



**ECONOMIC AND SOCIAL COMMISSION
FOR ASIA AND THE PACIFIC**

AND

WORLD METEOROLOGICAL ORGANIZATION

**REPORT OF THE TYPHOON COMMITTEE
ON ITS THIRTY-THIRD SESSION**

Macao, China

28 November - 04 December 2000

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I. ORGANIZATION OF THE SESSION

1. The thirty-third session of the ESCAP/WMO Typhoon Committee was held at the UNESCO Centre in Macao, China, from 28 November to 4 December 2000.

Attendance

2. The session was attended by participants, representing eleven (out of 14) Members of the Typhoon Committee, namely: China; Hong Kong, China; Japan; Macao, China; Malaysia; the Philippines; Republic of Korea; Singapore, Thailand, the United States of America (U.S.A.) and Viet Nam.

3. The session was also attended by two observers from Federal Republic of Germany and WMO/CAS. Six representatives from the World Meteorological Organization (WMO), Economic and Social Commission for Asia and the Pacific (ESCAP) and Typhoon Committee Secretariat (TCS) also attended the session. The list of participants is attached as Appendix I.

Opening of the Session (agenda item 1)

4. The opening ceremony was presided over by His Excellency Mr Edmund Ho Hau Wah, Chief Executive of the Macao Special Administrative Region and commenced at 1000 hrs on Tuesday, 28 November 2000 at the Lotus Room of the World Trade Centre.

5. In his welcome address, Mr Fong Soi Kun, Director of Macao Meteorological and Geophysical Bureau (MMGB) and Permanent Representative of Macao, China with WMO, extended a warm welcome to all the participants and delegates to Macao. He mentioned that it was a great honour for Macao to host the 33rd session of the ESCAP/WMO Typhoon Committee. Mr. Fong said that Macao is a region affected frequently by typhoons and has a long tradition in Macao meteorological activities to deal with these phenomena. The Bureau was officially established in 1952, however, he pointed out that meteorological observations had already been made since 1861, almost one hundred years before the establishment of the Meteorological and Geophysical Bureau. He also pointed out that, currently, one of the very important activities of the Bureau was the harmonization of meteorological observation data set for analysis and study the climate variation in this century. He mentioned that Macao had become a Member of Typhoon Committee since 1992 and two years later, in 1994, Macao hosted for the first time the annual session of the Committee, the 27th session. He also mentioned that Macao, through its Meteorological and Geophysical Bureau, would continue to support the Committee's programmes. Finally, he expressed deep gratitude to the Chief Executive of Macao Special Administrative Region, Mr Edmund Ho Hau Wah, for presiding over the opening ceremony and wished all participants and delegates a most fruitful and successful session as well as a very enjoyable stay in Macao.

6. The representative of ESCAP, Mr Le Huu Ti, delivered the message of the Executive Secretary of ESCAP. The Executive Secretary expressed sincere appreciation to the Government of the Macao Special Administrative Region for hosting the session and for its active role since joining the Typhoon Committee in 1992 in the common efforts to achieve the objectives of the Committee. He informed the Committee that the ESCAP Commission at its fifty-sixth session in June 2000 had noted with appreciation the progress and achievements made by the Committee and its Members in 1999 on meteorological observations, forecasts and warnings, hydrological components and on natural disaster reduction and the increase in the number of subregional cooperation activities of the Committee in these fields. The ESCAP Commission took a special note of the increased importance attached by the Committee to training activities, particularly the establishment of the Typhoon Committee Research Fellowship Scheme, with emphasis on the exchange programme among the Members. He pointed out that from the findings of a recent ESCAP regional survey on achievements of the International Decade for Natural Disaster Reduction, the Typhoon Committee had been recognized as one of the most successful subregional networks in the region. He also pointed out that these achievements had been realized through the excellent spirit of cooperation that prevails among the Members and related international organizations, based the findings of another recent ESCAP study. The spirit of self-reliance is evident from the contributions of many Members to the Typhoon Committee Trust Fund. He assured the Committee that ESCAP would continue to undertake activities in support of the Typhoon Committee.

7. The representative of the WMO Secretariat, Mr. Eisa H. Al-Majed, addressed the session on behalf of Professor G.O.P. Obasi, Secretary-General of the World Meteorological Organization. He expressed deep appreciation to the Government of the Macao Special Administrative Region for hosting the session. He also thanked the Government of the Philippines for hosting the TCS and the Government of the Republic of Korea for seconding of a hydrologist. He mentioned that it was expected that during the session major emphasis would be placed on improving the forecasts and warnings. He highlighted the importance of strengthening further interaction between NMHS and the national agencies concerned within disaster and preparedness in order to increase the effectiveness of warning system and prevent disaster. Mr Al-Majed added that the technological advances offer unprecedented opportunities in observing and monitoring, communications and data-processing. The NMHSs were required to undertake modernization on a continued and often costly basis, therefore, cooperation in regional initiatives and projects that could attract appropriate financial support was a vital management strategy to complement national efforts. He concluded by assuring that WMO would continue to make every effort to support the Typhoon Committee's work.

8. In his opening address, His Excellency Mr Ao Man Long, Secretary for Transport and Public Works of Macao Special Administrative Region, welcomed all the delegates and participants for the 33rd session of the ESCAP/WMO Typhoon Committee, on behalf of the Chief Executive of the Macao Special Administrative Region, Mr Edmund Ho Hau Wah. He mentioned that it was an

honour to the session that His Excellency the Chief Executive of the Macao Special Administrative Region, Mr Edmund Ho Hau Wah, presided over the opening ceremony. He also mentioned that it was the second time that Macao was hosting such an important event of the Committee and this offered a good opportunity for the Members of the Typhoon Committee to promote and coordinate joint efforts to minimize typhoon damage in the Asia-Pacific Region to better protect the economic and social well-being of the people in the region. He pointed out that the Macao Meteorological and Geophysical Bureau had issued timely and reliable information and warnings against typhoons and severe weather conditions. With this valuable information, both the Operation Center of Civil Protection and the citizens could be better prepared to minimize the damage caused by natural hazards. Moreover, the Bureau also continued to provide timely warning information and operational meteorological data to other Members of the Typhoon Committee. He also emphasized that besides modern technologies and equipment, good management techniques and qualified human resources, collaboration among the Members of the Typhoon Committee is undoubtedly one of the key factors to the achievement of better weather and environmental services. He expressed his hope that with expected successful results of this session, collaborations among the Members of the Typhoon Committee could be further strengthened. And on behalf of His Excellency the Chief Executive, he assured that the Government of the Macao Special Administrative Region would continue to support the work of the Typhoon Committee. Finally, His Excellency Mr Ao Man Long, Secretary for Transport and Public Works, wished all the delegates and participants a pleasant and unforgettable stay in Macao.

9. His Excellency Mr Edmund Ho Hau Wah, Chief Executive of the Macao Special Administrative Region declared the thirty-third session of the Typhoon Committee open.

10. A short ceremony was held in the presence of His Excellency Mr Edmund Ho Hau Wah, Chief Executive of the Macao Special Administrative Region, where the ESCAP/WMO Typhoon Committee Natural Disaster Prevention Award 2000 was presented to the Macao Meteorological and Geophysical Bureau (MMGB), in recognition of the Institution's distinguished efforts and contribution to the prevention of loss of lives and properties of the local population in the event of natural disasters. Mr Fong Soi Kun, Director of MMGB, accepted the award on behalf of the Bureau.

II. ELECTION OF OFFICERS (agenda item 2)

11. Mr Fong Soi Kun (Macao, China) and Mr Richard H. Hagemeyer (USA) were elected as the Chairman and Vice Chairman of the Typhoon Committee, respectively. Dr Lim Joo Tick (Malaysia) was elected as Chairman of the Drafting Committee.

III. ADOPTION OF THE AGENDA (agenda item 3)

12. The Committee adopted the Agenda shown in Appendix II.

IV. THE COMMITTEE'S ACTIVITIES DURING 2000 (agenda item 4)

13. The ESCAP Representative reported that the Economic and Social Commission for Asia and the Pacific, at its fifty-sixth session held in Bangkok, from 1 to 7 June 2000, noted with appreciation the progress and achievements made by the Committee and its Members in 1999 on meteorological observations; forecasts and warnings; on hydrological components; including improvements in flood forecasts and warning, as well as storm surge forecasts; and on natural disaster reduction. The Commission noted the increase in the number of subregional cooperation activities of the Committee in the fields of meteorology, hydrology, training and research. It took particular note of the increased importance attached by the Committee to addressing the impacts of water-related disasters, including an increase in research on and the improvement of forecasts. It also noted the support provided by ESCAP to various activities of the Committee Members and the valuable contribution of WMO to the work of the Typhoon Committee over the years.

14. The Typhoon Committee Secretariat (TCS), on behalf of the Typhoon Committee, expressed its gratitude to Mr Sampan Thaikruawan of the Thai Meteorological Department for representing the Committee at the Fifty-sixth session of ESCAP held in Bangkok in June 2000 and the Sixth Session of the Special Body on Pacific Island Developing Countries, in Bangkok on 30-31 May 2000. TCS also informed the session that:

- The TCS Meteorologist attended the Twenty-seventh session of the WMO/ESCAP Panel on Tropical Cyclones held in Muscat, Oman, 29 February to 6 March 2000.
- The TCS Coordinator delivered the World Meteorological Day (WMD) 2000 Address during the Australian Bureau of Meteorology's celebration of WMD in Melbourne on 23 March 2000.
- The TCS organized the Seminar on Development of Non-structural and Emergency Countermeasures for Sediment and Flood Disaster held in Quezon City, Philippines from 8 to 12 May 2000. The TCS Hydrologist participated in the seminar.
- The TCS Coordinator met with visiting WMO Consultant Kuniyuki Shida and discussed future technical cooperation activities and other new initiatives between TCS and WMO on 17 May 2000.

- The TCS continued the management of the Typhoon Committee Foundation, Inc (TCFI). The TCFI awarded the Typhoon Committee Natural Disaster Prevention Award 2000.
- The TCS published the Typhoon Committee Newsletter No. 12 in July 2000 and the 1999 Typhoon Committee Annual Review (TCAR) in October 2000.

(a) Meteorological Component (agenda 4.1)

15. The session reviewed the activities under the components of the Members of the Committee during the past year, details of which are presented in Appendix III.

16. The establishment of a centralized website for WMO from which the public can access the latest information on tropical cyclones issued by the National Meteorological Services and Regional Centers was considered an undertaking worth pursuing.

17. The delegate from Hong Kong, China informed the Committee that the new tropical cyclone names engendered considerable press interest and enhanced the alertness of the local community to impending tropical cyclone hazards and was well received by the public.

18. The Committee reviewed and approved the proposed amendments to the Typhoon Operational Manual - Meteorological Component (TOM) submitted by the Rapporteur, Mr Tatsuo Ueno (Japan), which is given in Appendix IV.

19. The Members of the Typhoon Committee expressed their gratitude for the services of the rapporteur in the past and accepted the offer of JMA to continue to provide the services of a rapporteur on TOM for the coming year. The WMO representative informed the Committee that a new edition of the Manual will be made available in early 2001.

20. The Committee expressed its gratitude to JMA for the exemplary work of the Regional Specialized Meteorological Center (RSMC) Tokyo-Typhoon Center and its continued provision of numerical weather products to other Members. The Members noted that these forecasts continue to be of great help to their operations. Its activities are contained in Appendix V.

(b) Hydrological Component (agenda 4.2)

21. The Committee reviewed its activities under this component in two stages: (i) during the meeting of TC hydrologists at the pre-session held on Monday 27 November 2000 and (ii) under agenda item 4.2.

(i) Meeting of TC Hydrologists

22. The Chairman of the annual pre-session meeting of the hydrologists presented the report of the meeting which had been convened at the "Centro UNESCO de Macao" on 27 November 2000, with participation of 17 representatives from nine Members, ESCAP, WMO, TCS, and the Local Organizing Committee. The report of the Meeting included the review of progress and achievements of the hydrological component and future priority activities. Among the recommendations of the Meeting to the plenary session for consideration were (1) to undertake a comprehensive review for the hydrological component and disaster prevention and preparedness, (2) to hold an expert workshop in 2001, and (3) to revise the Job Description of the TCS Hydrologist so as to reflect a programme approach towards enhancing subregional cooperation. Further details are shown in Appendix VI.

23. The Committee discussed the above meeting report and took decision as reflected in paragraph 60 of the session report.

(ii) Regional Cooperation Programme and Related National Activities

24. The Committee reviewed the activities of RCPIP related to the hydrological component, which were grouped in two categories: flood forecasting and warning, and comprehensive flood loss prevention and management. Activities on the hydrological component reported by the eleven TC Members, namely China; Hong Kong, China; Japan; Macao, China; Malaysia; the Philippines; Republic of Korea; Singapore; Thailand; the United States of America; and Viet Nam, as summarized in Appendix VII which includes also the summary of activities of ESCAP and WMO related to the hydrological component. These national reviews covered both categories of the hydrological component of RCPIP and it should be pointed out that most of these activities were implemented using national resources. In discussing the progress and achievements of national activities on flood forecasting and warning, several Members presented also opportunities for further strengthening of cooperation among the Members. These included the following activities which could benefit other TC Members:

- (1) Completion of several websites which could share hydrological data and information including real-time data with other TC Members (Malaysia)
- (2) Development of hydrological framework and plan for cooperation among the riparian countries of international rivers (China).
- (3) Development of standards on hydrological information and flood forecasting modeling including quality-assurance for data monitoring; manual and practices on flood management, especially for urban storm water management and landslide warnings.

(c) Disaster Prevention and Preparedness Component (agenda item 4.3)

25. The ESCAP representative informed the Committee that at the fifty-sixth session, the ESCAP Commission had noted the importance of natural disaster reduction for economic and social development in the twenty-first century and recognized the importance and benefits of regional and subregional cooperation in disaster management and mitigation.

26. Activities of RCPIP on disaster prevention and preparedness (DPP) are listed in two categories: public awareness and disaster management. All the eleven TC Members attending the session reported various developments on DPP as summarized in Appendix VI. Almost all the reports covered progress and achievements in both categories of the DPP component of RCPIP. It may be noted that as there was no TC project on DPP, most of these activities were implemented using national resources. However, there are several aspects of these achievements that could be of relevance to the promotion of further collaboration in the enhancement of public awareness (Hong Kong, China; Philippines; and United States of America) as well as strategic management of typhoon-related disasters (Malaysia). The representatives of ESCAP, WMO and the Asian Disaster Reduction Centre in Tokyo also briefed the Committee of their activities in the Typhoon Committee Area related to disaster prevention and preparedness. For further details, please refer to Appendix VIII.

(d) Training Component (agenda 4.4)

27. The Committee reviewed the activities involvement of the Members in a number of education and training activities supported mainly by Members themselves and WMO. The details are given in Appendix IX.

28. The Committee expressed its gratitude to those of its Members which had their national facilities available for the training of meteorological and hydrological personnel.

Report of the training seminar on hydrology

29. The TCS Hydrologist, reported that the five-day "Training Seminar on Development of Non-structural and Emergency Countermeasures for Sediment and Flood Disaster" was held in Manila from 8 to 12 May 2000. The Seminar was jointly organized by TCS and the Japan International Cooperation Agency (JICA) in coordination with the Philippine Department of Public Works and Highways (DPWH) and the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA). The Seminar was attended by 8 foreign participants from 8 TC Members and 33 local participants. Lectures were presented by 9 JICA experts, 8 Filipino officials as resource persons and an expert of ESCAP. Based on the results of an evaluation by the Seminar participants, the Seminar was considered to be an excellent forum for exchange of experience among the people of different areas of expertise, and to enrich participants of new knowledge on sediment and flood disaster countermeasures. The participants recommended that in implementing flood mitigation projects, the

following issues must be considered: budgetary constraints and restriction in land use and environmental conservation concerns and usually, non-structural and emergency countermeasures are necessary when coping with sediment and flood-related disasters.

(e) Research component (agenda item 4.5)

30. The Committee noted the research work undertaken by the Members focusing on predicting typhoon movement and intensity. The summary of reports of individual Members on national activities in the research component is given in Appendix X.

31. The Committee was informed that the international workshop for the third Comparison of Mesoscale Prediction and Research Experiments (COMPARE III) took place at JMA in December 1999. A total of 14 numerical models from 9 participating countries were presented in the experiments.

32. The representative of CAS informed the session that the first missions of "Aerosonde" have occurred with satellite communications testing in Japan (Shimoji Jima) in September 2000 and current flights are out of Guam for convective monitoring. The initial typhoon missions are expected to be undertaken in 2001, with Japan, Republic of Korea, the Philippines and Guam expressing interest to be involved or to support the programme.

33. The Committee was pleased to note that the CAS Working Group on Tropical Meteorology Research had established a research project on landfalling tropical cyclones under the World Weather Research Programme. The Committee invited the support of the scientific community for the urgent execution of the project which is expected to impact positively on current tropical cyclone landfalling operational and forecasting capabilities.

34. The Committee noted that one of the initial outcomes of the *Systematic Approach* to tropical cyclone track forecasting is the critical need for the predicted sea level pressure and selected wind fields to apply conceptual models that assist the forecaster in detecting likely erroneous dynamical model track forecasts. Only a few centers make the required digital fields available. The Committee was invited to further consider at its next session endorsing a request that all forecast centers that have skillful tropical cyclone track forecasts also provide the predicted fields in at least a limited domain around the tropical cyclone. These track forecasts and forecast fields would be collected at a central location and made available to all forecast centers via the Internet.

35. After an extensive discussion, the Committee agreed that there was a need for an official statement on the potential impacts of Global Warming on the frequency/intensity of tropical cyclones in the Northwest Pacific and South China Sea. The Committee noted that a Working Group of the WMO Commission for Atmospheric Sciences (CAS) had been invited to further study on the CAS Project TC 2 (Tropical Cyclone Climate Assessment), which is aimed at keeping Members abreast with current state of scientific knowledge on impact of climate

change on tropical cyclones. The Committee also noted that a statement on this subject would be considered by the CAS at its next session in February 2002. The Committee expressed the hope that the CAS will finalize the draft statement in time for the Committee's 34th session to consider recommending its use by the Members in responding to queries regarding the impact of global warming on tropical cyclones in the Committee's area of responsibility.

V. REVIEW OF THE 2000 TYPHOON SEASON/PUBLICATIONS (agenda item 5)

Review of the 2000 typhoon season

36. The Members noted that 22 typhoons developed in 2000, while 27 in the normal year by the end of November 2000. A review of the tropical cyclones affecting the Members are given in Appendix XI.

37. As in previous years, RSMC Tokyo-Typhoon Center provided the session with a review of the 2000 typhoon season contained in Appendix XII.

38. Thailand informed the Committee that the India Meteorological Department objected to the name "Hanuman" because of possible religious sentiments. Thailand also indicated a desire to replace "Prapiroon", "Durian" and "Khanun" and to correct the spelling of several names. The USA also indicated the need to change one name due to the fact, if mispronounced it would have an undesirable meaning. The Session accepted that proposed change in spelling and established the following process for changing the names so that all Members would have the opportunity to comment on their appropriateness. Thailand and the USA are to submit four names in priority order for each proposed names change to the TCS within one week of the ending of the Session. The TCS will forward these names to all Members for comment with a reply to the TCS required within one week of receipt. The highest priority name that is acceptable to all Members will become the new name. If none of the proposed names is acceptable another list of four names will be provided and the review process repeated.

Publications

39. The Members noted with satisfaction the publication of the 1999 Typhoon Committee Annual Review (TCAR) in November 2000 through the commendable efforts of the Chief Editor provided by the TCS and the National Editors provided by the Members. The Committee proposed that the current Chief Editor continue with the editorial task.

40. The TCS published the 12th issue of the Typhoon Committee Newsletter in July 2000.

41. The RSMC Tokyo -Typhoon Center published the "Annual Report on Activities of the RSMC Tokyo-Typhoon Center in 1998" in May 2000. The "1999

Annual Report" was published in November 2000 in the form of CD-ROM. The RSMC Tokyo will publish Technical Review No. 4 focusing on "Outline of the new Typhoon Model at JMA" in March 2001 and "Annual Report on Activities of the RSMC Tokyo – Typhoon Center in 2000" in May 2001.

VI. COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME (agenda item 6)

42. The consideration under this agenda item was based upon the information contained in the twenty-sixth status report on the implementation of the WMO Tropical Cyclone Programme (TCP) and supplementary information, in particular, recommendations of the WMO Regional Technical Conference on Tropical Cyclones and Storm Surges (Chiang Mai, Thailand, 13 to 17 November 2000), presented verbally at the session by the representative of the WMO Secretariat. The Committee noted its appreciation for the detailed information provided on the implementation of the TCP.

43. The Committee was informed that the Technical Conference had been organized with a view to promoting activities in tropical cyclone disaster mitigation of mutual interest to adjacent regional tropical cyclone bodies in Asia. The Committee was pleased to note that the proceedings of the technical conference, including the summary and recommendations, would be published in December 2000 as a WMO Technical Document in the TCP series, and would also be attached to the TCP homepage.

44. The Committee noted with appreciation that Hong Kong, China, at the request of CBS, would develop and host a demonstration website serving as a WMO centralized portal site for tropical cyclone warnings in the Western North Pacific and South China Sea for international media. Ten Members of the Typhoon Committee participated in the pilot project. The Committee was pleased to note that a prototype website was demonstrated at this session. It is highly desirable under the website to distinguish tropical cyclone information/advisories to be provided by RSMC Tokyo and warnings to be issued by NMSs more clearly in order to enable international media to easily identify the "first level" information on tropical cyclones (i.e. basic information covering the tropical cyclone's present and forecast position, movement and intensity). The Committee was informed that this prototype would be further developed in close consultation with the WMO Secretariat and Typhoon Committee Members concerned for launch, preferably, before the next tropical cyclone season.

45. The Committee was informed that NOAA, in cooperation with WMO, had organized the RA IV Workshop on Hurricane Forecasting and Warning, and Public Weather Services, at the RSMC Miami-Hurricane Center, from 27 March to 11 April 2000. The workshop aimed to assist 24 participants from 20 WMO Members (13 RA IV Hurricane Committee Members and seven Typhoon Committee Members), in their efforts to improve tropical cyclone warning systems and related public weather services, through the provision of refresher training for operational forecasters.

46. The Committee noted with interest that the RA V Tropical Cyclone Committee for the South Pacific and South-East Indian Ocean at its eighth session in September 2000 had formulated a new technical plan for future development of services for the period 2001 and 2002 with more realistic goals and with focus on the Committee's activities which could be actively pursued in the near term without too much economic restraints.

VII. PROGRAMME FOR 2001 AND BEYOND (agenda item 7)

Regional Cooperation Programme Implementation Plan (RCPIP)

47. The Typhoon Committee reviewed the Report of the Working Group on the structure of RCPIP (WRD/TC33/4 Add 1).

48. The Committee, in reviewing the report, considered carefully the general suggestions of the Working Group for restructuring the RCPIP. After an extensive discussion, it was agreed that the RCPIP should be restructured as suggested.

49. The Committee decided to reestablish the Working Group on the structure of RCPIP which will be chaired by the USA with experts from China; Hong Kong, China; Japan; Republic of Korea; Malaysia and Viet Nam. The members would present their recommendations for a vision statement and a broad action plan to the 34th session of the Committee for its consideration. The Working Group would be guided by the WMO Long Term Plan as it relates to Tropical Cyclones, Strategic Plan for the Enhancement of National Meteorological Services in RA II, the proposed project entitled "Integrated System for the Mitigation of Typhoon, Floods and Environmental Disasters in the Western North Pacific Area", and the Strategic Action Plan for Development of NMSs in the Pacific Region as prepared by the South Pacific Regional Environmental Programme (SPREP) and other relevant documents. It was agreed the working group would work by correspondence and have one meeting. A budget allocated for this activity has been approved by the Committee in paragraph 80.ix.

50. TCS is invited to distribute a document on the outcome of the Working Group to the Members for consideration at the thirty-fourth session of the Committee.

51. The recommended changes (Parts A and B) to the RCPIP based on Attachment A to the Working Group's report and other changes proposed by the Members were considered and approved by the Committee as given in Appendix XIII.

Typhoon Research Coordination Group (TRCG)

52. The Committee expressed its appreciation to the Chairman and members of the Typhoon Research Coordination Group (TRCG) for its report (see Appendix XIV) and their excellent work. The Committee decided to re-establish TRCG to be chaired by Dr. Woo-Jin Lee (Republic of Korea) and invited all Members to nominate representatives to take active part in the work of the Group. The Committee expressed its deep appreciation to Mr. C. Y. Lam (Hong Kong, China) for chairing TRCG during the past four years.

52. The Committee supported the proposal to hold a workshop on "Typhoon Forecasting Research" tentatively in October 2001 in Seoul, Republic of Korea. WMO offered financial support to this workshop. ESCAP was also requested to look into the possibility to support the workshop. The Committee requested TCS in cooperation with WMO to organize the workshop in consultation with the Korea Meteorological Administration (KMA).

53. Under the Typhoon Committee Research Fellowship Scheme, established by TRCG during the 32nd session, three research fellowships have been awarded. Other fellowships were being considered.

54. Since the success of the scheme depended on the centers willingness to play host, researchers to work with partners from other Members, and funding to support Research Fellows, the Committee urged Members to indicate through its member in the TRCG their intentions in these aspects.

Meteorological Component

55. The RSMC Tokyo plans to put into operation new NWP models, namely Typhoon Model and Global Spectral Model, in March 2001, in association with upgrade of JMA's supercomputer system. Major revisions will be made to both models, particularly with respect to horizontal and vertical resolutions. Along with the upgrade of the NWP system, the RSMC Tokyo will commence in March 2001 48-hour forecasts of tropical cyclone intensity.

56. The Committee was informed that the JMA would launch Multi-functional Transport Satellite, namely MTSAT-1R in early 2003 to replace GMS-5. The enhancement of observation with a new infrared channel and dissemination of numerical products via Low Rate Information Transmission (LRIT) would be undertaken by MTSAT-1R. The Committee noted with pleasure that the JMA would offer to hold a series of training seminars on the effective use of the data provided by LRIT of MSAT-1R, for 3 years starting from the 2000 fiscal year. The first seminar is scheduled to be held in Tokyo in February 2001. The Committee noted with interest that the JMA would provide the Typhoon Committee Members, upon request, with Computer-Aided Learning (CAL) software, which was developed for nephanalysis training, in consideration of its applicability in presentation of LRIT data.

57. The Committee was informed that the Chinese polar-orbiting meteorological satellite FY-1C was in smooth operation and the Geostationary meteorological satellite FY-2B would become operational as of 1 January 2001. Their images could be used in weather, flood and environmental monitoring. China would welcome other countries and regions to receive and use the satellite images. China would also give lectures on how to use format distributed to receive the images in the WMO training courses that China would host in the near future.

58. The Committee was pleased to note that JMA would offer an attachment of one or two typhoon forecasters to the RSMC Tokyo for 2 weeks in early July 2001 for the on-the-job training in typhoon operation (see paragraph 80. viii).

59. The Committee was informed by the CAS representative that the IWTC-V would be held in Cairns, Australia, in late November 2002. The Committee agreed that Director of the RSMC Tokyo – Typhoon Center would serve as a member of the International Organizing Committee (IOC) for the IWTC-V in the capacity as a regional representative of the Typhoon Committee.

Hydrological Component

60. The following decisions had been made by the Committee after detailed discussion of the various recommendations submitted by the Chairman of the Meeting of the TC Hydrologists:

- (1) To authorize a comprehensive review of the hydrological component and disaster preparedness and prevention to be undertaken. In this connection, the Committee agreed to request ESCAP in cooperation with TCS, WMO and interested Members to undertake a survey including design the questionnaire, conduct the survey, analyze responses and prepare the survey report before an expert mission is fielded. The Committee has also approved the proposed TOR of the expert mission as attached to Appendix VII and requested interested TC Members to provide financial support to undertake the field expert mission. In order to maintain continuity of planning of this activity, the Committee decided to establish a working group to be responsible for the planning and implementation of this activity to include the following experts.

- Mr Chong Sun Fatt, Malaysia as Chairman
- Mr Hisaya Sawano, Japan
- Ms Nophakun Somsin, Thailand
- Mr Liu Jinping, China
- Mr Park Jae Heyon, Republic of Korea

The Committee requested ESCAP and WMO to get involved in this Working Group and TCS to provide secretarial services.

(2) To request TCS in cooperation with Thailand to organize a 4-day expert workshop for TC hydrologists on "Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" to be held in Bangkok, Thailand sometime in July/August 2001 to promote greater information exchange and technology transfer among Typhoon Committee hydrologists. It also agreed to consider the detailed budget required to organize the workshop during the deliberation of agenda item 8. In order to enhance the effectiveness and impacts of the workshop, the Committee also approved the proposal by the Meeting of the TC Hydrologists on the following:

- To request ESCAP to provide the services of an expert to facilitate the Workshop
- To request ESCAP to assist TCS and Thailand in preparing the technical programme of the Workshop
- To allocate one day of the four-day Workshop to discuss the findings of the comprehensive review, planned to be submitted to the Workshop

Training component

61. The Committee decided to organize the following training events in 2001:

- Expert Workshop for hydrologists on Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area, in Thailand in July/August (see paragraph 80.vi).
- Workshop on Typhoon Forecasting Research, tentatively in October in Seoul, Republic of Korea (see paragraph 80.vii)
- Attachment of two typhoon forecasters in advanced centres including RSMC-Tokyo (see paragraph 80.viii)

62. The Committee requested WMO and ESCAP to cosponsor these activities. Furthermore, the Committee requested that summary of the outcomes of all the training and conference events supported from the Trust Fund and the research fellowships, which particularly benefit the Committee, be submitted by the parties concerned to the Members immediately after their completion.

Other matters

63. The Committee requested that all documentation for the next session should be dispatched to the Members one month in advance in electronic form. The Members are therefore requested to provide the Secretariats with the addresses of at least two contact points for each Member. The national reports with corresponding summary should be also sent to the TCS, WMO and ESCAP Secretariats and the Members by electronic means as much as possible or hard copies be brought in sufficient number to the session.

VIII. SUPPORT REQUIRED FOR THE COMMITTEE'S PROGRAMME (agenda item 8)

i) Arrangements for the Typhoon Committee Secretariat (TCS)

64. The Committee expressed its gratitude to the Government of the Philippines for hosting the TCS and for providing a full-time meteorologist and support staff and proposed that such arrangements continue.

65. The Committee expressed its appreciation to the Government of the Republic of Korea for providing the services of a hydrological expert, whose secondment would end in January 2001. In this connection, the Committee took note of the indication from the delegation of the Republic of Korea that its Government would favorably consider the request of the Committee to continue providing the services of a hydrologist attached to the TCS.

66. The Committee endorsed the revised Job Description of the TCS Hydrologist proposed by the Meeting of the TC Hydrologists and requested TCS to submit an official request to the Government of Republic of Korea for the continued provision of the services of the TCS Hydrologist.

67. The Committee expressed its appreciation to the Government of China for its offer to consider providing a hydrologist stationed in Beijing to assist the TCS if no donor provides the services of a hydrologist at TCS.

68. The Committee expressed its gratitude to the dedication and continuous services extended by Dr Roman L. Kintanar in his capacity as TCS Coordinator.

69. The Committee expressed its appreciation to TCS for publishing the Typhoon Committee Newsletter and the ESCAP/WMO Typhoon Committee Annual Review.

70. The Committee discussed on the additional amount not exceeding US\$5,000 per year mentioned in paragraph 118 as approved by the Thirty-second session (23-29 November 1999). In this regard, the Committee decided to rescind the above-mentioned decision. The Committee then approved the continuation of funding for the operating costs of TCS, including the support for the TCS Coordinator from the TCTF (see paragraph 80.i.).

ii) Technical cooperation

71. The Committee reviewed all the resources available to support the work programme of the Committee, including the contributions from Members themselves and external support from WMO/VCP, ESCAP, TCDC, TCTF, bilateral assistance and other potential donors.

72. The Committee was pleased to note that within the framework of the WMO Voluntary Cooperation Programme, several countries of the Typhoon Committee received support during the recent period. The Committee noted further the plan

of Hong Kong, China in offering through WMO VCP training programme for four years which will include training events in automatic observing system, presentation of weather information through web technology, weather warning systems and aviation meteorology and aviation meteorological systems.

73. The Committee reiterated the importance of TCDC as a means of promoting regional cooperation. In this regard, it encouraged its Members to take an active part in the activities such as expert missions, familiarization visits, study tours and training.

74. The Committee noted that the proposed project entitled "Integrated System for the Mitigation of Typhoon, Floods and Environment Disasters in the Western North Pacific Area" was prepared for submission to the funding agencies including the World Bank and the Asian Development Bank. It requested WMO to assist the Members in securing the required resources in order to implement the project as early as possible.

75. The Committee noted with appreciation that ESCAP had provided advisory services to a number of TC Members in the field of water resources planning and development including flood control and management. It also noted with interest arrangement had been made to translate a relevant ESCAP publication entitled "Regional Cooperation in the Twenty-first century on Flood Control and Management in Asia and the Pacific" into Chinese and Vietnamese. In order to facilitate the use of TCDC facilities ESCAP provided the Committee with a list of TCDC focal points in the region.

iii) Typhoon Committee Trust Fund (TCTF)

76. The WMO Secretariat presented to the session a detailed breakdown of expenses of the TCTF. The Committee expressed its gratitude to WMO for submitting the financial report. The Session requested that the WMO and TCS provide the Members, by 1 April 2001 and each year thereafter an accounting of the expenditures from the Trust Fund which, item by item, compares actual with authorized expenditures. The session also requested that a revised balance sheet be provided to the Members at the same time. This balance sheet shall be for the whole year, shall show all items of income and expenses, with expenses identified to current and prior years.

77. The Committee reviewed and approved the financial report on the TCTF and the balance of the fund as of 30 September 2000 as shown in Appendix XV.

78. WMO Secretariat informed the Committee that China, Japan, Republic of Korea and the USA had already made their 2000 contributions to the TCTF. However, it was noted that this was not reflected in the financial report mentioned in the preceding paragraph.

79. The Committee expressed the view that a certain degree of self-reliance still has to be achieved. In this connection, the Committee urged its Members to

continue to enhance their contributions to the Trust Fund as substantial support to the Committee's activities.

80. The Committee, after careful consideration, agreed to the use of the TCTF for the following specific purposes from 1 January to 31 December 2001:

- (i) Operating costs of TCS, including the support for the TCS Coordinator (approx. US\$ 26,220).
- (ii) Publishing the Typhoon Committee Newsletter No. 13 (approx. US\$ 1,400).
- (iii) Printing and distribution costs of the publication of the 2000 Typhoon Committee Annual Review (TCAR) [500 copies] (approx. US\$ 5,400).
- (iv) Augmentation of travel funds for TCS staff mission, including attendance at the thirty-fourth session of the Typhoon Committee (approx. US\$ 9,000).
- (v) Printing and distribution costs of documents for the thirty-fourth session of the Committee (approx. US\$ 1,700).
- (vi) Support for the attendance of participants to a four-day expert workshop for hydrologists in the Typhoon Committee area in 2001, including the participation of a staff from TCS, printing and local support (approx. US\$ 17,700).
- (vii) Support for the organization of a TRCG workshop in 2001, including the participation of a staff from TCS (approx. US\$ 22,000).
- (viii) Support for attachment of two typhoon forecasters to advanced centres including RSMC-Tokyo (approx. US\$ 4,000).
- (ix) Support for the Working Group on RCPIP (limited participation approx. US\$5,000)
- (ix) Any other emergency case that can be justified for the use of the TCTF requiring the concurrence of both the TCS Coordinator and the Typhoon Committee Chairman.

81. The Committee decided that total expenditures for the year 2001, however, are not to exceed US\$ 100,000.

IX. DATE AND PLACE OF THE THIRTY-FOURTH SESSION (agenda item 9)

82. The Committee welcomed the offer of the delegate from USA to hold the thirty-fourth session in Honolulu, from 27 November to 3 December 2001. The pre-session meeting of TC hydrologists will take place on Monday, 26 November 2001.

X. SCIENTIFIC LECTURES (agenda item 10)

83. The following scientific lectures were presented:

- a. Recent Studies on Landfalling Tropical Cyclones near Hong Kong, by Mr C. C. CHAN (Hong Kong, China)
- b. Recent Research on Typhoons and Extratropical Transition at the US Naval Post Graduate School, by Dr Russ Elberry (USA)
- c. Development in the JMA NWP System for Typhoon Prediction, by Dr Takeo Kitade (Japan)
- d. Progress in the KMA NWP System and Typhoon Prediction, by Dr Woo-Jin Lee (Republic of Korea)
- e. Real-time Numerical Weather Prediction Experiment in Typhoon Movement, by Mr Hao I. Pan (Macao, China)
- f. About the Third World Water Forum and Current Situation of our Activity, by Mr Masato Toyama (Japan)
- g. Development of River Information System In Japan, by Mr Hisaya Sawano (Japan)
- h. Infobanjir- The Malaysian Website On Real-time Hydrologic Data, by Mr Chong Sun Fatt (Malaysia)
- i. Flood Forecasting and Warning System in China, by Mr Liu Jinping (China)

84. The Committee has had informal discussions on various matters concerning the Typhoon Committee, in particular the Trust Fund, TCS support, co-sponsoring joint activities, and exchange of experts.

XI. ADOPTION OF THE REPORT (agenda item 11)

85. The Committee adopted the report of the session at 11.15 am, 4 December 2000.

XII. CLOSURE OF THE SESSION

86. The delegates from Members of the Typhoon Committee, observers, and representatives of ESCAP, WMO and TCS expressed their thanks and appreciation to Government of the Macao Special Administrative Region and the Macao Meteorological and Geophysical Bureau (MMGB) for the successful hosting of the 33rd session of the Typhoon Committee. They also expressed gratitude to Mr Fong Soi Kun, Director of MMGB, and his staff for the warm hospitality and excellent arrangements made. Their thanks also go to the Provisional Island Administrative Council of Macao Special Administrative Region for the hospitality extended to the participants of this year's session.

87. The session was closed by the Chairman at 12:00 am, 4 December 2000.



APPENDIX I

LIST OF PARTICIPANTS

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ESCAP/WMO TYPHOON COMMITTEE
28 NOVEMBER – 04 DECEMBER
MACAO, CHINA**

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Mr. Vong Va Sam,	Chefe de Divisão de Instrumentos e Manutenção
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Mr. Monteiro Américo de Souza	Oficial do Gabinete Coordenador de Segurança (Subintendente do CPSP)
Mr. Ku Chi Meng	Chefe do Centro de Processamento e Telecomunicações
Mr. Tong Si Man	Chefe do Centró de clima e Ambiente Atmosférico
Mr. Tam Kin Seng,	Técnico superior principal
Ms. Lou Mei Meng	Meteorologista de 2ª classe
Mr. Lai Chi Hou	Meteorologista de 2ª classe
Mr. Cheong Chin Chio	Meteorologista de 2ª classe
Mr. Lao Ieng Wai	Meteorologista de 2ª classe
Mr. Chan Weng Sio	Assistente Informática Principal
Mr. Chan I San	Assistente Informática de 1ª classe
Ms. So Ion Leng	Observadora Meteorológica
Ms Fong Sok Cheng	Observadora Meteorológica
Mr. Kuok Chong Tat	Observador Meteorológico de 2ª classe
Mr. Tomás Mendes António	Observador Meteorológico de 2ª classe
Mr. Lam Chi Hong	Adjunto Técnico de 1ª classe
Mr. Un Kam Cheng	Técnico Auxiliar de Manutenção de Instrumentos Precisão de 2ª classe
Mr. Chio Fok Choi	Primeiro 1º Oficial

APPENDIX II

AGENDA

1. Opening of the Session
2. Election of officers
3. Adoption of the agenda
4. The Committee's activities during 2000
 - 4.1 Meteorological component;
 - 4.2 Hydrological component;
 - 4.3 Disaster prevention and preparedness component;
 - 4.4 Training component; and
 - 4.5 Research component
5. Review of the 2000 typhoon season/annual publications
6. Coordination with other activities of the WMO Tropical Cyclone Programme
7. Programme for 2001 and beyond
8. Support required for the Committee's programme
9. Date and place of the thirty-fourth session
10. Scientific lectures
11. Adoption of the report



APPENDIX III

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS ON THEIR ACTIVITIES RELATED TO THE METEOROLOGICAL COMPONENT

The delegate from **China** informed the Committee that the second Chinese Geostationary Meteorological Satellite FY-2B was launched successfully on 25 June 2000 and stationed at 105°E. All functions of FY-2B have been realized and finished the checking-out tests. The satellite-ground system works well and VIS, IR and WV images are good. It will come into operation from 1 January 2001. FY-2A, launched on 10 June 1997, has been moved from 105°E to 86.5°E for backup and keeps discontinued observations and testing. China's operational polar meteorological satellite FY-1C, launched successfully on 10 May 1999, has been operating well in orbits for over 17 months. Current status of FY-1C is good. The on-board data storage capacity was extended from 60 minutes to 300 minutes, allowing daily global coverage observations. The government of China has approved the met-satellite program for the next 10 years. Two kinds of meteorological satellite will be running as operational serials. There will be 10 met-satellites launched. The investment in total will be more than \$600 million. China accelerates the construction of the New Generation Doppler Weather Radar Network. There are 9 radars being installed or tested. It is expected that 11 radars will be in operation by early 2001. During this year, 34 Automatic Weather Stations (AWSs) imported from Vaisala were installed in Qinghai province and 60 locally made AWSs became operational. The national satellite-based telecommunication network with 2400 receive-only stations (PC-VSAT) has been put in operation completely. In late 1999, 3 super parallel computer systems, SENWEI with the peak speed of 384 Gflops, YH3 (18 Gflops) and IBM SP (70 Gflops), were installed in the National Meteorological Center for numerical weather prediction and other scientific use. The circuits between BABJ and RSKL have been upgraded to 64 Kbps.

The delegate from **Hong Kong, China** reported that the Hong Kong Observatory's satellite reception has been receiving images from the CMA'S F-2Y satellite. Under the joint program of the Observatory and JMA the GTS link between Hong Kong and the regional Telecommunication Hub at Tokyo was upgraded from the original transmission rate of 200 bits to 16 kilobits per second at a cost of 40% less. The Observatory's Homepage had become one of the popular means for the public to obtain weather information with about 200,000 pages retrieved on average a day. To improve accessibility by visually impaired users, a text-based version of the home page was launched in April 2000. The Operational Spectral Model (ORSM), adapted from JMA, has migrated to the CRAY SVI computer with an outer horizontal domain of 60-km nesting into a 20-km domain. Rainfall information from radar and rain gauges was routinely incorporated into the model through a physical initialization process. The feasibility of operating a local non-hydrostatic model at a better resolution was being studied. As part of the on-going study to enhance the wind shear and turbulence warning system for aircraft, two intensive winds hear reporting

exercises were conducted with participation from a number of airline companies and government departments. A pilot project to implement an AMDAR Programme with local airlines had been initiated.

The delegate from **Japan** reported that the unsuccessful launch of MTSAT in November 1999 has extended the operation of GMS-5 for observation and data dissemination. The current implementation schedule of the Japanese' GMSs including MTSAT-IR was sent to members of the Typhoon Committee in July 2000. JMA has been replacing JMA-80 type surface observing equipment with the JMA-95 type since 1995 and have been installed in 125 stations as of September 2000. JMA had performed improvement on the GTS circuits, such as changes of Tokyo-Washington, Tokyo-Hong Kong and Tokyo-Seoul circuits. As of October 1, 2000, JMA has provided GPV and other products from the RSMC data serving System to the NMSs concerned. The JMA Global Spectral Model (GSM) was also be upgraded. JMA also started the provision of information of El Nino and La Nina from the DDB server.

The delegate from **Macao, China**, reported that the integration of two types of Automatic Weather Stations was completed and real data is collected into Oracle data base system. A wind drive ocean model has been implemented and computing daily for the 2-day forecast of the ocean's wave over the South China Sea. The Doppler radar began its operational scan in middle of March 2000. The SUN Enterprise E5500 server was installed at the end of 1999. The Meteorological Information System (MIS) using the web's techniques providing information to airport operators is undergoing development.

The delegate from **Malaysia** reported that the Malaysian Meteorological Service continued to upgrade its Information Communication Technology (ICT) facilities. In May 2000, it began implementing its computerization programs under the Seventh Malaysian Plan. The internet will be the main media of delivery to clients. New radars which will replace the 2 stand-alone manually operated weather radars. The four radars will be installed at different sites and will be integrated through a network.

The delegate from the **Philippines** reported that the 1999 Geostationary Meteorological Satellite Cloud Access and Process-based Systems (CMAPPS) acquired in 1999 was put in operational mode. The automated weather information system through telephone which has been in operation since 1998 has reached its optimum capability during 2000 and now provides public, shipping and severe weather forecast. Work on Numerical Weather Prediction Models have been carried out.

The delegate from **Singapore** reported that in December 1999, the NEC SX-3 was replaced by a NEC SX-4 supercomputer. A new networking and graphical visualization system was acquired to replace the existing SUN Server and work stations. A Marine Weather Intranet for shipping and maritime users has been implemented and made accessible via the Internet. Among the products offered are tropical storm warnings in both text and graphical formats.

The delegate from the **Republic of Korea** reported that KMA had installed automatic surface observation system (ASOS) at 11 Meteorological Stations, the two additions made this year. KMA shares weather observation data with related organizations. The six Doppler radars are being used routinely in meteorology to monitor storms and the processed data are distributed to all forecast divisions and also composites of radar images are posted in the Internet Homepage for users of weather information. KMA had operated a total of 440 Automatic Weather Stations (AWSs) at the interval of 15 kilometers through the establishment of additional 20 AWSs this year.

The delegate from **Thailand** informed the group that the Aeronautical Division will install a new Low Level Alert System to replace the one currently used. This will improve the OPMET Data Bank System at Bangkok International Airport. During September 1999 to August 2000, there were three tropical cyclones passing through Thailand which resulted to abundant rainfall and floods.

The delegate from the **United States** reported that during the period from October 1, 1999 to September 30, 2000, six tropical cyclones of tropical storm intensity or greater occurred within the WFO Guam area of responsibility. Improvements to facilities and modernization to systems were the significant improvements of the past year. The office moved to a new facility in the spring of 2000 greatly improving the employees working environment. The Guam Office modernization plan focused on three-tech systems: the AWIPS, NEXRAD and ASOS. EMWIN was installed in September 2000 and the AFTN/MET Terminal System was developed to provide international and domestic users with an automated capability to send and receive aviation data.

The delegate from **Viet Nam** reported that three new digital meteorological radars, a DWSR-2500C and two TRS-2730 had been successfully installed and put in operation. Three upper-air radiosonde stations were upgraded from DiGiCORA-OMEGA RS80-1F to DiGiCORA-GTS RS 80-15G since January 1998. A communication system based on TV Satellite had been established. The flash flood warning system for the Northwestern region of Vietnam had been established.

APPENDIX IV

PROPOSALS FOR THE UPGRADING OF THE TYPHOON COMMITTEE OPERATIONAL MANUAL METEOROLOGICAL COMPONENT (2001 EDITION)

Introduction

The typhoon Committee Operational Manual - Meteorological Component (TOM) has been reviewed and updated every year since the first issue in 1987. The 2000 edition of TOM was published in May 2000 in accordance with the approval of amendments to the previous issue of TOM at the thirty-second session of the Typhoon Committee (November 1999, Seoul, Republic of Korea) as proposed by the rapporteur.

At the thirty-second session, the Committee decided that a rapporteur of the Japan Meteorological Agency (JMA) would continue the services for upgrading TOM. On 16 June 2000, the rapportuer, Mr. Tatsuo Ueno, Head of the TSMC Tokyo- Typhoon Center, invited the individual focal points of the meteorological component of the Members to provide him with proposals on the further update of TOM.

As of the end of September 2000, proposals were submitted by the six focal points of China, the Democratic People's Republic of Korea, Hong Kong/China, Japan, Macao/China and the United State of America.

Major points of the proposed amendments are as follows:

- Amendment to the description of ship observations in Chapter 2 with the commencement of the operation of a new meteorological observing ship JPBN instead of the ship JFDG in Japan.
- Deletion of the description of buoy observations in Chapter 2 and Appendix 2-C due to the termination of the moored buoy observations in Japan.
- Addition of the description of 72-hour position forecasts by the RSMC Tokyo - Typhoon Center in Chapter 3 and upgrading examples of advisories issued by the Center (Appendix 4-A)
- Amendment to the Table 5.1 in Chapter 5 to included the improvement of meteorological telecommunication circuits: Washington - Tokyo, Beijing - Hanoi, Beijing - Macau, Tokyo - Hong Kong and Tokyo - Seoul.

- Addition of the radar station (45011) of Macau, China in the graph of the Appendix 2-D and Amendment to Appendix 2-E to include some changes in specifications of radar stations in Japan and Macau, China.
- Addition of satellite receiving facilities in the Democratic People's Republic of Korea to Appendix 2-G.
- Insertion of an appendix on the forecast area of USA to Appendix 4-B.

Action Proposed

The Committee is invited to:

- Note the information given in this document; and
- Review and approve the proposed amendments to TOM with modifications as necessary.

Proposed Amendments to the Typhoon Committee
Operational Manual - Meteorological Component (TOM)

Page	Line	Present Description	Proposed Amendment
CHAPTER 2			
8	5 - 8	Hourly surface observations are less than 990 hPa.	→ << to be replaced >> Hourly surface observations are made by the JMA meteorological observing ships (call sign of them are : JPBN, JGQH, JDWX, JIVB, JFDG and JCCX) in the seas adjacent to Japan and in the western North Pacific. Since October 2000, the new ship JPBN is operated instead of the ship JBOA. The ship JFDG is to retire in March 2001.
	9 - 12	Upper-air observations usually TS intensity or higher.	→ << to be replaced >> Upper-air observations are usually made twice a day (00, 12UTC) on board the ships JGQH, JDWX, JIVB and JCCX. Enhanced upper-air observations are carried out six-hourly when these ships are in the vicinity of a tropical cyclone of TS intensity or higher.
	13 - 17	The observation network to hourly observation.	→ << to be deleted >>
9	1 2 3 - 4	(a) ... desk data will be obtained ... (b) ... observation will be performed ... (c) ... observations will be disseminate	→ << to be replaced >> (a) ... desk data are obtained ... (b) ... observation is performed ... (c) ... observations are disseminated ...
CHAPTER 3			
16	20	(i) 24- and 48-hour forecast position;	→ << to be replaced >> (i) 24-, 48- and 72-hour forecast position;
17	25- 26	(ii) 24- and 48-hour forecasts of (72-hour at a later date);	→ << to be replaced >> (ii) 24-, 48- and 72-hour forecasts of the central position;
CHAPTER 5			
20	1	5.4 <u>Regional meteorological ...</u>	→ << to be replaced >> 5.4 <u>Meteorological ...</u>
		(Fig. 5.1) Fig. 5.1: Regional meteorological ...	→ << to be replaced >> Fig. 5.1: Meteorological ... "Tokyo - Washington" circuit is to be included in Fig. 5.1 as the Attachment 1 .
21	1	Table ... the regional meteorological	→ << to be replaced >> Table ... the meteorological
	5	Beijing - Tokyo Cable,.....	→ << to be inserted after this line >> Washington - Tokyo Cable, 64Kbit/s TCP/IP
	13	Beijing - Hanoi	→ << to be replaced >> Beijing - Hanoi Cable, 75 bauds (*submitted by China)

Proposed Amendments to the Typhoon Committee
Operational Manual - Meteorological Component (TOM)

Page Line	Present Description	Proposed Amendment
CHAPTER 2		
8 5 - 8	Hourly surface observations are less than 990 hPa.	<< to be replaced >> → Hourly surface observations are made by the JMA meteorological observing ships (call sign of them are : JPBN, JGQH, JDWX, JIVB, JFDG and JCCX) in the seas adjacent to Japan and in the western North Pacific. Since October 2000, the new ship JPBN is operated instead of the ship JBOA. The ship JFDG is to retire in March 2001.
9 - 12	Upper-air observations usually TS intensity or higher.	<< to be replaced >> → Upper-air observations are usually made twice a day (00, 12UTC) on board the ships JGQH, JDWX, JIVB and JCCX. Enhanced upper-air observations are carried out six-hourly when these ships are in the vicinity of a tropical cyclone of TS intensity or higher.
13 - 17	The observation network to hourly observation.	→ << to be deleted >>
9 1 2 3 - 4	(a) ... desk data will be obtained ... (b) ... observation will be performed ... (c) ... observations will be disseminate	<< to be replaced >> → (a) ... desk data are obtained ... → (b) ... observation is performed ... → (c) ... observations are disseminated ...
CHAPTER 3		
16 20	(i) 24- and 48-hour forecast position;	<< to be replaced >> → (i) 24-, 48- and 72-hour forecast position;
17 25- 26	(ii) 24- and 48-hour forecasts of (72-hour at a later date);	<< to be replaced >> → (ii) 24-, 48- and 72-hour forecasts of the central position;
CHAPTER 5		
20 1	5.4 <u>Regional meteorological ...</u>	<< to be replaced >> → 5.4 <u>Meteorological ...</u>
(Fig. 5.1)	Fig. 5.1: Regional meteorological ...	<< to be replaced >> → Fig. 5.1: Meteorological ... "Tokyo - Washington" circuit is to be included in Fig. 5.1 as the Attachment 1 .
21 1	Table ... the regional meteorological	<< to be replaced >> Table ... the meteorological
5	Beijing - Tokyo Cable,.....	<< to be inserted after this line >> → Washington - Tokyo Cable, 64Kbit/s TCP/IP
13	Beijing - Hanoi -	<< to be replaced >> → Beijing - Hanoi Cable, 75 bauds (*submitted by China)

Page Line	Present Description	Proposed Amendment
21 17-18	Beijing - Macau Cable, 9600 bit/s (Remote Terminal)	<< to be replaced >> → Beijing - Macau ISDN 64 Kbit/s IP connection (**submitted by Macau)
22-23	Tokyo - Hong Kong Cable/satellite, .. 64Kbit/s	<< to be replaced >> → Tokyo - Hong Kong Cable(FR), 16 Kbit/s(CIR) TCP/IO; Cable, ISDN 64 Kbit/s
24	Tokyo - Seoul Cable, 64 kbit/s X.25 .	<< to be replaced >> → Tokyo - Seoul Cable(FR) 16 Kbit/s(CIR)
22 5	6 <u>Satellite broadcast</u>	<< to be inserted after this line >> → Operated by China Asiasat-2 (100.5°E) Operational data, fax and image distribution (**submitted by China)
7	GMS-5 (140°E)	<< to be replaced >> GMS-5 (140°E) ...
Appendix 2-A		
1 18-19	Hong Kong, China (45): 004	<< to be replaced >> Hong Kong, China → (45): 007 (**submitted by Hong Kong, China)
Appendix 2-B		
1 15-18	Japan ... *:06UTC only	<< to be replaced >> Japan → *:except 18UTC
Appendix 2-C		
1	Observation Network of the Japanese Moored Buys (whole of this page)	→ << to be deleted >> → << Appendixes 2-D, 2-E, 2-F and 2-G are to be renumbered 2-C, 2-D, 2-E and 2-F >>
Appendix 2-D		
1	(in the graph)	<< to be inserted in the graph >> → 45011 (see the Attachment 2; **submitted by Macau)
1	47418 (in the graph)	<< to be replaced >> → 47419
Appendix 2-E		
3	NAME OF STATION ... Tste's Caim	<< to be replaced >> → NAME OF STATION ... Tate's Cairn (**submitted by Hong Kong, China)
4	Japan - 1	<< to be replaced >> by new Appendix 2-E, p.4 (see the Attachment 3)
5	Japan - 2	by new Appendix 2-E, p.5 (see the Attachment 4)
6	Japan - 3	by new Appendix 2-E, p.6 (see the Attachment 5)
7	Japan - 4	by new Appendix 2-E, p.7 (see the Attachment 6)
8	Macau, China	by new Appendix 2-E, p.8 (see the Attachment 7)

Page Line	Present Description	Proposed Amendment
Appendix 2-G		
1	DPR of Korea	<p><<to be replaced >></p> <p>→ DPR of KOREA Pyongyang (39.0°N, 125.8°E) 1.2 1</p> <p>(**submitted by the D.P.R. of KOREA)</p>
	Narita (...) 2,3	<p><<to be replaced >></p> <p>→ Narita (...) 1, 3</p>
	Haneda (...) 2, 3	<p>→ Haneda (...) 1, 3</p>
Appendix 4-A		
1-2	Examples of Advisories Issued from RSMC Tokyo - Typhoon Center	<p><<to be replaced >></p> <p>→ by new Appendix 4-A, p.1 (see the Attachment 8)</p> <p>→ by new Appendix 4-A, p.2 (see the Attachment 9)</p>
Appendix 4-B		
9-10	Thailand Weather Forecast Area Viet Nam Weather Forecast Area	<p><< to be inserted between the page 9 and the page 10 >></p> <p>→ new Appendix 4-B, p.10 (see the Attachment 10)</p> <p>(**submitted by USA)</p>
		<p>→ << Appendix 4-B, p.10 is to be renumbered B-4, p.11 >></p>
Appendix 5-A		
2	<u>Macau, China</u> Macau ... Geographical Service (Fong Soi Kun)	<p><<to be replaced >></p> <p>→ Macau ... Geographical Bureau</p> <p>→ (Director: Fong Soi Kun)</p> <p>(**submitted by Macau)</p>
3	<u>USA</u> National 1775 Admiral Sherman Drive Suite 3 Barrigada, Guam 96913	<p><<to be replaced >></p> <p>→ National ... 3232 Hueneme Road Barrigada, Guam 96913</p>
	National ...Tel.: (+1) (671) 472 7397	<p>→ National ... Tel.: (+1) (671) 472 0944</p> <p>(**submitted by USA)</p>
Appendix 7-A		
1 3-5	Kind of data : surface, ..., ...value and five-day mean sea surface temperature and cloud ...	<p><<to be replaced >></p> <p>→ Kind of data : surface, ..., ...value and cloud</p>
18	: CD-ROM (... Appendix 7-A, p.3).	<p>→ : CD-ROM (... Appendix 7-A, Annex, p.3)</p>

5.4 Meteorological telecommunication network for the Typhoon Committee region

The network is shown in Fig. 5.1 and its present status is summarized in Table 5.1.

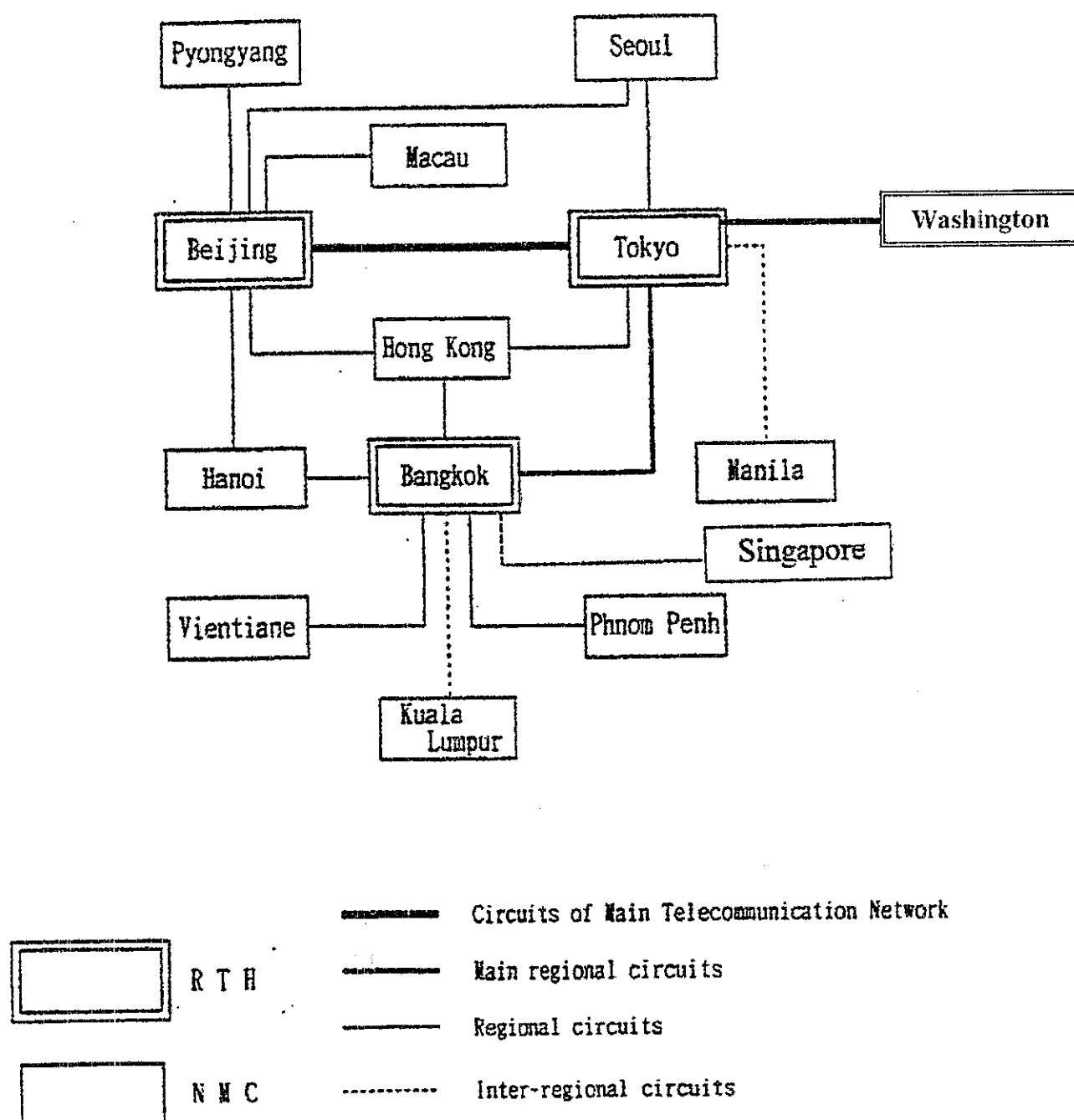
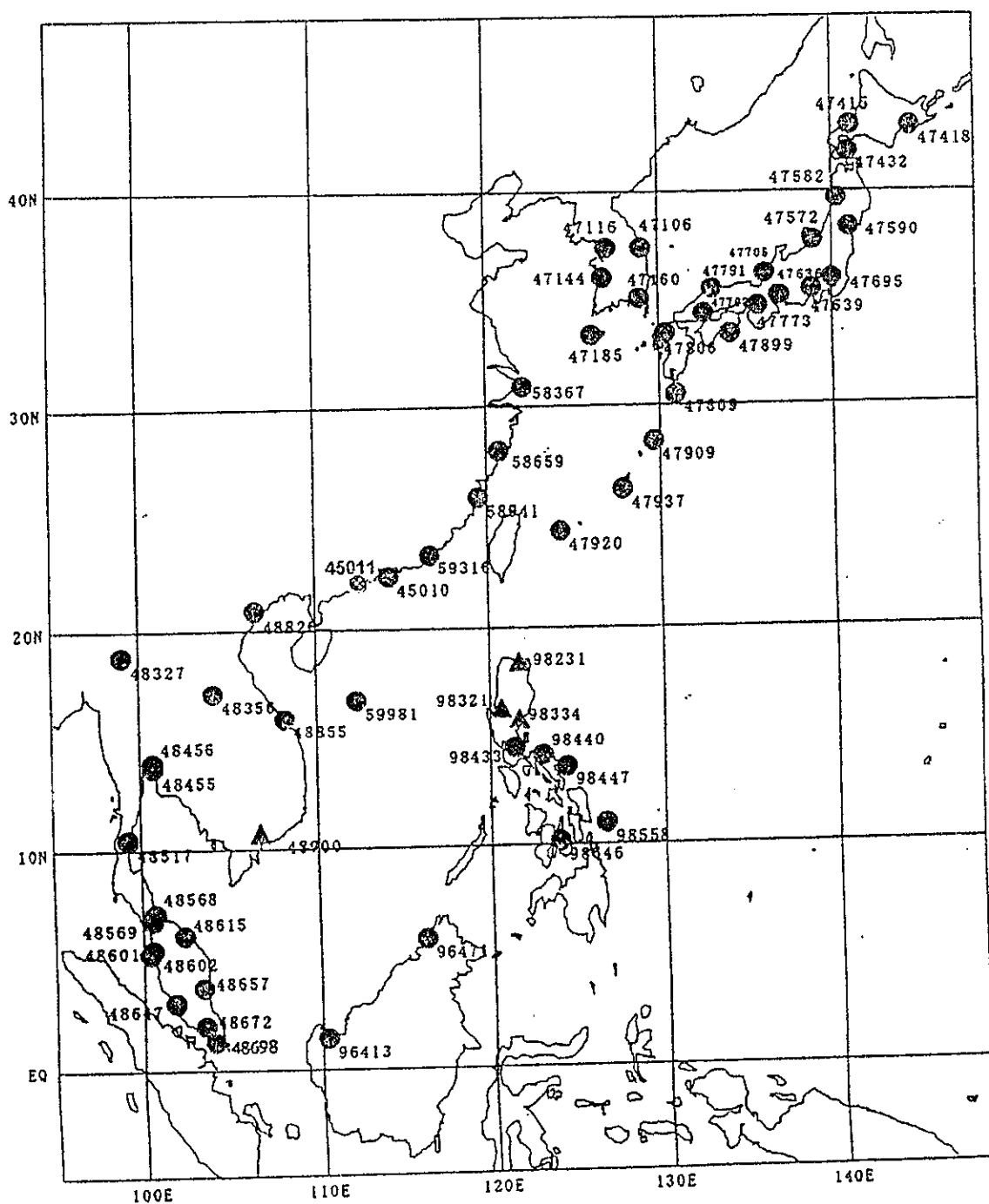


Fig. 5.1 Meteorological telecommunication network for the Typhoon Committee

DISTRIBUTION OF THE RADAR STATIONS OF TYPHOON COMMITTEE MEMBERS



Name of the Member Japan - 1

NAME OF STATION		Sapporo /Kenashiyama	Kushiro /Kombumori	Hakodate /Yokotsudake	Sendai	Akita
SPECIFICATIONS	Unit					
Index number		47415	47419	47432	47590	47582
Location of station		43° 08' N 141° 01' E	42° 58' N 144° 31' E	41° 56' N 140° 47' E	38° 16' N 140° 54' E	39° 43' N 140° 06' E
Antenna elevation	m	752.5	121.7	1141.7	99.4	56.8
Wave length	cm	5.65	5.62	5.66	5.67	5.64
Peak power of transmitter	kW	250	250	250	250	250
Pulse length	μs	2.5	2.6	2.7	2.8	2.6
Sensitivity minimum of receiver	dBm	-110	-113	-113	-113	-112
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.1(H) 1.0(V)	1.0(H) 1.0(V)	1.3(H) 1.4(V)	1.3(H) 1.4(V)	1.4(H) 1.4(V)
Detection range	km	300	300	300	300	300
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		2	2	2	2	2
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1	1	1	1	1
Doppler processing 1.Yes, 2.No		2	2	2	2	2
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		1	1	1	1	1
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1	1	1

Name of the Member Japan - 2

NAME OF STATION		Tokyo /Kashiwa	Niigata /Yahikoyama	Fukui /Tojimbo	Nagano /Kurumayama	Shizuoka /Makinohara
SPECIFICATIONS	Unit					
Index number		47695	47572	47705	47611	47659
Location of station		35° 51' N 139° 57' E	37° 43' N 138° 49' E	36° 14' N 136° 09' E	36° 06' N 138° 12' E	34° 43' N 138° 08' E
Antenna elevation	m	62.1	645.0	107.0	1937.1	186.0
Wave length	cm	5.64	5.66	5.68	5.64	5.66
Peak power of transmitter	kW	250	250	250	250	250
Pulse length	μs	2.7	2.6	2.7	2.6	2.6
Sensitivity minimum of receiver	dBm	-108	-110	-112	-113	-113
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.4(H) 1.5(V)	1.4(H) 1.5(V)	1.1(H) 1.1(V)	1.1(H) 1.1(V)	1.0(H) 1.1(V)
Detection range	km	300	300	300	300	300
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		2	2	2	2	2
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1	1	1	1	1
Doppler processing 1.Yes, 2.No		2	2	2	2	2
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		1	1	1	1	1
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1	1	1

Name of the Member Japan - 3

NAME OF STATION		Nagoya	Osaka /Takayasuyama	Matsue /Mikasayama	Hiroshima /Haigamine	Murotomisaki
SPECIFICATIONS	Unit					
Index number		47636	47773	47791	47792	47899
Location of station		35° 10' N 136° 58' E	34° 37' N 135° 40' E	35° 32' N 133° 06' E	34° 16' N 132° 36' E	33° 15' N 134° 11' E
Antenna elevation	m	72.2	497.6	554.7	746.9	200.3
Wave length	cm	5.66	5.66	5.69	5.66	5.66
Peak power of transmitter	kW	250	250	250	250	250
Pulse length	μs	2.5	2.8	2.8	2.8	2.7
Sensitivity minimum of receiver	dBm	-109	-113	-112	-112	-110
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.5(H) 1.3(V)	1.0(H) 1.0(V)	1.0(H) 1.0(V)	1.0(H) 1.0(V)	1.4(H) 1.5(V)
Detection range	km	300	300	300	300	300
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		2	2	2	2	2
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1	1	1	1	1
Doppler processing 1.Yes, 2.No		2	2	2	2	2
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		1	1	1	1	1
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1	1	1

Name of the Member Japan - 4

NAME OF STATION		Fukuoka /Sefurisan	Tanegashima /Nakatane	Naza /Funchatoge	Naha /Itokazu	Ishigakijima /Omotodake
SPECIFICATIONS	Unit					
Index number		47806	47869	47909	47937	47920
Location of station		33° 26' N 130° 22' E	30° 38' N 130° 59' E	28° 23' N 129° 33' E	26° 09' N 127° 46' E	24° 25' N 124° 11' E
Antenna elevation	m	984.2	292.0	317.2	209.7	535.5
Wave length	cm	5.66	5.66	5.66	5.66	5.70
Peak power of transmitter	kW	250	250	250	250	250
Pulse length	μs	2.5	2.5	2.8	2.7	2.5
Sensitivity minimum of receiver	dBm	-108	-112	-108	-112	-113
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.5(H) 1.5(V)	1.5(H) 1.4(V)	1.4(H) 1.5(V)	1.3(H) 1.4(V)	1.2(H) 1.2(V)
Detection range	km	300	300	300	300	300
Scan mode in observation 1.Fixed elevation 2.CAPPI 3.Manually controlled		2	2	2	2	2
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1	1	1	1	1
Doppler processing 1.Yes, 2.No		2	2	2	2	2
Display 1.Digital, 2.Analog		1	1	1	1	1
OPERATION MODE (When tropical cyclone is within range of detection) 1.Hourly 2.3-hourly 3.Others		1	1	1	1	1
PRESENT STATUS 1.Operational 2.Not operational(for research etc.)		1	1	1	1	1

Name of the Member Macau, China

NAME OF STATION		TAIPA GRANDE				
SPECIFICATIONS	Unit					
Index number		45011				
Location of station		22.1599N 113.5634E				
Antenna elevation	m	185				
Wave length	cm	10.9				
Peak power of transmitter	kW	800				
Pulse length	s	SP 0.83 LP 2.0				
Sensitivity minimum of receiver	dBm	-110 or -111				
Beam width (Width of over -3dB antenna gain of maximum)	deg	1.3				
Detection range	km	SP 100 LP 400				
Scan mode in observation 1. Fixed elevation 2. CAPPI 3. Manually controlled		3 others				
DATA PROCESSING						
MTI processing 1.Yes, 2.No		1				
Doppler processing 1.Yes, 2.No		1				
Display 1.Digital, 2.Analog		1				
OPERATION MODE (When tropical cyclone is within range of detection) 1. Hourly 2. 3-hourly 3. Others		Every 15 minutes				
PRESENT STATUS 1. Operational 2. Not operational (for research etc.)		1				

EXAMPLES OF ADVISORIES ISSUED FROM RSMC TOKYO – TYPHOON CENTER

RSMC Tropical cyclone advisory

WTPQ20 RJTD 180000
RSMC TROPICAL CYCLONE ADVISORY
NAME TY 0001 DAMREY (0001)
ANALYSIS
PSTN 180000UTC 14.8N 127.2E GOOD
MOVE W 12KT
PRES 905HPA
MXWD 105KT
50KT 180NM SOUTHEAST SEMICIRCLE 150NM ELSEWHERE
30KT 300NM
FORECAST
24HF 190000UTC 16.3N 125.7E 90NM 70%
MOVE NNW 06KT
PRES 910HPA
MXWD 100KT
48HF 200000UTC 18.5N 126.5E 180NM 70%
MOVE NNE 06KT
72HF 210000UTC 20.5N 129.0E 270NM 70%
MOVE NE 08KT =

RSMC Guidance for Forecast

FXPQ20 RJTD 180600
RSMC GUIDANCE FOR FORECAST
NAME T 0001 DAMREY (0001)
PSTN 180000UTC 15.2N 126.3E
PRES 905HPA
MXWD 105KT
FORECAST BY GLOBAL MODEL
TIME PSTN PRES MXWD
(CHANGE FROM T=0)
T=06 15.4N 125.8E +018HPA -008KT
T=12 15.5N 125.6E +011HPA -011KT
T=18 15.8N 125.7E +027HPA -028KT
:
:
T=78 20.7N 128.8E +021HPA -022KT=

RSMC Prognostic Reasoning

WTPQ30 RJTD 180000

RSMC TROPICAL CYCLONE PROGNOSTIC REASONING
REASONING NO. 9 FOR TY 0001 DAMREY (0001)

1.GENERAL COMMENTS

REASONING OF PROGNOSIS THIS TIME IS SIMILAR TO PREVIOUS ONE.
POSITION FORECAST IS MAINLY BASED ON NWP AND PERSISTENCY.

2.SYNOPTIC SITUATION

SUBTROPICAL RIDGE WILL NOT CHANGE ITS LOCATION AND STRENGTH FOR THE NEXT 24 HOURS.

3.MOTION FORECAST

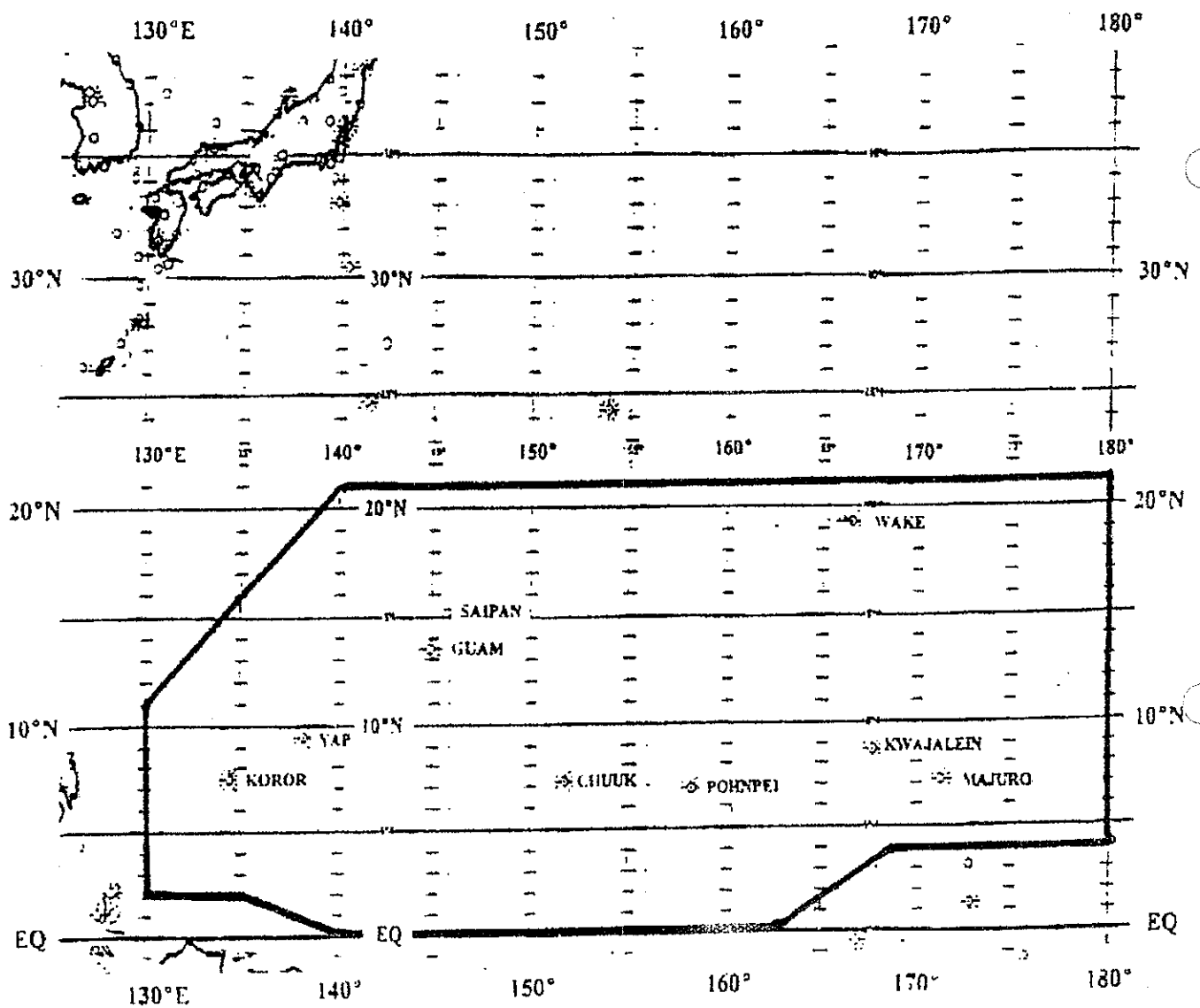
POSITION ACCURACY AT 180000 UTC IS GOOD.
TY WILL DECELERATE FOR THE NEXT 12 HOURS.
TY WILL RECURVE WITHIN 60 HOURS FROM 180000 UTC.
TY WILL MOVE WEST FOR THE NEXT 12 HOURS THEN MOVE GRADUALLY TO WEST-NORTHWEST.

4.INTENSITY FORECAST

TY WILL KEEP PRESENT INTENSITY FOR NEXT 24 HOURS.
FI-NUMBER WILL BE 7.0 AFTER 24 HOURS.=

NATIONAL WEATHER SERVICE OFFICE, GUAM, USA

AREA OF RESPONSIBILITY *



* Note: Within this Area of Responsibility tropical cyclone watch and warning products, based on tropical cyclone forecasts issued by the Joint Typhoon Warning Center, are provided by National Weather Service Office, Guam.

APPENDIX V

REPORT OF THE ACTIVITIES OF THE RSMC TOKYO-TYPHOON CENTRE

Provision of RSMC Products

The RSMC Tokyo-Typhoon Center has been providing TC Members with various kinds of products on tropical cyclones in the western North Pacific and the South China Sea via the GTS, HF broadcast, international SafetyNET service and others. Table 1 shows the total numbers of the products issued by the Center in 2000 (as of the end of September 2000).

Operational Typhoon Forecasts

Operational forecasts for 18 tropical in 2000 were verified against best track data prepared by the Center. Figure 1 shows annual mean errors of 24-hour (from 1982), 48-hour (from 1988) and 72-hour (from 1997) forecasts of center positions. The annual mean position errors for this year are approximately 150 km for 24-hour forecast, 270 km for 48-hour forecast and 410 km for 72-hour forecast (as of the end of September 2000). The overall performance of track forecast in 2000 is nearly equal to that of 1997, which recorded the best since 1982. Position errors of 24-, 48- and 72-hour forecasts for each tropical cyclone are shown in Table 2.

RSMC Data Serving System

JMA has been operating the RSMC Data Serving System that allows TC Members to retrieve NWP products such as Grid Point Values (GPVs) and observational data through the Internet and Integrated Service Digital Network (ISDN) since 1995. Eight Members are registered for access to the system. The products and data being provided through the system are listed in Table 3.

Publication

The Center published "Annual on Activities of the RSMC Tokyo-Typhoon Center in 1998" in April 2000 and "Annual Report on Activities of the RSMC Tokyo-Typhoon Center in 1999" in November 2000. In the 1998 issue, the center started to attach a compact disk (CD) to the report, which contains plenty of images of all the tropical cyclones in the year.

Implementation Plan

Table 4 shows the Implementation Plan of the RSMC Tokyo-Typhoon Center the period from 2000 to 2004.

Product	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
TCNA20	0	0	0	0	27	0	83	136	136				382
TCNA21	0	0	0	0	34	0	96	144	151				425
WTPQ20-25	0	0	0	0	37	0	102	151	157				447
WTPQ30-35	0	0	0	0	19	0	49	73	77				218
FXPQ20-25	0	0	0	0	32	0	96	147	138				413
FKPQ30-35	0	0	0	0	34	0	100	146	150				430
AXPQ20	0	0	0	0	0	1	1	0	0				2
AUXT85													
AUXT20	62	58	62	60	62	60	62	62	60				548
FUXT852													
FUXT854	62	58	62	60	62	60	62	62	60				548
FUXT202													
FUXT204	62	58	62	60	62	60	62	62	60				548

Table 1 Monthly and annual total numbers of products issued by the RSMC
Tokyo - Typhoon Center in 2000 (as of 30 September 2000)

Notes:

- via the GTS -

SAREP	TCNA20/21 RJTD
RSMC Tropical Cyclone Advisory	WTPQ20-25 RJTD
RSMC Prognostic Reasoning	WTPQ30-35 RJTD
RSMC Guidance for Forecast	FXPQ20-25 RJTD
Tropical Cyclone Advisory for SIGMET	FKPQ30-35 RJTD
RSMC Tropical Cyclone Best Track	AXPQ20 RJTD

- via the JMH Meteorological Radio Facsimile -

Analysis of 850 and 200 hPa Streamline	AUXT85/AUXT20
Prognosis of 850 hPa Streamline	FUXT852/FUXT854
Prognosis of 200 hPa Streamline	FUXT202/FUXT204

Tropical Cyclone			24-hour Forecast				48-hour Forecast				72-hour Forecast			
			Position Error & Number of Forecast				Position Error & Number of Forecast				Position Error & Number of Forecast			
			Mean	S.D.	Num.	EO/EP	Mean	S.D.	Num.	EO/EP	Mean	S.D.	Num.	EO/EP
			(km)	(km)		(%)	(km)	(km)		(%)	(km)	(km)		(%)
TY	DAMREY	(0001)	173	81	18	78	244	114	14	45	290	144	10	25
TS	LONGWANG	(0002)	245	111	2	-	-	-	0	-	-	-	0	-
TY	KIROGI	(0003)	144	74	19	70	206	80	15	37	214	92	11	22
TY	KAI-TAK	(0004)	142	100	17	49	471	318	13	60	689	378	9	58
TS	TEMBIN	(0005)	104	70	42	66	221	42	3	**	-	-	-	-
STS	BOLAVEN	(0006)	120	56	17	71	225	113	13	55	299	130	9	47
TS	CHANCHU	(0007)	-	-	0	-	-	-	0	-	-	-	0	-
TY	JELAWAT	(0008)	79	30	34	67	145	41	30	45	205	62	26	41
TY	EWINIAR	(0009)	186	157	36	44	255	192	32	30	438	260	28	30
TY	BILIS	(0010)	107	36	14	74	203	83	10	98	301	83	6	70
TS	KAEMI	(0011)	-	-	0	-	-	-	0	-	-	-	0	-
TY	PRAPIROON	(0012)	145	62	20	45	224	49	16	29	382	159	12	31
TS	MARIA	(0013)	212	73	12	107	516	72	8	85	924	113	4	65
TY	SAOMAI	(0014)	166	155	49	69	337	294	44	70	433	417	40	61
TS	BOPHA	(0015)	146	91	18	33	425	252	14	38	965	556	10	77
TY	WUKONG	(0016)	102	44	14	87	147	70	10	42	220	75	6	41
STS	SONAMU	(0017)	133	61	8	22	238	72	4	14	-	-	0	-
TY	SHANSHAN	(0018)	157	84	21	58	273	210	17	46	369	338	13	41
Annual Mean (Total)			145	107	306	57	273	213	243	47	407	351	184	44

Table 2 Mean position errors of 24-, 48- and 72-hour operational forecasts in 20000

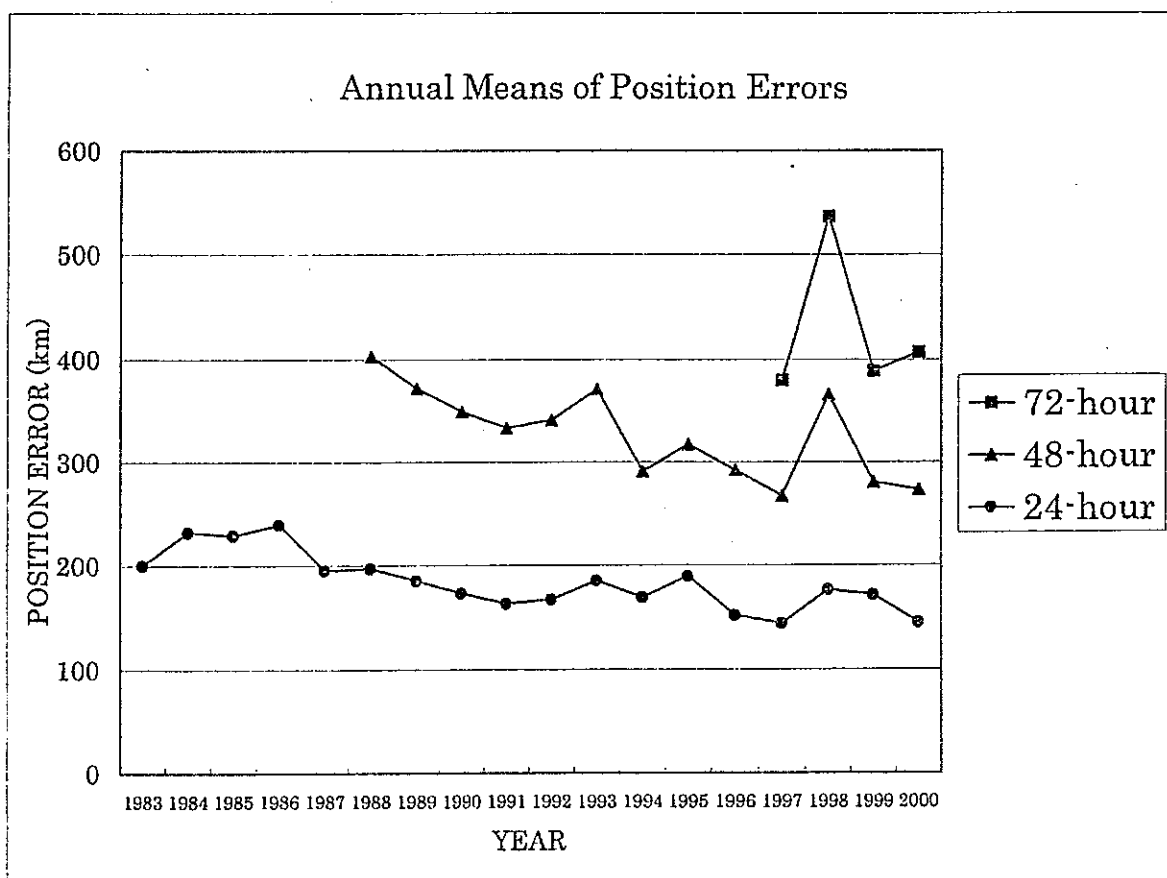


Figure 1 Annual mean position errors of 24-, 48- and 72-hour operational forecasts for tropical cyclones of TS intensity or higher

Area	20S-60N,80E-160W	20S-60N,60E-160W	global area	
Resolution	2.5 × 2.5 deg	1.25 × 1.25 deg	2.5 × 2.5 deg	
Level & Elements	surface(P,U,V,T,TTd,R) 850hPa(Z,U,V,T,TTd,ω) 700hPa(Z,U,V,T,TTd,ω) 500hPa(Z,U,V,T,TTd,ζ) 300hPa(Z,U,V,T) 250hPa(Z,U,V,T) 200hPa(Z,U,V,T) 150hPa(Z,U,V,T) 100hPa(Z,U,V,T)	surface(P,U,V,T,TTd,R) 1000hPa(Z,U,V,T,TTd) 925hPa(Z,U,V,T,TTd,ω) 850hPa(Z**,U**,V**,T**,TTd**,ω,ψ,x) 700hPa(Z**,U**,V**,T**,TTd**,ω) 500hPa(Z**,U**,V**,T**,TTd**,ζ) 400hPa(Z,U,V,T,TTd) 300hPa(Z,U,V,T,TTd) 250hPa(Z,U,V,T) 200hPa(Z**,U**,V**,T**,ψ,x) 150hPa(Z,U,V,T) 100hPa(Z,U,V,T) 70hPa(Z,U,V,T) 50hPa(Z,U,V,T) 30hPa(Z,U,V,T) 20hPa(Z,U,V,T) 10hPa(Z,U,V,T)	surface(P,U,V,T,R) 850hPa(Z,U,V,T,TTd)* 700hPa(Z,U,V,T,TTd)* 500hPa(Z,U,V,T)* 300hPa(Z,U,V,T) 250hPa(Z,U,V,T) 200hPa(Z,U,V,T)* 100hPa(Z,U,V,T)	surface(P,U,V,T,TTd) 1000hPa(Z,U,V,T,TTd) 850hPa(Z,U,V,T,TTd) 700hPa(Z,U,V,T,TTd) 500hPa(Z,U,V,T,TTd) 400hPa(Z,U,V,T,TTd) 300hPa(Z,U,V,T,TTd) 250hPa(Z,U,V,T) 200hPa(Z,U,V,T) 150hPa(Z,U,V,T) 100hPa(Z,U,V,T) 70hPa(Z,U,V,T) 50hPa(Z,U,V,T) 30hPa(Z,U,V,T) 20hPa(Z,U,V,T) 10hPa(Z,U,V,T)
FCST Hours	00,06,12,18,24,30,36,48, 60,72	00,06,12,18,24,30,36,42,48,54,60,66,72 12UTC: Surface(P,U,V,T,TTd,R), from 78 to 192 hours, every 6 hours **: 96,120,144,168,192(12UTC only)	00UTC : 24,48,72 12UTC : 00,248,72,96,120 *: 144,168,192(12UTC only)	00UTC : 00
Time/Day	2 times (00 and 12 UTC)	2 times (00 and 12 UTC)	2 times (00 and 12 UTC)	

Note: P : pressure reduced to MSL Z : geopotential height ζ : relative vorticity U : u-component of wind
 V : v-component of wind ψ : stream function R : total precipitation T : temperature
 χ : velocity potential TTd : dew point depression ω : vertical velocity

Products /Data	GMS Data	Typhoon Information	Global Wave Model	Observations data
Contents	(a) Digital data (GRIB) •Cloud amount •Convective cloud amount •Equivalent blackbody temperature (b) Satellite-derived high density cloud motion vectors (BUFR)	Tropical cyclone related information (BUFR) •Position, etc.	•Wave height •Wave period •Prevailing wave direction Forecast Times: Initial,06,12,18,24,30,36, 42,48,54,60,72 (00&12UTC), 96,120,144,168,192 (12UTC)	(a) Surface data (SYNOP) (b) Upper air data (TEMP, Part A-D) (PILOT, Part A-D)
Frequency (initial time(s))	(a) 4 times (00, 06, 12 and 18UTC) a day (b) Once (04UTC) a day	4 times (00, 06, 12 and 18 UTC) a day	2 times (00 and 12 UTC) a day	(a) Mainly 4 times a day (b) Mainly 2 times a day

Table 3 List of GPV products and data on the RSMC Data Serving System

PRODUCT	2000	2001	2002	2003	2004	REMARKS
Satellite Observation						
GMS S-VISSR						24 times/day (full-disk)
GMS/MTSAT WEFAX						8 times/day (4-sector), 24 times/day (Image H), 20 times/day (Image I or J)
Cloud motion wind						4 times/day
Analysis						
SAREP (for tropical cyclones)						4-8 times/day Dvorak intensity (estimation included)
Report of typhoon analysis*						4 times/day
Sea Surface Temperature						10-day mean and its anomaly
Objective analysis						
pressure pattern, etc						FAX
stream lines						FAX**
Cloud distribution						GPV**
Long-wave radiation						GPV**
Forecast						
RSMC Prognostic Reasoning						2 times/day
RSMC Guidance for Forecast						TYM up to 84 hours 4 times/day GSM up to 90 hours 2 times/day (effective in March 2001)
NWP products						
pressure pattern, etc						FAX, GPV (GSM)
stream line						FAX (GSM: 00,24,48 and 72 hrs)
RSMC Tropical Cyclone Advisory*						4 times/day up to 72 hrs
Others						
RSMC Tropical Cyclone Best Track						GTS
Annual Report						
Technical Review						
SUPPORTING ACTIVITY	2000	2001	2002	2003	2004	REMARKS
Data archive						
Monitoring of data exchange						
Dissemination of products						RSMC Data Server

* "RSMC Tropical Cyclone Advisory" involves "Report of typhoon analysis"

** Some of these products will be disseminated within the capacity of traffic of the GTS and JMH.

Table 4 Implementation Plan of the RSMC Tokyo – Typhoon Center (2000 – 2004)

APPENDIX VI

REPORT OF THE MEETING OF HYDROLOGISTS FROM TYPHOON COMMITTEE MEMBERS

Organization of the Pre-session

The annual pre-session meeting of the hydrologists was convened at the "Centro UNESCO de Macao" on 27 November 2000, with participation of 17 representatives from nine Members, ESCAP, WMO, TCS, and the Local Organizing Committee, as listed in Annex 1.

The Meeting elected Mr Chong Sun Fatt as the Chairman of the pre-session and endorsed the proposal of the Chairman to elect Mr Le Huu Ti of ESCAP as secretary of the Meeting.

The Meeting adopted the following agenda of the Meeting:

- 1) Introduction
- 2) Review of the activities of each TC member in 2000
- 3) Future activities for 2001
- 4) Other matters
- 5) Recommendations

Introduction

After the introduction of all the participants, the Chairman drew the attention of the participants on the importance of flood-related studies within the framework of cooperation of the Typhoon Committee and requested the Meeting to keep this focus in their deliberation. In this connection, the Meeting took note of the fact that in many countries, the current warnings on typhoons do not include hydrological information in the warning signals, as pointed out by participants of the recent regional technical conference on storm surge, jointly organized by WMO, Typhoon Committee and the Panel on Tropical Cyclones, in Chiang Mai in November 2000. The Meeting recognized the need to improve the hydrological information in the warnings and agreed that such improvement would need to be carried out in a systematic manner. In this connection, the Meeting noted a recent increase in the intensity of floods in several members of the Typhoon Committee and also a rapid increase in the number of urban floods in many major urban areas in the Typhoon Committee Area.

Review of activities

In order to ensure consistency of reporting of the Session, the summaries of the review of activities are incorporated in Appendix VII of the main report.

Future activities

Ms Nophakun Somsin presented an estimated budget for the organization of a four-day Expert Workshop for TC Hydrologists on "Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" for the Meeting to consider. The Meeting took note the increase in the cost estimate in comparison with the original estimate adopted at the 32nd Session and recommended that adjustment be made to stay within the total estimate of US\$19,000. The Meeting endorsed the proposal made by the Chairman to the effect that the total allocation for "Printing and local support" be kept at US\$3,000 as that allocated in the Training Seminar which was held in May 2000; and that the service of an expert to facilitate the Workshop be requested from ESCAP.

The Meeting endorsed the proposal made by several delegation to undertake a comprehensive review of achievements and to identify future direction for more effective cooperation in the hydrological component and also disaster preparedness and prevention of the Committee. The Meeting agreed that such a review would lead to improvement in the effectiveness of cooperation in the hydrological component and disaster preparedness and prevention not only at the short term (activities), but also in the medium and long-term (programme and strategies). The Meeting highlighted the importance of commitment to such a review and, therefore, recommended a two-pronged approach to undertake the review: (a) a survey by questionnaire including analysis, and (b) a field expert mission for consultation with the members. For the survey, the Meeting requested ESCAP in consultation with TCS and interested members to prepare the questionnaire, conduct the survey, analyze the information and report findings to the members. These findings will then be used by the field expert mission for detailed consultation. The draft Terms of Reference of the Review is attached in Annex 2.

The Meeting took note of the appreciation by several countries and organizations of the services provided by the Typhoon Committee in disaster reduction including flood disasters as reported by a recent regional survey conducted by ESCAP and IDNDR Secretariat. The Meeting also noted the important opportunity to enhance visibility of the Typhoon Committee in flood control and disaster reduction at the Third World Water Forum to be held in Japan in 2003 and suggested that findings of the above proposed review to be discussed at the Expert Workshop planned to be held in Thailand. In this connection, the Meeting recommended that one day of the four-day workshop be devoted to discuss the review findings and requested that ESCAP assist TCS and Thailand in preparing the technical programme of the workshop.

The Meeting recognized the importance of maintaining opportunities for hydrologists of the Committee to meet and exchange information and experience and to learn of latest development. It therefore recommended to hold a

workshop in 2002 on the tentative theme "Integration of Risk Analysis and Management for Water-related Disaster into Development Process".

Other matters

The Meeting took note of the scheduled completion of tenure of the TCS Hydrologist and the need to continue provision of such services. The Meeting recommended that TC send letter to the TC members to request for the provision of such services as soon as possible in order to avoid any gap after the completion of the services of Mr Han-Se Lee. The Meeting reviewed also the current Job Description of the hydrologist and strongly felt the need to upgrade the responsibility of the post so as to be in line with programme approach as well as strategic planning and management concept of the planned review of the hydrological component. The Meeting recommended the revised Job Description as shown in Annex 3 for the Committee to consider with a view to approval for further arrangements.

The Meeting wished to record its appreciation to Mr Han-Se Lee for his valuable services provided to TCS and TC members in the conduct of the hydrological component during the past three years and expressed to the Government of Republic of Korea its deep gratitude for the generosity in providing the services of the hydrologist. In view of the importance of the hydrological component, especially with expected new strategies following the planned review, it is hoped that continuation of the services of the TCS hydrologist would soon be made available.

Recommendations

Based on the above detailed discussion, the following recommendations were proposed to the Typhoon Committee for consideration and approval:

- 1) To authorize a comprehensive review of the hydrological component and disaster preparedness and prevention to be undertaken. In this connection, it is recommended that the Committee request ESCAP in cooperation with TCS, WMO and interested members to undertake a survey including design the questionnaire, conduct the survey, analyze responses and prepare the survey report before an expert mission is fielded. The Committee is requested to approve the proposed TOR of the expert mission and request interested TC members to provide annual financial support to undertake the field expert mission. In order to maintain continuity of planning of this activity, the Committee may wish to consider the possibility to establish a working group to be responsible for the planning and implementation of this activity.
- 2) To approve the revised Job Description of the TCS hydrologist and to request the TC members to provide the services of the hydrologist

as soon as possible in order to avoid any gap after the completion of the services of Mr Han-Se Lee in January 2001.

- 3) To request TCS to organize thematic workshops with a view to promote greater information exchange and technology transfer among Typhoon Committee hydrologists on the following activities (with budget estimate shown in Annex 4):
 - a) A 4-day expert workshop for TC hydrologists on "Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" to be held in Bangkok, Thailand sometime in July/August 2001;
 - b) A 4-day expert workshop for TC hydrologists on "Integration of Risk Analysis and Management for Water-related Disasters into Development Process" to be held in 2002.
- 4) ESCAP to take measures in informing TC Members of ESCAP's projects on water resources and flood mitigation.
- 5) Members should take advantage of TCDC arrangements by ESCAP for exchange visits of hydrologists.

LIST OF PARTICIPANTS IN THE PRE-SESSION 2000

China

Mr Sun Jichang Deputy Director-General, Bureau of Hydrology,
Ministry of Water Resources (MWS)

Mr Liu Jinping Deputy Division Director, Bureau of Hydrology,
MWS

Hong Kong, China

Mr C.C. Chan Senior Scientific Officer, Hong Kong Observatory

Japan

Mr Hisaya Sawano Deputy Director, River Development Division,
River Bureau, Ministry of Construction

Macao, China

Mr Hao I Pan Chief, Meteorological Division, Macao Meteorological and Geophysical Bureau

Ms Lou Mei Meng Meteorologist, Macao Meteorological and Geophysical Bureau

Malaysia

Mr Chong Sun Fatt Senior Assistant Director of Hydrology, Hydrology Division, Department of Irrigation and Drainage

Republic of Korea

Mr Park Jae-Heyon Deputy Director, River Planning Division, Ministry of Construction and Transportation (MOTC)

Mr Lee Chang-Do Deputy Director, Han River Flood Control Office, MOCT

Singapore

Mr Tan Yong Piu Head, Climatology and Marine Meteorological Service

Thailand

Mr Dusadee Sarigabutr Deputy Director General, Meteorological Department

Ms Nophakhun Somsin Expert on Hydrology, The Royal Irrigation Department

Viet Nam

Ms Nguyen Lan Chau Deputy Chief, Hydrological Forecast Division, NCHMF/HMS

ESCAP

Mr Le Huu Ti Economic Affairs Officer, Water and Mineral Resources Section

WMO

Mr Katsuhiko Abe Chief, Tropical Cyclone Programme Division, World Weather Watch, Applications Department

Typhoon Committee Secretariat

Dr Roman L. Kintanar Coordinator

Mr Han-Se Lee Hydrologist

Ms Efigenia C. Galang Meteorologist

THE TYPHOON COMMITTEE

TERMS OF REFERENCE OF A REVIEW MISSION

1. Background

The Economic and Social Commission for Asia and the Pacific (formerly ECAFE) at its twentieth session held in March 1964, recognized the urgency for improving typhoon warnings and the need for greater regional cooperation in connection with typhoons and called upon the World Meteorological Organization (WMO) to collaborate with ESCAP in the initiation of a joint programme. In 1968, the Typhoon Committee was established by the participating countries as an intergovernmental body and has been functioning and holding annual sessions since.

Over the past three decades, the Typhoon Committee has carried out a wide range of activities and cooperative projects. These activities and projects were the subject of constant examination within the programme of work of the Committee and its annual report. Efforts have been made also by various members and stakeholders so as to enhance the effectiveness of subregional cooperation. However, there has been no recent major efforts to undertake a comprehensive review of past achievements, systematic assessment of needs and strategic development of future programmes for further strengthening of subregional cooperation. This paper is prepared to set out Terms of Reference for collaborative efforts to undertake such a comprehensive review. Such a review is important in view of the recent important increase of attention on the needs to mitigate increasing damage by annual floods in the Typhoon Committee subregion. Furthermore, such subregional efforts are expected to provide useful information to the ongoing process to prepare for the Third World Water Forum to be held in Japan in 2003, especially on incorporation of water-related disaster reduction dimension into integrated water resources management.

2. Relevant past experience

In an internal desk study conducted by ESCAP secretariat in 1996 to assess achievements of the Typhoon Committee (TC) over the past decades, it was concluded that the Typhoon Operational Experiment (TOPEX) was one of the most important initial regional efforts that effectively binded the TC member countries together in a common goal to reduce annual damage and loss caused by typhoons. TOPEX was also a serious regional effort to test the initial investments made by the member countries for typhoon forecasting and warning. Within the common regional programme, Japan had played the role of a driving force when the Japan Meteorological Agency (JMA) placed all its modern

facilities at the disposal of TOPEX and thus provided typhoon forecasting agencies of different countries with opportunities to be exposed to modern facilities and latest techniques. All these factors contributed to the success of this important subregional cooperation programme. The most important achievements of TOPEX that have resulted in long-term impacts on TC cooperation and in a consolidated framework of subregional annual operations are summarized below:

- 1) A good network of modern facilities that were established with investment by the member countries and with assistance from donors, as a result of the TC cooperation and especially TOPEX. With the good facilities, a good data set of several typhoons is now available for research on the subregional scale.
- 2) Experiences from TOPEX are also of great value in designing flood warning systems and developing proper techniques of warnings. A good guide has been established to improve existing forecasting systems and designing new ones in the subregion.
- 3) A part of the success of TOPEX is perhaps due to intensive mobilization of facilities for a short period. Maintenance of these facilities and especially training of personnel were considered to be a key to the smooth operations of the existing systems and the TC cooperation programme. Within this context, different modalities of technical assistance were considered, including through TCDC.
- 4) Good achievements were made by the member countries in installation of new flood forecasting and warning systems and in upgrading existing systems. As a result of the cooperation, especially through TOPEX, forecasting systems were successfully established for several pilot river basins in most of the member countries. In some countries, new standards for the forecasting operations were established and modern equipment introduced, including telemetry systems.

3. Objectives of the review

The above desk study of ESCAP provides an interesting overall assessment of achievements. Not only that these achievements will have to be verified and systematically consolidated with actual surveys and consultation, but priority needs of the members for further strengthening in subregional cooperation must be surveyed and analyzed so as to enhance the effectiveness and benefits of cooperation through TC.

4. Terms of Reference

The review is expected to cover all areas of work of the TC on the hydrology component and disaster reduction and preparedness with the following expected outcomes:

- i) Assessment of major achievements
- ii) Identified priority needs for strengthening subregional cooperation so as to support social and economic development process of the TC members
- iii) Proposed programmes of action to address the above needs
- iv) Prepare priority projects for funds mobilization and implementation.

5. Implementation arrangements

The Committee may request funds from potential donors to undertake the review and to facilitate the discussion of the findings and recommendations of the field expert mission at a regional workshop of the Committee scheduled to be held in Bangkok 2001 prior to submission of the final review report to the Committee. It is expected that TCS, ESCAP and WMO would take an active role in the planning and implementation of the review.

JOB DESCRIPTION OF THE TCS HYDROLOGIST

1. Under the overall supervision of the Coordinator of the TCS, to be responsible for the formulation, coordination and monitoring of the implementation of the hydrological programme of the Typhoon Committee.
2. To report to the Committee of progress and achievements of the implementation of hydrological programme including regular evaluation and necessary revision to improve the effectiveness of cooperation in the hydrological component.
3. To formulate project proposals related to the work of the Typhoon Committee under the hydrological component and to seek funding from members and donors.
4. To formulate detailed activities for the hydrological component for consideration of the Typhoon Committee for consideration and approval of allocation from the Trust Funds.
5. To coordinate the implementation of projects and activities related to the hydrological component and to prepare final reports or proceedings for dissemination.
6. To cooperate with the hydrologists of the TC members for evaluation of the available capabilities and identification assistance needs.
7. To provide advisory services to members on request and if possible, under TCDC and/or TC Trust Fund.
8. To coordinate with ESCAP and WMO and whenever possible participate in their regional activities.
9. To participate in and service the annual session of the Typhoon Committee.

BUDGET ESTIMATE FOR ACTIVITIES UNDER THE HYDROLOGICAL COMPONENT

A. Workshop in 2001

Budget estimate for a 4-day Expert Workshop for TC Hydrologists on "Evaluation and Improvement of Operational Flood Forecasting Models in the Typhoon Committee Area" and "Review Mission Findings", Bangkok, Thailand, July/August 2001.

No. of Participants

TC member	13
Expert	1
Thai participants	20
Other	6
Total	40

Estimated costs

1. Per diem for 13 TC member participants (13*US\$100*5 days)	6,500
2. Air travel for 13 TC member participants (13*US\$500)	6,500
3. Per diem and air travel for 1 TCS staff	1,700
4. Printing and local support	3,000

Total	US\$17,700
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B. Workshop in 2002

Budget estimate for a 4-day Expert Workshop in "Integration of Risk Analysis and Management for Water-related Disasters into Development Process" in 2002: same level as that proposed for 2001 Workshop



APPENDIX VII

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS. ESCAP AND WMO ON THEIR ACTIVITIES RELATED TO THE HYDROLOGICAL COMPONENT

The delegate from **China** reported that in China, during the 2000 flood season, the serious drought happened again after 1999's drought in the northern area as well as large local floods in some other areas. A number of medium-size rivers became dried up and more than 600 cities and towns suffered from water scarcity. In this connection, the hydrological departments provided the public with good flood forecasts and accurate prediction of water resources conditions. In 2000, China constructed 21 experimental schemes for the hydrological data collection systems as part of the State Flood Control Command System. Solid-state data loggers, VSAT and other new facilities were installed for 20 hydrological information sub-centres, 245 hydrological stations and 2000 rainfall stations. A voice reporting technique was developed and used in real-time flood control. In 2000, China revised and issued the Standard of Hydrological Information and Forecasting and the revision of the Standard Hydrological Data Exchange Format has been undertaken. In order to enhance the management of international rivers, the Ministry of Water Resources started the hydrological plan and framework for international rivers. The work of reporting flood data of the Red (Honghe) River to Viet Nam has progressed positively. Chinese hydrologists submitted a new design programme for PMP and PMF which was accepted by the Eleventh Session of the Hydrological Commission of WMO. The Chinese Flood Forecasting System, which includes data processing model calibration, operational flood forecasting and interactive modification, is in its final stage of completion. China hydrology website (<http://www.hydroinfor.gov.cn>) and China water website (<http://www.mwr.gov.cn>) were established. China would like to see more cooperation among the members in the hydrological component.

The delegate from **Hong Kong, China** reported of a recent upgrading of the raingauge network to serve the purpose of mitigating of landslips due to heavy rains in Hong Kong, China. He further reported a programme of upgrading the drainage system which was being undertaken and was scheduled for completion in 2003. He also informed that six drainage master plan studies had recently been completed and the aims of the studies were to review the condition and performance of existing storm water drainage systems.

The delegate from **Japan** reported the successful completion of the "Training Seminar on Development of Non-structural and Emergency Countermeasures for Sediment and Flood Disaster" jointly organized by JICA and TCS in May 2000 in Manila. He then informed the Committee that hydrological and water quality database was being used efficiently not only

within public administrations but also by outside users through the Internet, according to the needs of the public for river information in terms of both day-to-day activities and emergency operations. The database is being developed by eliminating erroneous data automatically and by improving the level of information security management and distribution systems, in order to enable users to collect and analyze data easily. Regarding the event of an extreme flood, which occurred in Nagoya in September 2000, the importance of effective utilization of hydrological data such as hazard maps, which contribute to disaster preparedness in urbanized areas against flash floods, was recognized. He pointed out similar severe impacts caused by urban floods in other countries in the region and this fact offered good opportunity for the members to collaborate to mitigate impacts of urban floods. In addition, he informed the Committee that the Third World Water Forum will take place in Japan in 2003 and a lecture on this subject will be presented by a representative of the Third World Water Forum Secretariat on Saturday, 2 December 2000.

The delegate from **Macao, China** reported that Macao, China has no serious problem with floods in recent years. She also pointed out that the new graphical and tabular real-time display software of the AWS monitoring network was redesigned to record rainstorm event with alarm for monitoring of the amount of precipitation according to the heavy warning system in force in Macao.

The delegate for **Malaysia** reported that Malaysia has installed 250 telemetering stations for flood warning purpose, 2000 flood-prone areas were identified of which 500 areas were provided with monitoring flood gauges. He informed that the Malaysian Government has approved the implementation of the Urban Stormwater Management Manual by January 2001 to guide urban development to ensure no increase in flood peak and water quality improvement on the rivers as a result of urban development activities. He also pointed out that in the last one year urban flash floodings became more severe while the monsoon flood on 21-22 November 2000 which flooded the East coast of Peninsular Malaysia has resulted in a death toll of 19 and evacuation of about 5000 people. A website has been established to provide to the public on-line rainfall and water level data, currently flooded areas and highways, highland rainfalls and landslide risk; on-line flood camera pictures and hotlink to the useful websites such as satellite imageries. In this regard, he informed that Thailand could make use of the real-time data for the Golok River basin in Malaysia (a shared river between Thailand and Malaysia) while Singapore could also obtain real-time data for the Skudai River in which a water treatment plant of Singapore is located.

The delegate from the **Philippines** reported that widespread flooding in two river basins of Central Luzon including Metro Manila area had occurred in July 2000 primarily due to the intensification of the southwest monsoon brought about by Typhoon Kirogi and Kaitak. A total of 91 flood bulletins, 10 general flood advisories and 9 flood situationers were issued during the period under review. Collaboration with private and non-governmental organizations resulted

in the promotion of participatory community-based flood forecasting and warning in systems elected non-telemetered rivers in the country; conduct of focused group discussions; and modification of the contents of flood bulletins for better understanding by the end-users. Future activities included the derivations of generalized PMP estimates for some orographic regions, regional frequency analysis of rainfall for ungauged catchments, and rehabilitation of existing flood forecasting and warning systems in the four telemetered river basins.

The delegate from the **Republic of Korea** reported the government has approved in 1999 a 10-year plan for flood prevention. Flood forecasting systems have been installed in several river basins including Im-Jin River basin where radar facilities were provided. The Government has also standardized flood forecasting models used at the five flood forecasting centers of the country, including the adoption of quality-assurance system for data monitoring. Camera system has also been installed in the Han River.

The delegate from **Singapore** reported that the automated raingauge of Singapore has been enhanced to support various [purposes of water resources management, drainage and heavy rainfall warnings.

The representative of the **Thai Meteorological Department (TMD)** reported that TMD continued to improve its telemetering system including forecasting center and had been 38 percent completed by September 23000. The representative of the Royal Irrigation Department reported improvement of its hydrological network including telemetering stations for flood forecasting and monitoring. She also pointed out that major improvement has been made in the flood forecasting operations in the Chao Phraya River basin as part of the programme to improve the flood operations in 25 river basins in the country.

The delegate for the **United States** reported that the hydrologic services programme realized similar improvements from the modernization program as mentioned in the meteorological services portion with the installation and commissioning of the new computer workstation and software modifications. WFO Guam was developing and observation data network in flood prone areas. A human spotter network in Guam would supplement this network. Research was being conducted by the Alaska River Forecast Center to develop a forecast guidance data set that will link river flood forecast stages to precipitation amounts.

The delegate from **Viet Nam** reported that 225 stations of the monitoring network in Viet Nam has been equipped with communication facilities and important improvement has been made on data collection and processing in the Mekong Delta and Central Highlands. She also reported serious flooding affected the Central part of Viet Nam, particularly Hue where 1,384 mm of rain was recorded on 2 November 1999 (the highest value over the past 100 years) and the floods in the Mekong Delta were the highest one in 75 years. Several improvement measures have been made on flood forecasting models.

ESCAP

In terms of water resources management, the secretariat achieved some important milestones in 1999 in its efforts to implement the decision of the General Assembly at its 19th Special Session on "initiating a strategic approach for the implementation of all aspects of the sustainable use of freshwater for social and economic purposes". Among these are the approval by the General Assembly on 19 November 1999 on the use of the Development Account for the implementation of a project on "Capacity-building in strategic planning and management of natural resources in Asia and the Pacific" and the implementation of a joint FAO-ESCAP pilot project on the formulation of national water visions to action in the region. In this connection, the secretariat continued to assist the countries in the region to assess their respective water resources and in 1999, the results of an assessment of water resources and water demand by user sectors in the Philippines were published. In addition, the secretariat continued its work on the preparation of a set of comprehensive guidelines for the protection and rehabilitation of rivers and published the guidelines together with a publication on water quality of selected rivers in Asia. The secretariat also conducted a regional survey on wastewater management policies and practices, organized an expert workshop to identify areas of regional cooperation for improvement of related policies and practices, organized an expert workshop to identify areas of regional cooperation for improvement of related policies and practices in the region. These findings were also published and distributed widely to the members.

In continuation of its pivotal role in supporting cooperation between the United Nations and some regional agencies in the water resources field, ESCAP secretariat convened the forty-fourth session of the RICAP Subcommittee on Water in Bangkok on 9 December 1999, at which activities of the participating agencies were reviewed to avoid duplication and to enhance effectiveness of inter-agency regional projects. An exhibition commemorating the World Water Day was held on 22 March 2000, with contributions by various United Nations and national agencies and the Asian Institute of Technology. Cooperation has also continued with the Mekong River Commission (MRC) towards sustainable development of the Mekong water resources and with other United Nations agencies and international organizations, particularly with FAO in support to the consultation process for the preparation of the World Water Vision and follow-up activities. In this connection, a pilot project was initiated by ESCAP and funded by FAO to assist Malaysia, Philippines, Thailand and Viet Nam on the formulation of national water visions to action. The project started in January and completed in October 2000 and included country studies, national workshops and preparation of a final report.

ESCAP secretariat fielded advisory missions, including China, the Philippines, Lao PDR, Thailand and Viet Nam on various aspects of water

resources planning and management and has continued to publish its quarterly *Water Resources Journal* and the semi-annual *Confluence*.

WMO

The **WMO** representative informed the session of the new version of the HOMS Reference Manual that has been available through the Internet since July 2000. HOMS is the WMO system for technology transfer in hydrology and water resources. The new Manual includes 157 components and many of them are related to software packages that could be used to develop flood-forecasting models. Some of these software packages can now be downloaded directly from the Internet.

In the last few years WMO has given an ever increasing priority to water resources management and, in relation to flood management, the WMO Secretariat prepared very recently a project for the establishment of a global coordinating mechanism, within the framework of the Global Water Partnership (GWP). This project, which is referred to as the WMO/GWP - Associated Program on Flood Management - Global Coordination, would link regional bodies to WMO and GWP and other relevant intergovernmental and non-governmental organizations. The objective of this Programme are to save lives and property damage by promoting the inclusion of floods in all aspects of integrated water resources management, to provide a sound system of tools and policy options and to assist coordination of regional activities. The programme is expected to provide an international focal point for flood problems, to compile and disseminate information on floods and flood management, to develop new tools and policies, to coordinate regional activities and to support the development of regional projects.

The Committee note that, within the activities carried out by the WMO Commission for Hydrology (Chy), some draft reports of interest to the Committee had been prepared, namely those on "Intercomparison of Forecast Models for Streamflow Routing in Large Rivers", "Delphi Survey of Streamflow Routing Techniques in Large Rivers", and "Forecasting Dangerous Hydrological Phenomena - The Activities and Technologies of Hydrological Forecasting Centres".



APPENDIX VIII

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS AND INTERNATIONAL ORGANIZATIONS ON THEIR ACTIVITIES RELATED TO DISASTER PREVENTION AND PREPAREDNESS

The delegate from **China** informed the Committee that China was drafting the 10th five-year plan (2001-2005) of social-economic development, which would include disaster prevention and preparedness. The Chinese government continued to give priority to the preservation and construction of the ecological environment in the strategies on the development of the western part of the country. Some national and international workshops were held in 2000, such as "the Workshop on Summarizing Experience in Natural Disaster Reduction" and "The Workshop on Disaster Reduction in Western Development". New tropical cyclone name list was used from the beginning of this year and positive responds were received from the public and various users. From Sept. 1999 to August 2000, 7 tropical storms or typhoons landed in China and 2 others affected severely China although without landfall. CMA issued timely warnings to the public. The economic loss and casualties by tropical cyclones were greatly reduced. During this year CMA continued to maintain close ties with the media and other government departments. China continued to provide assistance to the other Members of Typhoon Committee and maintained her cooperation with the other Members and international organizations.

The delegate from **Hong Kong, China** informed the Committee that the use of new tropical cyclone names in Hong Kong engendered considerable interest from the press and helped enhance the local community to tropical cyclone hazards. The new names were well received by the people of Hong Kong. Construction of the pilot centralized website for WMO, from which the public, international and regional media can access the latest information on tropical cyclone issued by NMSs and regional centers, had been completed and sent to participating members for comments.

The delegate from **Japan** informed the Committee that in response to torrential rainfall caused by a stationary front and typhoon from 8-12 September 2000, the Government set up a coordination meeting of the ministries and agencies, and Disaster Relief Law and the Law to Support the Rebuilding of Lives of Disaster Reduction, Japan set up the Japan National Committee for International Disaster Management, which will hold a meeting with official from Asian countries in December 2000 and from the United Nations, OECD and the World Bank in February 2001. Japan would continue to promote positive cooperation on disaster reduction.

The delegate from **Macao, China** informed that for 1 September 1999 to 31 August 2000, the Macao Disaster Prevention and Operational Centre(DPOC)

had totally recorded 7 typhoons within its area of responsibility including the direct hit of Typhoon YORK on 16 September of 1999. The local warning of typhoon signal no. 10 was hoisted during Typhoon YORK. But Macao, China was not affected seriously by the typhoon last year. On the other hand, the Macao DPOC also continued to promote public awareness on typhoon disaster prevention to all Macao citizens, especially to new generations. Furthermore, it has also made a general revision of its typhoon contingency plan in order to improve its operations. It also informed the Committee that the Macao DPOC would continue to improve its work in disaster reduction to protect the citizens of Macao, China.

The delegate from **Malaysia** pointed out from the experience of a country with a rapidly developing economy that there was a serious need to integrate disaster preparedness and mitigation activities into the economic and social development process in order to enhance the national capability in disaster management. In this connection, Malaysia has taken various measures and approaches including the following:

1. To integrate disaster mitigation planning into the overall national development plans and projects for sustainable development
2. To develop risk assessment capabilities to reduce disaster vulnerability which can be translated into mitigation policies and measures.
3. To form Working Committees involving lead agencies in risk analysis and assessment for specific sectors of disaster prevention
4. To develop an integrated database management system for disaster planning and prevention
5. To set up the National Training Institute for Crisis and Disaster Management for the training and education for officials of related agencies, NGOs and communities.
6. To promote and develop international cooperation networking for exchanging, sharing and training on disaster management.

The delegate from the **Philippines** reported the activities of the Office of Civil Defense/National Disaster Coordinating Council (NDCC) in relation to the disaster prevention and preparedness component of the Committee. On emergency preparedness and response, emphasis is on the reinforcement of the disaster coordinating council systems capability and development of community-based early warning systems for typhoon and flood disasters. Vulnerability and risk reduction activities through community-based hazard identification and risk assessment and mitigation as well as impact control activities at brigade level are being undertaken. Civil protection through public information drive and civil

defense alert plugs and radio-TV programme on emergency preparedness and response in addition to human resources development in DPP were being advocated.

The delegate from the **Republic of Korea** reported that exercises under computer-simulated disaster conditions, a comprehensive exercise for disaster prevention, and emergency drills for each region were carried out during the period from 15 to 25 May 2000. The Government of Republic of Korea has designated 25 May as "National Disaster and Prevention Day" to increase public awareness of disaster prevention. The main events for the Day were inspection of disaster prevention facilities and equipment, campaigns and photograph display.

The delegate from **Singapore** reported that the Meteorological Service Singapore (MSS) continued to issue warning of tropical storm/typhoon to aircraft in Singapore Flight Information Region and to ships in the South China Sea. It also issues warning of prolong heavy rain that is likely to cause flash flood.

The delegate from **Thailand** informed the Committee of major disasters affecting Thailand, particularly the latest floods in the southern part of Thailand which caused much damage.

The delegate from the **United States** began broadcasting the data stream from its Emergency Managers Weather Information Network broadcast on PEACESAT (GOES-7) in late September 2000. This satellite located near the dateline provided broadcast coverage over the entire Western Pacific basin. In November 1999 a two-day workshop on Tsunamis and Typhoons was held for Emergency Managers and decision makers from Guam, the Commonwealth of the Northern Mariana Islands, the Republic of Palau. The Federated States of Micronesia, the Republic of the Marshall Islands and the two Samoas.

The delegate from **Viet Nam** informed the Committee of two major floods affected Viet Nam during the past one year, including serious flooding affected the Central part and in the Mekong Delta of Viet Nam. She also informed the Committee that Viet Nam had recently received an IDNDR Award in recognition of its efforts in disaster reduction and management.

ESCAP

During the previous year under review, the **ESCAP** secretariat continued its work on disaster prevention and preparedness, of which important activities on water-related disaster reduction are focused on flood control and management. Efforts are being made to implement the recommendations of the previous studies included on the special publication entitled "Regional Cooperation in the Twenty-First Century on Flood Control and Management in Asia and the Pacific". This publication is the first of its kind the focuses on regional experience of the flood control and management process at the basin,

national and regional levels. It is aimed primarily at assisting decision makers, planners and practicing engineers to improve flood control and management policies, strategies and programmes. These improvements will enable them to enhance the effectiveness of their contribution to the economic and social development process. The publication is also intended to serve as a reference for planners and practicing professionals working in other sectors when they are dealing with development projects related to flood control and management. Included in the publication was an agenda of priority activities aiming at strengthening regional cooperation in this area of work of ESCAP, which was formulated as part of a strategic planning and management process for regional development vision building, priority setting and common-goal setting. Following completion of the project, several advisory missions were undertaken by ESCAP to assist the countries in strategy formulation at their request, including China and Viet Nam. The experiences and findings of the project were also presented at the Seminar organized by the Typhoon Committee Secretariat in May 2000. Efforts are being made to mobilize financial resources to continue implementation of the regional programme.

ESCAP organized an exhibition to commemorate the International Day for Natural Disaster Reduction on 11 October 2000 at the United Nations Conference Centre in Bangkok. As in the past, ESCAP continued to include in the June issue of the *Water Resources Journal* a review of water-related disaster experiences in the region within the last year and recent developments in water-related disaster reduction.

WMO

The Committee was informed by the representative of the **WMO** Secretariat of the new developments since its last session. 1999 was the last year of IDNDR and now WMO is participating actively in the new arrangements after the decade has finished. Since the beginning of the year 2000 the International Strategy for Disaster Reduction (ISDR) has been established. Its main objective is to enable communities to become resilient to natural hazards to the management of risk. There is an Inter-agency Secretariat for ISDR and also an Inter-agency Task Force on Disaster Reduction. The first session of this Task Force was held in Geneva in April 2000. Some of the key areas of interest of the Task Force are in the fields of activities of WMO, namely: El Niño/La Niña, early warning and vulnerability indicators and the application of science and technology in disaster prevention. These activities are being supported by WMO's major Science and Technical Programmes, in particular the Tropical Cyclone, the Public Weather Services, the Hydrology and Water Resources, the World Climate Programmes.

Asian Disaster Reduction Centre (ADRC)

The representative of the **Asian Disaster Reduction Centre (ADRC)** informed the Committee that ADRC continued to deal with multi-national

reduction cooperation, such as to facilitate exchange of disaster reduction experts, accumulate and provide disaster reduction information and carry out research. ADRC published "Data Book on Asian Natural Disaster in the Twentieth Century" and made Internet GIS open to the public and launched a joint project of international disaster prevention with the United Nations Office for the Coordination of Humanitarian Affairs (UN-OCHA). ADRC was selected as one of the success stories during the International Decade for Natural Disaster Reduction (IDNDR).



APPENDIX IX

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS ON THEIR TRAINING ACTIVITIES RELATED TO THE TRAINING COMPONENT

The delegate from **China** reported that the China Meteorological Administration (CMA) continued to pay great attention to international cooperation in the field of training and education. The RMTTC Nanjing organized an International Training Course on Monsoon Meteorology in September – October 2000 and will sponsor a WMO training course on satellite meteorology from 4-25 December 2000. From 16-20 October, CMA hosted the WMO Workshop on the Use of Ensemble Prediction in Beijing. In 2000, CMA sent four delegations each to Thailand, Israel, Australia and Sweden, respectively.

In **Hong Kong, China**, the delegate reported that eleven observatory staff participated in overseas training. Hong Kong Observatory (HKO), organized 10 in-house meteorological courses from November 1999 to September 2000. A total of 106 Class I, II and III meteorological personnel, 19 staff of the Helicopter Hong Kong Ltd. and 4 meteorological officers from overseas attended the courses. One officer from the HKO served as a lecturer in the Regional Workshop on Doppler Radars organized by the Typhoon Committee and Panel on Tropical Cyclones in China in 1999.

In **Japan**, JMA has carried out the following technical cooperation with TC members related to the activities of the Typhoon Committee in terms of expert services. One JMA expert visited the HKO and another expert visited the KMA. Three KMA experts visited JMA for technical exchange of global spectral model, public weather services and satellite imagery interpretation for weather forecasting. Group training courses are offered by the River Bureau of the Ministry of Construction and also accepts individual training. Training on administration of disaster management is being offered by the National Land Agency, on behalf of many trainees from foreign agencies who are in charge of disaster preparedness. Group training course on Administration Prevention will be conducted by Japan funded by JICA in the year 2001-2004.

The delegate from **Macao, China**, reported that SMG personnel attended local seminar, training and workshops. Personnel also attended various overseas training courses, seminars and workshops.

In **Malaysia**, the delegate reported that courses on Operational Hydrology, Supervisory Control and Data Acquisition System, River Modelling and a Workshop on Flood Forecasting Models were organized.

The delegate from the **Philippines** reported that PAGASA personnel participated in many internationally held training, conferences, meetings on various subject matter such weather forecasting, climatology, satellite image processing, among others. Locally, training of field personnel was done on

weather forecasting and radar data interpretation. PAGASA also carried out computer literacy program for employees on different PC-based software.

The delegate from the **Republic of Korea** reported that staff members of KMA participated in overseas training courses conducted in Japan, Australia and the USA. Five flood control centers held regular workshops for in-situ operator on the hydrologic on hydrologic observation. KMA organized an 8-month training course for junior forecasters. A total of 16 Class I and IV meteorological personnel from KMA weather stations attended the course.

The delegate from **Singapore** reported that Meteorological Service Singapore hosted a WMO Training Seminar on Operational Post-Processing for Applications of Numerical Weather Prediction (NWP).

The delegate from **Thailand** reported that Thailand Meteorological Department (TMD) conducted the following in-house training courses: 1) Meteorology for official; 2) Meteorology for chief official; 3) Radar uses and maintenance; 4) Safety measures in Hydrogen usage; 5) Meteorology for Meteorologist; 6) Agrometeorology.

The delegate from the **United States** reported that the major training activity has been the continuation of the Micronesian Meteorologist Training program. The first graduate, with a BS in Meteorology from the University of Hawaii was installed as the Meteorologist in Charge of the Yap Office. By the end of 2001, the trainees from the Office of Pohnpei, Chuuk, and Koror will have been installed as meteorologists in Charge. At the request of the various governments the recruitment and selection of a second meteorologist trainee for each Office is underway. The National Weather Service maintains a WHFs training program and WFO Guam meteorologists continued to participate in the training workshops.

The delegate of **Viet Nam** reported that staff of the Meteorological Office have attended training courses abroad.

APPENDIX X

SUMMARY OF THE REPORTS OF THE TYPHOON COMMITTEE MEMBERS ON THEIR ACTIVITIES RELATED TO RESEARCH ACTIVITIES

The delegate from **China** informed the Committee that research on tropical cyclones were undertaken in 2000 such as: research on the structure of tropical cyclone and its impact on track, numerical prediction on TC track, heavy rainfall caused by TC, the relation between landing TC and SST. An ENSO monitoring and prediction project was established in the National Climate Center (NCC). Every March, a major ENSO meeting is held at NCC. The prediction of ENSO during the coming summer is the key topic. The Bulletin for ENSO monitoring is published 2-4 issues every year. In recent years Chinese scientists pay more attention to ENSO and the relationship between ENSO and activities of tropical cyclones, as well as the boundary force such as SST, land surface process and others.

The delegate of **Hong Kong, China** reported that six papers were presented at the Guangdong-Hong Kong-Macao Seminar on Severe Weather while research projects on tropical cyclone landfalling, track and intensity are being carried out. A fellowship under the Typhoon Committee Research Fellowship has been awarded to a scientist from the China Meteorological Administration and will work on a project entitled Analysis of Evolution of Landfalling Tropical Cyclones with a view to developing "Guidance on Wind and Rain".

The delegate from **Japan** reported on the international workshop for the third Comparison of Mesoscale Prediction and Research Experiments or COMPARE III for short. A total of 14 numerical models from 9 participating countries participated in the experiments. The Meteorological Research Institute of JMA carried out a special typhoon experiment over the Nansei Island in collaboration with the Institute for Hydrology and Atmospheric Sciences of the University of Nagoya and the Japan Weather Association. There is a wide range of research activities to mitigate the flood. Some flood forecasting models are now being studied with radar rain gages and GIS-based hydrologic models.

The delegate from **Macao, China** reported that 2 papers were presented in a conference held in Hangzhou, China. Case studies on hazardous weather and three research papers were also presented in a seminar in Shenzhen, China. Studies on monsoon and numerical modeling cases were undertaken.

In **Malaysia**, the delegate informed the group that steps are being undertaken to identify storm/typhoon cases in the last 10-20 years that entered into or developed within the South China Sea to collect the associated large scale dynamic and thermodynamic fields, rainfall and in-situ observations. These are analyzed in each specific category.

The delegate from the **Philippines** reported to the group that several research and development studies were completed as of June 2000. Among these researches were Socio-Economic Influence on Human Responses to Tropical Warnings: Part II, Flood Hazard Mapping and Vulnerability Analysis of Bataan coastal towns along Manila Bay area and Regional Rainfall Probability Forecasting in the Philippines.

The delegate from the **Republic of Korea** reported that research is on progress to incorporate GFDL's typhoon bogussing scheme into RDAPS. The new bogussing scheme based on GFDL's will be implemented and applied on the typhoon track prediction in summer 2001. The Meteorological Research Institute of KMA developed the Typhoon Analysis and Prediction System (TAPS). TAPS has enabled analysis of current typhoons, display of tracks of past typhoons and assistance in the production of typhoon prediction.

The delegate from the **United States** reported that Aerosonde Aircraft Ltd. in conjunction with the Japan Weather Association (JWA) began operational trials of the unmanned aerial vehicle known as the Aerosonde on Guam for the period November 20 through December 10, 2000. The Aerosonde Command Center is physically collocated with the WFO Guam Office. The team is conducting flights between Guam and Taiwan gathering meteorological information at various elevations. A study using Skew T analysis of the upper air soundings for thunderstorm and heavy rain potential is in progress.

The delegate from **Viet Nam** reported that continuing software development applicable to LAN for hydrological data collection, processing and timely transmitting of hydrological data/information forecasts to end users have been undertaken.

APPENDIX XI

REVIEW OF TROPICAL CYCLONES IN 2000 **AFFECTING TYPHOON COMMITTEE MEMBERS**

TC NAME	RSMC NO.	MONTH	MEMBERS AFFECTED
DAMREY	0001	MAY	PHIL, USA
LONGWANG	0002	MAY	PHIL
KIROGI	0003	JULY	PHIL, JAPAN
KAI-TAK	0004	JULY	CHINA, ROK, MACAO, PHIL, HK
TEMBIN	0005	JULY	JAPAN
BOLAVEN	0005	JULY	ROK, PHIL, JAPAN
CHANCHU	0007	JULY	US
JELAWAT	0008	AUG	CHINA, JAPAN
EWINIAR	0009	AUG	US
BILIS	0010	AUG	CHINA, PHIL, HK, USA
KAEMI	0011	AUG	THAILAND, VIET NAM
PRAPIROON	0012	AUG	CHINA, ROK, PHIL
MARIA	0013	AUG	CHINA, MACAO, HK
SAOMAI	0014	SEPT	CHINA, ROK, PHIL, USA, JAPAN
BOPHA	0015	SEPT	PHIL
WUKONG	0016	SEPT	CHINA, MACAO, PHIL
SONAMU	0017	SEPT	JAPAN
SHANSHAN	0018	SEPT	US



APPENDIX XII

SUMMARY OF 2000 TYPHOON SEASON

Summary (as of 30 September)

The tropical cyclone season of this year began in the beginning of May, about one month and a half later than normal with the development of TY DAMREY (001). After the second cyclone formed near the Philippines in mid-May, the cyclone activity in the basin was suppressed for more than one month. No tropical cyclone of TS intensity or higher was generated in June.

In July, cyclogenesis became active and a total of five storms were generated within the month. Four of them took northward tracks along the western flank of the sub-tropical high. Three storms crossed the Japanese Archipelago and two storms made landfall on the Korean Peninsula.

From August to September, tropical cyclone activity was normal. Six and five storms were generated in August and September, respectively. Among them, three storms made landfall on China, two storms on the Indo-China peninsula and two storms on the Korean Peninsula during the period.

Tropical cyclones in 2000 tended to form in higher latitudes following a similar tendency in the last season. Eight storms out of the total of 18 (44%) formed in latitudes higher than 20°N in contrast with 24% in the normal year. Movement of tropical cyclones was slower than normal particularly in waters of higher latitudes. There were many tropical cyclones which moved northward through their lives, not taking the normal westward track followed by the northeastward track with the recurvature in between.

TY DAMREY (0001)

A tropical depression formed early on 5 May about 350km northeast of Palau Islands. Moving northwestward, the depression attained TS intensity at 00UTC on 7 May and was named Damrey, the first one from the new name list which became effective 1 January 2000 for tropical cyclones in the western North Pacific and the South China Sea. It began to move northeastward east of the Philippines and developed into a typhoon the following day. Damrey reached peak intensity on 9 May. The minimum pressure of 930 hPa and the maximum sustained winds of 90 knots were estimated. With gradual weakening it migrated to waters south of Japan and crossed around Ogasawara-shoto (islands) in the evening of 11 May. The cyclone became an extra-tropical cyclone by 12UTC on 12 May.

TY LONGWANG (0002)

Longwang formed near the west coast of Luzon and became a tropical storm on the morning of 19 May about 400 km south of Miyako-jima (island)

(47927). The storm did not develop so much and moved on a northeastward track. The minimum pressure of 990 hPa and maximum sustained winds of 45 knots were estimated. By 06UTC 20 May became an extra-tropical cyclone and continued to move northeastward for several days.

TY KIROGI (0003)

After one-month rest of typhoon activity in June, a tropical depression formed on 2 July east of the Philippines. It rapidly developed into a typhoon on the morning of 4 July and moved northeastward in waters south of Japan. The minimum pressure of 940 hPa and the maximum sustained winds of 85 knots were estimated at 00UTC 5 July. Moving northeastward, Kirogi passed between Hachijo-jima (47678) and Miyake-jima (47677) and approached the coast of Kanto on the midnight of 8 July. During the passage, a wind gust of 49.3 m/s was observed at Hachijo-jima (47678). It further moved northeastward through waters east of Tohoku and became an extra-tropical cyclone over waters east of Hokkaido in the morning of 9 July.

TY KAI-TAK (0004)

Kai-tak was the first typhoon developed in the South China Sea. It formed about 80 km west of Luzon on 3 July and took a northward track firm. Then the movement of the system became slow in waters northwest of Luzon and intensified into TS grade on the morning of 6 July, TY grade on the evening of the day. The minimum pressure of 960 hPa and maximum sustained winds of 75 knots were estimated. After KAI-TAK reached peak intensity on 7 July, it began to move northward again and migrated to the East China Sea passing Taiwan and the eastern tip of central China. Further moving northeastward, it made landfall around the borderline between China and the D.P.R. of Korea on 11 July and then weakened into a tropical depression on the day.

TS TEMBIN (0005)

A tropical depression formed on 17 July around the northern part of Mariana Islands. After moving northwestward and then northward for a few days, the depression attained TS intensity around Ogasawa-shoto on the morning of 19 July. The minimum pressure of 992 hPa and maximum sustained winds of 40 knots were estimated. Keeping TS intensity, Tembin continued to move northward until it was downgraded into a tropical depression about 200 km southeast of Kanto at 12UTC 21 July. The depression crossed 200 to 300 km east of Kanto and Tohoku and became an extra-tropical cyclone over waters east of Hokkaido on the morning of 23 July.

STS BOLAVEN (0006)

Bolaven formed on 24 July about 150 km east of Luzon. Taking a northward track, it attained TS intensity about 100 km east of Miyako-jima (47927) at 12UTC on 26 July. The storm then began to move northeastward passing southwest of Okinawa and changed its direction again to northward on

the evening of 26 July. Decreasing moving speed, it crossed around Amami-ohshima (an island of the southern Kyusyu) on 28 July and developed into a severe tropical storm on 29 July. The minimum pressure of 980 hPa and maximum sustained winds of 50 knots were estimated. As Bolaven moved northward further in waters southwest of Kyushu, it weakened into a tropical depression at the southern tip of the Korean peninsula on the morning of 31 July.

TS CHANCHU (0007)

Chanchu was a short-lived system, which formed east of Marshall Island on 28 July. A depression moved northward and became a tropical storm on the morning of 29 July in the waters east of the Island. The minimum pressure of 996 hPa and maximum sustained winds of 35 knots were estimated. In one day after Chanchu reached TS grade, it weakened into a tropical depression in the southeastern edge of the area of responsibility.

TY JELAWAT (0008)

A tropical depression formed south of Marcus Island on the morning of 1 August. Moving westward, the depression developed rapidly and became a typhoon about 300 km southwest of Marcus Island on the following day. Jelawat reached peak intensity on 3 August and the minimum pressure of 940 hPa and maximum sustained winds of 85 knots were estimated. JELAWAT kept TY intensity for several days moving toward Okinawa. It then passed near Ninamidaito-jima (47945) on 6 August and Okinawa on 8 August. A wind gust of 61.5 m/s was observed at Minamidaito-jima (47945) during the passage. After JELAWAT made landfall on the central coast of China on 10 August, it weakened rapidly and downgraded into a tropical disturbance the following day.

TY EWINIAR (0009)

A tropical depression formed about 300 km west of Mariana Islands at 00UTC 9 August. Accelerating its northward movement, it attained TS grade the following day and STS grade west of Ogasawara-shoto on 11 August. In the waters about 500 km southeast of Kyusu, Ewiniar changed the movement direction to the northeast on 12 August. Passing about 200 km southeast of Hachijo-jima (47678), the storm continued to move northeastward for three days. Then the storm began to develop in waters about 800 km east of Tohoku and became a typhoon on 15 August. The minimum pressure of 965 hPa and maximum sustained winds of 70 knots were estimated. As moved northward further, it gradually weakened into STS grade the following day, TS grade on 17 August and became an extra-tropical cyclone by 18UTC 19 August.

TY BILIS (0010)

Bilis was the most intense tropical cyclone in this season, which was generated about 300 km northwest of Yap Island on 18 August. It took a northwestward direction in its almost whole life until making landfall on southern China. Moving northwestward in waters east of Luzon, Bilis attained TS grade on

19 August, TY grade on 20 August and reached peak intensity on the morning of 22 August. The minimum pressure of 915 hPa and maximum sustained winds of 110 knots were estimated. Keeping intensity, Bilis made landfall on Taiwan around midnight of 23 August. After the landfall, it weakened rapidly and made landfall on the southeast Chinese coast facing the Taiwan Strait on the day. As it moved into inland of China, it was downgraded into a tropical depression at 18UTC 23 August and dissipated on 25 August.

TY KAEMI (0011)

Kaemi formed in the South China Sea and was a very short-lived system. A tropical depression reached TS grade about 200 km of Viet Nam at 12 UTC on 21 August. The minimum pressure of 985 hPa and maximum sustained winds of 45 knots were estimated. Kaemi moved northwestward and made landfall on the central coast of Viet Nam on the afternoon of 22 August. After the landfall, it weakened to a tropical depression and dissipated over the northern Indo-China Peninsula on 23 August.

TY PRAPIROON (0012)

A tropical depression, which formed on 25 August about 400 km northwest of Yap Island, moved westward and then northward and reached TS intensity on the morning of 26 August. Changing its movement to the northwest in waters south of Okinawa, Prapiroon attained STS intensity and passed between Miyako-jima (47927) and Ishigaki-jima (47918) on the evening of 29 August. A wind gust of 36.6 m/s was observed at Miyako-jima (47927). The cyclone became a typhoon and reached peak intensity of 30 August. The minimum pressure of 965 hPa and maximum sustained winds of 70 knots were estimated. After crossing the East China Sea and the Yellow Sea, Prapiroon hit D.P.R. Korea on the night of 31 August and weakened into an extra-tropical cyclone over the Sea of Japan on 1 September.

TS MARIA (0013)

A tropical depression formed southeast of Hong Kong on 27 August. It took a southward track and became a tropical storm at 12UTC on 28 August. Keeping TS intensity, Maria continued to move southward over the northern South China Sea for about two days. It then stopped southward movement about 500 km west of Luzon and began to move northward on 30 August. The minimum pressure of 985 hPa and maximum sustained winds of 40 knots were estimated after changing the movement. Maria made landfall on the southern coast of China on the morning of 1 September and dissipated on the day.

TS SAOMAI (0014)

SAOMAI was a long-lived tropical cyclone, which maintained TS intensity or higher more than two weeks. A tropical depression formed on 1 September in waters east of Mariana islands and developed into TS grade on 2 September, STS grade on 3 September and TY grade on 4 September moving westward.

Turning to the south, Saomai was downgraded into STS grade on 5 September and began to move northwestward. After taking a northwestward track for about three days, it re-intensified into TY grade on the morning of 9 September and reached peak intensity the following day. The minimum pressure of 925 hPa and maximum sustained winds of 95 knots were estimated. It then passed Okinawa on the evening of 12 September. A wind gust of 42.0 m/s was observed during the passage. Moving into the East China Sea, SAOMAI changed its movement to the northeast and made landfall on the southern coast of the Korean Peninsula on the early morning of 16 September. It rapidly weakened and became an extra-tropical cyclone over the Sea of Japan on that day.

TS BOPHA (0015)

A tropical depression, which formed on 4 September about 350 km east of Luzon first took an eastward track. It turned to the north on 6 September and reached TS intensity the following day. The minimum pressure of 990 hPa and maximum sustained winds of 45 knots were estimated. Bopha then changed its movement to the west-westnorth and crossed just south of Okinawa on the evening of 9 September. After crossing north of Miyako-jima (47927), the storm began to move southward and hit Luzon on the morning of 11 September. It weakened into a tropical depression over Luzon and dissipated on the day.

TY WUKONG (0016)

A tropical depression formed on 4 September about 350 km west of Luzon in the South China Sea. Moving northward, it attained TS grade on 6 September and then turned to the west. Wukong developed into a typhoon on the morning of 8 September and reached peak intensity on the day. The minimum pressure of 955 hPa and maximum sustained winds of 75 knots were estimated. Continuing westward movement, Wukong crossed just south of Hainan Island on 9 September and made landfall on northern Viet Nam and next day. As it moved to the inland of the Indo-China Peninsula, it weakened and dissipated by 00UTC on 11 September.

STS SONAMU (0017)

A tropical depression, which formed on 14 September southwest of Iwo-jima, took a northward track and crossed just west of Ogasawara-shoto on 16 September. Accelerating its northward movement, it reached peak intensity of STS grade on 17 September. The minimum pressure of 980 hPa and the maximum sustained winds of 55 knots were estimated. As Sonamu migrated to east of Hokkaido crossing about 200 km east of Japan, it transformed into an extra-tropical cyclone on 18 September.

TS SHANSAN (0018)

A tropical depression formed on 17 September northeast of Marshall Island and moved northwestward. After it attained TS grade the following day, it changed the track to the north and crossed east of Wake Island. Changing the

movement direction from northward to northwestward, Shanshan became a typhoon on 19 September. Keeping TY intensity for several days, it changed its movement direction gradually from the northwest to the northeast. It migrated to waters in mid-latitudes and transitioned into an extra-tropical cyclone at 18UTC on 24 September.

APPENDIX XIII

REGIONAL COOPERATION PROGRAMME IMPLEMENTATION PLAN

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
1.	Meteorological Component							
1.1	Support to Meteorological Observing Systems and Facilities							
1.1.1	Expansion of observational programme: <i>With stress on radiosonde observations</i>	↔	↔	↔	↔	Members	National/External	Continuous activities
1.1.2	Maintaining services specified in the Operational Manual, including intensified observations (surface, upper-air and radars)	↔	↔	↔	↔	Members	National	Continuous activities
1.1.3	Provision of automated observation facilities and real-time telemetry of meteorological parameters, e.g., winds, rainfall, pressure, etc., by replacing with automatic instruments	↔	↔	↔	↔	Members	National	Continuous activities
1.1.4	Establishment of AMeddas, ASDAR, anemometer, tide gauge and water recorder networks	↔	↔	↔	↔	Members	National	Continuous activities
1.2	Support to Meteorological Telecommunication Systems and Facilities							
1.2.1	Establishment and maintenance of a communication line to RSMC Data Serving System via Internet or ISDN for distribution of RSMC Tokyo grid point data	↔	↔	↔	↔	TC Members, WMO and ESCAP	National/External	Continuous activities, RSMC Data Serving System will be used for the distribution of large amount of data which are not transmitted for the time being
1.2.2	Maintaining: Services and facilities for the real-time exchange of data and products • Monitoring of data exchange	↔	↔	↔	↔	Members RTHs Bangkok, Beijing and Tokyo RTH Bangkok, Vientiane-Hanoi Members	National Members concerned Members concerned National	Continuous activities Continuous activities Continuous activities Continuous activities
1.2.3	Improvement of facilities and their operation as necessary for the rapid and reliable collection and distribution of the required observational and processed information	↔	↔	↔	↔	Members	National	Continuous activities

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
1. Meteorological Component								
1.2.3.1	Improvement of data completeness and quality, including use of real-time and non real-time monitoring results for this purpose	↔	↔	↔	↔	Members	National	Continuous activity
1.2.3.2	Review of existing arrangements for dissemination of typhoon warnings with a view of introducing improvements where necessary	↔	↔	↔	↔	Members	National	Continuous activity
1.2.3.3	Improvement of national data collection and retransmission to associated RTHs	↔	↔	↔	↔	Members	National/External	
1.2.4	Maintain EMWIN Broadcast	↔	↔	↔	↔	U.S.A.	National	Commence in mid - 2000
1.2.5	Improvement in Member's capability in assessing information and knowledge via information and communication technologies (ICTs)	↔	↔	↔	↔	Members	National/External	Continuous activities
1.3 Requirements Specifically for Tropical Cyclone Forecasting and Warning								
1.3.1	Continuing provision and dissemination of processed information, advisories and other products needed by TC Members for their forecasting and warning systems, archival of information on typhoon data in accordance with the TC Typhoon Operational Manual	↔	↔	↔	↔	RSMC Tokyo-Typhoon Center	Japan	Continuous activity
1.3.2	Enhancement of cooperation in typhoon monitoring, forecasting and warning, and storm surge predictions	↔	↔	↔	↔	Members	National	Continuous activity
1.3.3	Installation and maintenance of a computer processing system in view of integrating satellite, radar and rainfall data so as to provide spatial distribution of rainfall amount over a large region	↔	↔	↔	↔	Members	National and external assistance	TCDC, technical consultancy and assistance from external sources would be required
1.3.4	Promotion of development at the interface between the meteorological warning services and the users of warnings for increasing the impact and effectiveness of these services	↔	↔	↔	↔	Members	National and external assistance in conjunction with IDNDR	Continuous activities

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
2.	Hydrological Component							
2.1	<i>Flood Forecasting and Warning</i>							
2.1.1	Installation and operation of networks of observing stations required for flood forecasting systems	↔	↔	↔	↔	Members	National	Continuous activity
2.1.2	Establishment and operation of flood forecasting and warning system	↔	↔	↔	↔	Members	National	Continuous activity
2.1.3	Establishment of flood forecasting and warning systems for dam operations	↔	↔	↔	↔	Interested Members	National and external assistance	
2.1.4	Establishment of flood forecasting and warning systems for inundation from storm surges	↔	↔	↔	↔	Members concerned	Members concerned and external assistance including TCDC	Includes interaction of river floods and storm surges
2.1.5	Evaluation of the performance of existing flood forecasting systems	↔	↔	↔	↔	Members	National and external assistance including TCDC and with support of TCS and WMO	Coordinated by WMO, using MOFFS
2.1.6	Further improvement or rehabilitation of existing flood forecasting and warning systems, making use, where appropriate, of the results of TOPEX	↔	↔	↔	↔	Members	Members concerned and external assistance including TCDC	Includes catchment modeling
2.1.7	Mission of experts to provide technical guidance on items 2.1.1 to 2.1.6	↔	↔	↔	↔	Members	External assistance, Missions to be organized by WMO and ESCAP	Using, where appropriate, technology available through HOMMS
2.1.8	Exchange of technical visits among flood forecasters	↔	↔	↔	↔	Members	National and external assistance	Coordinated by WMO
2.1.9	Development and use of improved techniques for Quantitative Precipitation Forecast (QPF) taking advantage of data provided by satellite and radar	↔	↔	↔	↔	Members	National and external assistance	WMO to assist in development and promulgation of improved techniques
2.2	<i>Comprehensive Flood Loss Prevention and Management</i>							

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
2.	Hydrological Component							
2.2.1	Preparation of comprehensive flood loss prevention and management plans for selected pilot area	↔	↔	↔	↔	Members	Bilateral or multilateral support if available	Detailed programme will be established by respective Members
2.2.2	Implementation of flood risk maps	↔	↔	↔	↔	Members	National	ESCAP and WMO to assist in organizing investigations and surveys
2.2.3	Application of the manual and guidelines for/and dissemination of techniques for comprehensive flood loss prevention and management	↔	↔	↔	↔	Members	National and external assistance	With assistance of ESCAP and WMO
2.2.4	Implementation of selected aspects of comprehensive flood loss prevention and management	↔	↔	↔	↔	Members	National and external assistance	With assistance of ESCAP and WMO and in cooperation with 3rd world water forum
2.2.5	Mission of experts to provide technical guidance to Members on items 2.2.1 to 2.2.4 above	↔	↔	↔	↔	Members	UNDP, TCDC and bilateral, multi-lateral support if available	With assistance of ESCAP and WMO
2.2.6	Application of the manual and guidelines for integrated river system development and management with reference to comprehensive flood loss prevention and management	↔	↔	↔	↔	Members	National and external assistance	With assistance of ESCAP and WMO
2.2.7	Preparation of guidelines for the formulation of a comprehensive master plan for urban flood loss prevention and mitigation	↔	↔	↔	↔	Members	National and external assistance	With assistance of ESCAP and WMO and in cooperation with 3rd world water forum
2.2.8	Storm surge prediction and risk analysis	↔	↔	↔	↔	Members	National and external assistance	With assistance of ESCAP and WMO
2.2.9	Improvement of dam water release operation system	↔	↔	↔	↔	Members	National and external assistance	With assistance of TCS, ESCAP and WMO

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
3. Disaster Prevention and Preparedness								
3.1 Public Awareness								
3.1.1 Improvement of public awareness on typhoon and flood threat and preparedness coupled with studies of human response to warnings		↔	↔	↔	↔	Members	National and external assistance in conjunction with IDNDR	With advice and assistance of OCHA/IFRC/WMO and other agencies concerned
3.1.2 Production of materials (audio-visual aids, pamphlets and booklets) related to public information and education		↔	↔	↔	↔	Members	National and external assistance	Work under the WMO TCP projects 12 and 14 is also relevant
3.2 Disaster Management								
3.2.1 Establishment/upgrading of national disaster prevention and preparedness plans		↔	↔	↔	↔	Members	Bilateral or multilateral support if available	With advice, and if possible, support from ESCAP
3.2.2 Strengthening national coordination and cooperation between departments and agencies involved in DPP activities		↔	↔	↔	↔	Members	National	
3.2.3 Improvement in the timely dissemination of warnings of typhoons, floods and storm surges with particular attention to remote areas		↔	↔	↔	↔	Members	National	
3.2.4 Improvement of communication systems for warning dissemination and relief operations		↔	↔	↔	↔	Members	Bilateral or multilateral support if available	
3.2.5 Improvement of damage assessment and reporting		↔	↔	↔	↔	Members	Multilateral support if available	With advice from ESCAP and OCHA
3.2.6 Development and exchange of information and guidance materials on structural and non-structural measures for mitigation of disasters		↔	↔	↔	↔	Members	External assistance	With guidance from international agencies, such as, OCHA, IFRC, ESCAP and WMO and in cooperation with 3rd world water forum
3.2.7 Conducting case studies of response to major disasters		↔	↔	↔	↔	Members	External assistance	With advice from OCHA, IFRC, and WMO
3.2.8 Compilation of annual information on loss of life and damage caused by typhoons, floods and storm surges		↔	↔	↔	↔	Members	External assistance	With advice from OCHA in co-operation with ESCAP

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
3.	Disaster Prevention and Preparedness							
	including damage to houses, public facilities, agricultural products, and so on							
3.2.9	Where appropriate, implementing the recommendations of joint missions and seminars to evaluate DPP procedures and to provide advice on local problems	↔	↔	↔	↔	Members	Bilateral or multilateral support if available	
3.2.10	Production of material related to public information and education on the Typhoon Committee activities, particularly storm warning and DPP	↔	↔	↔	↔	Members	External Assistance in conjunction with IDNDR	With support of ESCAP, WMO and TCS

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
4.	Training Component							
4.1	Meteorology							
4.1.1	Training on engineering application of tropical cyclone climatological data	↔	↔	↔	↔	Members	External assistance	Conferences, seminars and overseas training programmes, including roving missions and arrangements
4.1.2	Training on applications of radar and satellite data in tropical cyclone tracking, forecasting and very short-range precipitation forecasts	↔	↔	↔	↔	Members	External assistance	
4.1.3	Training in calibration, maintenance and repair of electronic meteorological instrumentation	↔	↔	↔	↔	Members	National and external assistance	Coordinated by WMO
4.1.4	Training on utilization of software for integrating satellite/radar/rainfall data	↔	↔	↔	↔	Members	Short-term fellowships with external support	Coordinated by WMO
4.1.5	Training of quantitative precipitation forecast (QPF) models					Members	Short-term fellowships with external support	Coordinated by WMO
4.1.6	Training of personnel through fellowships on tropical cyclone forecasting	↔	↔	↔	↔	Members	UNDP, WMO and other international organizations concerned	Coordinated by WMO
4.1.7	Other courses and seminars organized WMO and Members	↔	↔	↔	↔	Members	UNDP, WMO and other international organizations concerned	Coordinated by WMO
4.1.8/I	Group training courses in meteorology	↔	↔	↔	↔	Japan	JICA	Japan International Cooperation Agency
4.1.8/II	Group training workshop on hurricane forecasting and warning	↔		↔	↔	USA/WMO	TCTF and WMO	Every two years for two weeks
4.1.9/I	Exchange of forecaster(s) between tropical cyclone forecasting and warning centers	↔	↔	↔	↔	Members	External assistance	Through TCDC arrangement
4.1.9/II	Attachment of operational forecast to RSMC Tokyo			↔	↔	Japan	TCTF and WMO	During typhoon high season

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
4. Training Component								
4.1.10	Training on observing technology	↔	↔	↔	↔	Members	External support	Seminars
4.1.11	Exchange of meteorological experts between Members other than 4.1.9 above	↔	↔	↔	↔	Members	Bilateral or TCDC arrangements	
4.1.12	Training course on weather forecasting	↔	↔	↔	↔	Republic of Korea	KOICA	
4.1.13	Training on storm surge and wave prediction	↔	↔	↔	↔	Members	Short-term fellowships with external support	
4.1.14	Training in message-switching, wave forecasting, numerical weather prediction and cloud physics, through attachments	↔	↔	↔	↔	Members	External assistance	TCDC arrangements
4.1.15	Training personnel through fellowships on maintenance of electronic meteorological and hydrological equipment	↔	↔	↔	↔	Members	External assistance	
4.2 Hydrology								
4.2.1	Training on repair and maintenance of hydrologic and electronic equipment used in flood forecasting	↔	↔	↔	↔	Members	WMO, UNDP and other sources	Roving seminars to be organized by WMO
4.2.2	Training on advanced techniques for flood forecasting	↔	↔	↔	↔	Members	WMO, UNDP and other sources	Courses and seminars to be organized by WMO
4.2.3	Training on planning and design of flood forecasting systems							
4.2.4	Exchange of forecasters	↔	↔	↔	↔	Members	WMO, ESCAP, UNDP and other sources	TCDC requirements
4.3 Disaster Prevention and Preparedness								
4.3.1	Training of disaster managers and volunteer leaders	↔	↔	↔	↔	Members	National and external assistance	With advice from international agencies
4.3.2	Test exercises	↔	↔	↔	↔	Members	National and external assistance	With advice from international agencies

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
4.	Training Component							
4.3.3	Training in Disaster Prevention and Preparedness (DPP)	↔	↔	↔	↔	Members	External assistance	Regional seminars organized by TCS with help of OCHA, IFRC, ESCAP and WMO
4.3.4	Exchange of information on the socio-economic impact of disaster	↔	↔	↔	↔	Members	OCHA, IFRC	Seminars organized by OCHA, IFRC and WMO
4.3.5	Training on disaster vulnerability and risk assessment	↔	↔	↔	↔	Members	OCHA, IFRC	Courses and seminars organized by OCHA, IFRC and ESCAP
4.3.6	Exchange of DPP personnel	↔	↔	↔	↔	DHA, IFRC, TCS and ESCAP	OCHA, IFRC, ESCAP and other sources	TCDC arrangement organized by OCHA, IFRC, TCS and ESCAP

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
5.	Research Component							
5.1	Meteorology							
5.1.1	General studies on:							
5.1.1.1	Interaction between typhoons and the environmental circulation	↔	↔	↔	↔	Members or regionally coordinated programme	National	
5.1.1.2	Typhoon climatology in relation with anomalies in regional circulation	↔	↔	↔	↔	Members or regionally coordinated programme	National	
5.1.1.3	Forecasting storm surge and heavy rainfall	↔	↔	↔	↔	Members or regionally coordinated programme	National	
5.1.1.4	Tropical cyclone related rainfall and intensity rates aimed at detection of possible relationship to global climate change	↔	↔	↔	↔	Members or regionally coordinated programme	National	
5.1.2	Utilization of TOPEX, SPECTRUM, TCM-90 and TYPHOON-90 data set in tropical cyclone numerical and physical modeling, with the aim of improving existing methods of predicting formation, development and steering (Describe in general terms without specific reference to TOPEX, etc.)	↔	↔	↔	↔	Members or regionally coordinated programme	National	Need for short-term attachment of experts to advanced centers in the typhoon region
5.1.2.1	Establishment and operation of a tropical cyclone data bank for the northwestern Pacific and East Asia with software exchanges between Members	↔	↔	↔	↔	RSMC Tokyo	Japan	According to the procedure described in TOM
5.1.2.2	Development of an operational NWP model for typhoon movement and development	↔	↔	↔	↔	Members or regionally coordinated programme	National	
5.1.2.3	Irregular tropical cyclone behavior, such as, sudden turning of tracks, sudden increase/decrease of intensity, rainfall and storm surge	↔	↔	↔	↔	Members or regionally coordinated programme	National	
5.1.2.4	Air-sea interactions associated with the occurrence of typhoons, with emphasis on wave and storm surge generation	↔	↔	↔	↔	Members or regionally coordinated programme	National	
5.1.2.5	Study on typhoon-related wind climatology	↔	↔	↔	↔	Members	National	

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
5. Research Component								
5.1.2.6	Study on climatology of precipitation extremes	↔	↔	↔	↔	Members	National	
5.1.2.7	Encourage participation in the works of the CAS working group	↔	↔	↔	↔	Members	National	
5.1.2.8	Encourage members to provide the CAS Committee on Climate Change Aspects of Tropical Cyclones relevant data sets for their consideration	↔	↔	↔	↔	Members	National	
5.2 Hydrology								
5.2.1	Application of meteorological inputs to flood forecasting	↔	↔	↔	↔	National or regionally coordinated programmes	National	In cooperation with ESCAP
5.2.2	Study of effects of deforestation, urbanization and changing land use on the hydrology of the catchment and on the intensity of floods	↔	↔	↔	↔	Members	National	In cooperation with ESCAP
5.2.3	Research on hydrological aspects of ENSO phenomena	↔	↔	↔	↔	Members	National and external resources	In cooperation with ESCAP, WMO, OCHA and other concerned agencies
5.2.4	Study on physically-based flood forecasting models	↔	↔	↔	↔	National or regionally coordinated programmes	National and external resources	In cooperation with ESCAP, WMO, and other concerned agencies
5.3 Disaster Prevention and Preparedness								
5.3.1	Studies on the socio-economic impact of typhoon and flood disasters	↔	↔	↔	↔	Members	National	With advice and possible support of UNDP, IFRC, ESCAP and WMO
5.3.2	Vulnerability and risk assessment of disaster-prone areas	↔	↔	↔	↔	Members	National	With advice and possible support of UNDP, IFRC, ESCAP and WMO
5.3.3	Socio-economic implication of availability and quality of typhoon and flood forecasts and warnings	↔	↔	↔	↔	Members	National	With advice and possible support of UNDP, IFRC, ESCAP and WMO
5.3.4	Disaster impact modelling	↔	↔	↔	↔	Members	National	With advice and possible support of UNDP, IFRC, ESCAP and WMO

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART A. CONTINUING TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
5. Research Component								
5.3.5	Natural Disaster Insurance System	↔	↔	↔	↔	National or Regionally Coordinated Programme	National	With advice and possible support of UNDP, WMO and other international organizations concerned
5.3.6	Study on Flood Control Method for disaster prevention	↔	↔	↔	↔	Members	National	With advice and possible support of UNDP, WMO and other international organizations concerned
5.3.7	Preparedness for social and economic aspects of ENSO	↔	↔	↔	↔	Members	National	With advice and possible support of OCHA, ESCAP, WMO and other concerned agencies

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART B. SPECIFIC TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
1. Meteorological Component								
1.1 Support to Meteorological Observing Systems and Facilities								
1.1.1 CAS aerosonde field development and testing (typhoon reconnaissance by unmanned aerial vehicles) in the western North Pacific region as a Typhoon Committee Project		↔	↔	↔	↔	CAS	Possible Regional Consortium/Individual countries	Field experiment in 2000
1.1.2 Launch of satellite MSAT-IR						Members	Japan	The Multi-functional Transport Satellite (MSAT-IR) is to be put into operation in early 2003 as the successor to the Geostationary Meteorological Satellite-5 (GMS-5)
1.1.3 Establishment of WWW data user system for the reception of FAX and GPV data INTERNET or ISDN		↔	↔	↔	↔	Members	National	Continuous activities
1.2 Support to Meteorological Telecommunication Systems and Facilities								
1.2.1.1 Establishment of regional telecommunication links						Thailand and Cambodia	National and external assistance	Need donors
• Bangkok - Cambodia								
• Bangkok - Vientiane		↔	↔	↔	↔	Lao DPR	External assistance	Depending on bilateral discussion
• Seoul - Pyongyang						ROK and DPRK	National	Continuous activity
1.2.1.2 Upgrading of telecommunication circuit linking Hanoi and Bangkok from 1200 bps to 2400 bps - 9600 bps		↔	↔	↔	↔	Viet Nam	National and external assistance	Speed is under negotiation
• Upgrading of telecommunication circuit between Hanoi and Beijing with speed of 2400 - 9600 bps						Viet Nam	National and external assistance	
1.3 Requirements Specifically for Tropical Cyclone Forecasting and Warning								
1.3.1 Setting up of electronic equipment maintenance and repair workshops		↔	↔	↔	↔	Members	National and external assistance including ICDC	Continuous activity

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART B. SPECIFIC TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
1. Meteorological Component								
1.3.2	Dissemination of observational data, advisories and grid point values of NWP models needed by TC Members for their forecasting and warning systems via the Multifunctional Transport Satellite (MSAT-IR)			↔	↔	RSMC Tokyo-Typhoon Center	Japan	The Japan Meteorological Agency (JMA) will start to disseminate the above data and products with the Low Rate Information Transmission (LRIT) of the MSAT-IR in the early 2000
1.3.3	Upgrade of typhoon forecast models	↔	↔	↔	↔	RSMC Tokyo-Typhoon Center	Japan	TYM and GSM for typhoon prediction will be upgraded in March 2001

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART B. SPECIFIC TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
2. Training Component								
2.1 Meteorology								
2.1.1 Satellite meteorology		↔				China	China	Training course recently completed in 1998
2.1.2 Regional Workshop on Doppler Tropical Cyclone Radars		↔				China	Thailand and external	Organized by TCS and TSU in cooperation with WMO during 7-10 December 1999
2.1.3 Group training course on river and dam engineering		↔	↔	↔	↔	Japan	Japan International Cooperation Agency (JICA)	
2.1.4 Short training attachment on specific subjects				↔	↔	Hong Kong, China		
Training of Class II meteorologists in Applied Meteorology		↔	↔	↔	↔	Hong Kong, China	TC members may be waive of tuition subject to availability of space	
2.1.5 Training course on weather forecasting for operational meteorologists in the Asia-Pacific region (~ 3 weeks)		↔	↔	↔	↔	Republic of Korea	Republic of Korea	Under VCP
2.1.6 Attachment of operational forecasters to NMC or RSMC		↔	↔	↔	↔	China	Members concerned	One month attachment to NMC or RSMC during the peak of the typhoon season
2.1.7 Group training course on disaster mitigation and restoration system for infrastructure		↔	↔	↔	↔	Japan	JICA	At the request of Typhoon Committee
2.1.8 Training seminar on the effective use of data provided LRIT of MSAT-IR)		↔	↔	↔	↔	Japan	Japan	The first seminar is scheduled on February 2001 in Tokyo
2.1.9 Short training attachment on specific subjects:						Hong Kong, China		
a) Design and operation of automatic observing system		↔					Hong Kong, China to provide per diem and WMO/recipient members for provide passage	Training Fellowship under VCP
b) Dissemination of meteorological information to public using web technology			↔					

TYPHOON COMMITTEE'S REGIONAL CO-OPERATION PROGRAMME IMPLEMENTATION PLAN

PART B. SPECIFIC TASKS		TIME SCALE				BY WHOM	RESOURCES	REMARKS
		01	02	03	04			
2.	Training Component							
	c) Design and operation of warning systems			↔				
	d) Aviation meteorology and aviation meteorological systems				↔			
3.	Research Component							
3.1	Meteorology							
3.1.1	Set-up TC Research Fellowship Scheme					Members	Members and other sources	TRCG to assist

APPENDIX XIV

REPORT OF THE TYPHOON RESEARCH COORDINATION GROUP

Typhoon Committee Research Fellowship Programme

The Typhoon Committee at its 32nd session decided to establish the Typhoon Committee Research Fellowship Scheme as recommended by TRCG. After extensive consultation, a list of offers from Members was compiled by TRCG and communicated to Members by the Typhoon Committee Secretariat (Annex). Four members offered attachment opportunities, two of which were accompanied by financial support. Another Member offered financial support for the travel costs involved.

As at the writing of this report, three TC Research Fellows have been confirmed. A scientist from National Meteorological Centre, Beijing, will visit Hong Kong Observatory. The research topic would be "Analysis of the evolution of landfalling tropical cyclones with a view to developing forecast guidance for wind and rain". Two scientists from DPR Korea will visit Shanghai Typhoon Institute, to work on the optimization of the consensus forecast method for tropical cyclone track. Discussion is also taking place regarding another fellowship.

Identification of Problems

A term of reference of the TRCG is to identify scientific and technical problems in the analysis and forecasting of tropical cyclones. Based on exchanges among TRCG members, it is apparent that the main topics of current interest are:

- (a) tropical cyclone vortex initialisation in NWP models;
- (b) application of satellite-derived surface wind and precipitation in analysis, for operational warning and for NWP;
- (c) ensemble forecasting of tropical cyclone tracks, either in the true NWP sense or in the sense of optimising consensus forecast based on outputs of several models;
- (d) application of doppler radar data to tropical cyclone forecasting, especially with regard to landfalling tropical cyclones;
- (e) seasonal tropical cyclone rainfall forecasting, with an El Niño perspective.

A Workshop Proposal

In the last decade or so, there has been a gradual expansion and strengthening of meteorological research in universities in the region. It would be desirable to harness this resource to contribute to the advancement of operational tropical cyclone forecasting. It is observed that in a couple of Member countries, there has been some degree of success in this direction.

Globally, WMO has a long-term commitment to bring together operational tropical cyclone forecasters and academics, to exchange views and to establish collaboration, through the organization of the series of International Workshop on Tropical Cyclones, the 5th of which is likely to take place in 2002. It would be useful input to the workshop if a regional view could be established regarding problems unique to the region beforehand.

To bring together the academia and the operational meteorological service is not an easy task owing to fundamental different objectives of the two communities. However, dialogue would be a good step to start the development of partnership. A proposal to organise a workshop on "typhoon forecasting research" in 2001 with participation from both communities is recommended for consideration by Typhoon Committee.

The proposed objectives of the workshop are:

- (a) to identify current scientific problems faced by tropical cyclone forecasters in the region
- (b) to appreciate the opportunities offered by latest research results and technological developments
- (c) to promote partnership between meteorological services and the academia in the region in tropical cyclone research with forecasting applications
- (d) to develop a regional view on tropical cyclone issues as an input to the 5th International Workshop on Tropical Cyclones (IWTC-5)

The proposed participants include:

- (a) TRCG members
- (b) keynote speakers, including:
 - representative of RSMC Tokyo Typhoon Center
 - 1-2 operational forecasters
 - 1-2 researchers of world standing

- (c) a number of researchers from universities in the region with programmes in meteorology and from Members' meteorological services

Financial support for participation by TRCG members, keynote speakers and a specified number of the researchers in (c) may be offered by Typhoon Committee. The workshop should also be open to other researchers who could finance their participation themselves.

The workshop programme might include:

- (a) presentation on "problems" in operational tropical cyclone forecasting, including track, weather and hydrological impacts (identified by a survey beforehand) and what forecasters hope would be achieved in a few year' time
- (b) keynote speakers giving presentations on frontier research results with potential applications in tropical cyclone forecasting
- (c) researchers talking about research work done in the region on tropical cyclones and their forecasting
- (d) discussion forum to identify key research topics with potential to yield solution to forecasting problems in 3-5 years, to explore cooperation opportunities, and to propose institutional arrangements to facilitate related tropical cyclone research
- (e) formulation of a regional view on tropical cyclone issues in preparation for IWTC-5

Subject to guidance from Typhoon Committee, TRCG could provide assistance to Typhoon Committee Secretariat regarding the scientific programme of the proposed workshop and the survey on regional problems prior to the workshop.

Membership

The TRCG was set up in 1996 following the decision of the 28th session of Typhoon Committee. Membership consisted of members designated by Members and the coordinator of Typhoon Committee Research Correspondents (Meteorological Component). A number of membership changes have been notified to the TRCG Chairman since 1996. The current composition is:

Chairman : Mr C Y Lam; Hong Kong, China

Members : Ms Seth Vannareth, Cambodia
Ms Tian Cuiying, China
Dr Kang Bong Jin, DPR Korea

Mr T Ueno, Japan
Mr Thongphou Vongsyprasom, Lao PDR
Mr Ku Chi Ming; Macao, China
Mr Ooi See Hai, Malaysia
Dr Rosa T Perez, Philippines
Dr Woo-jin Lee, RO Korea
Dr Patipat Patvivatsiri, Thailand
Mr Frank Wells, USA
Ms Duong Lien Chau, Viet Nam
Dr M Nagata, Coordinator of Typhoon Committee Research
Correspondents (Meteorological Component)

Noting that four years have elapsed since the formation of the TRCG, it may be an opportune time for Members to review their nominations of representatives on the TRCG, the participation of the Coordinator of Typhoon Committee Research Correspondents (Meteorological Component) and the chairmanship of the TRCG.

(20.11.2000)

APPENDIX XV

ESCAP/WMO TYPHOON COMMITTEE TRUST FUND

INTERIM STATEMENT OF ACCOUNT
as at 30 September 2000

		\$	\$
Balance of fund at 1 January 2000		468,459	
Contributions Received		<u>72,000</u>	
Total revenue			540,459
Less: Expenditure	Liquidated	Unliquidated	Total
Mission travel - non-WMO staff	15,111	22,226	37,337
General Office expenses	19,698	5,562	25,260
Bank charges	27	-	27
Reproduction of documents	3,000	3,000	6,000
Printing services	1,664	5,900	7,564
Publications, books	-	4,928	4,928
Postage (franking)	371	386	757
Freight	712	-	712
Contribution, assistance, support, block grant	3,660	28,049	31,709
	<u>44,243</u>	<u>70,051</u>	<u>114,294</u>
Credit due to cancellation of prior year's obligation	-348		-348
	<u>43,895</u>	<u>70,051</u>	<u>113,946</u>
Total expenditure			113,946
Balance at 30 September 2000		\$	<u><u>426,513</u></u>
Represented by:			
Cash in Bank			517,819
Less: Unliquidated Obligations		70,051	
Accounts Payable		712	
Prior Years' Obligations		15,456	
Outstanding IOV's		<u>5,087</u>	91,306
		\$	<u><u>426,513</u></u>

Contributions Received*

\$

Hong Kong, China	12,000
Macau	12,000
Malaysia	12,000
Singapore	12,000
Thailand	12,000
Vietnam	12,000
Total	<u><u>72,000</u></u>

*A contribution of US\$12,000 received from Korea on 27 October 2000 is not included in the above.

WORLD METEOROLOGICAL ORGANIZATION
ORGANISATION MÉTÉOROLOGIQUE MONDIALE

D 01020249

Chief, Finance and Budget Division

