men now wear shirts and a number also wear dhotis; their wives wear colourful saris bought with money and they all spend lavishly on weddings. Wangala men pay frequent visits to Mandya [town], where they visit coffee shops and toddy shops; rice has replace dragi as their staple diet.'

These and other changes were made possible only by the extension of irrigation. As Epstein found, the coming of canal water was the turning point in the history of the village. Events of note, such as weddings, deaths and murders, were dated by whether they happened before or after irrigation.[48]

VII

Assured irrigation and chemical fertilizers increased agricultural productivity. But they could not solve what was a fundamental problem of rural India: inequality in access to land. Therefore, landless peasants were encouraged to settle in areas not previously under the plough. In the first decade of Independence, close to half a million hectares of land were colonized, principally from malarial forests in the northern Terai, the central Indian hills, and the Western Ghats. Previously these areas had been inhabited only by tribes genetically resistant to malaria. With the invention of DDT it became possible for the state to clear the forests. These lands were naturally fertile, rich in calcium and potassium and organic matter (if poor in phosphates). In any case, there was no shortage of peasants who wanted them.[49]

A second way of tackling landlessness was to persuade large landholders to voluntarily give up land under their possession. This was a method pioneered by a leading disciple of Gandhi, Vinoba Bhave. In 1951 Bhave undertook a walking tour through the then communist-dominated areas of Telengana. In Pochempelli village, he persuaded a zamindar named Ramchandra Reddi to donate a hundred acres of land. This encouraged Bhave to make this a country wide campaign, known as the 'Bhoodan movement. The saint trudged through the Indian heartland, giving speeches wherever he went. He must have walked perhaps 50,000 miles, while collecting in excess of 4 million acres. At first his mission was reckoned a success – like community development, a noble Gandhian alternative to violent revolution. But later assessments were less charitable. Like some other saints, Bhave preferred the grand gesture over humdrum detail. Critics pointed out that the bulk of the land donated to Bhave had never been distributed to the landless; over the years it had slowly returned to the hands of the original owners. Besides, much of the land that stayed under Bhoodan was rocky and sandy, unfit for cultivation. In few places were the intended beneficiaries organized to work the land they had been gifted. On balance, the Bhoodan movement must be reckoned a failure, albeit a spectacular one.[50]

A third way of ending landlessness was to use the arm of the state. Land reform legislation had long been on the agenda of the Congress. After Independence, the different states passed legislation abolishing the zamindari system which, under the British, had bestowed effective rights of ownership to absentee landlords. The abolition of zamindari freed up large areas of land for redistribution, while also freeing tenants from cesses and rents previously exacted from them.

Table 10.2 – Access to land in India, 1953–1960

Size class	*Percentage of holdings*		*Percentage of total area*	
(in hectares)	*1953–4*	*1959–60*	*1953–4*	*1959–60*
less than 1	56.15	40.70	5.58	6.71
1 to2	15.08	22.26	10.02	12.17
2 to4	14.19	18.85	18.56	19.95
4 to 10	10.36	13.45	29.22	30.47

more than 10	4.22	4.74	36.62	30.70

SOURCE: Nripen Bandyopadhyaya, 'The Story of Land Reforms in Indian Planning', in Amiya Kumar Bagchi, ed., *Economy, Society and Polity: Essays in the Political Economy of Indian Planning in Honour of Professor Bhabatosh Datta* (Calcutta: Oxford University Press, 1988)

After the end of zamindari, the state vested rights of ownership in their tenants. These, typically, came from the intermediate castes. Left unaffected were those at the bottom of the heap, such as low-caste labourers and sharecroppers. Their well-being would have required a second stage of land reforms, where ceilings would be placed on holdings, and excess land handed over to the landless. This was a task that the government was unable or unwilling to undertake.[51]

Even after a decade of planning, access to land remained very unequal. Table 10.2 indicates the percentages in five size classes of both the absolute number of holdings and the combined operational area of those holdings.

If we define those who own less than four hectares as 'small and marginal' farmers, and those who own more than four hectares as 'medium and large farmers', then Table 10.2 can be compressed into Table 10.3. This reveals a slight diminution in inequality, with a 3.6 per cent drop in the numbers of small/marginal farmers and a 4.6 percent increase in the land held by them. The operative word is 'slight'; so slight as to be almost imperceptible, and, in a democracy committed to the 'socialistic pattern of society', simply unacceptable.

Table 10.3 – Changes in land inequality in India, 1953–60

	Percentage of holdings		*Percentage of total area*	
Class of farmer	*1953–4*	*1959–60*	*1953–4*	*1959–60*
Small and Marginal	85.42	81.81	34.16	38.83
Medium and Large	14.58	18.19	65.84	61.17

VIII

The Nehru-Mahalanobis model emphasized heavy industrialization, state control, and ultimately, a subsidiary role for the private sector. Behind it rested a wide consensus – and not merely in India. That in a complex modern economy the state must occupy the 'commanding heights' was a belief then shared by governments and ideologues all over the world.

In the United States, purposive government intervention had brought the country out of the horrors of the Great Depression. In Britain, Keynesian economics had been energetically applied by the Labour government that came to power in 1945. An appreciation of the state as a positive agent in economic change was also heightened by the recent achievements of the Soviet Union. At the time of

the first war Russia was a backward peasant nation; by the time of the second, a mighty industrial power. Particularly impressive were its military victories against Germany, which had a far longer history of technological and industrial development. For the Western democracies, the feats of the Soviets only underlined the importance of the state direction of economic development.[52]

To be sure, there were dissenters. In the West there was Friedrich Hayek, who advocated a retreat of the state from economic activity. His ideas, however, were treated with benign – and sometimes not-so-benign – contempt. (He could not even get a position in the Department of Economics in the University of Chicago, being placed instead in the 'Committee on Social Thought'.) And in India there was B. R. Shenoy, the sole economist in the panel of experts who disagreed with the basic approach of the second five-year plan. As one commentator wrote, Shenoy 'appeared to be committed to laissez-faire methods in so doctrinaire a manner that no one, outside certain business circles, took much note of his criticisms'.[53]

In truth, Shenoy's arguments went beyond a mere belief in laissez faire. While he opposed the 'general extension of nationalisation on principle', his main criticism of the plan was that it was overambitious. It had, he thought, seriously overestimated the rate of savings in the Indian economy. The shortfall in funds would have to be made up by deficit financing, contributing to greater inflation.[54]

Another dissenter was the Chicago economist Milton Friedman. Visiting India in 1955 at the invitation of the government, he wrote a memorandum setting out his objections to the Mahalanobis model. He thought it too mathematical: obsessed by capital–output ratios, rather than by the development of human capital. He deplored the emphasis in industrial policy on the two extremes – large factories that used too little labour and cottage industries that used too much. As he saw it, the 'basic requisites' of economic policy in a developing country were 'a steady and moderately expansionary monetary framework, greatly widened opportunities for education and training, improved facilities for transportation and communication to promote the mobility not only of goods but even more important of people, and an environment that gives maximum scope to the initiatives and energy of farmers, businessmen, and traders'.[55]

Independently of Friedman, a young Indian economist had taken up one aspect of this critique – the neglect of education. The constitution mandated free and compulsory schooling for children up to the age of fourteen. But the sums allocated for this by the second plan, wrote B. V. Krishnamurti, were 'absurdly low'. He called for a 'substantial increase' in the allotment for education, the budget being balanced by an 'appropriate curtailment in the outlay on heavy industries'. Attention to detail was also crucial – to the enhancement of the social prestige of the schoolteacher, to higher salaries for them, to better buildings and playgrounds for the children. As Krishnamurti argued:

> A concerted effort on these lines to educate the mass of the population, specially in the rural areas, would undoubtedly have far-reaching benefits of a cumulatively expansionist character. This would greatly lighten the task of the Government in bringing about rapid economic development. For in a reasonable time, one could expect that the ignorance and inertia of the people would crumble and an urge to improve one's material conditions by utilising the available opportunities would develop. If this were to happen, the employment problem would take care of itself. The people of the country would begin to move along the lines of those in the advanced democratic countries such as Great Britain and Switzerland.[56]

If B. V. Krishnamurti had been a professor in the centre of power, Delhi, rather than a lowly lecturer

in Bombay, he might have got a hearing. In Friedman's case, his high position and prestige were offset by foreign economists of equal distinction but of opposing views. He was to them what B. R. Shenoy was to Indian economists – a lone free-marketeer drowned out by a chorus of social democrats and leftists.[57]

A critique of a different kind came from the Marxists. They thought that the Mahalanobis model gave not too little importance to the market, but too much. The second plan, they felt, should have mandated a thoroughgoing process of nationalization, whereby the state would not merely start new industries, but take under its wing the private firms already in operation. They wanted the working class to be involved with planning, on the model of the 'people's democracies' of Eastern Europe.[58]

Then there were the Gandhians, who provided a precocious ecological critique of modern development. In the vanguard of this 'early environmentalism' were two of the Mahatma's closest disciples, J. C. Kumarappa and Mira Behn (Madeleine Slade). Through the 1950s they pungently dissented from the conventional wisdom on agricultural policy. They argued that small irrigation systems were more efficacious than large dams; that organic manure was a cheap and sustainable method of augmenting soil fertility (when compared to chemicals that damaged the earth and increased foreign debt); that forests should be managed from the point of view of water conservation rather than revenue maximization (by protecting natural multispecies forests rather than the monocultural stands favoured by the state). These specific criticisms were part of a wider understanding of the world of nature. As Mira Behn wrote in 1949:

> The tragedy today is that educated and moneyed classes are altogether out of touch with the vital fundamentals of existence – our Mother Earth, and the animal and vegetable population which she sustains. This world of Nature's planning is ruthlessly plundered, despoiled and disorganized by man whenever he gets the chance. By his science and machinery he may get huge returns for a time, but ultimately will come desolation. We have got to study Nature's balance, and develop our lives within her laws, if we are to survive as a physically healthy and morally decent species.[59]

One modern technology the Gandhians had deep reservations about were large dams. They thought them costly and destructive of nature. But, as Indians were soon finding out, dams were destructive of human community as well. By the early 1950s reports began appearing of the sufferings of those displaced by dams. In the summer of 1952, when the Hirakud authorities issued eviction notices to the residents of the 150 villages the project would submerge, they met with stiff resistance. A reporter on the spot concluded that 'the prosperity of Hirakud will be built on the sacrifice of such people who are now being destituted [*sic*] by the Government of Orissa without compensation and rehabilitation'. Three years later, a similar tale surfaced of villagers in Himachal Pradesh, who had to make way for the reservoir of the Bhakra dam. A full year had passed since Nehru had inaugurated the power house; yet 'complacency and indifference seem to be guiding the counsels of the Bhakra Control Board, particularly the Rehabilitation Committee'. Even 'the basic question of compensation, and the where, why and how of it remains to be decided to the satisfaction of the people concerned'.[60]

IX

The free-market critique; the human capital critique; the ecological critique – these make for fascinating reading today. But at the time these notes of dissent were scattered, and they were politically weak. There was then an overwhelming consensus in favour of a heavy industry-oriented, state-supported model of development. This was a consensus among intellectuals; no fewer than twenty-three of the twenty-four expert economists asked to comment on the Mahalanobis plan agreed with it in principle.[61]

This consensus was shared by large sections of the ruling class as well. In their Bombay Plan the leading industrialists had asked for an 'enlargement of the positive functions of the State'. They approvingly quoted the Cambridge economist A. C. Pigou's view that freedom and planning were entirely compatible. Indeed, these big businessmen went so far as to state that 'the distinction between capitalism and socialism has lost much of its significance from a practical standpoint. In many respects there is now a large ground common to both and the gulf between the two is being steadily narrowed further as each shows signs of modifying itself in the direction of the other. In our view, no economic organization can function effectively or possess lasting qualities unless it accepts as its basis a judicious combination of the principles associated with each school of thought'.[62]

For a final word on the romance and enchantment of Indian planning, we turn to an anonymous journalist covering one of its showpiece projects. This was Bokaro, site both of a thermal power project and a large reservoir. Visiting the place in September 1949, the reporter found that 'Bokaro stood in the midst of barren, rocky land, overlooking the confluence of two sandy rivers. The only habitation there was the office of the Executive Engineer manned by half-a-dozen persons, without any living or other facilities. One could reach Bokaro only by jeep and we had to carry our own food.'

Three and a half years later the journalist went back to Bokaro to see the prime minister inaugurate the power plant and the dam. 'What a different sight met my eyes', he exulted. Approaching the Bokaro valley on a 'first-class tarmac road', he saw 'the three sturdy stacks of the PowerStation against the grey background of the hills'. What had been 'a dry river bed in 1949 has been turned into a fair-sized lake' with a concrete barrage thrown across it. For those who worked in dam and plant, there was now 'a modern residential area with tarred roads, electric lighting, a high school, hospital, filtered water supply and all the amenities one expects in the present day'.[63]

'Whenever I see these great engineering works', wrote Jawaharlal Nehru, 'I feel excited and exhilarated. They are visible symbols of building up the new India and of providing life and sustenance to our people'.[64] It appears the excitement and exhilaration were felt by plenty of other Indians as well.