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INTELLIGENCE MEMORANDUM

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CHINESE COMMUNIST PROGRAM  
FOR CONTROL OF THE YELLOW RIVER

CIA/RR IM-415

7 October 1955

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CIA/RR IM-415  
(ORR Project 15.950)

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CHINESE COMMUNIST PROGRAM  
FOR CONTROL OF THE YELLOW RIVER\*

I. Introduction.

On 18 July 1955 the State Council of the Peoples' Republic of China approved and presented to the Peoples' Congress an ambitious multipurpose program for the permanent control and development of water conservancy projects in the Yellow River basin. 1/\*\* Although the entire program will require over 50 years to complete, the major part of it, including construction of most of the dams, is planned for completion by 1967, the last year of the Third Five Year Plan (1963-67). Among the purposes of the program, which will materially aid Chinese Communist economic development, are the control of flooding in the lower reaches of the river and erosion in the middle reaches, the construction of hydroelectric generating plants at many of the planned dams, the construction of large irrigation systems, and the development of the main stream for small craft navigation.

The program follows closely the principles outlined in the program planned by US engineers in 1946-47, 2/ although the Chinese Communists have placed a greater emphasis on development around Lanchow. Plans and investigations of the US program very probably are being used by the Chinese Communists. 1

The Chinese Communists estimate that the first phase of this program alone, which is to be completed by the end of the Third Five Year Plan, will cost about 5.3 billion yuan. This may be compared with 2.5 billion yuan allocated for all water conservancy projects throughout China in the First Five Year Plan (1953-57). 1 It appears that the Chinese Communists may allocate to the Yellow River project in the next 10 years up to one-half their total investment in water conservancy. Because of the general nature of the Chinese cost estimate, it is not possible to analyze or evaluate the cost of the program. It is difficult to compare the cost of such a project with a similar one in the US because of the vast difference in the cost of inputs, particularly of labor.

\* The estimates and conclusions contained in this memorandum represent the best judgment of ORR as of 1 September 1955.

\*\* For serially numbered source references, see the Appendix.

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II. Flood Control.

The Yellow River flood problem, which has been termed "China's sorrow," has existed for centuries. Rainfall in the basin is erratic and seasonal. Of the annual precipitation, which averages about 400 millimeters (15.7 inches), about 50 percent falls during July and August. During these months the rate of discharge increases some 20 times over normal. In the middle reaches the stream flows through loose and fragile loess deposits which erode easily, especially during periods of heavy rainfall. The river waters become heavily laden with silt (up to 50 percent by weight), and in the lower reaches, when the stream slope decreases as the stream flows on to the level North China plain, much of the silt is deposited on the river bottom. This process has occurred for centuries and has caused the mean river bed actually to lie above the river flood plain. Only the continued building of dikes and retardation basins has contained the river in this section to any degree, and the area still experiences more than one flood every 2 years. The annual direct damage to property has been estimated at US \$15 million, <sup>3</sup>/<sub>4</sub> which represents an enormous cumulative drain on the economic resources of the area.

In order to alleviate this condition, the present program provides for control of the flow of water and silt by (a) constructing a series of dams and reservoirs on the main stream and tributaries in order to detain flood waters and (b) preserving water and soil in the middle reaches of the basin through extensive afforestation and other soil and water conservation measures. Forty-six dams are planned for the entire program (44 in the middle reaches and 2 in the lower reaches). Two main dam complexes have been described, in the San-men Gorge and the Liu-chia Gorge, as shown in the following map.\* The San-men Dam, with its tributary dams, was part of the Yellow River conservancy program recommended and planned by the US engineering group. According to the Chinese Communists, this project will be designed and constructed by the USSR. Completion of the San-men project in 1961 and the probable completion of the Liu-chia project by 1967 should reduce the maximum flow in the lower river to containable amounts.

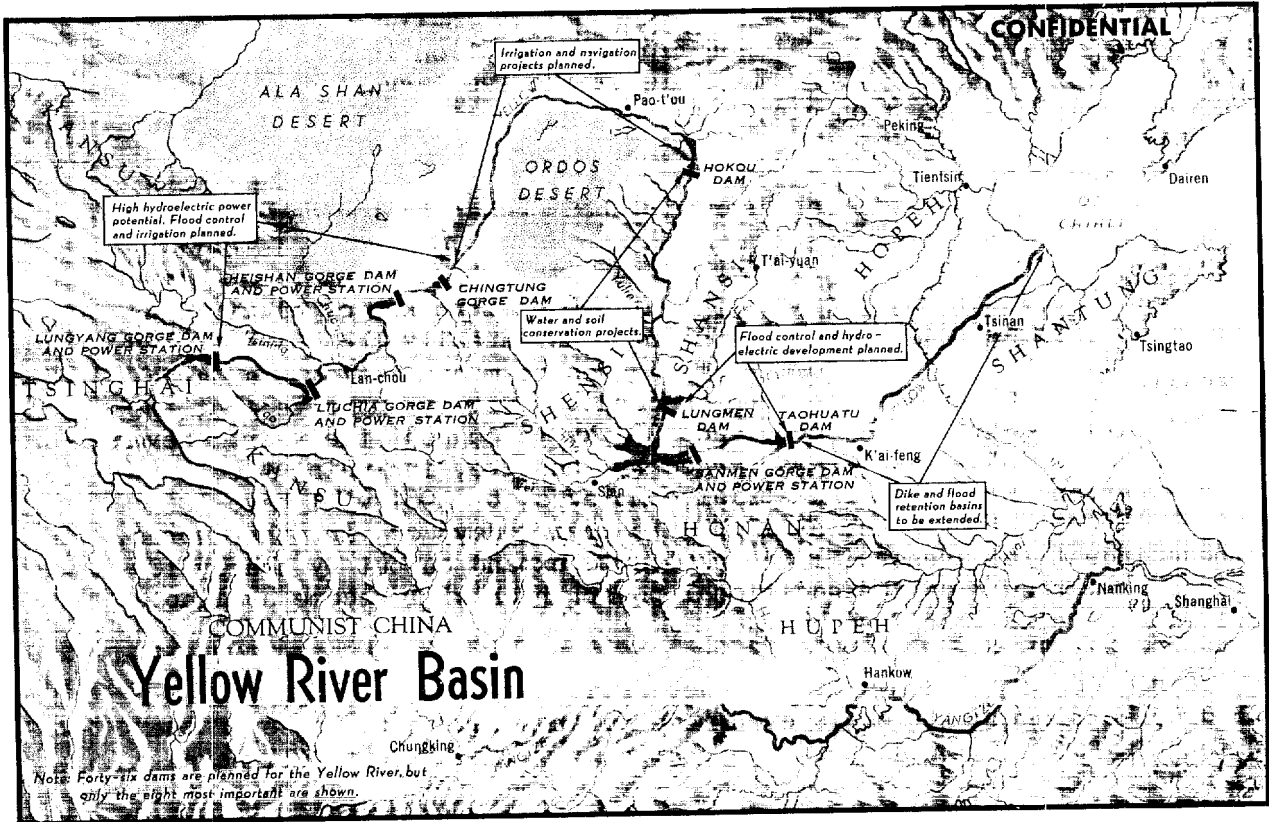
Although construction will not be started on the dams until about 1957, work is to be started immediately on building additional flood retardation basins and on strengthening and reinforcing the existing

\* Map follows on p. 3.

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dikes and flood retardation basins in the lower reaches of the river to aid in flood prevention during the period of construction of the main river dams. The first phase of the program, including construction of most of the dams, is planned for completion by the end of the Third Five Year Plan, but the program as a whole, covering the long-term water and soil conservation projects, is not planned for completion until after the turn of the century.

III. Power.

The hydroelectric power aspects of this program are extremely important to Chinese Communist industrial and irrigation expansion in the Yellow River basin. None of the hydroelectric generating sites along the Yellow River has yet been exploited. The Chinese Communists estimate that the completed system will have a theoretical total capacity of 23 million kilowatts (kw), providing 110 billion kilowatt-hours (kwh)

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per year, or about 10 times the national production in 1954. During the first phase of the program, at least the two largest dams, the San-men and Liu-chia projects, will have generating equipment installed.

The San-men Dam, with a reservoir about equal to the capacity of Lake Mead (behind the Hoover Dam) and a head of 70 meters, is estimated by the Chinese Communists to have a theoretical power capacity of about 1 million kw, providing about 4.6 billion kwh of electricity annually. It is not known how much of this capacity the Chinese plan to install. The Chinese Communist figures on minimum flow standards at the site (500 cubic meters per second), however, indicate that the plant could maintain only about 280,000 kw throughout the year. Nevertheless, the industrial areas served by the site, including the T'ai-yuan and K'ai-feng industrial complexes, by 1961 will have 10 times the amount of power available to them today; or, in other words, these industrial areas will be enabled to expand output by nearly 10 times as a result of the additional power which will become available within the next 6 or 7 years.

This increase in available power production upon completion of hydroelectric facilities is even more outstanding in the case of the Liu-chia Dam. Its reservoir is relatively small, but it will have a head of 107 meters and a minimum flow not much less than that of the San-men Dam. The Chinese Communists estimate that this plant will have a theoretical power capacity of 1 million kw, providing 5.23 billion kwh of electricity annually. Again, using the Chinese Communist figures on planned minimum flow (465 cubic meters per second), it is indicated that the plant could maintain only about 400,000 kw throughout the year. This is more than 200 times the amount of power now available in the Lanchow area.

One of the aims of the First Five Year Plan is to begin the movement of industrial concentration inland from the coastal area. The program to supply a large amount of power in the Yellow River basin, which presently is deficient in power, indicates that the Chinese Communists may be starting the preliminary steps toward this objective. That the initial power projects will not be operational until after 1961, and for the most part until after 1967, indicates that large-scale industrialization in the basin will be a long-term program.

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IV. Irrigation.

Although flood conditions are a serious problem in the lower reaches of the Yellow River, drought conditions brought on by the erratic rainfall patterns are a deterrent to agriculture in the middle reaches, and irrigation is necessary in order to insure regular and good crop yields. The long-term program provides for an increase in the irrigated area along the river from the present 1.1 million hectares (1 hectare = 2.47 acres) to 7.73 million hectares, which would increase grain production by 6.85 million metric tons and cotton production by over 600,000 metric tons.

By the end of the first phase of the program in 1967, the Chinese estimate that 2 million hectares will be added to the irrigated area along the river and that 800,000 hectares of existing irrigated land will be improved. Accordingly, the annual food production will be increased by 2.73 million metric tons and cotton production by 200,000 metric tons. During this first phase of the program, five large dams will be constructed on the main stream, primarily for irrigation. One of these, in the Lung-yang Gorge above Lanchow, will aid an already heavily irrigated area. Three of these, at the Ching-tung Gorge, the Hei-shan Gorge, and Ho-ch'u, will service a fertile valley plain lacking in moisture. This area, part of the hard-wheat belt, produces the best quality of wheat flour in China, comparable to high-grade Canadian or US flour. In the past, however, crop yields have been very low because of the erratic and uncertain precipitation in this semidesert area.

Another irrigation dam will be located on the main stream at Tao-hua-tu below the San-men Gorge and will furnish additional water to the important wheat and cotton areas on the North China plain. Erratic rainfall in the past has limited severely the cotton crop yield. In addition to a probable doubling of the cotton yield per hectare, 4/ irrigation possibly will increase the proportion of land planted in cotton.

V. Soil Conservation.

The Yellow River program also calls for extensive soil conservancy projects, especially in the lower middle reaches of the main stream, where the greatest soil erosion occurs. By conservancy measures alone the Chinese Communists hope to reduce by half the amount of silt being dumped into the Yellow River. Most of these conservation measures are long-term, but work is to be started on them immediately

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so that the earliest possible reduction in eroded material entering the river can be realized. In addition to plans for improving farming techniques and soils, conservation work will be carried out in afforestation and in localized water conservancy projects designed to detain eroded material close to its source.

Once the rate of flow is stabilized and the silt retarded upstream, the Yellow River in its lower reaches probably will stabilize its course within a short time, and crop production on the North China plain, already one of China's richest agricultural regions, should increase considerably.

#### VI. Navigation.

Of minor importance to the economy as a whole are plans for developing navigation along the Yellow River. In the past, navigation has been limited to small craft and rafts, but regulation of river flow by the end of the first phase of the program will permit navigation on some sections of the river by craft of less than 500 gross register tons.

#### VII. Conclusion.

At the earliest, it will be 10 years before the Chinese Communists realize any appreciable return on the Yellow River program, a program which will consume a large part of the investment allocations for conservancy for a long period. From the power aspect of the program, construction of hydroelectric plants, especially in the Lanchow area, will provide essential elements for future industrialization. From the agricultural point of view, water conservancy measures are as important as expansion of the chemical fertilizer industry as a means of obtaining increased crop production.

In view of the important results to be achieved from this program in flood prevention, soil conservation, and increased agricultural production and power supply, and the favorable bearing which these accomplishments might have on the implementation of the first three 5-year plans, the contrast in emphasis between conservancy and heavy industry projects in Chinese Communist economic planning is striking. It is clear that the Chinese Communists are postponing longer than would seem desirable the building of the foundations for long-term economic development in favor of a concentration of investment in heavy industry. Meanwhile, "China's sorrow" will continue to take its toll of crops, animals, and other property -- and irreplaceable soil.

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APPENDIX

SOURCE REFERENCES

Evaluations, following the classification entry and designated "Eval.," have the following significance:

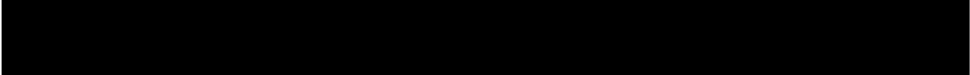
<u>Source of Information</u>	<u>Information</u>
Doc. - Documentary	1 - Confirmed by other sources
A - Completely reliable	2 - Probably true
B - Usually reliable	3 - Possibly true
C - Fairly reliable	4 - Doubtful
D - Not usually reliable	5 - Probably false
E - Not reliable	6 - Cannot be judged
F - Cannot be judged	

"Documentary" refers to original documents of foreign governments and organizations; copies or translations of such documents by a staff officer; or information extracted from such documents by a staff officer, all of which may carry the field evaluation "Documentary."

Evaluations not otherwise designated are those appearing on the cited document; those designated "RR" are by the author of this report. No "RR" evaluation is given when the author agrees with the evaluation on the cited document.

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2. Public Works Commission. Studies on Yellow River Project, no 10, "Preliminary Report on Yellow River Project," Nanking, Feb 47, U. Eval. RR 2.  
Ibid., no 11, "Report on Investigating and Planning the Development of the Yellow River Basin, China," Nanking, Feb 47, U. Eval. RR 2.

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3. Shen, T.H. Agricultural Resources of China, Cornell University Press, 1951, U. Eval. RR 2.
4. Ibid.

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