



UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION

FOR ASIA AND THE PACIFIC

AND

WORLD METEOROLOGICAL ORGANIZATION

REPORT OF THE TYPHOON COMMITTEE

ON ITS TENTH SESSION

**Tokyo, Japan
25 - 31 October 1977**

TENTH SESSION OF THE TYPHOON COMMITTEE

STUDY TOUR

PARTICIPATION INFORMATION

In order to assist the organizers in facilitating arrangements and making transport and hotel reservations, participants are kindly requested to complete the form below and send it to:

Mr. Yubun Narita
Liaison Officer
Specialized Agencies Division
United Nations Bureau
Ministry of Foreign Affairs
2-2-1 Kasumigaseki, Chiyoda-ku
Tokyo, 100, Japan

CABLE ADDRESS

GAIMUDALJIN TOKYO
(Japan)

with a copy to:

Mr. C. Roy Smith
Chief
Division of Administration
United Nations Economic and Social
Commission for Asia and the Pacific
(ESCAP)
United Nations Building
Rajadamnern Avenue
Bangkok 2
Thailand

ESCAP BANGKOK
(Thailand)

I will join the study tour from 29 to 31 October 1977.
not join

(Please cross out words not applicable.)

NAME: _____

SIGNATURE: _____

COUNTRY/
ORGANIZATION: _____

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo, Japan

NOTES FOR INFORMATION OF PARTICIPANTS

Schedule of meetings

1. The tenth session of the Typhoon Committee will be held at Tokyo, Japan, from 25 to 31 October 1977. It will open at 10 a.m. on Tuesday, 25 October 1977, in the Conference Hall, Ministry of Foreign Affairs, Government of Japan, Tokyo, where all meetings will be held.

2. Subject to confirmation by the Committee, the daily schedule, except for the opening meeting, will be as follows:

Monday through Friday	0930 to 1230 hours 1430 to 1700 hours
Saturday	0930 to 1300 hours

Registration

3. A registration desk will be located outside the committee room. Participants are requested to be in the lobby outside the committee room between 0900 and 0945 hours on the opening day, in order to allow time for registration.

Badges

4. On obtaining their identification badges after registration, participants are requested to wear them at all meetings and official functions.

/Reception

Reception on arrival

5. Provided that advance notice is given, participants will be met on arrival at Tokyo International Airport by officials of the Japanese Government, who will assist them in going through the customs and immigration formalities. Arrangements will also be made for transportation to their respective hotels.

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Tokyo, 100, Japan

- (a) Name of participant
- (b) Country/organization represented
- (c) Airline by which travelling
- (d) Flight number
- (e) Expected date and time of arrival in Tokyo
- (f) Whether hotel accommodation is required and, if so, at which hotel and from what date
- (g) Names of family members accompanying participant
- (h) Two passport-size photographs for the use of the reception committee

7. The above information is requested in addition to the official notification by Governments and organizations to the Executive Secretary of ESCAP, Bangkok, concerning the composition of delegations.

8. Participants are advised to mark their baggage clearly for easy identification, so as to avoid any inconvenience or possible delay at the airport on arrival. It is suggested that, in addition to the participants' names, the baggage labels should include the words "TYPHOON COMMITTEE, TOKYO" in block letters.

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9. Hotel accommodation will be reserved upon request at the Shimbashi Daiichi Hotel. The rates shown below are for air-conditioned rooms (class A standard) which are well-furnished and fully carpeted.

Single room:	¥ 6,000	(\$ 22.64)
Double room:	¥ 8,000	(\$ 30.19)

These rates do not include the cost of meals, which is approximately ¥ 1,000 (\$ 3.77) for breakfast, ¥ 2,500 (\$ 9.43) for lunch and ¥ 4,000 (\$ 15.09) for dinner.

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11. Participants are requested to obtain, before their departure, entry visas for Japan from Japanese diplomatic or consular missions in their countries. Where there is no such mission, participants are advised to make a brief stopover at a convenient place to obtain the required visas. These missions have been instructed by the Government of Japan to issue entry visas expeditiously on application. Participants are, however, advised that, wherever possible, their applications for entry visas should be submitted through their respective Governments or organizations, or else accompanied by a certificate of their participation in the meeting to facilitate the verification of their identity and the issue of entry visas. Participants are also requested to obtain, where necessary, transit visas for places en route to Tokyo before commencing their journey. No entry visa is required if there is a visa waiver arrangement between the participant's country and Japan.

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13. Participants are advised to bring with them pound sterling or US dollar traveller's cheques, bank drafts or letters of credit which can be exchanged for Japanese currency at the prevailing bank rates. The exchange rates, which fluctuate from time to time, are approximately as follows:

\$US 1.00	=	¥ 265 - 270
£ 1.00	=	¥ 465 - 470

Weather

14. The climate of Tokyo during October is usually mild with some rain. The mean daily maximum temperature is 21.1°C (70°F) and the mean daily minimum 13.5°C (56°F). In particular, the 5-day mean temperature from 28 October to 1 November is 15.0°C (59°F). The average monthly relative humidity is 74 per cent. The mean monthly total rainfall is 203 mm (7.9 inches).

Communications

15. Mail intended for participants should be addressed c/o Mr. Yubun Narita (see paragraph 6).

Working languages

16. The working languages of the meeting will be English and French.

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17. Some of the documents for the session will be supplied to participants in advance. Others will be distributed as they are issued

during the session. In view of the limited number of copies available, it will be appreciated if participants bring with them the sets of documents supplied in advance.

Study tour

18. All members of delegations are invited to join the study tour of the Yodo river dams located in western Japan. The tour is so designed as to increase the participants' understanding of disaster prevention measures against floods caused by typhoons.

The tentative itinerary includes a sight-seeing tour of the ancient capital of Kyoto. Partial expenses of the study tour should be borne by the participants. Such expenses are hotel accommodation and transportation fee, which will be about 30,000 yen (\$ 113.00).

The tentative itinerary for the study tour is shown below:

Saturday, 29 October

1500	Depart for Kyoto by Shinkansen (super express train)
1800	Arrive at Kyoto Station
1810	Arrive at Kyoto Second Tower Hotel
1830	Reception by the Ministry of Construction

Sunday, 30 October

0900	Leave the hotel
1000	Arrive at the Integrated Control Office of Yodo River Dams
....	Tour around the facilities (description attached)
1200	Lunch
1330	Leave the dam for Kyoto City for sightseeing
1730	Arrive at the hotel

Monday, 31 October

0900	Leave the hotel
0910	Depart for Tokyo Station
0930	Depart for Tokyo by Shinkansen
1230	Arrive at Tokyo Station
1430	Arrive at the Conference Hall.

/Description

Description of the facilities

Integrated Control Office of Yodo River Dams

This Office is located in Hirakata City, Osaka Prefecture, in the Yodo River basin, the area of which is 7,281 sq km with a total population of about 9 million.

In the Yodo River basin there are four dams, a weir and a lake named Lake Biwa, which is the biggest lake in Japan. It is planned to construct two other dams.

This Office is the centre for operating the control facilities. As the Yodo River basin is in the central part of western Japan where big cities such as Osaka, Kyoto and Nara are located, flood control is a very important aspect of the operations.

In the operation of these facilities, it is also necessary to take into consideration water supply, power generation and water conservation requirements besides flood control. The control systems include an electronic computer and receiving equipment for 89 telemeters reporting precipitation and river water level and discharge data which are connected to the computer. Receiving equipment for water quality data and facsimiles of cloud images from a meteorological observatory are also installed in the Control Office.

/ATTENDANCE INFORMATION

UNITED NATIONS
ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TENTH SESSION OF THE TYPHOON COMMITTEE
Tokyo, 25-31 October 1977

ATTENDANCE INFORMATION

(Please type or print)

1. NAME _____
(As it should appear in official listing)
2. TITLE OF PRESENT OFFICIAL POSITION _____
(In home country or official duty station)
3. PERMANENT MAILING ADDRESS _____

4. COUNTRY/ORGANIZATION REPRESENTED _____

5. WILL ATTEND THE SESSION AS:

REPRESENTATIVE _____ ADVISER

ALTERNATE _____ OTHER
6. ACCOMPANIED BY FOLLOWING MEMBERS OF FAMILY

<u>Name</u>	<u>Relationship</u>	<u>Age if under 18</u>
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

25 October 1977

7. DATE OF ARRIVAL IN TOKYO _____

FLIGHT NUMBER, TIME, ETC. _____

8. PLEASE RESERVE LIVING ACCOMMODATION IN TOKYO AS INDICATED BELOW:

ROOMS: Single _____ Double _____ Suite _____

NAME OF HOTEL: _____

CHECK-IN DATE: _____

CHECK-OUT DATE: _____

Note: All rooms and suites will be assigned according to information furnished above and on a first-come, first-served basis. It is essential that any change in plans, i.e., arrival date, accommodation required, etc. be communicated to Mr. Yubun Narita at the address shown below. Rooms not occupied in accordance with the latest advice to him will be held 24 hours at the participant's expense and then released.

9. IF MAKING OWN LIVING ARRANGEMENTS IN TOKYO, PLEASE INDICATE ADDRESS IN TOKYO AND DATES OF ARRIVAL AND DEPARTURE:

PLEASE ADDRESS THIS ATTENDANCE INFORMATION TO:

Mr. Yubun Narita
Liaison Officer
Specialized Agencies Division
United Nations Bureau
Ministry of Foreign Affairs
2-2-1 Kasumigaseki, Chiyoda-ku
Tokyo, 100, Japan

with a copy to:

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ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

Typhoon Committee
Tenth session
25-31 October 1977
Tokyo

MESSAGE BY MR. J.B.P. MARAMIS, EXECUTIVE SECRETARY
OF THE UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION FOR
ASIA AND THE PACIFIC

Your Excellencies, Distinguished Delegates, Ladies and Gentlemen,

It is my pleasure and privilege to welcome you to the tenth session of the Typhoon Committee.

First of all, may I express my sincere appreciation to the Government of Japan for inviting the Typhoon Committee to hold this session in Tokyo, and for the excellent arrangements it has made to facilitate your work. Indeed, the fact that the tenth session is now meeting in Tokyo is but one more example of the interest in, and support for, the Typhoon Committee that your Government has manifested from the very beginning.

This session marks the tenth anniversary of the expert group meeting which in 1967 recommended the establishment of the Typhoon Committee. In making its unanimous recommendation, that meeting was convinced that if the countries which had been subjected to the annual buffeting of typhoons would form a cohesive group, institutionalize it and speak as one voice, there was a greater chance of being heard and of receiving assistance from the international community.

/That meeting

That meeting was confident that, with proper direction and guidance, the countries could channel and co-ordinate their national activities more effectively in their efforts to mitigate the damage suffered annually from typhoons.

The meeting also held great hopes that the Typhoon Committee would foster closer relations among the specialists concerned in the member countries and lead to useful regional co-operation in this sphere of activity.

I believe that this tenth anniversary of that meeting is an auspicious and proper time to assess whether the group of experts comprising that initial meeting was justified in entertaining those hopes and convictions.

It seems to me that in the field of assistance from the international community, the Typhoon Committee has been very successful. It has received considerable backstopping from ESCAP, WMO and the League of Red Cross Societies, financial assistance from UNDP and magnanimous technical and financial assistance from a number of developed countries, particularly from the Government of Japan. I think it can safely be said that the recipient countries would not have received a large part of this assistance without the Typhoon Committee.

As to the co-ordination in the national efforts of the members of the Typhoon Committee to minimize the annual damage from typhoons, I am sure we can all agree that, while there is room for considerable improvement in this regard, the national agencies concerned in each country are now much more aware of the importance of the functions of other agencies which are pursuing the same objectives, and the need for

/co-ordination of

co-ordination of their efforts to ensure effectiveness and economy. Thus, meteorological departments, hydrological departments, disaster prevention and preparedness agencies and relief agencies have started a useful and, it is hoped continuing dialogue in a field where there was generally little contact before the establishment of the Typhoon Committee.

As to the third point, no one can doubt that the Typhoon Committee had been successful in fostering close relations among the specialists concerned in the member countries, and in promoting regional co-operation through the exchange of important meteorological data required for forecasting and tracking typhoons.

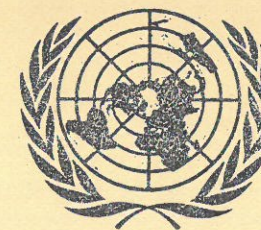
In addition to the foregoing, the interagency co-operation between ESCAP and WMO, which was already good, improved still further after the establishment of the Typhoon Committee; in fact, the partnership was so successful that they decided to extend their efforts in this field by establishing the WMO/ESCAP Panel on Tropical Cyclones.

So much for the past. Like a number of other ESCAP projects, the Typhoon Committee is faced with the need to find alternative resources in the near future as UNDP assistance is phased out. This is the most important consideration facing the meeting, and I am confident that, building on the experience and achievements to which I have referred, you will find ways, through increasing collective self-reliance, of ensuring that your programme goes forward unabated.

ESCAP, and I am sure WMO, will continue to assist you in your efforts to achieve the noble objectives of the Typhoon Committee.

In conclusion, may I convey to you all my very best wishes for the success of the tenth session of the Typhoon Committee.

.....



ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

PROVISIONAL AGENDA

1. Opening of the session
 2. Election of the Chairman and Vice-Chairman
 3. Adoption of the agenda
 4. The Committee's activities during 1977
 - (a) Meteorological component
 - (b) Hydrological component
 - (c) Disaster prevention and preparedness
 - (d) Training
 - (e) Research
 5. Impact of related programmes on the Typhoon Committee's activities
 - (a) The Japanese Geostationary Meteorological Satellite (GMS)
 - (b) The First GARP Global Experiment (FGGE)
 6. Support for the regional typhoon programme
 7. Programme for 1978 *and beyond?*
 8. Co-ordination with the WMO Tropical Cyclone Project and regional programmes
 9. Consideration of the agenda for the next session of the Committee
 10. Date and place of meeting of the eleventh session
 11. Scientific lectures
 12. Adoption of the report
-

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ESCAP BANGKOK
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I will join the study tour from 29 to 31 October 1977.
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(Please cross out words not applicable.)

NAME: _____

SIGNATURE: _____

COUNTRY/
ORGANIZATION: _____

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

TENTATIVE PROGRAMME

Tuesday, 25 October 1977

1000 - 1230 hours

1. Opening ceremony
2. Election of the Chairman and Vice-Chairman
3. Adoption of the agenda
4. Agenda item 4 - The Committee's activities during 1977

1430 - 1700 hours

5. Agenda item 4 (continued)

Wednesday, 26 October 1977

0930 - 1230 hours

1. Agenda item 4 (continued)

1430 - 1700 hours

2. Agenda item 4 (continued)

Thursday, 27 October 1977

0930 - 1230 hours

1. Agenda item 5 - Impact of related programmes on the Typhoon Committee's activities
2. Agenda item 6 - Support for the regional typhoon programme

1430 - 1700 hours

3. Agenda item 6 (continued)

Friday, 28 October 1977

0930 - 1230 hours

1. Agenda item 6 (continued)
2. Agenda item 7 - Programme for 1978
3. Agenda item 8 - Co-ordination with the WMO Tropical Cyclone Project and regional programmes

1430 - 1700 hours

4. Agenda item 9 - Consideration of the agenda for the next session of the Committee
5. Agenda item 10 - Date and place of meeting of the eleventh session
6. Agenda item 11 - Scientific lectures

Saturday, 29 October 1977

0930 - 1300 hours

1. Meeting of the Drafting Committee

1500 hours

2. Departure for Kyoto

Sunday, 30 October 1977

1. Study tour

Monday, 31 October 1977

0900 hours

1. Departure for Tokyo

1230 hours

2. Arrival in Tokyo from study tour

1430 hours

3. Agenda item 12 - Adoption of the report
 4. Closing of the session.
-

FOR PARTICIPANTS ONLY

WRD/TC.10/1
24 August 1977

ORIGINAL : ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

THE COMMITTEE'S ACTIVITIES DURING 1977

(Item 4 of the provisional agenda)

Note by the Typhoon Committee secretariat

ACTIVITIES DURING 1977

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General

1. At its thirty-third session, held at Bangkok in April 1977, ESCAP noted with interest the considerable progress and accomplishments of the Typhoon Committee. It was pleased to note that the Pampanga Flood Forecasting Centre in the Philippines had issued timely and effective flood warnings during a severe typhoon in May 1976 and that those warnings had facilitated disaster prevention operations. The Commission also noted with satisfaction the addition of Malaysia as a new member of the Committee and the provision by Japan and the Philippines of counterpart professional staff to the secretariat of the Committee. Noting, however, that the Committee would continue to require financial and technical assistance to achieve its important objectives, the Commission urged WMO and ESCAP to negotiate with UNDP to continue its support for the Committee. It noted with appreciation the expression of continued support by Japan and the United States to the Committee.

2. The most recent phase of the regional typhoon programme (1974-1976) ended in December 1976. Although a request had been submitted for assistance for a further period of five years (1977-1981), UNDP indicated that assistance was to be phased out over the next two years (1977 and 1978). In accordance with the Committee's recommendation and subsequent support by ESCAP and the WMO Executive Committee, WMO and ESCAP requested UNDP headquarters to support the regional typhoon programme for at least a few more years. Details of these requests and subsequent developments are given in document WRD/TC.10/6.

3. The remaining items of UNDP-provided telecommunication and radar ancillary equipment were delivered during the year. The equipment was installed or brought into use with the assistance of the telecommunication/electronics expert of the Typhoon Committee secretariat (TCS), where necessary.

4. The United Nations hydrologist and flood forecasting expert, Mr. A. Hamamori, left the Typhoon Committee secretariat in mid-December 1976, after nearly six years of work on the project. During that time he gave invaluable advice to the participating countries on the establishment of flood forecasting and warning systems. The Government of Japan provided a hydrologist (Mr. Hidetomi Oi) to TCS with effect from March 1977. The meteorologist provided by the Philippines in November 1975 continued to work in TCS as a counterpart professional staff member.

5. In accordance with the ninth session's recommendation, a fact-finding mission was carried out in Malaysia by the Chief Technical Adviser and the telecommunication/electronics expert of TCS in May-June 1977 in order to review the existing facilities and additional requirements, and ensure Malaysia's participation in the Committee's programme.

6. In accordance with the Committee's recommendation that close liaison be ensured between the Typhoon Committee and the WMO/ESCAP Panel on Tropical Cyclones, the Chief Technical Adviser of TCS attended the fourth session of the Panel, held at Dacca in April 1977.

7. The official missions undertaken by the experts of TCS during 1977 (including the missions planned up to the tenth session) are indicated below:

Mr. S.N. Sen	:	Cebu, Philippines (February); Dacca, Bangkok and Hong Kong (April); Kuala Lumpur, Penang and Bangkok (May-June); Seoul and Tokyo (August); Tokyo (October)
Mr. C.H. Tang	:	Cebu, Philippines (February); Kuala Lumpur, Penang, Kota Bharu, and Bangkok (May-June); Seoul/ Tokyo (October)
Mr. Hidetomi Oi	:	Bangkok (August); Seoul/Tokyo (October)

A. Meteorological component

1. Status of meteorological observing and telecommunication system → Refer to Annexes I-IV

8. The information presented in annexes I-IV is intended to assist the Committee in examining the degree to which the meteorological observing and telecommunication facilities essential to typhoon warning services have been implemented in the member countries. The principal deficiencies (RS/RW, storm warning radar, telecommunication) relating to facilities forming part of the World Weather Watch (WWW) have been summarized in annexes I-III. The status of implementation and further plans for those facilities included in the revised priority list drawn up at the ninth session are summarized in annex IV.

9. The Committee may wish to review the deficiencies listed in the annexes and consider possible means of speeding up action where appropriate. Notification at the session of any correction, addition and changes to the information furnished in the annexes would be appreciated.

2. RS/RW and radar stations

10. The reception of RS/RW observations from Cebu, Laoag and Clark (Philippines), which were recommended as a minimum desirable network for the Philippines, were examined. While Clark observations (0000 and 1200 GMT) were received regularly, Cebu and Laoag (0000 GMT) observations continued to have occasional interruptions mainly owing to an inadequate supply of hydrogen gas. PAGASA's request for supply of chemicals and hydrogen generators through VAP assistance was approved by WMO for circulation. An additional RS/RW station was established at Zamboanga in April 1977. A wind-finding radar offered by the United States under VAP assistance was expected to be installed in the near future at Davao in the southern part of the Philippines.

11. A 10-cm radar was installed at Basco (Philippines), to which high priority had been attached by the Typhoon Committee since its inception. The radar at Basco has been in regular operation since June 1977. A 5.6 cm radar at Aparri, in northern Luzon, has been in operation since November 1976. The 10-cm radars at Baguio, Cebu, Daet and Guian continued to be operational with occasional interruption, while that at Virac was out of commission for most of the period owing to lack of spare parts. The proposed site for the 10-cm radar at Tanay (30 km east of Manila) has been under negotiation.

12. The TCS experts had detailed discussions with the PAGASA officials in February 1977 concerning operation and maintenance of the radar and RS/RW stations and national data collection facilities in the Philippines. The results of these discussions with recommendations were forwarded to the Administrator of PAGASA for the necessary action.

13. The 10-cm radar installed at Bangkok in 1976 continued to be in regular operation. The proposed transfer of the 10-cm radar from Khon Kaen in northeastern Thailand to Chumphon on the east coast of southern Thailand was expected to be completed by the end of 1977.

14. The establishment of a 10-cm radar at Vientiane (included in the priority list), for which the USSR had offered assistance under VAP, was expected to be completed by the end of 1976. However, no definite information regarding its installation was available up to the time of preparation of this document. *completed in 1977*

15. In connexion with the establishment of a 10-cm radar at Cheju (Republic of Korea), which was also included in the Committee's priority list, the Korean meteorological service was considering, in consultation with TCS, the possibility of obtaining the radar through VAP assistance. *all the information recd. recently*

// The function re. radars in Malaysia is recorded in para 16.

16. Three 10-cm radars are now in operation in West Malaysia (Kuala Lumpur, Kota Bharu and Kuantan). A new radar is to be installed at Penang, for which site selection has been under consideration. Three additional radars are also to be installed, one in West Malaysia and two in East Malaysia (one each in Sarawak and Sabah). The need to train technicians in radar maintenance and provide radar test equipment was pointed out by the TCS experts during their mission to Malaysia.

17. Some of the radar stations in the region continued to experience difficulties due to lack of spare parts and shortage of trained technicians. The telecommunication/electronics expert of TCS provided guidance in calibration and maintenance of weather radar during visits to radar stations in the Philippines, Thailand and Malaysia.

18. The UNDP-provided radar picture transmission equipment was installed at Mactan and Daet in the Philippines. Three additional sets of radar picture transmission equipment procured by PAGASA were being installed at the Basco, Aparri and Baguio radar stations.

// An integrated radar picture transmission equipment is being established in the Philippines.

3. Telecommunication system

19. With a view to improving the national data collection system in the Philippines, new antenna systems had been installed at Aparri and Diliman (Manila) by January 1977. The communication test between these stations was carried out with the new antenna systems and low frequency band crystals, and the results were found satisfactory throughout the day and night. Installation or modification of antennae at other provincial stations has since been under consideration.

19 Various steps were in progress for improvement of national data collection in the Philippines.

20. A 1 kW SSB transmitter, an SSB receiver and two sets of log-periodic antennae as well as spare parts donated by the Government of France through WMO VAP assistance were received by the Philippines in January 1977. This equipment was being installed at the Virac radar station for transmission of radar observations to Manila.

in charge - Manila

// The transmitter and receiver installed at Manila (Diliman) which is useful for national data coll.

21. The Bangkok-New Delhi point-to-point circuit commenced operation via satellite on 29 February 1977, which improved data collection and retransmission from the Bangkok radio telecommunication hub (RTH). The Bangkok-Hong Kong circuit is likely to be linked via satellite in the near future and the establishment of a new Bangkok-Tokyo circuit via satellite is also under consideration.

22. There has been appreciable improvement in the operation of the Bangkok RTH resulting from additional telecommunication equipment provided by UNDP and Australia, the Federal Republic of Germany and the United States, and the establishment of satellite communication links. For further strengthening of the Bangkok RTH, a computerized automatic switching system is needed, for which a VAP request has been pending.

23. Information was received from the Japan Meteorological Agency (JMA) that the Tokyo-New Delhi meteorological circuit was to be upgraded to 200 bands in July 1977 and the Tokyo-Peking circuit was expected to be in operation shortly.

24. For reviewing the efficiency of national data collection and their retransmission to the associated RTH, TCS continued to receive quarterly statistics from the Philippines, the Republic of Korea and Thailand. These statistics were scrutinized and the results in summarized form were being circulated to the concerned countries.

Statistics for 1975-1977 analyzed and summarized findings circulated recently

4. Other meteorological activities

25. The preparation of a manual for the prediction of the intensity and movement of tropical cyclones was undertaken as a subproject of the WMO tropical cyclone project. The co-ordinator for this subproject is from the United States and his collaborators from Hong Kong, Japan, India, the USSR and TCS. The first draft of the manual is expected to be available later in 1977 and will be reviewed at a meeting of the group in March 1978.

26. In response to the Committee's request, JMA completed the translation of its manual on typhoon forecasting into English, copies of which were distributed to the member countries in January 1977. Copies were also distributed through WMO to the member countries of the WMO/ESCAP Panel on Tropical cyclones and the RA I Tropical Cyclone Committee.

Committee approved to JMA

27. A review of the collection of observations from mobile ships was carried out under a subproject of the WMO tropical cyclone project. Hong Kong acted as executing member for this subproject with several collaborating countries, including Japan and Thailand, among the members of the Typhoon Committee. The survey covered tropical cyclone-prone areas where ships observations are sparse, including the Pacific Ocean east of the Philippines. A report on this survey with recommendations prepared by Hong Kong was circulated by WMO to all concerned in February 1977.

5. Action on decisions adopted at the ninth session

(a) Ocean weather ships in the western Pacific

28. Recalling that USSR research vessels had operated in the western Pacific in 1975 (and in previous years), the ninth session of the Committee expressed the hope that the USSR would consider the continuation of the programme in future years. WMO approached the permanent representative of the USSR inquiring about future plans for the operation of the Soviet ships. However, no reply had been received from the USSR at the time of preparation of this document.

29. Japan announced that its ocean weather station "Tango" (29°N, 135°E) would operate during the period May-October 1977 and report three-hourly surface observations and twice-daily radiosonde and pibal observations. Information was also received that the ocean weather ship "Keifu Maru" would be operating at 20°N, 130°E during September 1977 and at 30°N, 140°E during October 1977.

(b) Automatic marine buoy

30. JMA maintained ocean buoys as follows:

JMA No. 3 buoy at 25° 40'N, 135° 55'E

JMA No. 4 buoy at 28° 20'N, 126° 05'E

JMA No. 6 buoy at 37° 45'N, 134° 23'E

(c) Priorities for the implementation of observing and telecommunication facilities

31. TCS has maintained close contacts with the member countries, by correspondence and visits of its experts, with a view to expediting implementation of the recommended facilities. Where bilateral or VAP assistance was offered or there were prospects of such assistance, the countries concerned were advised on further action.

(d) Exchange of radar fixes

32. The ninth session noted with satisfaction that the programme of exchange of radar fix messages had been very satisfactory during 1976. TCS issued a circular letter requesting member countries to ensure regular and prompt exchanges of radar fixes of typhoons. Attention was drawn to the further improvement of the radar network with the establishment of 10-cm radar stations at Aparri and Basco (Philippines).

(e) Meteorological satellites

33. In connexion with the launching of the Japanese GMS in July 1977 and replacement of the NOAA-series satellites by TIROS-N satellites in 1978, the need for modification of APT equipment or for procurement of new receiving equipment was reviewed by TCS in consultation with JMA, WMO and the concerned member countries. More details on this subject are given in document WRD/TC.10/4.2 and will be followed under agenda item 5 (a).

(f) Meteorological reconnaissance flights

34. It may be recalled that the ninth session noted with appreciation that reconnaissance flights by United States aircraft in the typhoon area had continued to provide valuable information for warning purposes and expressed the hope that the United States would continue its programme of typhoon reconnaissance in the years ahead. WMO has written to the permanent representative of the United States inquiring about his country's plans for continuing such flights.

6. Further action proposed

35. It is suggested that the Typhoon Committee may wish to:

(a) Examine the information in the annexes, especially in regard to the state of implementation of the facilities to which priority was accorded at the ninth session;

(b) Revise the list of priorities;

(c) Recommend further measures to expedite implementation of the required meteorological observing and telecommunication facilities;

(d) Express its appreciation to France, the USSR and the United States for offering assistance under VAP projects in the typhoon area;

(e) Express appreciation to JMA for producing an English version of the manual on typhoon forecasting and for its distribution to the member countries;

(f) Invite the Government of the USSR to resume operation of its ocean weather ships in the typhoon area,

(g) Recommend continuation of the exchange of radar fix messages and consider, in the light of the latest experience, any measures for improvement of these exchanges;

- (h) Reiterate the importance of typhoon reconnaissance flights and express the hope that the United States will continue to provide this valuable information for typhoon warning services.

B. Hydrological component

1. General activities

36. Further progress has been made in developing comprehensive plans for improvement of pilot flood forecasting and warning systems in the key river basins in the Philippines, the Republic of Korea and Thailand. Preparations, for extending flood forecasting systems to cover other major river basins in the Philippines have been actively pursued with the assistance of the Government of Japan. Two river basins were selected in East Malaysia for implementation of flood forecasting systems. Developments during 1977 are summarized below:

(a) Republic of Korea

37. For the purpose of increasing the capability of the Han River flood forecasting system, a team of Japanese experts visited the Republic of Korea in March-April 1976, when the TCS hydrologist participated in part of the mission. The team's recommendations included countermeasures to lightning damage, reinforcement of the emergency power supply, long-term training of telecommunication engineers, study of hydraulic behaviour of dams and reservoirs and development of techniques for forecasting frontal rainfall. In response to a further request from the Republic of Korea, another team of experts from Japan visited that country for four months (June-September 1977) with a view to reviewing the latest position and providing further assistance for the improvement of hydrological techniques and telecommunication facilities. Information on further developments may be expected at the tenth session.

(b) Lao People's Democratic Republic

38. Following a preliminary survey in the Se Bang Hieng River basin conducted by a team of Japanese experts in 1975, the TCS hydrologist visited Vientiane in October 1976 and explained the survey report to the concerned government officials. He recommended early installation of ordinary and automatic rain gauges and stream gauges at strategic sites in the basin. The need for a second survey was considered since a major part of the basin was not accessible at the time of the first

/survey

survey. TCS made inquiries regarding further developments in the country as follow-up of the preliminary survey conducted by the Japanese team in 1975 and the recommendations made by the TCS hydrologist in October 1976. No reply to these inquiries had been received at the time of preparation of this document.

(c) Philippines

39. The Pampanga flood forecasting system implemented in 1973 has been working satisfactorily. The flood forecasting centre issued 48 flood alerts or flood warnings in 1976. There has been no occasion for issuing flood warnings during the current year up to the time of preparing this document. In accordance with the recommendations by the Japanese review mission in December 1975, the Flood Forecasting Centre continued studies for improvements in flood forecasting, particularly those relating to improvements of the tank model and the introduction of the co-axial method.

40. The Pampanga Flood Forecasting Centre issued timely flood warnings during a severe typhoon in May 1976, which facilitated effective rescue operations, evacuation and flood fighting by the agencies concerned. In view of the recognized effectiveness of the pilot flood forecasting system, the Government initiated prompt action to extend flood forecasting to other major river basins in the country, including the Agno River, which had been already under study by the Government in co-operation with TCS.

41. In response to a request from the Philippines, the Government of Japan sent a team of 11 experts for one month during November-December 1976 to conduct a feasibility survey of flood forecasting for the Agno, Cagayan and Bicol river basins. A second survey, including a radio wave propagation test, was conducted by another group of 11 experts for over one month during February-March 1977. Detailed progress reports I and II on the feasibility survey were submitted in March and April 1977 respectively.

42. Based on the feasibility survey conducted by the Japanese experts, the Government of the Philippines proposed obtaining further assistance from Japan in the form of a loan for procurement of the required equipment for flood forecasting in the Agno, Cagayan and Bicol river basins. The cost of equipment, including technical services, was estimated as \$US 6,470,000 if implemented in one year and \$US 7,600,000 if the implementation is spread over three years. The Government of the Philippines attaches high priority to the scheme and a loan agreement for this purpose has been under negotiation with the Government of Japan. Further developments with regard to this project will be reported at the tenth session.

43. In line with the proposed expansion of flood forecasting activities in the Philippines, a major organizational division designated as the National Flood Forecasting Office was created within PAGASA in pursuance of a Presidential decree. The National Flood Forecasting Office will undertake operational activities in flood forecasting and warning systems, development and improvement of facilities and techniques with the co-operation of the Bureau of Public Works.

44. In connexion with the improvement of the Pampanga flood forecasting system and the proposed extension of flood forecasting to other major river basins, training of personnel has been under active consideration by the Philippines. A telecommunication engineer received on-the-job training for four months (March-July 1977) in Japan and a hydrologist is expected to proceed to Japan for four months' training in operational flood forecasting in the near future. The Government of the Philippines also requested Japan to provide three experts for a period of four months for the training of personnel engaged in flood forecasting.

(d) Thailand

45. Arrangements similar to those in 1975 and 1976 were made for trial flood forecasting in the Mae Klong river by the Meteorological Department and the Royal Irrigation Department. The TCS hydrologist is scheduled to visit Bangkok in August 1977 to discuss the latest developments under the Mae Klong project.

46. As a follow-up of the preliminary survey conducted by the Japanese experts in 1975 and in response to a recent request by Thailand, another Japanese team of seven experts is expected to visit Thailand for a period of 40 days commencing early November 1977. The object of this survey is to finalize the plans for the flood forecasting system, including the design of the telecommunication network. The TCS hydrologist is expected to participate in this survey for at least a part of the period.

(e) Malaysia

47. During the fact-finding survey conducted by the Chief Technical Adviser and the telecommunication/electronics expert of TCS in May-June 1977, the existing flood forecasting system in Malaysia and the need for further expansion were considered. Flood forecasting in Malaysia is carried out by the Drainage and Irrigation Department with the co-operation of the Malaysian Meteorological Service. Four river basins in West Malaysia (Kelantan, Trengganu, Pahang and Perak) have been equipped with a total of 24 telemetering stations and computerized flood forecasting is carried out on the basis of the Sacramento model.

48. The Government of Malaysia is particularly interested in extending the flood forecasting system to East Malaysia (Sarawak and Sabah). The river basins selected for this purpose are Sungai Sadon river in Sarawak and Sungai Kina Batangan in Sabah. It was recognized that, before detailed planning could be done for flood forecasting in that area, a preliminary survey by the hydrologist and flood forecasting experts should be undertaken. The Government officials informed the TCS experts that they would welcome assistance from external sources to carry out such a preliminary survey. The TCS experts explored the possibilities in this regard in consultation with ESCAP.

2. Action on decisions adopted at the ninth session

49. The action taken on the decisions contained in the report of the Committee on its ninth session regarding the establishment and improvement of flood forecasting systems in the Republic of Korea, the Lao People's Democratic Republic, the Philippines and Thailand has been described in the preceding section.

3. Further action proposed

50. It is suggested that the Committee may wish:

(a) To record its appreciation of the valuable assistance provided by the Government of Japan in:

(i) Sending two teams of experts to the Philippines in connexion with the proposed extension of the flood forecasting system to the Agno, Cagayan and Bicol river basins and for considering further assistance for this major project;

(ii) Sending another team of experts to assist the Government of the Republic of Korea in improving the hydrological techniques and telecommunication facilities for the Han River flood forecasting system;

(iii) Arranging a second mission of experts to Thailand in November 1977 to finalize the plans for flood forecasting in the Mae Klong river;

(b) To consider further steps to be taken to establish pilot flood forecasting systems in the Lao People's Democratic Republic and Thailand and for the proposed extension of flood forecasting to East Malaysia.

C. Disaster prevention and preparedness

Follow-up to the joint LRCS/WMO/ESCAP mission

51. The joint LRCS/WMO/ESCAP mission carried out follow-up visits to Hong Kong, the Philippines, the Republic of Korea and Thailand during 1976. Reports on these informal discussions were presented at the ninth session in document WRD/TC.9/10. Fresh developments during 1977 are summarized below:

(a) Hong Kong

52. With regard to the question of instituting a dedicated meteorological broadcast, Hong Kong informed TCS in April 1977 that, although funds had not been approved by the Government, the Royal Observatory planned to broadcast weather reports and warnings from 9 a.m. to 5 p.m. through the use of the existing time service broadcast transmission facilities of the Royal Observatory on an experimental basis. *implemented in April 1977*

(b) Thailand

53. Mr. R.T. Jones, WMO consultant, carried out a survey on community preparedness and disaster prevention during November-December 1976 in the member countries of the WMO/ESCAP Panel on Tropical cyclones. In Thailand, the consultant concentrated on preparedness measures as a follow-up to the joint LRCS/WMO/ESCAP mission and informal discussions. He made several recommendations, including the establishment of a standing sub-committee for emergency situations with responsibility for the development of the basic systems and procedures. The TCS experts who visited Bangkok in June 1977 were informed that the recommendations made by Mr. Jones were under consideration by the Government.

(c) Philippines

54. The ninth session was informed that, to improve the dissemination of typhoon warnings, arrangements were being made to tap all available radio broadcast capability to build up an emergency broadcast system (EBS). The Office of Civil Defense organized a committee on a warning system to co-ordinate and ensure fast and efficient dissemination of warning information. A scheduled test of EBS with the participation of 46 radio and TV stations was conducted in the Manila area on 10 June 1977 and proved to be successful. The committee on a warning system intends to build up EBS at the national, regional and local levels. A representative of TCS participated in some of the meetings of this committee.

/Disaster

Disaster preparedness in Malaysia

55. During their fact-finding mission to Malaysia in May-June 1977, the TCS experts discussed disaster prevention and preparedness arrangements with the concerned officials. Malaysia has developed a national flood disaster plan for which the Secretary of the National Security Council acts as the Co-ordinator. Rescue operations are essentially carried out by the Police and the Army. Support services include medical, health, equipment, transport, communications, aerial reconnaissance and welfare services. The Police and Army, responsible for rescue operations, request support services as required through the Co-ordinator. The operation of the disaster plan is decentralized, the lowest level being the district, administered by a district officer. The TCS experts were informed that Malaysia would welcome the services of an experienced consultant who could review the existing disaster plan and suggest improvements.

Regional Seminar on Community Preparedness and Disaster Prevention held at Tokyo in June 1976

56. In accordance with the recommendation of the session for follow-up action, ESCAP issued a circular letter in May 1977 to the participants in the Regional Seminar requesting them to send brief reports describing the recommendations which they had made to their Governments after returning from the Seminar. They were also requested to submit to the authorities concerned for transmittal by their Governments, to ESCAP, a brief report on the achievements during the last 12 months in the improvements of CP/DP measures. *13 countries*

UNDRO/UNDP Regional Seminar on Disaster Relief (Manila, 12-13 April 1977)

57. The main subjects discussed at this Seminar were: (1) disaster versus economic development, (2) preparedness arrangements among in-country donor missions, (3) preparedness arrangements at headquarters level and (4) the role of the United Nations in matters relating to disasters. The telecommunication/electronics expert of TCS represented ESCAP at the Seminar. *(with support Malaysia)*

Guidelines for disaster prevention and preparedness

58. The ninth session was informed of the action taken by ESCAP, WMO, LRCS and TCS in co-operation with UNDRO to compile a manual providing guidance on the organization of effective systems for disaster prevention and preparedness. The final edition of the manual entitled Guidelines for Disaster Prevention and Preparedness in Tropical Cyclone Areas was printed under the joint authorship of ESCAP, WMO and LRCS. At the time of preparing this document, copies of the Guidelines were being distributed to all concerned.

/Used for

Need for consultant services in disaster prevention and preparedness

59. The representatives of UNDRO at sessions of the Typhoon Committee (Manila, November 1976) and the WMO/ESCAP Panel on Tropical Cyclones (Dacca, April 1977) expressed the willingness of UNDRO to consider requests for expert services in disaster prevention and preparedness. With a view to accelerating progress in this important component of the programmes, WMO wrote to UNDRO inquiring about the probable scope of UNDRO assistance, in terms of both expert services and cash to support the provision of facilities and the training of personnel. The salient features of the reply from UNDRO are reproduced below:

"In this respect I should perhaps first mention that our technical co-operation activities are financed entirely from voluntary contributions; therefore it is highly unlikely that we will be able to provide direct cash support for training facilities. However, we do consider on an ad hoc basis requests for fellowships in disaster-related fields. Depending on the requirements of each case, we attempt to arrange with a host country to place the trainee in the appropriate institution or service which provides the training facilities free of charge, while UNDRO meets the cost of travel and subsistence involved. We might be able to absorb, through the same procedure, a very limited number of the requests that may result from your proposed consultation with WMO member countries which have expressed their interest in such training.

"With regard to expert services, here again, we respond to requests for assistance in disaster preparedness and prevention as and when they are received, locating and selecting experts in the specific field required according to the nature of the requests. It might be possible, in certain cases, to finance consultant services in connexion with the Committee/Panel programmes, but it is difficult at this stage to make any firm commitment until we know to what extent these services are likely to be required.

I would suggest therefore that your proposed consultations with countries and the Chief Technical Advisers of TCS and TSU should proceed as planned, to obtain further information of their detailed requirements. In the light of replies received, we shall then be in a position to examine individual requests and decide, by mutual agreement, how each one should be dealt with.

/Further

Further action proposed

60. It is suggested that the Committee may wish to:

(a) Note the action taken to follow up the joint LRCS/WMO/ESCAP missions and encourage continued activities of this type, whenever feasible, through occasional visits to the member countries;

(b) Note with satisfaction the publication and distribution of the Guidelines for Disaster Prevention and Preparedness in Tropical Cyclone Areas and request member countries to ensure that they are brought to the attention of all concerned within their own countries;

(c) Note the action taken to obtain expert services in disaster prevention and preparedness and, if possible, specify in detail the requirements of member countries for such assistance."

D. Training

61. In accordance with the information given at the ninth session, the Government of Japan decided to organize group training courses in river engineering and in meteorology in 1977. The course in river engineering is to be held from 21 July to 19 November 1977 and that in meteorology for four months commencing October 1977. TCS requested the member countries to send timely nominations for the training courses.

62. At the ninth session of the Committee, the representatives of France and the United States renewed their offers of assistance for training of personnel in meteorology and hydrology under bilateral assistance programmes or VAP. At earlier sessions offers of assistance were also made by the USSR, Australia and the Federal Republic of Germany. TCS sent a circular letter drawing the attention of the member countries to these offers of assistance.

63. At its eighth session, the Committee was informed that the Government of the Philippines had notified WMO of the availability of meteorological training leading to the M.Sc. degree at the University of the Philippines as its contribution to VAP. Four candidates from neighbouring countries have already completed their studies under such fellowships. A meteorologist from Burma commenced the training course in June 1977.

use of satellite data - No further action for now -
It is now understood that a seminar on (b) is likely to be
held in 2nd half of 1978, possibly in Japan.
2. Representation of France in panel TC-9 that his country

64. A research fellowship for Ph.D. studies in tropical dynamic meteorology was provided to the Philippines under the WMO regular budget. The fellowship commenced in January 1977 in the University of Reading, United Kingdom.

65. As part of the UNDP project, one international fellowship for Thailand for training in the United States and Japan was in progress and another fellowship for Thailand was to commence in Hong Kong in July 1977. The possibility of a fellowship for Malaysia out of the project fund was under consideration by WMO.

66. The telecommunication/electronics expert of TCS gave on-the-job training at Bangkok on calibration and maintenance of weather radar and precipitation measurement by radar to the radar technicians of Thailand for a period of two weeks in June 1977.

Further action proposed

67. The Committee may wish to:

(a) Record its appreciation of the valuable assistance provided by the Government of Japan in organizing group training courses for the benefit of the member countries during 1977;

(b) Advise members to avail themselves of the training facilities offered by the developed countries and those obtainable under VAP, including short-term fellowships.

E. Research

1. General activities

68. Within the framework of the WMO tropical cyclone project, a number of specific studies in the form of subprojects have been undertaken. A status report on the implementation programme, including objectives, mode of implementation and status as at 31 January 1977 of each of the subprojects was circulated by WMO. Some members of the Typhoon Committee and TCS are participating in some of the subprojects.

69. The Royal Observatory, Hong Kong, continued to produce objective forecasts of typhoon tracks by computer programming by selected techniques, which were disseminated to member countries for operational use. The Royal Observatory has agreed to extend the area for issuing the objective forecasts as requested by some member countries. In addition, it plans to provide

indications of the accuracy of these forecasts for different areas and seasons in the form of probability ellipses. It has also made a further analysis of the available tropical cyclone data and obtained mean error charts for all objective technique forecasts.

70. Copies of Mr. P.C. Chin's paper on 'A diagnostic approach in tropical cyclone forecasting by objective techniques', which formed the subject of his lecture at the ninth session, were distributed to the member countries in March 1977.

71. At its ninth session, the Typhoon Committee was informed that, under the typhoon research project of the Philippines, operational testing of a barotropic model for forecasting typhoon movement was being carried out. Refinement of this technique has been under consideration. A technical paper describing the results of this technique was circulated to the member countries in March 1977.

72. A status report on the typhoon moderation programme in the Philippines was presented as one of the scientific lectures at the ninth session. The report referred to the weather modification experiment carried out in 1976. A Presidential decree issued in June 1977 reorganizing PAGASA to include a typhoon moderation research and development office as a major organizational unit gave further impetus to the programmes.

73. The research project "Development of design criteria and methodology for low-rise/low-cost buildings to better resist extreme winds", which was being carried out by Bangladesh, Jamaica, the Philippines and the United States, with its focal point in the Philippines, was terminated in May 1977. The research produced among others, five volumes entitled "Building to resist the effect of wind" (National Bureau of Standards Building Science Series No. 100) and a documentary film on the subject.

74. Copies of the following papers received from the United States National Environmental Satellite Service were distributed to the member countries in June 1977:

(a) "Early signs of tropical storm development in the Western Atlantic" by V.F. Dvorak and (b) "Merger of tropical cyclone remnants over the northeast Pacific" by A.C. Pike.

These studies would
/2. now be incorporated in
the Building codes of

2. Action on decisions adopted at the ninth session

(a) Joint collaboration in typhoon research

75. In connexion with the joint study on "Tropical cyclone prediction by objective techniques", Mr. P.C. Chin (Hong Kong), acting as the co-ordinator for the joint study, held consultations at Manila with the PAGASA officials and TCS in October 1976. The scheme for the joint study was finalized after further discussion during the visit of the Chief Technical Adviser of TCS to Hong Kong in April 1977. The techniques to be tried by participating countries were selected. It was further agreed that the co-ordinator would finalize the best common track based on the JMA track and taking into account the amendments proposed by the participating countries. The co-ordinator finalized a verification form which was to be printed and distributed in the near future.

76. It may be recalled that Dr. Miyazaki (Japan), co-ordinator for the joint study on storm surges, sent a detailed circular in September 1976 on existing facilities, suggestions for improvement and plans for co-operative studies in the respective countries. He presented a progress report on the joint study on storm surges at the ninth session. A report from the Philippines entitled "A scheme for predicting peak storm surges in the Philippines" by Arafles and Alcances was distributed in May 1977. Studies were also in progress in Hong Kong by Robert Lau of the Royal Observatory based on a combination of the observatory's numerical bay model with Jelesniaski's open coast model. A note on his studies was expected to be circulated in the near future. To facilitate storm surge studies in the Republic of Korea, an officer of the Korean Meteorological Service was given one year's training in Japan in 1976. The co-ordinator of the joint study is expected to prepare a note summarizing the latest developments.

(b) Flood risk mapping

77. The ninth session considered the desirability of initiating provisional studies related to the quantitative risk evaluation of floods caused by typhoons. The WMO manual Quantitative Evaluation of Disaster Risks (Tropical Cyclones), copies of which have since been distributed, provided some useful information in this connexion. The Ministry of Construction in Japan has undertaken flood risk mapping for selected rivers since 1976. TCS has requested the Ministry of Construction to send copies of relevant papers to facilitate similar studies in other member countries.

3. Further action proposed

78. The Committee may wish to:

(a) Record its appreciation to the Government of Hong Kong for continuing the preparation of objective forecasts of typhoon tracks and for disseminating them to member countries for operational use;

(b) Consider the action taken for joint collaboration in typhoon research and recommend measures to foster such collaboration.

/ANNEXES

ANNEXES

Annex I

WWW GLOBAL OBSERVING SYSTEM - UPPER-AIR STATIONS

Deficiencies and further plans (0000 and 1200 GMT observations only considered)

Country and station	Radiowind (RW)		Radiosonde (RS)		Plans and remarks
	00	12	00	12	
<u>Democratic Kampuchea</u>					
48991 Phnom Penh (Pochentong) ^{a/}	0	0	<u>b/</u>	<u>b/</u>	No information available no offer to date.
<u>Philippines</u>					
98223 Laoag ^{a/}		0		0	1200 GMT expected by 1977
444 Legaspi		0			
618 Puerto Princesa	0	0			RW 0000 GMT expected in 1977.
645 Cebu ^{a/}		0	0		} 1200 GMT expected by 1977 RW expected by 1977 (VAP assistance offered by the United States).
753 Davao	0	0			
836 Zamboanga		0		0	

^{a/} Typhoon Committee priority station.^{b/} VAP request.

Annex II

WWW GLOBAL OBSERVING SYSTEM - OTHER FACILITIES NOT YET IMPLEMENTED

Storm-warning radar station

Country	Station	Future plans
Philippines	Tanay (30 km east of Manila)	Implementation planned for 1979
Republic of Korea	Cheju	National or VAP project (time of implementation uncertain).

Annex III

WWW GLOBAL TELECOMMUNICATION SYSTEM

Regional telecommunication links not yet implemented

Country	Link	Remarks
Thailand/Democratic Kampuchea	Bangkok-Phnom Penh	No plans at present
Thailand/Socialist Republic of Viet Nam	Bangkok-Ho Chi Minh City	No plans at present

Annex IV

PRIORITIES SET BY THE TYPHOON COMMITTEE AT ITS TENTH NINTH SESSION

Summary of the state of implementation and further plans

Observing facilities

i) Upper-air stations

No plans: 48991 Phnom Penh (Democratic Kampuchea) - No information available.

Already planned: 98223 Laoag (Philippines) } - 1200 GMT radiosonde/radiowind (national project 1978).
98465 Cebu }

ii) Weather radar

Already planned: Vientiane (Lao People's Democratic Republic) - VAP assistance by USSR accepted.
Tanay (near Manila, Philippines) - National project 1979 implemented in 1977.
Basco (Philippines)
Cheju (Republic of Korea) - National project (or VAP).

iii) Ocean weather station

Already planned: Ship at 16°N, 135°E - USSR operated research vessels in west Pacific up to 1975 and again scheduled to operate in 1978

Communication facilities

i) Improvement of national data collection facilities

Already planned: Lao People's Democratic Republic - Bilateral/UNDP project (equipment supplied).
Philippines - National/VAP project (partly implemented).

ii) Regional telecommunication links

Establishment of the following point-to-point links

Already planned: Bangkok-Phnom Penh - No plans for implementation at present.
Bangkok-Ho Chi Minh City - No plans for implementation at present.
Tokyo-Peking - National project 1977. Implemented in 1977

ii) Other telecommunication facilities

Already planned: Strengthening of RTH, Bangkok - Partially implemented with VAP/bilateral help and national resources; another VAP request is pending.

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
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TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

THE COMMITTEE'S ACTIVITIES DURING 1977

(Item 4 of the provisional agenda)

Note by the Typhoon Committee secretariat

CORRIGENDUM

Page 18, paragraph 77

At the end of the paragraph add WMO has submitted to UNEP a proposal for a regional project for Asia which would include the application of the hydrological techniques described in this manual to selected areas in member countries and would yield results of value to those countries individually and to the region as a whole. No response to this proposal had been received by August 1977.

Page 19, paragraph 78

Add a new subparagraph (c) as follows (c) Consider the possibilities for collaboration in the testing and application of techniques for flood-risk evaluation, in particular in the light of any developments in the proposed WMO/UNEP project.

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FOR PARTICIPANTS ONLY

WRD/TC.10/2
31 August 1977

ORIGINAL : ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

IMPACT OF THE JAPANESE GEOSTATIONARY METEOROLOGICAL SATELLITE (GMS)
ON THE TYPHOON COMMITTEE'S ACTIVITIES

(Item 5(a) of the provisional agenda)

Note by the Typhoon Committee secretariat

Introduction

1. The Japanese Geostationary Meteorological Satellite (GMS) was successfully launched in July 1977. GMS has been placed in a stationary orbit about 36,000 km above the equator at 140°E. It is expected to be operational from September 1977. This satellite is one of five geostationary satellites forming part of the Global Observing System (GOS) under the World Weather Watch plan which will assist the First GARP Global Experiment (FGGE), the others being provided by the European Space Agency (ESA) (one), the United States of America (two) and the USSR (one). Such satellites provide useful information over a circular area up to about 7,500 km from the sub-point. GMS will cover a large area of the western Pacific and southeast Asia, including the whole of the typhoon area.

2. Since 1974, at each session of the Typhoon Committee, the preparations for GMS have been discussed on the basis of information provided by Japan. The following papers were distributed by Japan at the seventh, eighth and ninth sessions respectively:

- (a) "Data collection and dissemination by GMS of Japan",
- (b) "GMS programme of Japan",
- (c) "A guide for receiving the weather facsimile transmission through the GMS of Japan".

3. At its ninth session the Committee decided that a separate item should be included in the agenda for the tenth session, dealing with GMS and its impact upon the Committee's activities. The most important point for consideration appears to be the equipment that member countries will need to receive information from GMS, and its cost.

The GMS missions

The GMS missions are:

- (a) Acquisition of day and night cloud pictures by means of the visible and infra-red spin scan radiometer (VISSR);
- (b) Data collection from data collection platforms (DCPs) when normal telecommunication systems are not adequate, and the retransmission by HR and LR (WEFAX) facsimile of processed data;
- (c) Monitoring of solar particles.

/Dissemination

Dissemination of GMS data

5. GMS is equipped for high resolution (HR) facsimile transmissions to medium data utilization stations (MDUS) and low resolution (LR) WEFAX-type facsimile transmissions to small data utilization stations (SDUS). A tentative schedule of facsimile broadcasts from GMS is given in WMO publication No. 411, Information on Meteorological Satellite Programmes Operated by Members and Organizations. An outline of the specifications for MDUS and SDUS are given in paragraph 5.2 of the same publication.

6. The images received from GMS are further processed at the Data Processing Centre (DPC) at Tokyo to obtain wind speeds, cloud distribution, cloud top and surface temperatures, etc. The data processed by DPC are transmitted from the radio telecommunication hub (RTH), Tokyo, to WMO members through the WWW Global Telecommunication System (GTS).

Modification of existing APT equipment and/or procurement of new equipment

7. The main purpose of this document, as stated in paragraph 3 above, is to provide the Committee with information on the equipment required and its cost as a consequence of the successful launching of GMS. There is, however, another development with regard to the acquisition of satellite data which should be taken into account at the same time. This is the projected replacement in the second half of 1978 of the current NOAA series of polar-orbiting satellites by the new TIROS-N series. Besides low resolution picture transmission (APT) and high resolution picture transmission (HRPT) in the visible and infra-red bands, TIROS-N satellites will provide digital data, including atmospheric temperatures, water vapour soundings, sea temperature mapping, data collection from DCPs, etc. It is therefore of considerable interest to member countries that they should be able to acquire the available data from both the GMS and TIROS-N satellites for the minimum outlay of funds. The DCP capabilities of both GMS and TIROS-N are also considered most suitable for real-time transmission of hydrological data in hydrological forecasting projects. Further information from JMA would be most useful to those member countries in need of such hydrological data collection systems.

8. Based on the specifications given for an SDUS, it is considered that the modification of existing APT equipment for the reception of GMS LR facsimile transmissions would call for new antenna assemblies, pre-amplifiers and frequency converters, and a modified recorder assembly. The cost of these modifications is estimated at about \$US 10,000. The modifications required for reception of

TIROS-N data are complicated and costly and the procurement of new equipment seems preferable.

9. In response to an inquiry from the Typhoon Committee secretariat (TCS), the Japan Meteorological Agency has expressed the view that modifications for reception from both GMS and TIROS-N is certain to be very costly although no precise estimates are available. An informal meeting of "GMS users" in the area was held at Tokyo from 28 June to 1 July 1977 to provide detailed information to help participants to establish reception facilities. It is expected that the representative of Japan will provide further information on the outcome of that meeting at the tenth session. No doubt the lectures on GMS to be given at the session will also provide valuable information of this kind.

10. On the basis of the information so far collected, rough estimates of the cost of modifying or replacing existing equipment are given below:

(a) <u>New equipment</u>	<u>\$US</u>
SDUS	50,000
MDUS	300,000
DCP	10,000
TIROS-N APT	50,000
(b) <u>Modified equipment</u>	
Conversion to SDUS	10,000

Considering the requirements of member countries for data reception from both GMS and TIROS-N satellites, and the desirability of restricting costs as much as possible, the following suggestions are offered for consideration:

(a) Provision of new TIROS-N APT receiver and new SDUS	(\$50,000), (\$50,000),
Total cost	\$100,000
(b) Provision of new TIROS-N APT receiver and modification of existing APT to SDUS-type receiver	(\$50,000) (\$10,000)
Total cost	<u>\$60,000</u>

/Further

Further action proposed

12. The Committee may wish to:

- (a) Express appreciation to the Government of Japan for launching GMS, which will provide valuable information for typhoon warning purposes;
- (b) Note the information given in this document and any additional information that may be furnished by the Japanese delegation;
- (c) Recommend the steps to be taken by member countries for modifying existing APT and/or procuring new equipment for data reception from GMS and TIROS-N satellites;
- (d) Request Japan to advise member countries on the operational procedures for establishing data collection platforms (DCPs).

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FOR PARTICIPANTS ONLY

WRD/TC.10/2
31 August 1977

ORIGINAL : ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

IMPACT OF THE JAPANESE GEOSTATIONARY METEOROLOGICAL SATELLITE (GMS)
ON THE TYPHOON COMMITTEE'S ACTIVITIES

(Item 5(a) of the provisional agenda)

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10. On the basis of the information so far collected, rough estimates of the cost of modifying or replacing existing equipment are given below:

(a) <u>New equipment</u>	\$US
SDUS	50,000 93,000
MDUS	300,000 270,000
DCP	10,000 — 106,000
TIROS-N APT	50,000
(b) <u>Modified equipment</u>	
Conversion to SDUS	10,000

11. Considering the requirements of member countries for data reception from both GMS and TIROS-N satellites, and the desirability of restricting costs as much as possible, the following suggestions are offered for consideration:

(a) Provision of new TIROS-N APT receiver and new SDUS	(\$50,000), (\$50,000), 93,000
Total cost	\$100,000 143,000
(b) Provision of new TIROS-N APT receiver and modification of existing APT to SDUS-type receiver	(\$50,000) (\$10,000)
Total cost	\$60,000

/Further

Further action proposed

2. The Committee may wish to:

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- (c) Recommend the steps to be taken by member countries for modifying existing APT and/or procuring new equipment for data reception from GMS and TIROS-N satellites;
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FOR PARTICIPANTS ONLY

WRD/TC.10/3
10 August 1977

ORIGINAL : ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

IMPACT OF RELATED PROGRAMMES
ON THE TYPHOON COMMITTEE'S ACTIVITIES:
THE FIRST GARP GLOBAL EXPERIMENT (FGGE)

(Item 5(b) of the provisional agenda)

Note by the WMO secretariat

Introduction

1. At its ninth session the Typhoon Committee requested that a number of items be taken into account in the establishment of the provisional agenda for the tenth session. One of these was the impact of the First GARP Global Experiment (FGGE) on the Committee's activities.
2. The main objective of FGGE is to provide a basic global data set that will be adequate for research aimed at:
 - (a) Increasing the time range and accuracy of weather forecasts on a national, regional and global basis, thereby making them more useful in practical application to the various activities of mankind;
 - (b) Studies of physical processes related to climate dynamics.
3. The paragraphs which follow give further information on the planning and execution of FGGE and its associated regional programme, the Monsoon Experiment (MONEX), for the benefit of the Typhoon Committee.

Schedule and relationship to typhoon studies

4. FGGE will be held according to the following schedule:

Build-up year	1 December 1977-30 November 1978
Operational year	1 December 1978-30 November 1979
Special observing period (SOP)I	5 January 1979-5 March 1979
Special observing period (SOP)II	1 May 1979-30 June 1979
5. MONEX is designed to be phased with FGGE and has the following principal components and schedule:

Winter MONEX, cold monsoon surges study	- December 1978
Winter MONEX, interaction study	- January-February 1979
Summer MONEX, Arabian Sea study	- May-June 1979
Summer MONEX, Bay of Bengal study	- July-August 1979

6. The observational programmes of FGGE and MONEX are designed to observe the atmosphere across a spectrum of time and distance scales ranging from the global down to circulation systems such as monsoon depressions that originate in the Bay of Bengal. The comprehensive coverage of data from the FGGE basic and special observing systems, which will be deployed during the FGGE special observing periods, will offer a unique opportunity to study phenomena such as typhoons, especially as they are related to larger circulation systems.

/The

he FGGE special observing systems of interest are: aircraft dropwindsondes, high-altitude constant-level balloons, tropical wind observing ships, southern hemisphere drifting buoys and special island-based upper-air stations. The FGGE basic observing system is comprised of the specially augmented WWW global observing system of upper-air observations and geosynchronous and polar-orbiting satellite systems. Indeed, one of the basic scientific objectives of MONEX is the examination of the possible existence of atmospheric tele-connexion or lateral coupling between the monsoon region and the Pacific region. One of the prime tele-connexions could be between the monsoon circulations and the occurrence of typhoons.

Participation by Typhoon Committee member countries in FGGE

All the countries will participate in FGGE through the World Weather Watch (WWW). The Secretary-General of WMO has requested all members to undertake special effort to install new stations and to upgrade other stations to the level requested by the WWW plan.

In addition, many of the typhoon countries or areas are planning special contributions to FGGE and MONEX. These include:

- (a) Hong Kong: Possible contribution of ships for the tropical wind observing system and MONEX; possible contribution of research aircraft to MONEX; provision of radar data to MONEX;
- (b) Japan: Geostationary satellite system and data products; one ship for FGGE SOP I and two ships for SOP II; deployment of drifting buoys in the southern hemisphere; FGGE data management area subcentre;
- (c) Malaysia: Contribution of the facilities and some personnel for the MONEX management centre for the winter monsoon; provision of radar, precipitation and radiation data in addition to special efforts to implement the WWW plan;
- (d) Philippines: Possible contribution of one or two ships to the FGGE tropical wind observing ship system;
- (e) Thailand: Provision of radar, precipitation and radar data in addition to a special effort to implement the WWW plan.

/Additional

Additional contributions required

9. The Third Planning Meeting on MONEX, held at New Delhi from 28 February to 4 March 1977, suggested some additional specific contributions that countries might make in addition to the provision of ships and aircraft for FGGE and MONEX. These suggestions include:

- (i) Malaysia: Implementation of radar-wind and radiosonde stations at Tawan (approx. 6°N, 117°E) and at Bintulu (96441) by the beginning of the winter monsoon experiment (December 1978);
- (ii) Philippines: Implementation of upper-air observations, especially during December 1978 and January-February 1979, at Puerto Princesa (98618) and Zamboanga (98836).

10. It is hoped that these stations might be implemented for MONEX and FGGE and that the Typhoon Committee might suggest operational periods that would satisfy typhoon research.

Action proposed

11. The Committee is invited to:

- (i) Note the information contained in this document on the planning of FGGE and MONEX;
 - (ii) Urge the member countries concerned to implement the additional observations requested in paragraph 9 above;
 - (iii) Express its views on suitable operational periods that would satisfy typhoon research as suggested in paragraph 10 above;
 - (iv) Encourage its member countries to co-operate to the maximum extent in FGGE and MONEX and to make known to WMO any special requirements they may have regarding future studies of typhoons.
-

FOR PARTICIPANTS ONLY

WRD/TC.10/3
10 August 1977

ORIGINAL : ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

IMPACT OF RELATED PROGRAMMES
ON THE TYPHOON COMMITTEE'S ACTIVITIES:
THE FIRST GARP GLOBAL EXPERIMENT (FGGE)

(Item 5(b) of the provisional agenda)

Note by the WMO secretariat

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/Additional

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Action proposed

11. The Committee is invited to:

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 - (ii) Urge the member countries concerned to implement the additional observations requested in paragraph 9 above;
 - (iii) Express its views on suitable operational periods that would satisfy typhoon research as suggested in paragraph 10 above;
 - (iv) Encourage its member countries to co-operate to the maximum extent in FGGE and MONEX and to make known to WMO any special requirements they may have regarding future studies of typhoons.
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FOR PARTICIPANTS ONLY

WRD/TC.10/4
22 August 1977

ORIGINAL : ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

Typhoon Committee
Tenth session
25-31 October 1977
Tokyo

SUPPORT FOR THE REGIONAL TYPHOON PROGRAMME

(Item 6 of the provisional agenda)

Note by the WMO and ESCAP secretariats

Introduction

1. The regional typhoon programme consists of the collective efforts of the member countries to provide an effective forecasting and warning system, together with those other measures necessary for the protection of life and property. Today, as in the past, it is the countries themselves which furnish by far the largest portion of the system from their own national resources. The notion of a regional approach to the problems arising from typhoons has, however, led to a need for additional facilities and services if the joint efforts of the countries to improve the system are to be successful. Member countries, other developed countries and UNDP have all contributed substantially to these efforts.

2. Since its inception in 1968, the Typhoon Committee's prime source of support for its technical secretariat has been UNDP. The funding provided by UNDP has consisted chiefly of the resources required to maintain a small group of experts in the Typhoon Committee secretariat (TCS), whose functions are the broad management of the Committee's programme. The resources made available have also covered some fellowships and the supply of limited amounts of equipment. It has, however, always been the expressed view of UNDP that the member countries themselves should ultimately assume full responsibility for TCS. This process began in late 1975 when a meteorologist provided by the Government of the Philippines joined TCS. A hydrologist provided by Japan assumed his functions there in early 1977.

Decisions at the Committee's ninth session

3. At its ninth session the Committee was informed by UNDP that its request for a new project covering the programming period 1977-1981 had not been approved. However, UNDP would continue to support the programme on a reducing scale for 1977 and 1978, after which no further assistance would be given. The Committee recorded its deep concern at the phasing-out of UNDP support and, in the light of the information received, reviewed its minimum requirements for the period 1977-1981. To meet these requirements, it adopted a three-fold approach:

- (a) A renewed appeal to UNDP to reconsider the proposed allocations;
- (b) The assignment of costs to the member countries themselves through a proposed scale of contributions;
- (c) Specification of those requirements for which international assistance was required.

4. The Committee drew up one table setting forth the requirements and assigning the funding variously to UNDP, member countries or international sources, and another showing the proposed contributions in cash or kind from member countries. It requested WMO and ESCAP to take the necessary action with UNDP, member countries and other potential donors to implement the decisions of the session.

Follow-up action and present status

(a) With UNDP

5. WMO has taken action to impress upon UNDP the seriousness with which the member countries of the Typhoon Committee regard the reduction of its support in 1977 and 1978 and, especially, the total withdrawal of its aid after 1978. As requested at the ninth session, the need to continue the services of the Chief Technical Adviser and the telecommunication/electronics expert for a few more years has been given special emphasis. The attention of UNDP has been drawn to the adverse consequences that may seriously affect the countries' operational programmes if a means cannot be found to continue the services of these two experts.

6. The difficulties consequent upon UNDP announcing its decision for 1977 only at the ninth session (five weeks before the beginning of 1977) have also been pointed out with the request that a decision on the renewed approach be made sufficiently far in advance of the tenth session to permit representatives to consult their Governments prior to discussion of the financing of the Committee's future programme.

7. In this context, it should be mentioned that the thirty-third session of ESCAP (April 1977) and the twenty-ninth session of the WMO Executive Committee (May/June 1977) both urged further negotiations with UNDP, particularly in relation to the two expert posts mentioned in paragraph 5 above. Further contacts with UNDP have been made by WMO and ESCAP in the light of these important decisions. In addition, Hong Kong and Japan both formally requested that WMO and ESCAP should seek continued support from UNDP. These requests have also been notified to UNDP. At the time of preparing this document, no response had been received from UNDP. Efforts to obtain one were continuing with the intention of notifying member countries immediately of the outcome.

/(b)

(b) With member countries

8. In full consultation with ESCAP, WMO addressed a letter to the Governments of the six member countries which were present at the ninth session conveying the decisions made on that occasion. The main objective of the letter was to seek the Governments' concurrence to the proposed scale of contributions (in cash or in kind) drawn up for the member countries present at the session. Replies were sought by 1 June 1977 to facilitate the planning of arrangements to administer the contributions so that they could be submitted to the tenth session.

9. Of the four replies received to date, two were from member countries for which the contributions assessed are already more than covered by the secondment of staff to TCS. One country has already approved the scale proposed and paid its contribution for 1977. and the fourth stated that it was already making a substantial contribution to international meteorology and that further efforts should be made to obtain additional support from UNDP or other international sources.

(c) Other international sources

10. Both ESCAP and WMO have made approaches to developed countries which, in the past, have shown considerable interest in the activities of the Typhoon Committee and which have, in most cases, provided support of one kind or another to these activities. Such assistance has usually been provided under the WMO voluntary assistance programme or through bilateral arrangements. It therefore seems very probable that aid of this kind can be expected to continue over the years ahead but no firm commitments have as yet been made.

11. During missions made in 1977 to member countries by the Chief Technical Adviser in TCS, the opportunity has been taken to discuss with the Governments the future financing of the Committee's programme. Advice on the decisions taken at the ninth session has been given where required and the need for the full participation of the member countries explained.

12. In summing up the present status of the known availability of the resources required to meet the Committee's minimum requirements in the 1977-1981 period, it can be seen from the above results of the action taken since the ninth session that these resources are far from being assured at the present time. One of the objectives of the decisions made at the ninth

/session

session was to establish a system that would permit the Committee's programme to be carried out smoothly over the next few years rather than to have to fall back on improvized arrangements for each successive year. This objective has not yet been attained.

13. Failing a radical change over the next few months in the known sources of financing the Committee's programme, the tenth session will need to give very careful consideration to the different courses of action open to it in order to rectify the present position, in which an increasing shortfall of the resources necessary to support its minimum requirements appears likely.

Review of requirements and contributions

14. It will be recalled that the Committee at its ninth session did not have a proper opportunity to develop proposals to ensure that its requirements would be met - information on the unexpected cut-back in UNDP support after 1977 was received so close to the session that countries could not be advised in time for the matter to receive due consideration. Representatives attending the session developed proposals which involved a radical departure from the past practices of the Committee, and which required formal consideration by Governments. It is not surprising, therefore, that some comments have been received suggesting that the tables summarizing requirements and contributions should be revised. In particular, it has been suggested that table 1 should reflect the actual cost of contributions of member countries for counterpart staff, and that it should be clearly indicated that the requirements given in table 2 are only part of the total requirements needed to enable the Committee's programme to be carried out, the other part being the contributions to be provided from international sources.

15. A review has been carried out and has led to a number of conclusions. First, that it would be clearer if table 1 was divided into two parts - (a) showing requirements for which international funding must be sought and (b) showing those items to be funded by the member countries. In separating the requirements in this way, the period has been reduced to the four years 1978-1981. It was also felt, upon examination, that some of the figures used in 1976 were no longer realistic. For example, UNDP pro forma costs

/have changed

have changed substantially, allowance also being made for rising costs over the four-year period. The new UNDP costs (applicable to Manila) have therefore been inserted. As remarked in paragraph 14 above, the cost used for counterpart staff did not reflect the real cost to the member countries. After consultation with the countries concerned the figures have been revised to bring them closer to reality, provision also being made for increases at the rate of 10 per cent per annum. The cost of the telecommunication/electronics expert is at the UNDP rate in table 1 (a) for 1978 and 1979, and at the same rate as for the hydrologist in table 1 (b) for 1980 and 1981. As can be seen, the actual cost of expert services can vary considerably, depending on the source. To illustrate this variation, tables 1 (b) and (c) have been prepared, using estimated costs to countries and UNDP pro forma costs respectively.

16. The revised table 1, divided into (a), (b) and (c), is shown below:

Minimum requirements for the regional typhoon programme

Table 1 (a). International funding required

ITEM	1978		1979		1980		1981	
	Source	Value	Source	Value	Source	Value	Source	Value
Chief Technical Adviser ^{a/}	UNDP	55,200	None	58,800	None	62,400	None	67,200
Tel./electronics expert ^{a/}	None	44,400	None	48,000	-	-	-	-
Consultants (4 m/m year) ^{b/}	UNDP	19,200	None	20,500	None	21,800	None	23,100
Travel	UNDP	5,000	-	-	-	-	-	-
Equipment	None	25,000	None	25,000	None	25,000	None	25,000
Totals	-	148,800	-	152,300	-	109,200	-	115,300

^{a/} UNDP costs by level and post adjustment class for the Philippines.

^{b/} UNDP costs, including travel.

Table 1 (b). Contributions by member countries based on estimated costs

I T E M	1978	1979	1980	1981
el./electronics expert ^{a/}	-	-	48,400	53,240
eteorologist ^{b/}	10,000	11,000	12,100	13,310
ydrologist ^{b/}	40,000	44,000	48,400	53,240
ravel	15,000	20,000	20,000	20,000
ost facilities ^{c/}	35,000	38,500	42,350	46,585
Totals	100,000	113,500	171,250	186,375

- ^{a/} Cost assessed as for expert from developed country in typhoon area.
^{b/} Estimated cost to countries providing counterpart staff, plus 10 per cent p.a. for rising costs.
^{c/} Made available by the Philippines without cost to member countries.

Table 1 (c). Contributions by member countries based on UNDP pro forma costs

I T E M	1978	1979	1980	1981
el./electronics expert ^{a/}	-	-	52,800	58,000
Meteorologist ^{a/}	44,400	48,000	52,800	58,000
Hydrologist ^{a/}	44,400	48,000	52,800	58,000
Travel	15,000	20,000	20,000	20,000
Host facilities ^{b/}	35,000	38,500	42,350	46,585
Totals	138,800	154,500	220,750	240,585

- ^{a/} At UNDP pro forma costs.
^{b/} Made available by the Philippines without cost to member countries.

17. Some comment might be made on these tables, particularly in relation to the assumed sources of funds, and the values shown for professional services. On the first point, it is assumed in table 1(a) that international funding will be available for the Chief Technical Adviser throughout the four-year period, and for the telecommunication electronics expert for 1978 and 1979. The present position is that, of these requirements, UNDP has at the moment undertaken to provide only for the Chief Technical Adviser in 1978, and, as mentioned in paragraph 7, countries will be advised as soon as any response is received from UNDP, in relation to the submission that has been made in accordance with the request of the Committee at its ninth session. That, there is at present no guarantee that international funding will be available for the telecommunication/electronics expert in 1978 and 1979, or the Chief Technical Adviser in 1977, since no alternative source of funds for these positions has yet been identified. More time is available to find funds for the Chief Technical Adviser position in 1979 so that there is presumably a greater chance of success in that case. Thus, the question may arise whether the members would be prepared to contribute the funds required for a telecommunication/electronics expert, and what financial provision this would involve - as can be seen from table 1, there may be some difference depending on the sources of recruitment.

18. The matters referred to above have obvious implications for the assessment of contributions required from members to meet the stated requirements of the Committee. The provision of a meteorologist and hydrologist by the Governments of the Philippines and Japan respectively, with the understanding that travel costs would also be met in the latter case, represent major contributions of services to the Committee. These contributions have been applauded as marking the first steps towards self-sufficiency on the part of the Committee. The question now arises as to whether the other "expert" position could also be filled by one of the member countries, and, if so, whether it could also be a contribution in kind to the work of the Committee, or would have to be based on availability of other funds. As indicated above, the assumption that international funds will be available for this position in 1978 and 1979 may prove in the near future to be invalid, so that the issue raised here may require urgent consideration at the tenth session of the Committee. With further reference to the telecommunication/electronics post, if international funding is not available, the post might, along the lines discussed above, be filled either as a contribution by a member country on a non-reimbursable basis or on the basis of the reimbursement of actual costs or, if that were not possible, by international recruitment, in which case rates close to those shown in table 1(c) would presumably have to apply.

Thus, with regard to the contributions of member countries, assuming a continuation of the provision of host facilities by the Philippine Government without charge to other member countries, there are various possibilities depending on the practices to be adopted in relation to the provision of staff by the members. If the principle of contributions of staff by members without charge to the Committee is to be extended as far as possible, one approach would be that, in cases where the estimated cost of such contributions equalled or exceeded the assessed percentage, no other contribution would be required from such countries, and remaining requirements could be allocated to the other countries in proportion to their assessed percentages. Table 2 (a) has been prepared on this basis for the years 1978 and 1979, assuming international funding for the Chief Technical Adviser and telecommunication/electronics expert. In this case, the estimated cost of expert services provided by Japan and the Philippines represents approximately 61 and 15 per cent respectively of the total contributions by member countries (other than host facilities) based on estimated costs, or nearly 43 per cent in both cases based on UNDP pro forma costs.

Table 2 (a). Proposed contributions^{a/} (cash or kind) of member countries present at the ninth session (not including host facilities)

Member country or area	Contribution for	Annual assessment (\$US)	
		1978	1979
Hong Kong	Travel	5,000	6,667
Japan	Hydrologist	40,000	44,000
Malaysia	Travel	2,500	3,333
Philippines	Meteorologist	10,000	11,000
Republic of Korea	Travel	5,000	6,667
Thailand	Travel	2,500	3,333
	Totals	65,000	75,000

^{a/} Part of total requirements, some of which involve international funding.

10. As indicated previously, the resources required in 1978 and 1979 ~~and~~ require greater contributions than those shown in table 2 (a) and the position in 1980 and 1981 also involves a number of possibilities. Table 2 (b) shows what might be involved if it were necessary to provide for international funding of a telecommunication/electronics expert starting in 1978, assuming continuation of the services of

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the meteorologist and hydrologist from the Philippines and Japan respectively, but including the estimated cost of the services in the total to be met, and allocating this total in accordance with the percentages adopted at the ninth session. The allocation for travel has been reduced to take account of the fact that for both the telecommunication/electronics expert and the hydrologist these costs are included in the figures shown in the table.

Table 2 (b). Requirements and contributions of member countries present at the ninth session

ITEM	Requirements			
	1978	1979	1980	1981
Tel./electronics expert	44,000	48,000	52,800	58,000
Meteorologist	10,000	11,000	12,100	13,310
Hydrologist	40,000	44,000	48,400	53,240
Travel	5,600	7,000	7,700	8,550
Total	100,000	110,000	121,000	133,100

Country or area	Percentage	Proposed contributions ^{a/}			
		1978	1979	1980	1981
Hong kong	10	10,000	11,000	12,100	13,310
Japan	40	40,000	44,000	48,400	53,240
Malaysia	5	5,000	5,500	6,050	6,655
Philippines	30	30,000	33,000	36,300	39,930
Republic of Korea	10	10,000	11,000	12,100	13,310
Thailand	5	5,000	5,500	6,050	6,655
Total	100	100,000	110,000	121,000	133,100

^{a/} Part of total requirements, some of which involve international funding.

21. The Committee is obviously at a turning point in its programme. The amounts involved are no doubt relatively small compared with related expenditures in programmes to mitigate cyclone and flood damage, and the services in question are likely to be of great benefit to country programmes. However, it is recognized that very important principles are involved, and members are asked to give these matters careful consideration so that the Committee may reach firm conclusions.

Administration of contributions

22. Regardless of the magnitude of the total amount of the contributions from member countries finally recommended by the Committee, arrangements must be made for their formal adoption. The scale of contributions recommended by the Committee should be submitted for national approval, and could perhaps be the subject of a formal agreement between the Governments involved. This agreement should be ratified by representatives of each of the participating Governments and, if desired, a short meeting of the Typhoon Committee could be called specifically for this purpose. It will be recalled that a similar short meeting was called in early 1968 for the adoption of the Statute establishing the Committee. However, an exchange of letters might well suffice in this case.

23. There is a need to determine the most expeditious and least costly means for the day-to-day administration of the contributions from the international community and member countries. The various possibilities which could be studied may be briefly outlined as follows:

(a) Management by WMO;

(b) Management by ESCAP - In view of the presence in Bangkok of the permanent representatives of the members of the Typhoon Committee to ESCAP, and the close relations between them and the ESCAP secretariat, ESCAP appears to be in a good position to assume this function. On the other hand, a major problem would be the mandatory requirement of a 14-per cent administrative overhead charge, which, under current United Nations Headquarters regulations, must be imposed for managing extrabudgetary resources. Moreover, it is necessary to obtain United Nations approval before ESCAP can accept the administration of extrabudgetary funds;

(c) Management by the Typhoon Committee - This possibility may also be explored. There appears to be no strong reason why the Committee itself cannot manage the funds, provided that the proper administrative procedures are agreed upon by the member countries. As only travel funds will be managed at the outset the Committee could open an account in its own name and all contributions would be deposited to that account. The Committee could authorize the Philippine representative

to sign cheques covering expenses for travel recommended by the Chief of TCS and approved by the Chairman for the current year. A statement of accounts could be submitted to the Committee at its annual sessions.

International support

24. Paragraph 10 of this document relates the present position with regard to support from international sources. In its consideration of this item the Committee should discuss what further steps should be taken if no definite commitments are forthcoming. It should be remembered that the items included in table 1 (a) are minimum requirements for the continuation of the Committee's programme at its present level and that their absence will seriously impede progress. Whilst the Committee will no doubt wish to request ESCAP and WMO to continue efforts to obtain international support, it should also consider the possibility of transferring some of the items in table 1 (a) to table 1 (b) if no other solution can be found.

Action proposed

25. The Committee is invited to:

(a) Review the action taken since the ninth session by ESCAP, WMO and TCS (paras. 5-11);

(b) Determine whether all members agree in principle to contribute to the work of the Committee, and, if so, specify any limitations or conditions on the nature or size of the contribution;

(c) Compile tables of requirements to be met internationally and by member countries, and proposals for contributions to meet requirements assigned to member countries (paras. 16 to 20);

(d) Determine the procedure for formal agreement on the contributions to be made by members (para. 22);

(e) Determine the arrangements to be adopted for administration of the contributions, and authorize ESCAP and WMO to make these arrangements (para. 23);

(f) Determine alternative courses of action should the planned international support not be available (para. 24);

(g) Request ESCAP and WMO to pursue their efforts to obtain international support from all available sources.

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FOR PARTICIPANTS ONLY

WRD/TC.10/5
17 August 1977

ORIGINAL : ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

PROGRAMME FOR 1978

(Item 7 of the provisional agenda)

Note by the Typhoon Committee secretariat

(c) Provision of radar test equipment, spare parts and trained technicians for proper calibration and maintenance of weather radars;

(d) Establishment of suitable receiving equipment for reception of cloud imagery and other data from GMS and TIROS-N satellites;

(e) Exploring the possibility of establishing ocean buoys at strategic locations such as the data sparse and typhoon-prone area to the east of the Philippines;

It is recognized that many activities of interest to the Typhoon Committee will be carried out by the member countries. However, under this item, the Committee may wish to consider only those items of work on which it will concentrate during 1978, with the assistance of the Typhoon Committee secretariat (TCS). For this purpose, the latest developments in the execution of the Committee's programme and expected assistance from external sources should be taken into consideration. The functions of the Committee laid down in article 6 of its Statute, and the functions and duties of TCS as revised at the sixth session, are also relevant in this connexion.

On the basis of the above considerations, the following tentative programme of work is drawn up for special attention during 1978 under the different components of the Committee's activities.

Meteorological component

(a) Operation and maintenance of electronic equipment provided by UNDP, through national resources or with bilateral/VAP assistance. These include RS/RW, radar, APT, radar picture transmission and telecommunication equipment;

(b) Provision or improvement of meteorological and telecommunication facilities included in the priority list established by the Committee;

(c) Review of national data collection facilities and data exchanges needed for typhoon warning services with a view to taking remedial measures, where necessary;

(d) Review of the present arrangements for dissemination of typhoon and flood warnings with a view to introducing improvements, where necessary;

(e) Institution of suitable arrangements for reception of satellite meteorological information, including those from the GMS launched by Japan in 1977 and TIROS-N series satellites which will replace NOAA satellites in 1978;

(f) Review of techniques used for operational typhoon forecasting and introduction of improvements, where appropriate.

Hydrological component

(a) Further progress in the establishment of pilot flood forecasting systems in the Lao People's Democratic Republic and Thailand with possible assistance from the Government of Japan;

(b) Development of flood forecasting systems in the Agno, Cagayan and Bicol River basins in the Philippines, with further assistance from the Government of Japan;

(c) Further improvements in the operation of flood forecasting systems in the Pampanga River basin (Philippines) and in the Han River basin (Republic of Korea);

✓ (d) Organization of survey missions and follow-up action for the establishment of flood forecasting systems in selected river basins in East Malaysia.

Sabah and Sarawak (Malaysia), with possible assistance from Japan.
Disaster prevention and preparedness

(a) Follow-up action on the joint LRCS/WMO/ESCAP missions (1973-1976), taking into account the recommendations of the Regional Seminar held at Tokyo in 1976 and the Guidelines on Disaster Prevention and Preparedness in Tropical Cyclone Areas, with the assistance of consultants, where necessary;

(b) Review of flood disaster prevention and preparedness organization in Malaysia and suggestion of improvements, with the assistance of consultants.

Training

(a) Training of personnel through group training courses in Japan and other fellowships through bilateral and VAP assistance. Short-term training courses on maintenance of radar, APT and telemetering equipment might be given special consideration;

(b) Participation in seminars relevant to the Committee's programme;

(c) On-the-job training by TCS experts, particularly in the operation and maintenance of radar, APT and telecommunication equipment.

Research

(a) Stimulation of research activities through advisory services, exchange of information and joint collaboration among member countries. Special attention will be given to ensuring further progress in the studies of objective typhoon forecasting and of storm surges;

(b) Contributions to the subprojects under the WMO tropical cyclone project, in which member countries of the Typhoon Committee and TCS are participating;

(c) Promotion of exchange of information on typhoon research activities, including developments on related matters outside the region;

(d) Initiation of provisional studies on disaster risk evaluation in typhoon-prone areas, including flood risk mapping.

/Action

Action proposed

The Committee may wish:

(a) To approve in principle or suggest amendments to the items of work outlined above on which the Committee should concentrate during 1978;

(b) To urge member countries to take all possible measures, with the assistance of TCS, to accelerate implementation of the Committee's programmes.

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FOR PARTICIPANTS ONLY

WRD/TC.10/6
10 August 1977

ORIGINAL : ENGLISH

ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC
AND
WORLD METEOROLOGICAL ORGANIZATION

TYPHOON COMMITTEE

Tenth session
25-31 October 1977
Tokyo

CO-ORDINATION WITH THE WMO TROPICAL CYCLONE PROJECT
AND REGIONAL PROGRAMMES

(Item 8 of the provisional agenda)

Note by the WMO secretariat

Purpose of document

1. The annex to this document (third status report on the implementation of the WMO tropical cyclone project) provides the tenth session of the Typhoon Committee with information on the activities under the project up to 30 June 1977. Any later information available by the time of the session will be presented to the Committee by the WMO secretariat representative.

Action proposed

2. The Committee is invited:
- (a) To note and comment upon the information provided in the annex to this document;
 - (b) To consider what further measures, if any, are required to ensure the necessary degree of co-ordination with these activities.

/Annex

Annex

THIRD
STATUS REPORT ON THE IMPLEMENTATION OF
THE WMO TROPICAL CYCLONE PROJECT

General

1. The WMO tropical cyclone project represents the response of WMO to a series of United Nations General Assembly resolutions which express concern at the losses of human lives and the material damage caused by tropical cyclones and other natural disasters and which also request, inter alia, international action for the mitigation of the harmful effects of such disasters. As recently as 8 November 1976, the General Assembly adopted a further resolution (31/8), paragraph 11 of which reads as follows:

"Reiterates its request to the World Meteorological Organization to pursue actively the implementation of its tropical cyclone project while continuing and intensifying its other related action programmes, including World Weather Watch and, especially, the efforts being undertaken towards obtaining basic meteorological data and discovering ways and means to mitigate the harmful effects of tropical storms and to remove or minimize their destructive potential, and looks forward to its report thereon in accordance with the relevant General Assembly resolutions".

2. At its twenty-ninth session, the WMO Executive Committee (Geneva, June 1977), realizing the very heavy responsibilities placed on WMO by the above series of resolutions, noted that the General Assembly had reiterated its request to WMO "to pursue actively the implementation of its tropical cyclone project" and considered that that request also reinforced the views it had expressed in calling for greater support for the project. In that context, the Committee reaffirmed that it was important for members to provide assistance through the WMO Voluntary Assistance Programme (VAP) or bilaterally for urgent improvements, i.e., the forecasting and warning systems of countries affected by tropical cyclones (general summary EC-XXIX, para. 3.2.7).

3. It may be recalled that the activities conducted under the tropical cyclone project are based upon the plan of action prepared by the former Executive Committee Panel of Experts on Tropical Cyclones and adopted by

/resolution 5

resolution 5 (EC-XXIV), "WMO Tropical Cyclone Project - Plan of Action". The Seventh Congress reviewed the progress made and confirmed that the primary objectives were (Abridged report of Cg-VII, para. 3.2.4.6 of the general summary):

- (a) Strengthening the present capabilities of detection, tracking and forecasting of tropical cyclones;
- (b) Making more generally available the techniques of quantitative storm-surge forecasting;
- (c) Strengthening flood-forecasting capabilities, particularly with respect to flooding associated with tropical cyclones;
- (d) Improving tropical cyclone warning systems;
- (e) Providing support to disaster prevention and community preparedness and related activities;
- (f) Providing basic data on risk of loss by winds, storm surges and floods to those who need them for development planning or other purposes.

4. The project clearly covers a wide range of activities mainly of an operational character and would be well served by the further implementation of WMO's World Weather Watch (WWW) and Operational Hydrology Programmes. Research and development are also required for a number of activities. In view of the wide scope of the project, it is convenient to regard it as having:

- (i) A global component involving many members, a number of technical commissions and various international bodies;
- (ii) A regional component concerned with the provision of forecasts and warnings of tropical cyclones and associated phenomena, and with activities in disaster prevention and preparedness which are being carried out in co-operation with other international organizations and regional bodies.

Global component

5. Under the plan of action, the principal steps taken on the global level have been the continuation of 11 subprojects. A summary of the status

/of implementation

of implementation of these subprojects, as at the time of preparing this report, is given in the appendix. The summary shows that reports on the following subprojects have been completed:

(a) Subproject No. 2 - Observations from mobile ships

A report entitled "Observations from mobile ships", which was prepared on behalf of WMO by Hong Kong with the collaboration of a number of other WMO members, was distributed to members of the regional bodies of the WMO tropical cyclone project on 16 March 1977 under cover of letter 6.895/W/CY/G.5. It deals with the present problems of the collection of ships' reports from cycloneprone areas and their subsequent transmission to the meteorological forecasting and warning centres, as well as formulating recommendations to improve the availability of these reports. It is therefore of considerable interest to all WMO members affected by tropical cyclones. Furthermore, this report has been considered by the appropriate bodies of the Commission for Marine Meteorology (CMM);

(b) Subproject No. 5 - Geostationary satellites, "The use of satellite imagery in tropical cyclone analysis"

Recently a great deal of effort has gone into developing systematic techniques whereby satellite cloud pictures can provide information for both the analysis and forecasting of tropical cyclone intensity and movement. Experts from the United States of America, in consultation with experts designated by the USSR, Japan and European Space Agency (ESA) have undertaken this subproject aimed at the production of a text on the use of satellite imagery for tropical cyclone analysis. This work has led to the production of WMO Technical Note No. 153, "The use of satellite imagery in tropical cyclone analysis", which is to be issued shortly;

(c) Subproject No. 7 - Storm-surge prediction

Under this subproject, a publication entitled Guidelines on Storm Surge Prediction has been prepared by Drs. M. Miyazaki (Japan), P.K. Das (India) and C.P. Jelesnianski (United States), and is being printed for publication as a WWW Planning Report.

/The aim

The aim of the publication is to present an up-to-date review of the storm-surge problem in tropical cyclone-prone areas, beginning with the observational data needed, explaining the characteristics of storm surges and the principles of their prediction, and continuing with simulation and prediction by numerical techniques, and practical methods of prediction. Information on evaluating the risk of storm surges and the need for field surveys of the damage they have caused is also given.

Within the framework of the tropical cyclone project, and as a consequence of this subproject, a co-ordinated programme of storm-surge data acquisition in the Bay of Bengal is being organized by ESCAP and WMO at the request of the fourth session of the WMO/ESCAP Panel on Tropical Cyclones. An informal planning meeting for the establishment of this co-ordinated programme will be held in November 1977 at Bangkok with the participation of the member countries concerned and experts from Hong Kong and Japan;

(d) Subproject No. 8 - Risk evaluation techniques

The objective of this subproject is to provide basic data on risk of loss by cyclone wind, storm surge, flood and river flood to those countries affected by tropical cyclones which need them for development planning and other purposes. With the help of a number of short-term consultants and a substantial financial contribution from UNEP, the study was completed in 1976 and published at the end of the year as WWW Special Environmental Report No. 8, The Quantitative Evaluation of the Risk of Disaster from Tropical Cyclones (WMO publication No. 455), a report of a WMO/UNEP project on the meteorological and hydrological aspects;

(e) Subproject No. 10 - Community preparedness and disaster prevention

This subproject stemmed from a series of joint missions carried out by the League of Red Cross Societies (LRCS), WMO and ESCAP as part of the programme of the Typhoon Committee. As a consequence of its visits to member countries, the joint mission

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recommended the compilation and publication of a manual providing countries, in particular developing countries, with guidance for the organization of effective disaster prevention and preparedness systems. An editorial board was set up to supervise the work which was carried out by staff members of LRCS, WMO and ESCAP with some assistance from consultants. The completed volume, Guidelines for Disaster Prevention and Preparedness in Tropical Cyclone Areas", was issued in June 1977.

6. The completion of a number of these subprojects and the progress made towards the implementation of several others, inevitably raises the question as to whether there is a need for a general revision of the plan of action and the updating of the initial implementation programme. As far as the plan of action is concerned, it is considered that it constitutes the main lines of a project that, by its nature, is essentially of a long-term character. It sets forth the principles and guidelines which should be followed to develop implementation programmes designed to improve members' capability to defend themselves better against tropical cyclones. Its validity is thus unlikely to change for many years to come.

7. The initial implementation programme, as set forth in paragraph 4.5 of the WMO tropical cyclone project plan of action was the basis for the initiation of a series of studies and development work, i.e., the 11 subprojects on which progress to date is summarized in the appendix to this report. The progress made indicates that there is a requirement to review the initial implementation programme to see to what extent the subprojects, when completed, fulfil the aims it expressed. The WMO Executive Committee at its twenty-ninth session (Geneva, June 1977) considered these questions and, whilst agreeing that the plan of action was essentially of a long-term character, requested the Secretary-General to undertake a review of the initial implementation programme and to report thereon to the Eighth Congress. The regional cyclone bodies, technical commissions and regional associations should be consulted as necessary so that the proposals to the Congress reflect the views of all concerned on the action

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desirable on the WMO tropical cyclone project in the next financial period (see EC-XXIX, general summary, para. 3.2.3).

8. In accordance with the directives of the Congress and the Executive Committee, the Commission for Atmospheric Sciences (CAS) is giving attention to the research aspects of the tropical cyclone project.

Regional component

9. The regional programmes are aimed primarily at the efficient operation of tropical cyclone early warning systems, including warnings of associated phenomena such as storm surge and floods, and of the relevant disaster prevention and preparedness organization. In all these aspects, progress is heavily dependent upon the World Weather Watch and the Operational Hydrology Programmes of WMO and upon the support of the regional associations concerned. The disaster prevention and preparedness activities are carried out in collaboration with other international organizations such as ESCAP, the Office of the United Nations Disaster Relief Co-ordinator (UNDRO) and LRCS.

Africa (RA I)

10. The RA I Tropical Cyclone Committee for the South-West Indian Ocean held its last session in October 1974, when a technical plan and action programme were adopted. Good progress towards implementation has been reported by the member countries of the Committee, a noteworthy feature being the installation of three 10-cm surveillance radar stations in Madagascar and the advanced plans for the early installation of another in Mauritius. Encouraging plans have also been announced for the early installation of a few new upper-air stations at strategic points of the southwest Indian Ocean area. The third session of the Committee will be held in Vacoas, Mauritius, from 20 to 26 September 1977 at the kind invitation of the Government of Mauritius.

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Asia (RA II and RA V)

11. The ninth session of the Typhoon Committee took place at Manila from 23 to 29 November 1976. The Committee reviewed the progress made in implementing its programme during the preceding year and noted with satisfaction that significant progress had been made. Specific mention was made of new radar stations and telecommunication facilities, of the community preparedness and disaster prevention activities such as the preparation of a volume of Guidelines and the Seminar held in Japan, and of joint collaboration in research activities.
12. Considerable attention was given by the Committee to the funding of its future activities in the light of the information from UNDP that there would be a phased withdrawal of its support over the years 1977 and 1978. The Committee accordingly reassessed its minimum requirements for the continuation of its work and proposed a scale of contributions from which to fund them. These contributions, which have been submitted to the Governments of member countries for approval, were based on the incidence of typhoons, their impact on national economies and the economic resources of the countries concerned. Replies were coming to hand at the time of preparing this report. It was recognized that additional support from international sources would still be needed to meet some of the minimum requirements and the Committee requested WMO and ESCAP to investigate all possibilities of donors which might provide assistance for the Committee's programme. Negotiations with UNDP and potential donor countries are continuing.
13. A programme of work to which special attention should be given in 1977 was also drawn up. Malaysia became the ninth member of the Committee at the opening of the session.
14. This brief summary of the ninth session cannot, by its nature, do justice to the scope of the activities the Committee is carrying out. Since its inception in 1968, the Typhoon Committee has consistently played a pioneering role in developing new measures for the reduction of tropical cyclone damage which has been closely followed by other subregional bodies set up with the same objective. Several of the activities in 1976 originating with the Committee are worthy of a mention, if only because the benefits accruing from them extend to other countries which are outside the typhoon belt but which are also seriously affected by tropical cyclones.
15. Noteworthy among these are the ESCAP Seminar on Community Preparedness and Disaster Prevention, held at Tokyo, attended not only by Typhoon Committee countries but also by participants from many other disaster-prone countries in the ESCAP region. Similarly, the Guidelines for Disaster Prevention and Preparedness in Tropical Cyclone Areas, a joint LRCS/WMO/ESCAP publication, is of wide

application to countries everywhere affected by tropical cyclones even though it was the Committee's programme that gave rise to it. The Committee's tenth session is scheduled to be held at Tokyo from 25 to 31 October 1977.

16. The WMO/ESCAP Panel on Tropical Cyclones held its fourth session at Dacca, Bangladesh, in April 1977. The session was inaugurated at an impressive ceremony attended by more than 400 persons at which Major-General Ziaur Rahman, Chief Martial Law Administrator (and now President of Bangladesh), was the chief guest and speaker. The Panel gave special attention to two aspects of its activities, the revision of its technical plan and the need for resources to implement the plan. Apart from revising the meteorological, research and training components of the plan, completely new components in hydrology and in disaster prevention and preparedness were adopted by the Panel. In seeking resources for the execution of its work programme, the Panel was particularly mindful of the importance of expert services for its Technical Support Unit (TSU) at New Delhi. During the session news was received that UNDP was prepared to fund the post of Chief Technical Adviser for 1978-1979. The member countries, whilst welcoming this assistance, felt that it did not go far enough and adopted a resolution appealing to UNDP for further aid. WMO and ESCAP were requested to revise and resubmit to UNDP the project request prepared in 1976. A further approach to UNDP has since been made.

17. In addition to revising the long-term objectives contained in the technical plan, the session drew up a programme for the years 1977-1979, the full implementation of which will inevitably depend upon the assistance forthcoming from international sources. Concern over the arrangements necessary for ground reception equipment for the geostationary satellites to be launched over the area in 1977 and 1978 was expressed by member countries and a meeting of all countries covered by these satellites proposed. A storm-surge data acquisition programme in the Bay of Bengal, leading to the development of prediction techniques, was also suggested by the Panel. Action by WMO and ESCAP on this suggestion has already been initiated as requested in paragraph 5 (c) under the global component. The fifth session of the Panel is tentatively scheduled for 28 February-6 March 1978 at Lahore, Pakistan.

North and Central America (RA IV)

18. The seventh session of the WMO Regional Association for North and Central America, held at Mexico City, in April-May 1977, expressed its close interest in the WMO tropical cyclone project as nearly all its members were

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affected frequently or occasionally by hurricanes. The growing awareness of the problems brought by hurricanes, especially amongst the countries in Central America and the Caribbean, had led the Association to take measures to improve the existing arrangements to combat the danger they brought. The session therefore decided to establish a working group to be known as the RA IV Hurricane Committee for the Caribbean, Central America and the Eastern Pacific and to invite all members of RA IV affected by hurricanes to nominate the directors of meteorological, hydrological and hydrometeorological services, or those individuals responsible for hurricane forecasting, to serve on the Committee.

19. The recently established RA IV Hurricane Committee is therefore the fourth regional body under the WMO tropical cyclone project. Its terms of reference include the co-ordination of hurricane forecast and warning operational procedures, exchange of information on new developments in the science and technology of hurricane observation and prediction; hurricane disaster preparedness activities appropriate to meteorological and hydrological services and co-operation with other international bodies in those aspects of hurricane preparedness and disaster prevention which can benefit from meteorological and hydrological assistance. Sessions of this regional body are to be held annually and the first session of the Committee, tentatively scheduled for May 1978, is to be held in conjunction with an RA IV Workshop on Hurricane Warning and Alert Systems.

Co-operation with other organizations

20. In accordance with the wishes of the Seventh Congress, close co-operation with other international organizations active in disaster mitigation has continued. Thus, WMO, ESCAP and LRCS, with considerable assistance from UNDRO, have compiled a publication providing guidance on the organization of effective disaster prevention and preparedness systems. This publication, entitled Guidelines for Disaster Prevention and Preparedness in Tropical Cyclone Areas, was completed in late 1976 and published in June 1977.

21. Throughout the year close liaison has been maintained with UNDRO on a variety of matters of common interest. UNDRO provided valuable advice by reviewing draft texts and participating in meetings of the Editorial Board, set up to carry out the guidelines project referred to above. WMO has co-operated in a number of UNDRO projects, including that on "A Study of the state-of-the-art in disaster prevention and mitigation". A number of publications emanating from this project have been completed, or will be completed in the months ahead.

22. An ESCAP Regional Seminar on Community Preparedness and Disaster Prevention, organized in co-operation with WMO and LRCS, was held at Tokyo in June 1976. The proceedings of this Seminar will be issued by ESCAP later in 1977. Very close contact is maintained with ESCAP at all times in the activities of the jointly-sponsored Typhoon Committee and Panel on Tropical Cyclones.

23. The WMO/UNEP project on the quantitative evaluation of the risk of disaster from tropical cyclones, carried out under UNEP's Natural Disaster Programme Activity, was completed in 1976 and the publication issued before the end of the year. The UNEP/WMO project, entitled "Tropical cyclone monitoring and early warning systems in countries in the areas of the Bay of Bengal and the Arabian Sea", reported last year, continues to 30 June 1978, and a request has been made to UNEP for a small amount of additional funds for equipment. Under this project, a consultant was engaged to make a two-month survey of community preparedness and disaster prevention arrangements relevant to tropical cyclones and associated phenomena in all the member countries of the Panel on Tropical Cyclones in November-December 1976. His report was considered by the fourth session of the Panel in April 1977 and formed the basis for the new component of the technical plan on disaster prevention and preparedness, adopted by the session. Another WMO/UNEP project, "Selection of hurricane and early warning, including flood forecasting, systems for operational application in Central America", was initiated in 1976 and will continue to the end of 1977. It consists of a hydrological component and a meteorological component, both of which are already under implementation.

Programme for 1977-1978

24. As mentioned last year, the activities of the WMO Tropical Cyclone Project are of a continuing and long-term nature. It is, therefore, appropriate to present the programme as a whole for the two-year period 1977-1978 rather than in separate parts for each year. The project covers a very wide range of activities which, on the technical and operational side, are of close concern to the World Weather Watch and Operational Hydrology Programmes. There are also research aspects of the project to which CAS is giving attention in response to the directives of the Congress and the Executive Committee. The undertaking of studies on special problems connected with the implementation of the tropical cyclone project will assist members concerned in intensifying their research effort in the field of tropical meteorology. The proposed studies fall naturally within the programme

on research in tropical meteorology. In the 1977-1978 programme, therefore, sections A, B and C relate to activities which are taken care of within the WWW programme but the total context is much wider and includes many aspects of operational hydrology, a number of matters involving training and, to a lesser extent research, the work on disaster prevention and preparedness carried out in collaboration with other international organizations. Section D relates to specific activities in hydrology and section E to research items.

25. The problem faced by the regional cyclone bodies, as a result of uncertainties concerning future UNDP support, have been mentioned briefly in the regional component of this report. The Typhoon Committee has already taken some initial steps to ensure the continuation of its programme in the face of the phased withdrawal of UNDP support. It should be noted that some very important requirements will still need to be provided from international sources. The situation is particularly difficult for the WMO/ESCAP Panel on Tropical Cyclones because its programme has not yet reached the stage when member countries can provide the essential services themselves. There is full recognition that, ultimately, the member countries must become largely self-supporting in carrying out their regional programmes, but international assistance for several years is vital if that stage is to be reached as quickly as possible.

26. The twenty-ninth session of the WMO Executive Committee was informed of the activities being carried out by the regional cyclone bodies of the WMO tropical cyclone project and considered that these regional activities were mainly of an operational nature and thus directly related to the safety of life and property in the countries concerned. For this reason it was disturbed to learn of the financial problems which continue to hinder the work of the WMO/ESCAP Panel on Tropical Cyclones and, in particular, though to a lesser degree, threaten to impede the progress being made by the Typhoon Committee. Noting that the Panel had adopted a resolution appealing to UNDP for increased support which had subsequently been endorsed by the thirty-third session of ESCAP and also that ESCAP at the same session decided to request the secretariat of WMO and ESCAP to negotiate further with UNDP for continued support of the Typhoon Committee, the Committee expressed its full support for and agreement with those appeals. It requested the Secretary-General, in consultation with the Executive Secretary of ESCAP, to make representations to UNDP to extend its financial support for the Panel's programme and to continue its support to the Typhoon Committee at least for the years 1978 and 1979 at the same level as in 1977. In view of those decisions, the Secretary-General of WMO, in consultation with the Executive Secretary of ESCAP, took the required action with UNDP in June 1977.

A. Global component

- (a) Implementation of the various subprojects of the plan of action (see appendix); preparation, editing and publication of reports;
- (b) Meeting of experts of the tropical cyclone project, subproject No. 6 - Forecasting tropical cyclone intensity and movement;
- (c) Other meetings of experts required for the implementation of the tropical cyclone project, subprojects listed in the appendix.

B. Regional component

- (a) RA I Tropical Cyclone Committee for the South-West Indian Ocean
Third session (tentatively), Mauritius, 20-26 September 1977; preparations for and follow-up of decisions of the session;
- (b) ESCAP/WMO Typhoon Committee - tenth session, Tokyo, 25-31 October 1977 - preparations for and follow-up of decisions of the session;
- (c) Informal planning meeting for the establishment of a co-ordinated programme of storm-surge data acquisition in the Bay of Bengal (Bangkok, 2-5 November 1978);
- (d) WMO/ESCAP Panel on Tropical Cyclones - fifth session (tentative, Lahore, Pakistan, 28 February-6 March 1978) - preparations for and follow-up of decisions of the session;
- (e) RA IV Hurricane Committee - first session (tentatively May 1978 - place and dates to be decided) - preparations for and follow-up of decisions of the session;
- (f) RA IV Workshop on Hurricane Warning and Alert Systems (tentatively May 1978, place and dates to be decided);
- (g) ESCAP/WMO Typhoon Committee - eleventh session (tentatively October/November 1978 - place and dates to be decided) - preparations for and follow-up of decisions of the session.

In addition to the above, WWW informal planning meetings on topics of concern to the global and regional components of the tropical cyclone project, such as the reception and use of satellite data, will be arranged as needed.

C. Disaster prevention and preparedness

- (a) Follow-up action on recommendations from co-operating organizations;
- (b) Follow-up of LRCS/WMO/ESCAP missions to developing countries in tropical cyclone areas;
- (c) XXIII International Red Cross Conference (Bucharest, 20-26 September 1977).

D. Specific hydrological aspects

- (a) Catchment models; trials of various models leading to adoption of standard model(s) for tropical cyclone areas; expansion and improvement, including automation of hydrological networks;
- (b) Flood frequencies; disaster risk studies in selected countries using, when appropriate, techniques described in WMO/UNEP report on risk evaluation; applications to data-sparse areas;
- (c) RA II/RA V Training Seminar on Intense Precipitation and Floods in Asia and South-West Pacific - a roving seminar (1978, dates and places to be decided).

E. Research aspects

- (a) Operational aspects of recent research on tropical cyclones and storm surges, including the preparation of technical notes;
- (b) Development of techniques for determining eye-wall radius from observational data;
- (c) Preparation of tropical cyclone climatology of southeast Asia;
- (d) Study of combined effects of storm surge and heavy rainfall upon river flow;
- (e) Development of specific research projects on tropical cyclones (which are relevant to the WMO tropical cyclone project) for implementation as part of the WMO programme on research in

Appendix

WMO TROPICAL CYCLONE PROJECT - PLAN OF ACTION

Implementation programme and its status on 30 June 1977

<u>Subproject number, title and objectives</u>	<u>Mode of implementation</u>	<u>Status</u>
1. <u>Special tropical cyclone observing network (anemometer and barometer networks)</u> Objectives: To produce a report on the desirability and feasibility of establishing a relatively dense network of wind and pressure observing stations	Australia, with the collaboration of the United States, Japan, India and the Typhoon Committee secretariat (TCS) Leader: Australia Experts nominated: Dr. Saburo Yamada (Japan), Shri V. Balasubramaniam (India) Dr. S. N. Sen (TCS)	Preliminary draft report completed and being circulated to team members for comments. Final report expected by end of 1977
2. <u>Observations from mobile ships</u> Objectives: To assess the present status of the availability, collection, dissemination and density of ships' reports for tropical cyclone detection and warning, and to make recommendations for improvements	Hong Kong, with the collaboration of India, Japan, Kenya, Mauritius, Pakistan and Thailand Leader: Mr. P.P. Sham (Hong Kong) Experts nominated: Shri V. Balasubramaniam (India) Mr. Hajime Mitsuno (Japan) Mr. E.G. Njoroge (Kenya) Mr. I. Dunpath (Mauritius) Mr. S. Akhlague Husain (Pakistan)	A report entitled "Observations from mobile ships" distributed on 16 March 1977 under cover of letter 6.895/W/CY/G.5. This report has also been considered by the appropriate bodies of CMM
3. <u>Automatic weather stations</u> Objectives: Production of a report, sufficiently comprehensive, complete and detailed to enable developing countries with suitable sites to obtain and install automatic weather stations at strategic points to obtain additional data for tropical cyclone detection and warning	Japan, with the collaboration of Australia, France, Thailand, the United States and CIMO Leader: Japan Mr. M.C. Fichaux (France) has been nominated as the CIMO expert	In consultation with the president of CIMO, a subproject sheet was drafted on "The role of automatic weather stations in tropical cyclone monitoring". Japan was invited in June 1977 to undertake this subproject in collaboration with Australia, France, Thailand, the United States and CIMO
4. <u>Radar</u> Development of guides which will assist members in selecting storm warning radar equipment, installing it in the best practical location and making the best use of it in tropical cyclone tracking, forecasting and warning	The United States, with the collaboration of Australia, France, Japan and CIMO Leader: the United States Dr. Kodaira (Japan) has been nominated as the CIMO expert	A subproject sheet on "Radars for monitoring of tropical cyclones", drafted in consultation with the president of CIMO, has been submitted to the United States (June 1977) with an invitation to undertake this subproject in collaboration with the other countries indicated and CIMO

<u>Subproject number, title and objectives</u>	<u>Mode of implementation</u>	<u>Status</u>
<p>5. <u>Geostationary satellites</u></p> <p>Objectives:</p> <p>(i) To develop an operational plan for providing satellite data to cyclone forecasting centres</p> <p>(ii) To develop a technique for the analysis and forecasting of tropical cyclone intensities, using satellite data</p> <p>(iii) To advise the cyclone warning centres on the installation and operation of ground equipment</p>	<p>Experts from the United States, in collaboration with experts designated by Japan, the USSR and ESA, have prepared a manuscript on the "Use of Satellite Imagery in Tropical Cyclone Analysis"</p>	<p>Information on satellite data for cyclone forecasting is now available in WHO publication No. 411, <u>Information on Meteorological Satellite Programmes</u> Operated by Members and Organizations.</p> <p>WHO Technical Note No. 153, "The use of satellite imagery in tropical cyclone analysis", will be published in July 1977.</p>
<p>6. <u>Forecasting tropical cyclone intensity and movement</u></p> <p>Objectives:</p> <p>To prepare a manual on available techniques at cyclone warning centres for the prediction of intensity and direction of motion of the tropical disturbances. Evaluation of the above methods and of the applicability of the semi-objective techniques used in some regions for other regions affected by tropical cyclones</p>	<p>The United States, in collaboration with Hong Kong, India, Japan, the USSR and TCS</p> <p>Experts nominated: Dr. Neil L. Frank, leader (the United States) Dr. P.C. Chin (Hong Kong) Shri V. Balasubramaniam (India) Mr. Yasuchi Okamura (Japan) Dr. S.N. Sen (TCS)</p>	<p>A draft, prepared at the United States National Hurricane Center under the direction of the leader and in consultation with the experts nominated by the collaborating countries, will be available by the summer of 1977. A meeting of the experts nominated for this subproject is scheduled at Manila in November 1977 to finalize the draft of the manual.</p>
<p>7. <u>Storm-surge prediction</u></p> <p>Objectives:</p> <p>Preparation and publication of guidelines on storm-surge prediction</p>	<p>Japan, in collaboration with India and the United States. A text for the <u>Guidelines on Storm Surge Prediction</u> has been prepared by Drs. M. Miyazaki, P.K. Das and C.P. Jelesnianski</p>	<p><u>Study terminated</u></p> <p>The <u>Guidelines on Storm Surge Prediction</u> is now being edited for publication as a WHO WWH Planning Report.</p>
<p>8. <u>Risk evaluation techniques</u></p> <p>Objectives:</p> <p>Providing basic data on risk of loss by cyclone wind, storm surge, flood and river flood to those countries affected by tropical cyclones which need them for development planning and other purposes</p>	<p>WHO secretariat, with assistance of consultants. Implemented in conjunction with UNEP/WHO project on "Quantitative evaluation of disaster risks (tropical cyclones)"</p>	<p>The <u>Quantitative Evaluation of the Risk of Disaster from Tropical Cyclones</u>, report of a WHO/UNEP project on the meteorological and hydrological aspects, was published at the end of 1976 (WHO-455). Pilot studies are being undertaken in a number of countries to test the techniques described in the hydrological component of the above report.</p>

<u>Subproject number, title and objectives</u>	<u>Mode of implementation</u>	<u>Status</u>
<p>9. <u>Tropical cyclone warning systems</u></p> <p>Objectives:</p> <p>The production of guidelines describing the main principles and practical considerations to be followed in setting up a tropical cyclone warning system</p>	<p>India, in collaboration with Australia, France (La Réunion), Japan and the United States</p> <p>Experts nominated: Shri V. Balasubramaniam, leader (India), Dr. Riji Uchide (Japan), Mr. F. Herry (Australia)</p>	<p>Material from the nominated experts has been received by the leader. A first draft is being prepared for circulation to collaborators. A draft text is expected by the end of 1977.</p>
<p>10. <u>Community preparedness and disaster prevention</u></p> <p>Objectives:</p> <p>Preparation and publication of a guide on community preparedness and disaster prevention to assist developing countries in the protection of human lives and property against the harmful effect of tropical cyclones</p>	<p>Joint project ESCAP/LRCS/WHO with the collaboration of UNDRP and TCS.</p> <p>Publication by WHO</p>	<p><u>Study terminated</u></p> <p>The <u>Guidelines for Disaster Prevention and Preparedness in Tropical Cyclone Areas</u> was published in English in June 1977. The French and Spanish versions will follow in due course. Copies may be obtained from the WHO, LRCS and ESCAP secretariats.</p>
<p>11. <u>Flood forecasting and warning</u></p> <p>Objectives:</p> <p>To establish and/or strengthen river and flood forecasting capability in countries affected by tropical cyclones</p>	<p>WHO and ESCAP secretariats, with assistance of consultants</p>	<p>A joint ESCAP/WHO mission visited the Tropical Cyclone Panel member countries to assess facilities available and evaluate the improvements required. Significant progress has been made in improving hydrological facilities in the Typhoon Committee area. A pilot project on the selection of a standardized forecasting system is under way in the Central American region. A roving seminar will be organized to train local personnel in the analysis and prediction of intense precipitation and floods in Asia and the southwest Pacific.</p>

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