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- COMMUNIST CHINA -

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[Following is a translation of an article written by the Hydrological Office of the Chekiang Provincial Water Conservancy Office in Shui-wen Yueh-k'an, No. 10, Peiping, 15 October 1960, pp 11-14.]

I. Natural Conditions

Chekiang Province is located on the southeastern coast of China. On the north, it touches Kiangsu Province at Tai-hu. On the west, it is bordered by Anhwei and Kiangsi Provinces. On the south, it is bordered by Fukien Province and on the east by the East China Sea. The province has a total area of 102,000 square kilometers. The southwestern part is a mountainous region and the land slopes towards the northeast. There are more mountainous areas in the province than level lands, the former constitutes 70% of the total area and the latter only 20%. There are very few hills, constituting 10% of the total area. The entire province has abundant rainfall. The annual volume of rainfall is about 1,100-2,100 millimeters.

There are many rivers, including Ch'ien-t'ang-chiang, Ts'ao-o-chiang, Yung-chiang, Ling-chiang, Ou-chiang, Fei-yun-chiang, Ao-chiang, and Tai-hu Canal, making eight basins. The rivers are all short with swift currents. With the exception of the Tai-hu Canal system that flows north into Kiangsu Province, where it joins the Huang-po-chiang and finally empties into the sea, all the other rivers flow independently and into the sea. Among them, the largest is the Ch'ien-t'ang-chiang, which covers an area of 35,850 square kilometers, equivalent to one third of the total area of the province.

II. Hydrological Work in Chekiang Province under the Reactionary Regime

Though there was a 66-year history of hydrological work

in Chekiang Province before the Liberation, these 66 years were under the reactionary regime, when development was very slow. The survey stations were mostly limited to the observation and survey of the volume of rainfall and water elevation. Within the 66 years, they had merely accumulated rainfall data amounting to 1,057 station years, water elevation data 454 station years, tide level data 193 station years, water flow data 145 station years, and data concerning the amount of sand contained by the water 81 station years. The quality of these data was inferior and was mostly false.

In regard to the water flow survey, the number of checks taken was few and distribution was improper. About 40% of the station years had only water flow survey but no checking on the water elevation, so in the 145 station years of water flow data, there were only 10 station years in which the volume of daily water flow could be calculated, equivalent to less than 7% of the total data.

The data concerning the amount of sand contained by water were worse. In most of the years, there was not even a single year in which daily calculations could be made. Data concerning the volume of rainfall and water elevation contained countless errors and the data were far from complete. Based on such test results, whatever was compiled, analyzed and studied was of no value.

From these facts, we can also see the nature of a reactionary government. It was merely a system by which the bureaucrats, landlords, and compradores carried on their exploitation. This type of government never had any interest in construction and scientific research nor was there any far-sighted all-out planning for construction. Hydrological workers' morale was extremely unstable. The common saying was: "There is no future in hydrological work", "A hydrological station is a home for the aged", and "When there is any lay-off, the personnel of the hydrological station will be the first to go".

As such, hydrological work in those years was in name only but not in practice. Especially, when Chiang Kai-shek's reactionary government was fleeing from the mainland, the few established stations were completely wrecked. Left behind was merely a heap of incomplete and disorderly materials. It was upon such a ruin that the new hydrological work was to be constructed. It was a difficult task.

III. Party Guidance, Socialist System, Great Construction Program Gave New Birth to Hydrological Work

In 1949, the Liberation struggle was victorious over the whole country. The People's Government had been just

established. The country was laid waste by the reactionaries on the eve of their fleeing from the mainland. Ruin reigned everywhere. The State's economic conditions were very serious. Even under such conditions, hydrological work, like all other economic construction, received special attention from the Party and the Government. In November 1949, the Water Conservancy Ministry of the Central Government called a joint meeting for all liberated areas to discuss conservancy problems. When the meeting was drawing up construction programs, the gathering, studying and compiling of basic information about the various waterways were listed among the important work.

Since then, special hydrological meetings have been held every year. Various regulations and systems have been set up. Based on conditions, development and the prospects of socialist construction, the hydrological working program and task have been constantly revised. Hydrological work in Chekiang Province within the last ten years, under the guidance of the Party and the Government, has marched forward as 10,000 galloping horses and has attained glorious development and great achievements.

IV. Complete Hydrological Stations Network Ahead of Schedule

After the whole province was liberated in 1949, the Provincial Water Conservancy Bureau, under the direct guidance of the Central Government's East China Water Conservancy, began to re-establish and construct new hydrological stations, striving to re-open all those stations that were able to function in that year. In 1950, in accordance with the Central Government's program: "Within three to five years' time, all necessary hydrological information and laws must be basically completed in order to furnish the preliminary planning for the various important water-way systems", the Provincial Water Conservancy Bureau, within one year's time, completed the construction of 19 water-flow stations, established the Ch'ien-t'ang-chiang Tidal Experimental Station, mobilized a great number of cadres and began the surveying and testing of tidal waters at the mouth of the Ch'ien-t'ang-chiang. In 1952, the number of newly-established and already-existing stations reached 139, surpassing the greatest number of stations in 1935 under the reactionary regime.

In 1956, under the encouragement of the high tide of agricultural cooperation throughout the country, and in accord with Article 33 of the Agricultural Development Program, which said, "Beginning from 1956, the basic hydrological and weather stations network must be completely established ...

within 12 years", the Water Conservancy Ministry of the Central Government held a special hydrological meeting in Peiping. Soviet advanced experience in planning the basic establishment of hydrological stations network was adopted, and the capitalist construction line of the plan-less building of stations whenever there was such a need was criticized. The meeting adopted the principles for the planning of China's hydrological stations network, so that hydrological work was transformed from merely serving irrigation to an all-out service.

Chekiang Province rapidly implemented the decisions of this meeting and adopted the method of making plans and constructing stations all at the same time. In 1957, the stations network plan was completed. In 1958, the all-out construction of basic stations network was completed. The number of stations completed included 325 rainfall stations, 140 water elevation stations, 71 basic water flow stations, 25 basic evaporation stations, 12 basic hydro-chemical stations, and 37 basic mud and sand stations (including special stations added in the various years in Chekiang Province, as shown in Table 1).

While constructing the stations network, a great number of hydrological cadres was correspondingly trained and a large quantity of equipment was installed. This equipment included 84 water elevation automatic recording machines, 225 rainfall meters, each water flow station was equipped with surveying boats, corss-river ferrying cables, hand-operated current meters and cables so that hydrological observation and surveying became further automatic and mechanized. Other instruments such as mud and sand treatment and analysis instruments, hydro-chemistry instruments, etc., were improved and increased. The old and run-down appearance of the hydrological stations under the reactionary regime was thoroughly transformed.

Table 1. Number of Hydrological Stations Established in Chekiang Province in Successive Years

Yr	Rainfall Stations	Water Level Stations	Water Flow Stations	Experimental Stations	TOTAL	Yr	Rainfall Stations	Water Level Stations	Water Flow Stations	Experimental Stations	TOTAL
1883	1				1	1922	9	1			10
84	1				1	3	9	1			10
85						4	8	2			10
86	3				3	5	9	2			11
87	3				3	6	9	2			11
88	3				3	7	8	2			10
89	3				3	8	12	4			16
90	3				3	9	12	38	1		51
1	3				3	1930	12	62	1		75
2	3				3	1	41	72	5		118
3	3				3	2	2	76	11		89
4	3				3	3	64	37	17		118
5	3				3	4	75	34	20		129
6	3				3	5	73	41	21		135
7	3				3	6	77	27	24		128
8	3				3	7	70	35	20		125
9	3				3	8	36	16	1		53
1900	3				3	9	30	18			48
1	3				3	1940	31	17			48
2	3				3	1	14	17			31
3	3				3	2	23	14			37
4	5				5	3	19	4			23
5	4				4	4	18	3			21
6	4				4	5	15	1			16
7	4				4	6	21	1	3		25
8	4				4	7	17	12	10		39
9	4				4	8	15	14	10		39
1910	4				4	9	6	6	10		22
1	4				4	1950	2	9	29	1	41
2	4				4	1	53	30	46	1	130
3	4				4	2	55	35	48	1	139
4	4				4	3	66	51	54	1	172
5	4	1			5	4	68	54	55	1	178
6	4	1			5	5	74	82	63	1	220
7	4	1			5	6	92	80	77	5	254
8	4	1			5	7	200	122	81	5	414
9	4	1			5	8	215	119	89	8	431
1920	4	1			5	9	230	136	101	19	476
1	5	1			6						

In 1958, a high tide of water conservancy construction was aroused throughout the country. Comrade T'an Chen-lin, secretary of the Chinese Communist Central Committee's secretariat, at the Honan Provincial Sha-ying River Control Conference, pointed out that there must be a wide-spread mass movement for research work concerning the observation and surveying activities in water conservancy engineering. With the active support from the various levels of Party Committees, Chekiang Province aroused a high tide in the mass movement of hydrological work. As of June 1959, in the entire province, there was a great number of hydrological stations, operated by the masses and manned with specially trained workers. These stations included 301 rainfall stations, 145 water elevation stations, 28 water flow stations, and 39 reservoir stations; the total number of hydrological stations reached 989, with one station to every 100 square kilometer of land.

V. Constant Improvement in Surveying Technique, Constant Expansion in the Scope of Observation and Survey, Constant Improvement in Data Quality

Hydrological work in Chekiang Province during the last ten years has not only attained a rapid numerical increase but also a constant improvement in surveying technique, constant expansion in the scope of observation and survey and an obvious leap forward in data quality. In the improvement of surveying technique, since the Water Conservancy Ministry of the Central Government proclaimed the temporary regulations for hydrological stations in 1955, especially during the high tide of the great leap forward in 1958, the province has made many improvements in surveying methods and created many new instruments.

For instance, in 1956, the creation of the hand-operated current meter was widely employed throughout the province. At present, many stations outside of the province have made requests that the machine be copied. In 1957, the Chen-ts'un Water Flow Station established a 710-meter span of steel cable over a deep-sea swift current and used two joined boats to make water flow surveys. Most of the other stations in the province have adopted this method to accomplish rapid surveying. This method stabilizes the vertical line and, at the same time, multiple items of survey can be conducted. The high span and river bed steel cables for cross-the-river surveys were also created by the station.

In 1958, the Hsin-ch'ang non-declination cable current surveying experiment was completed. This method solved the long impending international surveying problem in connection

with mountain stream surveying. By this method, surveys could be done by an electrically-operated machine on the shore. It is safe and economical in manpower and its results also meet the demands stipulated by regulations. Because of the improvement of surveying techniques and the improvement of surveying instruments, all the water flow stations used the current meter to survey the flow of water in 1958. In the survey of tidal waves on Ch'ien-t'ang-chiang, the highest tidal flow was surveyed at 5.78 meters.

In regard to the method of data calculation and compilation, in 1952, this province created the method of large cross-section current survey. It was adopted by the Water Conservancy Ministry of the Central Government as the official form for reports and has been in use to the present. In 1955, the method of calculating tide volume on the basis of tidal errors was created. This solved the problem of calculating the volume of tide by tidal elevation and checked by the tide and river water stations, which were located on regular, even water-ways and were seldom affected by mountain floods.

Because of the constant improvement of surveying techniques and the constant improving of equipment, data quality has attained obvious improvements. Since 1951, the surveying data were compiled from year to year. In 1953, the data of the existing year were compiled and published the next year, thus reaching the advanced levels inside and outside the country. The 1958 data were completely compiled and edited by January 1959 and were published by April. Those data that were scattered in various places before the Liberation, were gathered together, revised, compiled and all were published in 1958. These data belonging to the previous years were collected into 12 volumes. The figures for the various years are listed in Table 2. From this table, it can be seen that during the ten years since the Liberation, the number of principal surveying items not only have greatly surpassed that of the 66 years before the Liberation, but also reflects how rapidly the quality of the achievements attained by these data has risen (judging from the figures in the two calculations of the daily average of water flow and of the daily average sand content in the water).

Table 2 Volume of Hydrological Data Compiled in Chekiang Province in Successive Years

Items / Yr.	Rainfall (station year)	Water Elevation (station year)	Tide Elevation (station year)	Result of Actual Current Survey (station year)	Daily Average Water Flow (station year)	Result of Actual Survey on Amount of Sand (station year)	Daily Average Sand Content (station year)	Remarks
1883~1949	1057	454	193	145	10	81	0	1950-1953 includes stations established by Chekiang Province in Anhwei Province.
1950	28	31	7	29	10	13		
1951	115	58	18	46	15	32		
1952	117	67	16	48	13	34		
1953	121	83	22	54	27	36		
1954	145	86	23	55	45	39		
1955	171	111	36	63	59	17	10	
1956	201	121	36	76	76	40	40	
1957	310	170	33	81	81	66	53	
1958	332	176	32	89	87	61	61	
1959								
1950~1958	1540	903	259	541	413	338	164	

While surveying techniques and the quality of achievements have attained obvious improvement, the number of surveying items have been greatly expanded. For instance, in 1949 when Liberation had just been completed, Chekiang Province had only five survey items: rainfall, water elevation, water flow, stable and moving sand, and evaporation. But now, the surveying items have greatly increased; in addition to these five items, there have been added the following items: soil evaporation, penetration and sipping, sand content in a single water sample, the flowing rate of stable and moving sand, the flowing rate of movable sand, the nature of river beds, mud and sand granular analysis, the amount of salt, water analysis, subterranean water elevation, the amount of water needed by paddy rice fields, the amount of water needed by rice grown on dry lands, and the amount of water contained by soil. There were 13 items of hydrological survey added.

In 1958, a hydrological investigation work was also started, so that hydrological work was not restricted to merely a cross-section but was expanded to whole regions, not merely collecting information as it occurred but also investigating floods that occurred in the past. As such, investigations were made, from the present to the past, from the surface to the subterranean and to the sky. Within this short period of ten years, China's hydrological work has grown up and become strong.

VI. Various Types of Testing and Research Work Started

Since the establishment of the Ch'ien-t'ang-chiang Tidal Waters Experimental Station in 1950, Chekiang Province has begun a series of experimental and research works, such as the small-area rainstorm water-flow experiment, the experiment of balancing water volume on the plains, the survey and study of medium-sized and small reservoirs. These works have all been started one after another.

VII. All-out Service for Production; Masses Welcome Hydrological Work

Hydrological work in Chekiang Province, from the beginning to the end, has always served production. Since 1950, all hydrological stations in the province have begun flood forecasts, affecting greatly flood and drought prevention activities. During the various great floods, owing to the timely forecasts, countless lives and properties were saved. For instance, in the latter part of June 1955, a great flood

occurred in the Ch'ien-t'ang-chiang region. The Chiang-shan Water Elevation Station made a timely flood forecast, based on which, the Ch'eng-kuan Ch'u Party Committee in Chiang-shan rescued the lives of more than 200 residents and saved a great amount of flood prevention equipment. The number of flood forecasting stations in Chekiang Province is shown in Table 3.

Table 3 Number of Flood Forecasting Stations in Chekiang Province in Successive Years

Year	1950	1951	1952	1953	1954	1955	1956	1957	1958	1959
No.of Stations	25	25	38	45	71	84	85	95	99	103

Note: The number of stations listed in the table pertains to those stations that make forecasts for the province.

Since 1952, Chekiang Province has begun a study of flood forecasts. In 1953, flood forecasting experimentation was held at Po-yang-chiang. Then, it was gradually developed and spread to Tung-t'iao-chi, Ts'ao-o-chiang, Ch'ien-t'ang-chiang and Au-chiang regions. Tide forecasting was also started at Wen-chia-ch'uan, Wen-chou, etc. In 1959, every water flow station and some of the water elevation stations were able to make flood forecasts. Owing to the development of flood forecasting activity, the function of hydrological information service has been further enhanced.

For instance, in August 1956, a heavy rain strom occurred in the Ts'ao-o-chiang region; flood water rose to an unprecedented height at the Tung-sha-fou Station. Some of the masses lost confidence while rescuing their dike. But, after the Tung-sha-fou Hydrological Station assured them that the flood crest would not surpass 14 meters, the masses regained their confidence and saved their dike, enabling a vast area of farm lands to secure a bumper harvest. The local people praised the hydrological station in such words, "The hydrological station is very accurate. It can foretell things like a super-human being".

In 1959, some hydrological stations operated by the masses also began to make flood forecasts. For example, on 21 May, the Hsia-wang Hydrological and Weather Depot under the Li-tung People's Commune in Ch'eng Hsien, based on the weather forecast from the Provincial Weather

Bureau, made a forecast concerning the local water elevation. The Party Committee of the People's Commune understood the meaning this forecast and mobilized the masses immediately to make urgent repairs to the Li-tung-yao Reservoir, which could hold 100,000 cubic meters of water. As a result, the reservoir was saved, and in addition, a bridge and more than 100,000 chin of wood piled along the banks were also saved. The residents praised the good work of this hydrological and weather depot, "When we have a hydrological and weather deport, there is protection for agricultural production. If you want to know to whom we should be grateful, let us thank Chairman Mao Tse-tung and the Communist Party".

In the field of hydrological calculations, in 1955, under the direction of the Peiping Water Conservancy Science Institute's Hydrological Department, Chekiang Province started rainfall and rainstorm analysis. In 1957, the province published three documents: Rainfall Analysis in Chekiang Province, Storm Analysis in Chekiang Province, An Outline of Hydrology in Chekiang Province. These documents had a great effect on the irrigation repair movement during the winter and spring of 1957-1958. In 1958, again on the basis of these three documents and with the addition of a section concerning flood calculation, a Practical Hydrological Handbook for Chekiang Province was published. In 1959, the province completed the statistics on the characteristic value of hydrological data collected in previous years in this province, collected a number of hydrological diagrams from all parts of the country and finished the revision of the Practical Hydrological Handbook for Chekiang Province.

In connection with the several hundreds of thousands of medium-sized and small irrigation engineering construction, these works have had great effect. They have given assurance to the huge hydro-electric engineering projects at Hsin-an-chiang, Au-chiang, and Fu-ch'un-chiang and to over 30 large reservoir construction projects, each of which have a water capacity of 50,000,000 cubic meters. Construction has been started ahead of schedule. Because hydrological work has shown obvious effect on various types of productive construction, it has left a deep impression on the minds of the masses.

VIII. Great Achievement is the Result of the Sky-high Morale of the Hydrological Workers

The Party's leadership and the superiority of the socialist system have provided healthy conditions for the development of hydrological work. Also, it has been only under the Party's guidance that the cadres' level of awareness could be

rapidly raised and their creative ability and diligence could attain normal development. After the Liberation, this province trained a large number of hydrological cadres. Through the various political movements, a majority of the cadres have attained an obvious rising in their political and ideological levels. For instance, in 1951, out of the 190 cadres who were working in the stations, 130 were sent to participate in the anti-reactionary and "san-fan" movements. In 1953, a movement was launched in the various stations to eliminate all false records and to eradicate all bad habits left behind by the reactionary regime. Through the rectification movement in 1957-58, the cadres drew a line between right and wrong, underwent a communist ideological training, established a point of view in life to serve the people and to understand the socialist construction general line. The cadres' morale ran high and they contributed over 10,000 suggestions in a year. About 106 instruments were improved.

There were also many heroic incidents. In May 1958, a great flood was rising at the Sha-wan Water Flow Station in Ching-ning Hsien. When the workers were prepared to make a survey, they found their survey boat was on the other side of the river. They seemed to be unable to do anything in spite of the rising flood. Mindful of their responsibility, one of the workers, Comrade Chang Yen-kang, risked his life by climbing over the 120-meter long steel cable that spanned the river and finally brought back the boat to survey the flood current. In the same month, that station had another great flood. Chang Yen-kang and another worker were making a survey of the flood current and the cable was suddenly broken. The boat was carried down the stream by the roaring flood. Chang Yen-kang controlled the boat and with great effort he helped his comrade, Ma Tzu-min, who did not know how to swim, to reach shore. But the swift currents again carried the boat down the stream for more than 10 li. At the time, the boat was filled with water and was about to sink. At this moment, Chang Yen-kang took some of the valuable instruments and records. Carrying them, he jumped into the water, which carried him further down the stream for another 10 li. Finally, he climbed a tree, from which he was rescued.

In May the same year, the Ch'ien-t'ang-chiang Tide Survey Team was making a survey at Che-shan. During the night, the survey boat was capsized by the currents. The 10 workers in the boat fell into the flood. At this dangerous moment, Comrade Yu I-po, a communist member, encouraged his companions to struggle on until all were rescued.

With such braverly and high sense of responsibility to fight against floods and to collect hydrological informations,

there were countless courageous incidents. Of course, there also were unfortunate workers who sacrificed their lives doing their duty. During floods, hydrological workers worked day and night in spite of gusty winds and storm. In this province's hydrological work, under the Party's guidance, the entire body of workers, through ten years of vigorous struggle, have collected a definite quantity of hydrological information for the great development of socialist construction and have thoroughly transformed the appearance of hydrological work in Chekiang Province. But, a more complicated, precise and burdensome task still lies ahead of us; we must arouse higher morale to strive for the realization of the Party's and the people's ideals ahead of schedule.

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