III. The India of tomorrow

The world's workshop

The industrial development of the Asian subcontinent

This section is a partial reprint from an EIR Special Report to be published soon, "The Industrialization of India," a program developed in collaboration with scientists from the Fusion Energy Foundation by a team under the direction of Contributing Editor Uwe Parpart. What follows is Mr. Parpart's introduction to that EIR Special Report in full:

In a speech delivered in the Lok Sabha (house of Parliament) on May 23, 1956, Prime Minister Jawaharlal Nehru, initiating the debate on India's Second Five Year Plan, spoke on the principles adopted by the Planning Commission in the preparation of its report:

"When we talk of planning we have to think in technological terms, because it is this growth of science and technology that has enabled man to produce wealth which nobody could ever have dreamed of. It is that which has made other countries wealthy and prosperous, and it is only through the growth of their technological process that we shall grow and become a prosperous and wealthy nation; there is no other way. . . . Therefore, if India is to advance, she must advance in science and technology, and India must use the latest techniques, always keeping in view, no doubt, the fact that in doing so, the intervening period, which is inevitable, must not cause unhappiness or misery. . . . But the fact is that our poverty is due to our backwardness in science and technology, and by the measure that we remedy that backwardness, we create not only wealth but also employment."

This report on the future industrial development of India, initially commissioned in July 1979 by Lyndon H. LaRouche, candidate for the Democratic presidential nomination, in consultation and after discussion with Indian scientists, engineers and political leaders, was prepared in the spirit that guided Nehru's 1956 remarks, although—as he would be happy to note—its proposed goals and objectives well exceed those he envisaged 25 years ago. The report's principal conclusion is that in the 40-year period between 1980 and 2020, India, while almost doubling the size of its population from 660 million to slightly less than 1.2 billion, is entirely capable of advancing from abject backwardness to the status of a modern industrialized nation with an educated population and an industrial infrastructure comparable to those of the Soviet Union today.

This of course presupposes precisely what Nehru demanded: utilization in the development process of the latest, most advanced production technologies rather than reliance on the World Bank or Club of Rome "appropriate technologies" concept which stresses labor-intensive production methods and technologies appropriate only to the present backwardness of the overwhelming majority of the population. Nor can a gradual, "organic growth" approach to economic development—the type of growth currently advocated by the Club of Rome in contraposition to the allegedly "cancerous" exponential growth experienced by the advanced sector nations during the past century and a half—be expected to alleviate India's misery. Nothing but a sharp, well-defined shock delivered to the entire economy, especially to the dominant but at best marginally productive rural and so-called unorganized sectors, will break the cycle of underdevelopment.

This will be accomplished by marshalling the 10 million most highly skilled of Indian workers joined by India's extraordinary and well-qualified corps of scientists and engineers, exceeded in size only by the Soviet Union and the United States, and set in motion by a necessary initial infusion of imported capital, bringing this concentrated force to bear on two principal objectives:

1. A crash nuclear-based energy development program to power the industrialization process; by 1990, ten years into the program, more than 50 1000 MWe nuclear power plants should either be operating or in various phases of construction. Simultaneously the first nuclear-centered agro-industrial complexes, so-called nuplexes,

Table 1
GNP and consumption per capita comparisons*

	GNP per capita* (U.S. dollars)	Energy (kg coal* equivalent/capita)	Steel (kg)**
United States	10,331	4040	549
France	3,282	2340	350
F.R. Germany	4,484	2085	490
Japan	2,515	1155	583
Soviet Union	4,058	970	554
Mexico	1,064	528	103
Brazil	450	309	105
Korea	579	162	85
Egypt	301	160	42
India	183	90	14

* Computed from 1968 figures.
**Computed from 1975 figures.

will come on line and become the highly productive cores of several major new cities. This will spearhead a rapid urbanization process which by the turn of the century will have increased the share of the urban population from today's 22 percent to almost one-third. Detailed plans for nuplexes at two separate locations were initially drawn up in the mid-1960s by the Atomic Energy Commission of India and Oak Ridge National Laboratory in the United States.

The extent to which worldwide energy development, industrial development, and standard of living go hand-in-hand is evident from Table 1, and there should be no illusions about the fate of tens of millions of Indians between now and the year 2000 if the "hard technology" energy program detailed below is not enacted. This fact is well known in India. As the great Indian scientist Homi Jehangir Bhabha remarked in 1955 before the Geneva Conference on the Peaceful Uses of Atomic Energy, "For the full industrialization of the underdeveloped areas, for the continuation of our civilization and its further development, atomic energy is not merely an aid; it is an absolute necessity."

2. The second principal target area for Indian economic development is water management—the huge but entirely unavoidable task of harnessing the subcontinent's immense water resources, if the deadly, centuries-old cycle of droughts and flood is to be broken and a modern agricultural industry is to replace one of the world's least productive rural economies. While presently only the Ganges carries sufficient water during the dry season, India's other rivers, if properly dammed up and channeled, could put the whole country under two feet of water year round and in addition, produce at least 40,000 megawatts of hydroelectric power, or four times the present amount.

The irrigation and power reserves stored up in India's river and hydroelectric balance thus are enormous and require a commensurate effort for their development and activation. It is proposed here that a National Water Management System of the kind first put forward by former irrigation minister K. L. Rao, representing an approximate total investment of $180-200 billion over a 30-year period, become the single largest industrial construction project for the subcontinent. This plan, through the required manpower and capital resources mobilization and its massive impact upon the productivity of agriculture, singularly exhibits those shock properties for the economy mentioned above.

Concomitantly with the high-impact nuclear energy and water development project, an in-depth mass literacy and education policy must be adopted to eradicate illiteracy which still afflicts close to 70 percent of the population. The problem was defined by Jamsetji Tata, the founder of one of India's largest industrial concerns. In 1876, speaking of the preconditions of industrialization, he listed these priorities: "Knowledge and know-how. And once again, knowledge, know-how, and experience. In addition our own iron and steel. Plus our own cheap electricity."

Through the expansion of primary education, the broadening of secondary education to enlarge the base of an already, in many areas, qualitatively excellent higher education program educating the teachers of the next generation, and the targeted development of adult manpower training programs geared toward specific industrial projects, illiteracy can be substantially eliminated by the turn of the century. At that point, what now appears as India's greatest liability and is defined by the World Bank as the principal barrier to its development, its population, will turn out to be its greatest asset. In 2020, the final years in the projections for this program, the productive industrial (non-agricultural) labor force will reach between 230 million and 240 million—greater than the world's entire manufacturing workforce today.

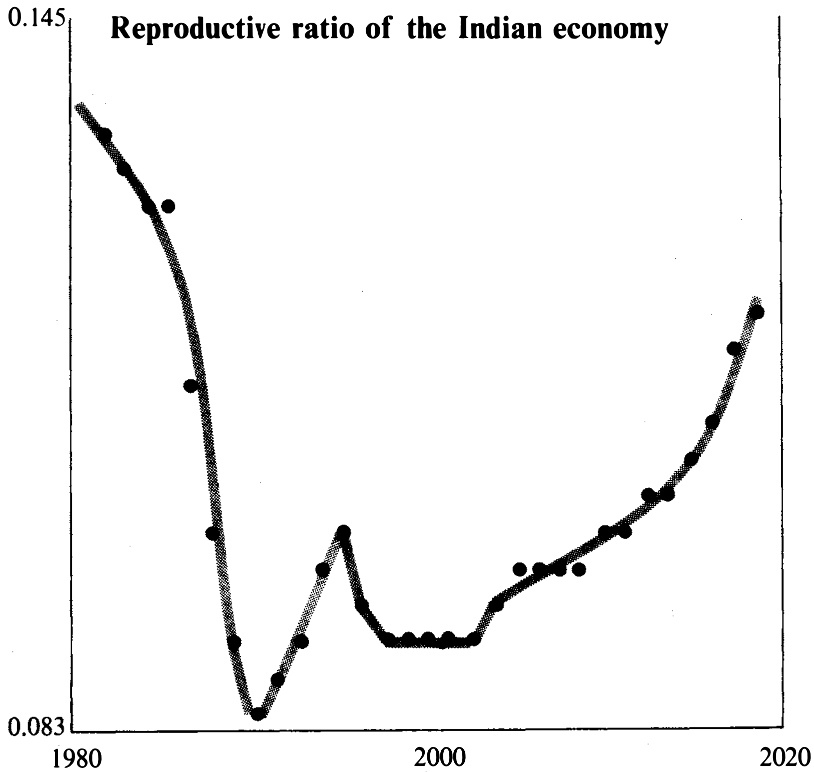
Agricultural labor will decline to around 130 million. But India's agricultural potential is so large, the gap between the present production per hectare and the productivity levels reached in advanced sector countries so wide, that the water and energy inputs provided for by the water and nuclear projects will transform the country into a major exporter of agricultural goods.

Here are some of the relevant figures: India now has about 190 million hectares under cultivation which could easily be increased by 20 to 30 percent; but even of the existing cultivated land on average only two-thirds was sown in recent years. Even more telling: U.S. farmers use 90 times the amount of fertilizer per hectare as their Indian counterparts.

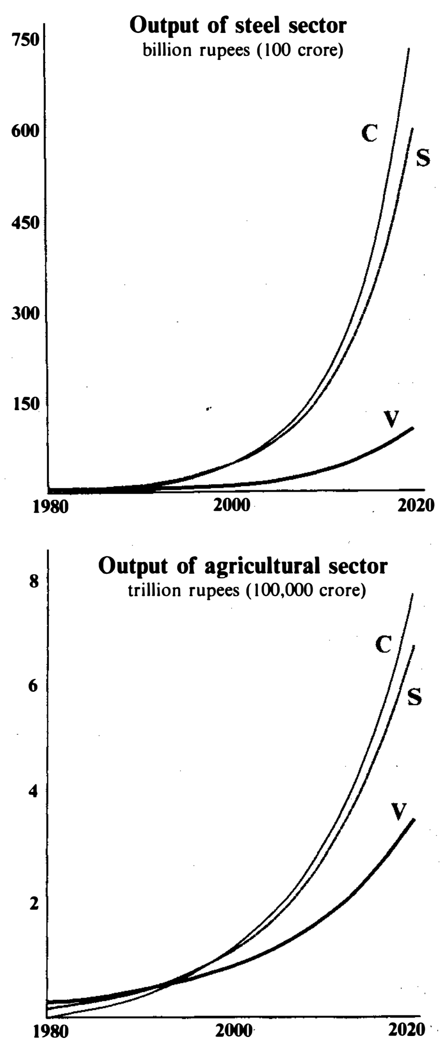
While these figures demonstrate the enormous development potential of Indian agriculture—provided advanced sector levels of energy throughput, representing higher degrees of mechanization, irrigation, and fertilization, are realized—these same figures, left unchanged, and juxtaposed to present consumption levels of the population, show an equally enormous potential for ecological catastrophe. Out of 660 million Indians, 360 million, or well over half of the population today receives less than the government-designated daily minimum requirement of 1900 calories, and this minimum is already 500 calories less than that specified by advanced sector countries, for their populations. At least a half-million people die of malnutrition every year, and the mortality rate of children under five years of age has risen from 32.2 percent in 1951 to 36.1 percent in 1976.

These last figures are the most telling, but the trend they indicate can be reversed. The physical parameters generated by the program presented here allow us to chart a navigable course for India which will find the country well on its way toward advanced sector status by the turn of the century.

Politically, and as a matter of historical record, it is not unimportant to point out at this juncture that India today is not so much an underdeveloped country as it is a country that was ruined by centuries of British colonial rule and imposed backwardness. As late as the 17th century, India was a developed country by the standards



The above graphs project Indian growth through 2020 on the basis of the Riemannian-LaRouche computerized model, in which the reproductive ratio is defined as S/(C + V), where C is the relative reproductive cost of plant and raw materials, V the relative cost of maintaining the productive labor force, and S is relative surplus as tangible output available to expand the total economy through combined increases in C and V. Through realized applications of new technology, as well as mere utilization of existing resources, the reproductive ratio itself will rise dramatically, after the sharp decrease of the first ten years due to mandatory initial investment costs (C and V) preparatory to turn-of-the-century "take-off."



of that time and throughout its long history had, over several protracted periods, achieved cultural heights and initiated developments exemplary for the rest of the world. Our "Arabic" numerals should rightfully be called "Indian," advanced techniques of iron and textile production have their origin in India, and, at the time of Emperor Ashoka in the third century B.C., India's was the world's most highly developed educational system. Through what nowadays would be called an agricultural extension service, new cultivation and irrigation techniques were spread throughout the land, and in 1950 Pandit Nehru consciously adopted several of Ashoka's ideas and guidelines to demonstrate the continuity of his service as prime minister with that of his great ancestor.

India now must reconnect its destiny to this tradition, and in attempting to do so, she will find herself confronted every step of the way by today's disciples of the British East India Company's most evil product, Thomas R. Malthus.

An ugly mixture of updated Malthusianism and cultural relativism is presented in the chapter " India and the West" of Arnold Toynbee's *The World and the West*. Explaining that Western culture on the planes of technology and science, language and literature, administration and law is "extremely alien" to Indians, he voices his hypocritical concern that "the tension in Hindu souls must be extreme, and sooner or later it must find some means of discharging itself." Aside from the social catastrophe implied by such an "emotional discharge," there looms, according to Toynbee, the truly unsolvable problem of overpopulation: "Since progressive improvements in productivity must sooner or later bring in diminishing returns, the standard of this swollen population seems bound to decline, and there is no margin between the present standards and sheer disaster on the grand scale."

To the extent that India's present political leadership understands the very palpable threat behind Toynbee's theorizing will it be able to recover India's historical greatness following the course outlined two decades ago by Nehru and the scientific elite exemplified and organized by Bhabha.

Energy

Breeders and nuplexes, the foundation of growth

Today India produces less than 50 gigawatts of energy. To meet its development goals, India must produce 365 gigawatts energy; 286 gigawatts of that energy will come from nuclear power. By the second decade of the development porgram, India will be an exporter of nuclear power plants to its neighbors.

Meeting that requirement means bringing on line 316 nuclear plants in India; 190 of them imported, and exporting another 58.

India will also become the first nation in the world with operating nuplexes. Beginning in 1980, India will begin the designing and building of nuplexes, or agro-industrial complexes, in which the nuclear power plant acts as the hub for a network of industrial and irrigated agricultural production.

Why nuclear power?

Hydroelectricity and coal and oil-powered fuel capacity will provide 79 gigawatts of India's total energy by the year 2005, a little more than a fifth of the total.

Although hydroelectricity is cheaper than nuclear power, its future capacity in India is relatively limited, and it is usually located far from the areas where it is needed. When fully developed it can provide only about 40 gigawatts of India's power.

India does have large deposits of coal, and although it is of a low grade (high-sulphur-content lignite, etc.), it can be burned in fossil fuels-based plants. However, the coal is is also located far from the areas needing it, making transport costs high. Thus, compared to nuclear power, coal electricity is more costly.

Over the next ten-year period, India's coal-based electricity will be increased, requiring at least a doubling of India's current coal production capability. As nuclear power plants are brought on line, coal and other fossil-fuel resources will be diverted to more productive uses—petrochemicals, steel, and fertilizer industries.

1. India's thorium resource

India's cheapest energy source is the thorium-based nuclear plant. India has the largest reserves in the world of thorium, a potential nuclear reactor fuel—over

500,000 tons presently known, and undoubtedly more to be discovered. If this resource can be efficiently tapped, it can become the cheapest way for India tò produce electricity. Thorium can also become a resource for export, creating a major income generator for India.

India must immediately launch a program for its own CANDU design and construction for plants of the 1000 MWe size, quickly ending its reliance on Canadian CANDU technology. Uranium fuel for these reactors will come in small part from India's tiny uranium ore supply; the bulk of it must be imported until the breeder reactors come on line. This ore could come from several locations—most likely Australia, Canada, or the Soviet Union.

At the same time, India must begin importing Liquid Metal Fast Breeder Reactors (LMFBR). The current plan is to build up an inventory of plutonium, a reactor fuel produced in the CANDU reactor, and use it to fuel the LMFBRs. The fast breeder moves India to the thorium fuel cycle. The fast breeder is able to convert thorium into U-233 fuel, which can be used effectively in any reactor.

Thus, India's CANDU reactors and imported Light Water Reactors will produce plutonium, which will fuel the fast breeders, which will, in turn, produce U-233 in their thorium blankets, and plutonium in their fuel regions. Both fuels can be used to fuel more fast breeders, LWRs, CANDUs, or High Temperature Gas Reactors, or a combination of all of these.

2. The outlines of the program

The goal of the nuclear energy program is to install about *150 nuclear reactors, averaging 1000 MWe capacity each, in India by the year 2000.*

In the same time frame, India will develop the capacity to export 20 reactors, produced by Indian skilled labor in Indian-owned and operated production facilities. India's electrical generation by the year 2000 will be 185 to 190 gigawattts, up from the present figure of 26 to 28 gigawatts. Of this total capacity, 80 percent will be nuclear.

In its first phase especially, India will have to rely upon imports. It will import 16 Light Water Reactors, five of which will be Floating Nuclear Plants; six High Temperature Gas Reactors; and three fast breeders.

The country most advanced in the development of the fast breeder is France, and it is the most likely source for India's imports. France has a 1200 MWe SuperPhenix power plant under construction, scheduled for completion in 1983. India is already working with France in constructing a 15 MWe experimental fast breeder slated for operation in the early 1980s. This effort should be expanded and advanced so that India will have several commcercial-size LMFBRs coming on line by 1990. The

Total power generating capacity

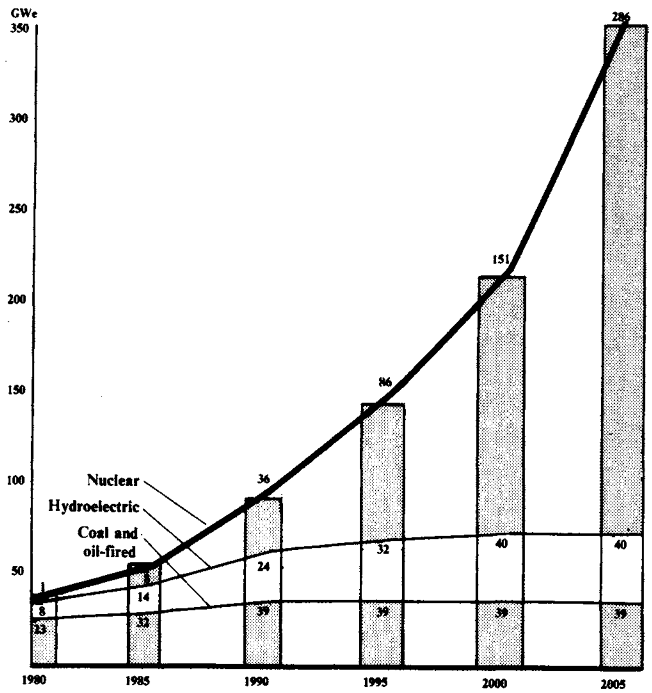
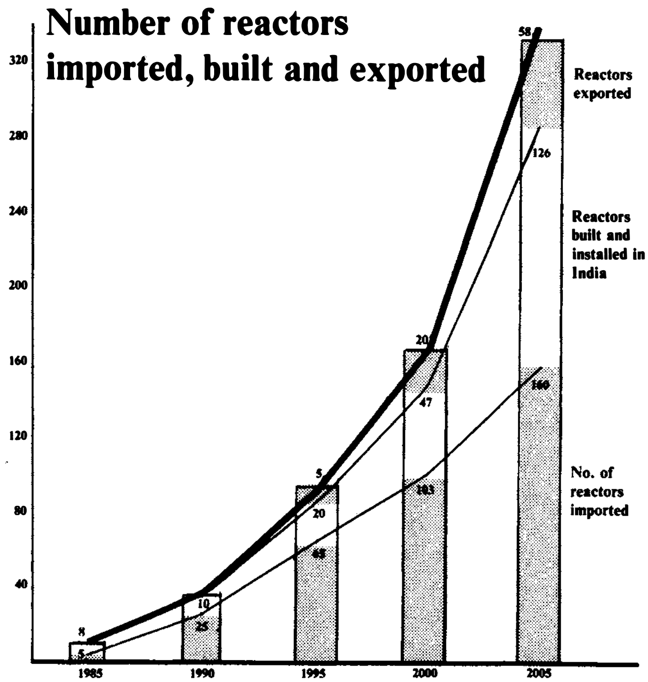


Chart shows the increase in total power generating capacity projected over the first 25 years of the program. Note that nuclear energy, which now supplies 1 percent of India's capacity, will supply 78 percent by 2005.

Number of reactors imported, built and exported



Over the first 25 years of the program, 316 nuclear plants are slated to come on line in India, 58 of them built for export.

Soviet Union, the United States, West Germany, and Great Britain also have the capability to supply India with the 37 fast breeders it will need to import by the year 2005.

Before the year 2000, when India can begin building its own, it will import 12 High Temperature Gas-Cooled Reactors (HTGR). The HTGR is especially required for nuplexes. This reactor is already a developed system in both the United States and West Germany, and should be ordered almost immediately from these sources.

During the second decade of the development program, India will import 26 LWRs, 19 of them Floating Nuclear Plants; six High Temperature Gas Reactors; and eight fast breeders. After the turn of the century, the balance will shift to importing only Floating Nuclear Plants, HTGRs, and fast breeders.

India's goals for domestic production are 45 CANDUs, seven HTGRs, and five fast breeders by the year 2000. By 1990, India will build 10 CANDU reactors. By the middle to the end of the second decade, India will begin contruction of its own version of the fast breeder and HTGR. These designs will be based on the experience gained from those imported plants.

Manpower

The use of science to end illiteracy

To become an industrial power by 2020, India must utilize her extraordinarily high number of scientists and engineers (the largest concentration of any place in the world after the U.S. and the U.S.S.R.) to drastically transform the overall character of the workforce.

At present, out of a population of 64 million, 70 percent are illiterate; 78 percent live in rural areas; and out of an official "workforce" of about 230 million, 74 percent are engaged in subsistence agriculture, and 2/3 of the rest work in what is called the "unorganized" industrial sector, which consists of the total of factories with more than 10 and less than 50 employees and no electricity, and of factories with less than 10 employees and electricity.

On top of this miserable state of affairs are two other alarming reflections of the threat to India's most vital resource: 1) 60 percent of the population consumes less than the government standard 1900 calories a day, which is itself 500 calories below industrial nation standards, and 2) infant mortality has in fact been rising over the recent period of World Bank strangulation of credit and technology.

India needs her populaton—projected to nearly double over 40 years—to carry out her transition to an industrial power, but its living standards, skill, and literacy must be upgraded immediately, long before the entire job-age workforce can be integrated into industrial production.

To create a skilled labor force in India of 239 million by the year 2020 requires three concurrent approaches. First, a program to put millions of people through secondary and higher education training; second, the calling back of thousands of Indian scientists, engineers, and skilled workers who are currently abroad; and finally, in this context, a campaign for basic literacy for the entire population.

To accomplish the necessary literacy and skill level, the program proposes the creation of at least 25 new cities over the period of the program.

The literacy goal is defined as that similar to the Soviet Union today: 58 per 1000 trained at a university level; 530 per 1000 at a secondary level; and 586 for higher and secondary combined (all measured from total population over age 10). If this virtual total literacy is to be reached by 2020 and production goals met, at least 60 percent of its goals must be reached by 2000.

This is a conservative estimate of labor force requirements for the economy at that time. This projection is feasible with the most crucial period being the first ten years of the program, when the enrollment level must be more than doubled. The university levels of the program are also on a scale which is not at all beyond the resources of the Indian economy. Qualitatively, higher education will shift toward an emphasis on scientific training and engineering. In those areas, the needs defined by the water control and nuclear projects alone are well beyond the present level of training available.

The program for creating mass literacy depends on simultaneously putting millions of undereducated and miseducated people into secondary and higher education training and calling back thousands of Indian scientists, engineers, and skilled workers now living abroad. It is out of the universities and already skilled workforce that brigades for educating the broader population must be formed. The proper approach is the creation of a universal service corps based on universal conscription from secondary school and university students, plus on-site job training.

Such an approach contrasts sharply with the "basic needs" literacy programs now going on under World Bank sponsorship. Successful literacy will be achieved by concentrating on fostering the highest scientific development throughout the universities and workforce, not leveling off to a lowest common denominator.

Agriculture

The water of India is India's oil

India has some of the greatest water resources of any country in the world—water that, harnessed under a Water Management System, can provide hydroelectric power and irrigation. India's water is its oil.

The problem to solve with a Water Management System is the poor distribution of the country's water, both by season and by geography. The water comes from the north in the Himalayas, distant from the central agricultural plateau and from the Ganges and Brahmaputra rivers which flood seasonally with the monsoon rains of August through October and then reside, leaving India's fertile central plateau dry much of the year.

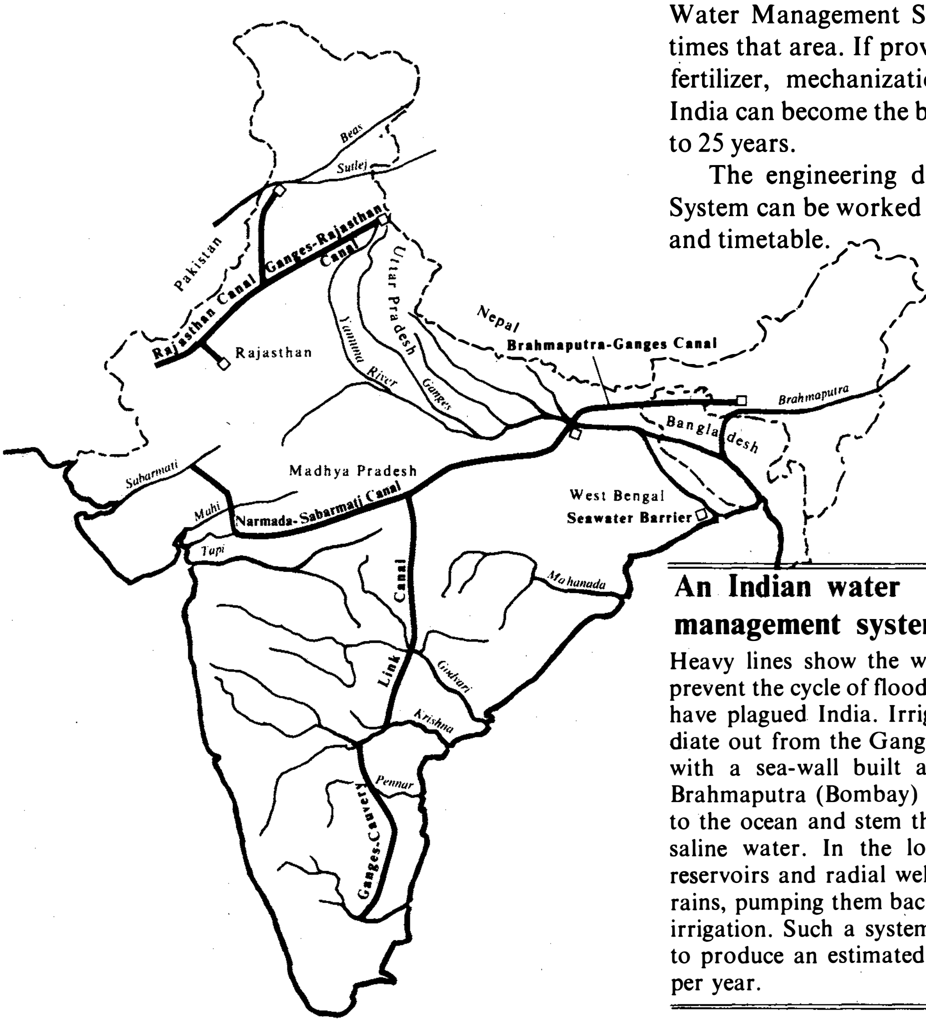
The aims of the Water Management System are to:

1. Bring the water from the snow-melting process in the Himalayas south, to where it is needed, by capturing the water in reservoirs and taking it through a series of lifts over the mountains.
2. Link the Ganges and Brahmaputra rivers with a canal, from which irrigation canals can radiate;
3. Build a sea barrier for the water at the mouth of the Brahmaputra at Bombay.
4. Trap the monsoon rain in the lower plains with multiple reservoirs and radial wells, so that it can be pumped back up when needed for irrigation.

This Water Management System will enable India to generate *40,000 megawatts of electricity* through hydroelectric dams. At present, approximately 18 percent of India's total installed generating capacity of 28,000 megawatts—or 5,000 megawatts—comes from hydroelectric power.

The irrigation afforded by the program will enable India to produce over *1 billion tons of grain per year.* No other region in the world is better-suited for large-scale cultivation than the Ganges-Brahmaputra river basin. Today India produces 120 million tons of grain per year, with 43 million hectares of land under irrigation. With a Water Management System, India could irrigate three times that area. If provided with the necessary inputs of fertilizer, mechanization, and most important, water, India can become the breadbasket of the world within 15 to 25 years.

The engineering details for a Water Management System can be worked out, with this two-stage approach and timetable.



An Indian water management system

Heavy lines show the water links which will prevent the cycle of floods and droughts which have plagued India. Irrigation canals will radiate out from the Ganges-Brahmaputra link, with a sea-wall built at the mouth of the Brahmaputra (Bombay) to prevent water loss to the ocean and stem the inflow of unusable saline water. In the lower plains, multiple reservoirs and radial wells will trap monsoon rains, pumping them back up when needed for irrigation. Such a system would permit India to produce an estimated billion tons of grain per year.