



WMO

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



ESCAP

WMO/ESCAP PANEL ON TROPICAL CYCLONES

THIRTY-FIRST SESSION

Colombo, Sri Lanka

(1 to 6 March 2004)

FINAL REPORT

GENERAL SUMMARY OF THE WORK OF THE SESSION

1. ORGANIZATION OF THE SESSION (Agenda 1)

1.0.1 The thirty - first session of the WMO/ESCAP Panel on Tropical Cyclones was held at the Colombo Plaza Hotel in Colombo, Sri Lanka from 1 to 6 March 2004.

Attendance

1.0.2 The session was attended by representatives of seven of the eight Member countries of the Panel namely: Bangladesh, India, Maldives, Oman, Pakistan, Sri Lanka and Thailand. The session was attended by observers from China, Asian Disaster Reduction Center (ADRC), International Civil Aviation Organization (ICAO), Indian Institute of Technology (IIT)-Kharagpur, International Strategy for Disaster Reduction (ISDR) and Saudi Arabia. The session was also attended by representatives from WMO, UNESCAP and TSU. The list of participants is attached as **Appendix I**.

1.1 OPENING OF THE SESSION (Agenda item 1.1)

1.1.1 The opening ceremony commenced at 10.00 a.m. on Monday, 1 March 2004 at the Colombo Plaza Hotel in Colombo, Sri Lanka.

1.1.2 Mr N.A. Amaradasa, the Director-General of Sri Lanka Department of Meteorology, extended a warm welcome to all the participants. He mentioned that the Meteorological Services would continue to play a major role in natural disaster reduction activities providing more reliable cyclone forecasts and warnings, as well as necessary data, information and advice in all phases of before, during and after the occurrence of a tropical cyclone. Mr Amaradasa expressed his appreciation for the necessary assistance provided by the WMO and UNESCAP to the Panel and to its Member countries, in the form of fellowship, equipment and technical assistance as well as financial support. He wished the participants a pleasant stay in Sri Lanka.

1.1.3 On behalf of Mr Michel Jarraud, Secretary-General of WMO, Mr Katsuhiko Abe, the representative of the WMO Secretariat, welcomed all participants to the session and expressed the appreciation of WMO to the Government of Sri Lanka for hosting the session and for the excellent arrangements made. He expressed his sincere thanks to observers of China Meteorological Administration (CMA), Saudi Arabia Meteorological service, ADRC, ICAO, IIT- Kharagpur and ISDR for their favorable assistance and contribution to activities of the Panel. Mr Abe informed the session that Mr Jarraud had stressed that special efforts are needed to develop and improve the capabilities of National Meteorological and Hydrological Services (NMHSs) in the developing countries in Asia in the light of their importance for socio-economic development. Within the framework of its Programmes, Mr Jarraud is looking forward to, through its Members and their NMHSs, contributing even more substantially to the protection of life and property against natural disasters, to poverty alleviation, to safeguarding the environment and to enhancing the economic and social well-being of all sectors of society especially in areas such as food security, water resources, health, energy, transport and tourism. Mr Abe assured the session that WMO would continue making every effort to support the Panel's work to the extent possible.

1.1.4 The Executive Secretary of UNESCAP, in his message transmitted by Mr Ti Le-Huu as representative of UNESCAP, expressed his appreciation to the Government of Sri Lanka for hosting this session in Colombo. He also expressed appreciation to the Government of Pakistan for hosting the Technical Support Unit and providing the services of a coordinator and a meteorologist to support the activities of the Panel since 2000 and to the Government of India for the valuable contribution to the work of the Panel, especially through the forecasting services of the Regional Specialized Meteorological Centre at New Delhi. He expressed his particular concern with the increasing trend of socio-economic losses in several parts of the region, including the most disastrous flash flood during the past 55 years

experienced in Sri Lanka in May 2003, which resulted in over 250 people lost their lives, 300,000 people displaced and loss of US\$135 million. He also pointed out the special importance of the impact of the cyclone-related disasters on the poor, especially in South Asia where most of the World's poor live. He assured the Panel Members of continued support of UNESCAP to the activities of the Panel and of the initiatives reflected in the Memorandum of Understanding between WMO and UNESCAP signed in July 2003 aiming at synergizing efforts towards better serving the countries affected by cyclones. He urged the Panel to address the recent increase in damage by cyclone-related disasters and to take an active part in the preparation for the United Nations World Conference on Disaster Reduction to be held in Kobe in January 2005.

1.1.5 Dr Qamar-uz-Zaman Chaudhry, the Coordinator of Technical Support Unit (TSU) welcomed all the participants to the session. He mentioned that, although modern technological advances have enabled man to combat severe weather phenomena and natural disasters through scientific means, Panel Member countries are, however, still suffering heavily from violent vagaries of tropical cyclones, storm surges and floods unlike other typhoon, hurricane and tropical cyclone regions. Dr Chaudhry appreciated the spirit of cooperation among Panel Members, WMO and UNESCAP and looked forward to further strengthening it. He hoped that the learned delegates would inject new ideas to further enhance the effectiveness of this cooperation especially in the coordinated technical plan. Dr Chaudhry impressed upon the participants to come up with concrete proposals aimed at not only implementing the agreed programmes but to turn them into strategies and mechanisms for improving the lot of our peoples as well. He assured that TSU would try its best to carry out its Terms of Reference in letter and spirit.

1.1.6 In his inaugural address, Mr G. Hewagama, Secretary to the Ministry of Economic Reform, Science and Technology, extended a warm welcome to all the participants. He stated that in the developing countries, the impact of tropical cyclone disasters, in terms of human suffering, homelessness, loss of means of livelihood and setbacks to social and economic development had been particularly harsh. Mr Hewagama further stated that meteorology had gained tremendous importance and recognition for their services with time by the public, aviation, agriculture, transport, tourism, disaster mitigation agencies and others. In this regard, he noted the increased accuracy of weather forecasts and warnings by the Sri Lanka Department of Meteorology. The Secretary expressed the appreciation for the joint efforts of WMO and UNESCAP in capacity building of National Meteorological and Hydrological Services of Panel Members that is aimed at strengthening the regional cooperation and coordination of activities for mitigation of tropical cyclones. Mr Hewagama declared the session open and wished the participants a pleasant stay in Sri Lanka.

1.2 ELECTION OF THE CHAIRMAN AND VICE-CHAIRMAN (Agenda item 1.2)

Election of the Chairman and Vice-chairman of the Panel on Tropical Cyclones

1.2.1 Mr N.A. Amaradasa (Sri Lanka) and Mr S.K. Subramanian (India) were unanimously elected as Chairman and Vice-chairman of the Panel, respectively, to hold their posts until the next session.

Election of the chairman of the drafting committee

1.2.2 Mr Ahmed Hamoud Mohamed Al-Harthy (Oman) was elected as chairman of the drafting committee.

1.3 WORKING ARRANGEMENTS (Agenda item 1.3)

The Panel decided on its working hours and the arrangements for the session.

2. ADOPTION OF THE AGENDA (Agenda item 2)

The Panel adopted the agenda as given in **Appendix II**.

3. FOLLOW-UP ACTION ON PTC-30 (Agenda item 3)

3.1 A detailed review of the recommendations of the thirtieth session and their follow-up action taken was carried out based on the action sheet.

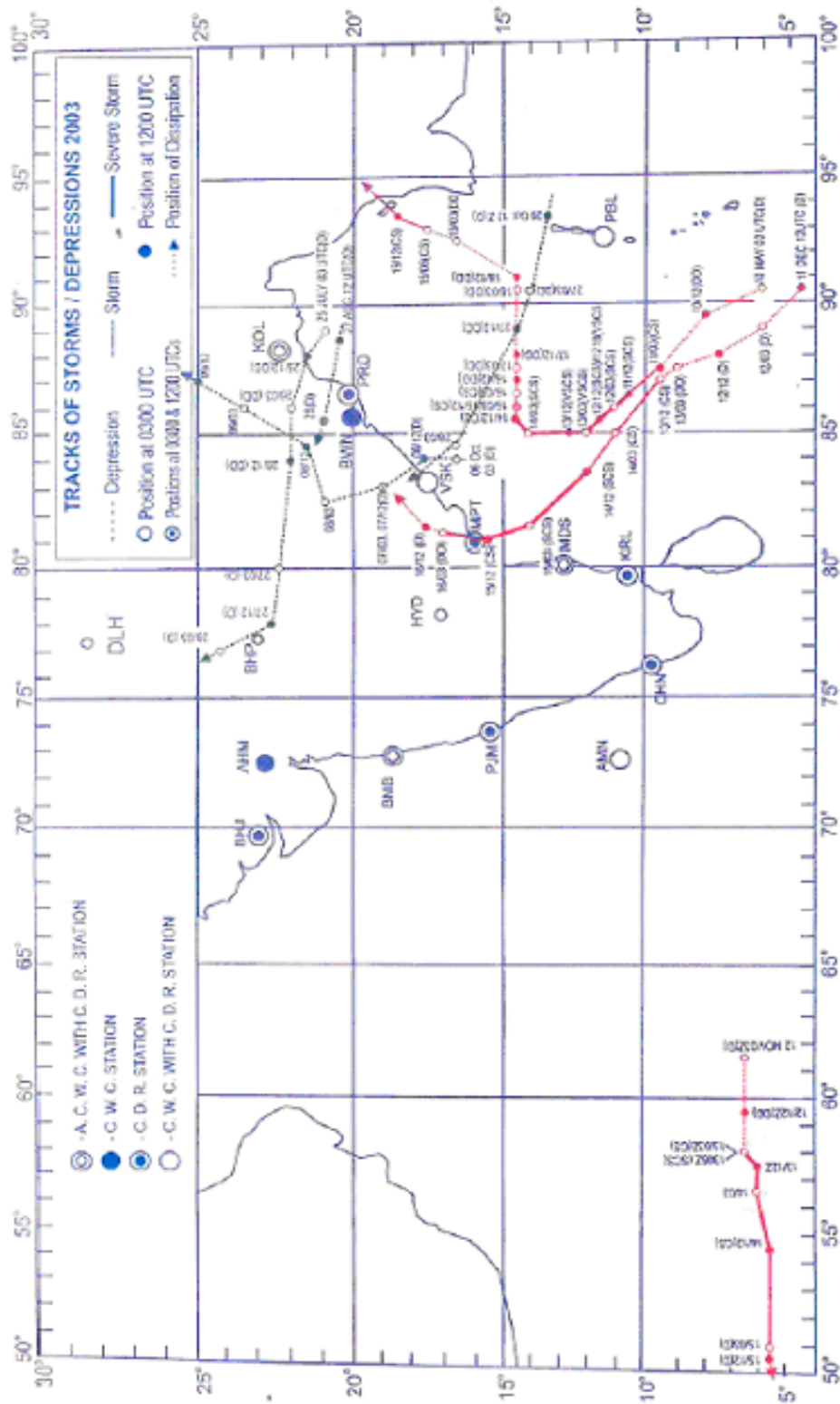
3.2 The Panel recalled that a regional project was being formulated for the use of PC clusters in Numerical Weather Prediction between the Republic of Korea and WMO. The Panel urged WMO to finalize the document of the project and to submit it to the Members for consideration and appropriate participation.

3.3 The Panel invited WMO to incorporate their follow-up items/activities implemented or action taken in "Remarks", prior to submission of the action sheet for review at the Panel's session.

4. REVIEW OF THE 2003 CYCLONE SEASON (Agenda item 4)

4.1 The representative of India presented a review of the 2003 cyclone season on the basis of the comprehensive report entitled "REPORT ON CYCLONIC DISTURBANCES OVER NORTH INDIAN OCEAN DURING 2003", which had been prepared by RSMC-tropical cyclones New Delhi.

4.2 The North Indian Ocean witnessed development of seven disturbances out of which three systems attained the intensity of Cyclonic Storms viz., one Very Severe Cyclonic Storm and two Severe Cyclonic Storms. Remaining four systems were depressions out of which two became deep depressions. Tracks of the systems are given in figure on page 4. During this year, out of three cyclones, two developed in the Bay of Bengal and only one in the Arabian Sea. All the four depressions developed in the Bay of Bengal. The first cyclone formed over southeast Bay of Bengal on 10 May. Moving initially in a northwesterly direction it subsequently recurved towards Myanmar coast and weakened into a deep depression. It re-intensified into a cyclonic storm and finally crossed Myanmar coast on 19 May. No damage occurred over the Indian Sub-continent because of this cyclone. The second system formed over the South West Arabian Sea at very low latitude (around 6° N) on 11 November. It attained the intensity of a Severe Cyclonic Storm on 13 November. This system moved westwards throughout its lifespan and dissipated over the sea itself off Somalia coast. The third system formed over the Southeast Bay of Bengal during the period 11-16 December. This system attained the intensity of a Severe Cyclonic Storm on 14th December. Moving in a northwesterly direction it crossed the North Andhra Pradesh coast close to Machilipatnam (43185) as a Severe Cyclonic Storm. It caused extensive damage to life and property over central parts of coastal Andhra Pradesh. The system weakened rapidly over north coastal Andhra Pradesh and adjoining Orissa. One of the notable features is that the frequency of depressions is higher this year compared to the last three years though the total number of disturbances is much lower than the normal frequency of about 15 per year.



4.3 The representatives of Bangladesh, Maldives, Oman, Pakistan, Sri Lanka and Thailand reported to the session a review of the 2003 cyclone season of their respective countries, a summary of which is given in **Appendix III**.

4.4 The Panel expressed its appreciation to the RSMC-tropical cyclones New Delhi for the valuable contribution it was making to its Members.

5. COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME (Agenda item 5)

5.1 The Panel expressed its appreciation for the comprehensive information provided by the WMO Secretariat on the implementation of the WMO Tropical Cyclone Programme (TCP). It noted with satisfaction the developments and progress made in both the general component and the regional component of the TCP since the thirtieth session of the WMO/ESCAP Panel on Tropical Cyclones (Islamabad, Pakistan, 4 to 10 March 2003).

5.2 The Panel noted with appreciation the detailed arrangements for the Second WMO Regional Technical Conference on Tropical Cyclones, Storm Surges and Floods which would be held in Brisbane, Australia from 1 to 3 July 2004 in association with the International Conference on Storms (Brisbane, 5 to 9 July 2004). The Regional Technical Conference will not only provide a forum for the exchange of views and experience on improving tropical cyclone, storm surge and flood forecasting but also strengthen cooperation and coordination between TC regional bodies having common interests, in particular, the Panel and the Typhoon Committee.

5.3 The Panel was informed that the TCP published the "Annual Summary of Global Tropical Cyclone Season 2002" (WMO/TD-No. 1194) (TCP-49) in December 2003 and that the next issue of the annual summary is under preparation and will be published in August 2004. The publications for 2001 and 2002 are available on the TCP home page (<http://www.wmo.int7web/www/TCP/trop-cyc.html>). Aside from providing, an overview of the cyclone season, the annual publication also gives a report on the significant activities during the cyclone season of the six TC RSMCs (i.e. Honolulu, La Réunion, Miami, Nadi, New Delhi and Tokyo) and four Tropical Cyclone Warning Centres (i.e. Brisbane, Darwin, Perth and Wellington).

5.4 The Panel was pleased to note that TCP had engaged the services of Systems Engineering Australia Pty. Ltd. in July 2003 to undertake reviews and assessments that would lead to suitable conversion factors between the WMO 10-minute average wind and 1-minute, 2-minute and 3-minute "sustained" winds. The technical report from the study would be subsequently included in the updated edition of the Global Guide to Tropical Cyclone Forecasting and the Operational Plans/Manual of the five tropical cyclone regional bodies.

5.5 The Panel was pleased to note that two storm surge experts from Pakistan and Thailand undertook a two-week training (13 to 24 October 2003) at the Indian Institute of Technology (IIT, Kharagpur) in the implementation and running of a PC-based high-resolution storm surge model. The Panel expressed its appreciation to IIT for this valuable contribution to the Panel's activities and requested that WMO make similar arrangements with the IIT for the year 2004 for the attachment of an expert from Maldives and Oman.

5.6 The Panel was pleased to note that six tropical cyclone/storm surge experts from four Panel Members participated in the Second South China Sea Storm Surge Workshop "A Hands-on Ocean Forecast Training Laboratory for the South China Sea" (Kuantan, Malaysia, 15 to 19 September 2003).

5.7 The Panel was informed that a meeting of international experts would be convened in Brisbane from 6 to 9 July 2004 which would be tasked to formulate TCP Sub-Project

No. 23: *Combined effects of storm surges/wind waves and river floods in low-lying areas* and Sub-Project No. 24: *Establishment of a tropical cyclone forecaster Web site*. With regard to TCP sub-project No. 23, the resource persons, composed of meteorologists, hydrologists and disaster prevention and preparedness experts, will delve into current knowledge on the effects of combined storm-surge/river flooding, the deficiencies, studies made, new developments, operational storm-surge/river flooding forecasting techniques and systems and provided useful guidance on how to develop improved forecasting techniques and risk mapping tailored to the needs of those in coastal or low-lying areas.

6. REVIEW OF THE COORDINATED TECHNICAL PLAN AND CONSIDERATION OF THE WORK PROGRAMME FOR THE NEXT FIVE YEARS (Agenda item 6)

6.0.1 Dr Somsri Huntrakul (Thailand), Chairperson of the Working Group tasked to carry out a detailed review of the Coordinated Technical Plan was unable to attend the session but submitted a report for the Panel's consideration. The Panel expressed its appreciation on the work done by Dr Somsri Huntrakul.

6.0.2 In view of the lack of substantial progress as reflected in the report submitted by the Chairperson of the Working Group, the Panel requested the UNESCAP representative to assist in soliciting participation of all the representatives attending the session with a view to compiling their views and recommendations on possible directions to guide further improvement of the Coordinated Technical Plan (CTP). Accordingly, a questionnaire was circulated to all the delegations and the results are summarized in **Appendix IV**.

6.0.3 On the basis of the inputs of the Members, the Panel discussed the broad goals, specific priority objectives and direction to undertake further work. The Panel approved the general framework for CTP (2005-2009) with elaborated broad goals and specific priority objectives as shown in **Appendix V**.

6.0.4 On this occasion, the Panel expressed its appreciation to Dr Somsri Huntrakul of Thailand for serving as the Chairperson of the Working Group for 2002 and 2003. It decided to re-establish the Working Group and noted that Dr Somsri Huntrakul, due to her new work of assignment at the Thai Meteorological Department, would not be able to continue to serve as the Chairperson. The Panel agreed to appoint Mr Ahmed Hamoud Mohamed Al-Harthy (Oman) to be the new Chairperson of the Working Group. It requested the Working Group to carry on its task based on the revised Terms of Reference as shown in **Appendix VI**, which include names of members. The session urged all Members to take active part in the work of the Group and requested TSU, WMO, and UNESCAP to assist in this effort. It requested the Chairperson of the Working Group to submit its report to all the Members through TSU at least two months before the next session.

6.1 Meteorological Component (agenda item 6.1)

6.1.1 Under this item, matters relating to the basic observational network, the telecommunication links and data-processing systems established in the region to fulfill the requirements of WMO's World Weather Watch Programme were given priority. The Panel Members were invited to present reports on the current progress in dealing with problems encountered and on programmes for the modernization of observing and telecommunication networks and forecasting systems, aiming at further improvements in tropical cyclone monitoring, forecasting and warning services. The Panel reviewed the activities under the meteorological component of the Members during the past year, details of which are presented in **Appendix VII**.

Meteorological Observing and Telecommunications Systems

6.1.2 According to the results of special MTN Monitoring (SMM) for the year 2003 (February, April, July and October), the average availability of **SYNOP** reports expected to be received during these periods from RBSN of Members of Panel on Tropical Cyclones ranged

from 46 to 100 per cent. The percentage of the reports received from India, Oman and Thailand with slight oscillations, remained stable constituting 78, 90 and 100 per cent respectively. The availability of data from Bangladesh, Myanmar, Pakistan and Sri Lanka was increased, providing an average of 69, 46, 54 and 69 per cent respectively. A noticeable drop in the availability of data from Maldives had been registered in October (from 80 per cent in July to 3 per cent in October). The average figure for this country constituted 56 per cent of the expected reports.

6.1.3 The availability of **TEMP** reports during the same SMM period in 2003 ranged from 0 to 84 per cent. India continued to provide the highest coverage of data from its 29 upper-air stations, while 4 stations in Myanmar and six stations in Pakistan continued to be silent during the whole SMM. Availability of reports from Oman was oscillated from 18 to 50 per cent resulting in average for the whole SMM of 36 per cent. Bangladesh and Thailand were producing in average of 20 and 36 per cent of expected reports respectively.

6.1.4 The Panel felt that the deficiencies described in the monitoring results above, as before, arose largely due to lack of consumables because of the high cost of radiosondes, spare parts and trained staff in some Member countries. It urged Members to take necessary action to ameliorate the implementation of the observational programme in particular upper air observations and data exchange.

6.1.5 The Panel recommended that all point-to-point circuit between NMCs of the Member countries and RTH New Delhi to be upgraded to 64 kbps. The represent of Maldives informed the session that the link between Male and RTH New Delhi has been upgraded to 64 kbps on 26th February 2004 on a trial basis. It is expected that it will be fully operational in April 2004.

6.1.6 The Panel was informed that the reception of data and products on the point-to-point circuits was complemented by the reception of satellite data-distribution systems. The satellite system operated by China and METEOSAT/MDD were integrated into the RMTN. The INSAT satellite operated by India includes a Meteorological Data Distribution channel (INSAT/MDD), which can be received at some NMCs associated to RTH New Delhi and located within the footprint of the satellite. EUMETSAT MDD receiving systems were installed in Oman, INSAT MDD receiving systems were installed in Bangladesh, Maldives and Sri Lanka.

6.1.7 India has replaced H/F based broadcast by digital data casting through World-Space technology with effect from 1 July 2003. India in co-ordination with M/s World-Space and a few vendors has successfully carried out and implemented the design of a low cost integrated forecaster's workstation specifically tailored to the unreliable electricity supply situation of the developing countries of South-Asia by which the WMO/ESCAP Panel countries can greatly benefit by ensuring the reliable reception of raw data, satellite imagery, analyzed charts during cyclone periods. A presentation of this new "*Integrated Meteorological Data Receiving and Analysis System (IMDRAS)*" was made by India, which was well received by the Panel.

6.1.8 RTH New Delhi is keeping its GTS data on ftp server which are being accessed by some NMCs. Almost all NMCs have access to the Internet, at least for E-mail services, and a number of NMCs are also maintaining a Web site. Some RTHs' Web servers were used as an efficient complementary means for providing data and products to the NMCs, in particular for those NMCs with low-speed connectivity. It was noted that some RTHs were also collecting observational data from NMCs through E-mail.

Cyclone Detection Radar

6.1.9 **Bangladesh** informed the Panel that it is currently operating four 10cm S-band radars at Dhaka, Cox's Bazaar, Khepurara and Rangpur. However, Cox's Bazaar and Khepurara radars are quite old and need replacement. The Panel requested WMO to look into the matter and give it high priority.

6.1.10 **India** informed the Panel that the Cyclone detection radars at Chennai and Kolkata were replaced by state-of-the-art Doppler weather Radar. It has planned to replace three more existing S-band conventional radars by Doppler Weather Radar at Visakhapatnam, Machilipatnam and Paradeep.

6.1.11 **Sri Lanka** informed the Panel that the cyclone detection radar installed at Trincomalee in 1982 was in working condition. However, its effective range has now decreased and more and more operational problems were encountered. A proposal to acquire a microMET radar has been submitted to Japan.

Meteorological Satellites

6.1.12 The Panel noted with appreciation the latest detailed information on the status reports on the operational meteorological satellite systems that are presently providing data or having the potential to provide the data to Members in the Bay of Bengal and the Arabian Sea.

6.1.13 The Panel expressed its appreciation to the EUMETSAT for agreeing to keep Meteosat - 5 in its present position until 2005 and again requested that it continue to do so beyond 2005.

Tropical Cyclone Names

6.1.14 The Panel expressed its appreciation on the excellent work done by Mr Ahmed Hamoud Mohamed Al-Harthy (Oman), Rapporteur on the Naming of Tropical Cyclones for the Bay of Bengal and the Arabian Sea. The report of the Rapporteur is reproduced as **Appendix VIII**.

6.1.15 The Panel was pleased with the progress made in this subject and took note of the recommendation of the Rapporteur that the provisional name list be used on an experimental basis during the coming cyclone season as an important milestone in strengthening regional cooperation through the Panel towards enhancing visibility of the Panel at the United Nations World Conference on Disaster reduction to be held in Kobe, Japan in January 2005. In this connection, the Panel expressed its appreciation to the representative of India for his kind agreement to seek concurrence from the Permanent Representative of India with WMO for possible implementation of the name list on an experimental basis in the coming cyclone season as well as possible provision of names from India for inclusion in the list before May 2004.

6.1.16 The Panel requested that Mr Al-Harthy continue his assignment as Rapporteur on the Naming of Tropical Cyclones for the Bay of Bengal and the Arabian Sea, including the monitoring of implementation of this programme to enhance public awareness.

ICAO

6.1.17 The observer from ICAO presented to the Panel the current status of implementation of the issuance of TC advisories and warnings for aviation. He noted with appreciation that the TC Panel has been very instrumental in introducing the recent ICAO requirements regarding the TC advisories and warnings in the scope of discussions by the Panel, as well as in incorporating these requirements in the Tropical Cyclone Operational Plan for the Bay of Bengal and the Arabian Sea, WMO/TD-No. 84.

6.1.18 The ICAO observer expressed particular appreciation to TCAC New Delhi for the introduction from November 2003 of the TC advisories for aviation in the format specified in the ICAO Annex 3/WMO No.49, Technical Regulations (C.3.1). He pointed out that, in order to achieve full compliance with the ICAO requirements for TC advisories and warnings, some outstanding problems should be addressed by the Panel, as follows:

- proper use of the communications, including the correct AFTN addressing, to ensure that the TC advisories and SIGMETs reach the aviation users; the importance of sending the TC advisories to the Regional OPMET Data Banks and SADIS provider State (the U.K.) was stressed, in particular;
- aligning the formats and procedures for the issuance of SIGMET with the relevant ICAO provisions; the meeting was advised that a new ASIA/PAC Regional SIGMET Guide, intended to provide detailed instructions on the SIGMET formats and procedures was issued by ICAO in September 2003 and circulated to all States in the Region; the Panel Members were advised that this guidance material should be used by their meteorological watch offices (MWO) in order to improve the availability and quality of the SIGMET information.

6.1.19 The Panel was further advised on the recent approval by the ICAO Council of the Amendment 73 to Annex 3, which was to become applicable on 25 November 2004. Amongst other important changes in the new edition of Annex 3, a new Template for TC advisories has been included. In view of the timely implementation of the new provisions included in Amendment 73, the Members were advised to ensure that the new edition of Annex 3 is received on time by their meteorological authorities and that the aviation meteorological offices were informed accordingly on the necessary changes to their operational meteorological practices.

6.1.20 The Panel noted the information provided by ICAO and agreed on the need for further improvement of the specialized meteorological services for the aviation users. The Panel considered the ICAO attendance at the Panel's sessions as very beneficial for the Member countries by providing them with timely updates on the ICAO requirements for TC related information for the international air navigation. Therefore, the Panel felt that the close cooperation with ICAO and invitations for ICAO to attend the Panel's sessions should continue.

6.2 Hydrological Component (agenda item 6.2)

6.2.1 Under the hydrological component, the Panel reviewed the activities of its Members, UNESCAP and WMO. The representatives of the Members reported the activities of their respective countries as reflected in **Appendix IX**. In 2003, several important improvements in the hydrological component had been made in the Panel Members, including flood forecasting techniques and modelling, real-time monitoring of water level and rainfall, risk mapping and participation of stakeholders in flood warning systems, such as in Bangladesh, India, Oman, Pakistan, Sri Lanka and Thailand.

6.2.2 The Panel was informed of continued good cooperation among the concerned Members in the exchange of hydrological data in the international river basins. The Panel urged that these Members continue this kind of cooperation to further improve flood forecasting services and hoped that this spirit of cooperation for humanitarian cause be highlighted at the upcoming World Conference on Disaster Reduction to be held in Kobe in January 2005 with more specific details to enhance the visibility of the Panel's achievements.

Activities of UNESCAP

6.2.3 In the area of water resources management, UNESCAP started Phase III of the project on "Capacity-building in strategic planning and management of natural resources in Asia and the Pacific" in 2003, which focused on application of strategic planning and management to water resources at the national level. In Phase III, it is expected that about ten case studies and corresponding national workshops would be held in 2003 and 2004. In 2003, three case studies and national workshops were held in Lao PDR, Malaysia and Thailand. It is scheduled to hold other national workshops in the first eight months of 2004, including those for Myanmar, Pakistan and Sri Lanka. In connection with regional efforts in strategic planning and management, UNESCAP continues the joint FAO-UNESCAP pilot project on the formulation of national water visions to action into the second phase and completed a case study for the Union of Myanmar in June 2003.

6.2.4 The Panel Members were urged to make use of the advisory services which could be made available by UNESCAP to developing countries in the region on various aspects of water resources planning and management and to contribute their experiences, especially best practices, and research results related to water resources management to be published in the *Water Resources Journal* of UNESCAP for dissemination to developing countries in the region.

Activities of WMO

6.2.5 The main objective of the Hindu Kush Himalayan HYCOS project is the establishment of an efficient and operational flood information system based on real-time data and information on a regional level. During the Second High Level Meeting held in Katmandu in March 2003, government representatives from participating countries (Bangladesh, Bhutan, China, India, Nepal and Pakistan) endorsed the project proposal with some amendments. During the meeting, Afghanistan and Myanmar have been assigned an affiliated status to the project with full participation under consideration at a later stage. A data transmission and information dissemination strategy will be developed in cooperation with the donors and a Secretary-level meeting is planned to be held to endorse the final project document in June/July 2004. Funding of project activities including the testing phase of the information management system is secured until March 2005.

6.2.6 WMO launched in collaboration with its Technical Commission for Hydrology (CHy) a flood initiative that aims to improve flood forecasting by making use of advanced weather forecasting products through the enhanced cooperation between NMHSs.

6.2.7 With regard to the Associated Programme on Flood Management (APFM) that is undertaken jointly between WMO and the Global Water Partnership (GWP) progress has been achieved on the pilot project: "Community Approaches to Flood Management" in selected communities in Bangladesh, India and Nepal.

6.2.8 It is recalled that the twelfth session (Seoul, 19-27 September 2000) of the Regional Association II (Asia) endorsed the "Strategic Plan for the Enhancement of National Meteorological Services in RA II (Asia)" and requested WMO to prepare a Strategic Plan for the Enhancement of National Hydrological Services in RA II.

6.2.9 The principal motivation to develop a region-wide strategy is because the changing role of NHSs not only necessitates changes in the institutional set-up and the operation of these services but also requires a comprehensive forward-looking plan for the future development of NHSs. This will help to meet societal demands ranging from resource assessment, forecasting services and planning for water resources infrastructure to meeting regional and global requirements for accurate and timely hydrological data, analysis and products. The development of a strategy is also expected to serve as an appropriate tool in strengthening cooperation in the Region and enhance cooperation with regional and sub-regional organizations and institutions through joint cooperative arrangements, projects and organization of events.

6.2.10 WMO would like to encourage participants of this meeting to discuss and endorse a more effective approach to implement priority issues of the hydrological component that have been identified in a number of past meetings. It may be recalled at this point that the analysis of a questionnaire to Members of the PTC had yielded substantial information on priorities.

6.2.11 One possible approach could be to identify pilot projects for the implementation of recommendations and the enhanced involvement of National Hydrological Services – in collaboration with National Meteorological Services of PTC Members – and to plan and implement these projects under the umbrella of the PTC using own and extra budgetary resources. Panel Members are also encouraged to exchange experience with members of the TC that in recent years has been successful to shape a strong hydrological component to the benefit of its Members.

6.3 Disaster Prevention and Preparedness (DPP) Component (agenda item 6.3)

6.3.1 Under this agenda item, the Panel reviewed the activities of its Members and discussed the related activities of WMO, UNESCAP, ADRC and ISDR. The representatives of the Members reported the situations on disaster mitigation and related disaster management activities of their respective countries in the past year and the future plans. The Panel noted with appreciations the participation of the DPP experts from India and the host country, Sri Lanka. In view of the importance of DPP for effective impacts of the Panel's activities the Panel urged Members to send their DPP experts to take part in future sessions.

6.3.2 In general, the situation of cyclone-related disasters in the Panel Area in 2003 was not serious, except for floods in Sri Lanka in May 2003, which were recorded as the most severe one during the past 55 years and caused over 250 deaths, 300,000 people displaced and property loss of US\$135 million.

6.3.3 In most of the Panel Members, efforts are continuously being strengthened to provide training to stakeholders to enhance awareness and participation. Summary of DPP activities of Panel Members is given in **Appendix X**.

6.3.4 Activities of WMO

6.3.4.1 WMO participated in the activities of all the working groups established under the ISDR framework, including the ad hoc group on drought. Regular El Niño monitoring, El Niño outlooks and the establishment of the International Research Centre for El Niño in collaboration with the Government of Ecuador were tangible results of those activities. Projects to establish a climate alert system and to link climate and disaster databases on floods were developed.

6.3.4.2 WMO participated actively in the Second International Conference on Early Warning that aimed to achieve better integration of early warning into public policy. It also collaborated in the review of the Yokohama strategy.

6.3.4.3 WMO is a member of the ProVention Consortium and is represented in the Consortium Steering Committee. The Consortium aims at helping developing countries to cope with disasters. WMO is also a Special Supporting Organization of the International Consortium on Landslides, which aims to promote related research and capacity building.

6.3.4.4 WMO initiated the Programme on Natural Disaster Prevention and Mitigation. The main objectives are to develop a mechanism to respond to the requirements of Members and to ensure that WMO participates fully in the ISDR.

6.3.5 Activities of UNESCAP

6.3.5.1 The UNESCAP continued its work on disaster prevention and preparedness with emphasis on water-related disasters reduction, particularly for flood mitigation and preparedness. In this connection, UNESCAP published a set of guidelines on participatory planning and management for flood mitigation and preparedness in June 2003.

6.3.5.2 In continuation of promoting cooperation between the Members of the Panel on the one hand and the Members of the Typhoon Committee on the other hand, UNESCAP continued to assist in creating opportunities for selected Panel Members to take part in various the regional meeting related to flood hazard mapping, organized jointly by the Typhoon Committee and UNESCAP in Beijing in September 2003. However, due to communication difficulties, no participants from Panel could take part in the Workshop. Meanwhile, the same arrangements provided opportunities for two participants from the Panel Members could take part in the Second Early Warning Conference held in Bonn, Germany in October 2003. In 2003, UNESCAP in cooperation with the Asian Disaster Preparedness Centre (ADPC) implemented a one-year project on Partnership for Disaster Reduction – South-East Asia, Phase II from June 2003 to help building up capacity in six countries, including Thailand, on disaster management with special emphasis on community-based disaster management (CBDM). A regional workshop is expected to be held in Bangkok in May 2004 to discuss the application of a handbook on CBDM and possible follow-up.

6.3.5.3 In cooperation with UNDP and the United Nations Economic Commission for Latin America and Caribbean (UNECLAC), UNESCAP has finalized a project on promoting methodologies for assessing socio-economic impacts of natural disasters in Asia, which is scheduled to be implemented in 2004. The project would involve review of relevant methodologies, including the one proposed by UN-ECLAC and establishment of pilot projects on the application to assess impacts of natural disasters on poverty reduction programmes.

6.3.5.4 UNESCAP organized a special event to commemorate the International Day for Natural Disaster Reduction on 8 October 2003 at the United Nations Conference Centre in Bangkok. The event included three major activities: (a) an exhibition of achievements and ongoing efforts of various international agencies and national agencies in the region on this subject, (b) The UNESCAP-ADPC Forum on Disaster Reduction addressed major issues on “Turning the tide on disasters towards sustainable development: Living with Risk”. The Forum moderated by the Director of the Environment and Sustainable Development Division, UNESCAP, included keynote speeches by the Executive Secretary of UNESCAP and Executive Director of the Asian Disaster Preparedness Centre (ADPC) and lectures by the distinguished experts from Thailand and the region: Director General, Meteorological Department of Thailand, Royal Thai Government; Deputy Director General, Department of Disaster Mitigation and Prevention, Senior Adviser of the Department of Public Works, Town and Country Planning, Ministry of Interior; and a Senior Remote Sensing Specialist of UNESCAP.

6.3.6 *Activities of other regional and international organizations*

United Nations International Strategy for Disaster Reduction (ISDR)

6.3.6.1 The observer from ISDR provided the basic information on its activities. The mission of ISDR is to take initiatives to promote global partnerships for disaster resilient communities through three main activities, namely, coordination, advocacy, and information management.

6.3.6.2 Based on the experience of the establishment of National Committees for International Decade for Natural Disaster Reduction (IDNDR), the Panel expressed the need of mobilizing political commitment on possible establishment of a national platform for disaster reduction. The ISDR observer replied that there is need to re-identify or strengthen the existing bodies because some of the national committees became idle or stopped functioning. It was also noted that new nations which became independent within a decade

may not have designated a national committee. The Panel expected a new national platform would focus on disaster risk management.

6.3.6.3 The ISDR observer made an announcement on World Conference on Disaster Reduction (WCDR) to be held in Kobe, Hyogo, Japan during 18-22 January 2005. Background information, objectives, expected outcomes, format, and prepared process for the Conference were introduced to the Panel. In particular, early warning issue was stressed because the subject is most closely related to the Panel activities. It is expected that the Panel would provide value-added information on review activities since the World Conference on Natural Disaster Reduction held in Yokohama, Japan in 1994. It should include achievements, shortcomings, and recommendations. Such outputs from the Panel are expected to be coordinated with other regional activities. The Panel felt the need for high-level participation from countries for effective implementation of outcomes of WCDR.

Asian Disaster Reduction Centre (ADRC)

6.3.6.4 The Asian Disaster Reduction Center (ADRC), established in 1998 in Kobe, Japan, is a regional organization for multilateral cooperation composed of 24 member countries, five advisor countries and one observer. It promotes disaster reduction activities in Asia, in cooperation with its Member countries and partner organizations, with a view to ensure sustainable development of the region.

6.3.6.5 The mandate of the Panel is relevant to ADRC's activities. Therefore, ADRC has been cooperating and will continue to cooperate with the Panel in its activities. Some of the areas of cooperation with the Panel suggested during the 31st session are as follows:

- 1) It was proposed that ADRC discuss with the Technical Support Unit (TSU), in consultation with WMO and UNESCAP, to develop an additional Web site for the Panel, complementing the existing website developed by TSU (www.tsuptc.org). It would be useful to include hydrological information and information regarding disaster reduction of the Panel Members.
- 2) The ADRC visiting researcher programme has been developed to assist its member countries in their efforts to enhance the capacity of personnel involved in disaster reduction. Panel Members who are ADRC member countries are encouraged to apply for the programme through the ADRC counterpart organizations.

6.4 Training (agenda item 6.4)

6.4.1 The Panel reviewed the involvement of its Members in the various education and training activities supported under UNDP, WMO Voluntary Cooperation Programme (VCP), regular budget and TCDC arrangements.

6.4.2 The Panel noted that since its last session, the Panel had benefited from WMO's education and training activities, relating to the award of fellowships, relevant training courses, workshops, seminars, the preparation of training publications, and the provision of advice and assistance to Members. The Panel expressed appreciation for the number of training events and workshops, which were organized in 2003 for the benefit of its Members.

6.4.3 The Panel noted that WMO fellowships for long-term and short-term training continued to be granted to the Member countries of the Committee under the various WMO programmes.

6.4.4 The Panel expressed appreciation to Panel's Member countries, which offered their national training facilities to other Members under bilateral arrangements. These cooperative efforts by the Panel Members have been found by the recipient countries to be very useful, and the Panel strongly recommended that such endeavours should continue in

the future and be strengthened. The Panel urged its Members to make maximum use of such training facilities.

6.4.5 The Panel noted with satisfaction the information on the activities of the Training Library and the use made of its services. It also appreciated the continuous updating of the Virtual Training Library (VTL) in an effort to provide the latest and most suitable available training material through Internet and recommended that those actions should be encouraged and continued.

6.4.6 The Panel was pleased to note that India would make arrangements for the first attachment of tropical cyclone forecasters from the Panel Members at the RSMC New Delhi in October 2005.

6.4.7 The Panel was also pleased that two WMO-sponsored operational tropical cyclone forecasters would be invited to attend the 2005 Miami Hurricane Workshop (see paragraph 9.8 (ii)). The representative of Oman requested WMO to allocate an additional seat at the above Workshop for a tropical cyclone forecaster from Oman with financial assistance from his Government.

6.4.8 In view of the successful China Roving Study Tour for the Panel Members including TSU several years ago, the observer from CMA was invited to convey a request for a second Roving Study Tour for the Panel Members and TSU in 2005 or 2006 to his Administrator.

6.4.9 The Panel was informed that Oman successfully hosted the First EUMETSAT Satellite Applications Course For the Middle East (ESAC-ME-1) training course which was held in Muscat from 21 to 25 February 2004. It was organized by EUMETSAT and WMO. The course was attended by about thirty participants from thirteen countries from the Middle East the first-ever training session in the Middle East for the new Meteosat Second Generation (MSG-1) satellite. EUMETSAT, the European Organization for the Exploitation of Meteorological Satellites, is sponsoring the five-day session to inform users how to best exploit data from the MSG-1 satellite, which was declared operational in January 2004.

6.4.9 Oman was very grateful to EUMETSAT for recognizing the training needs for the countries in western RA II under the footprint of EUMETSAT satellite. Therefore, after the successful launch of this training course, Oman hopes that EUMETSAT will continue to sponsor the above mentioned training on a periodical basis similar to what is being done in Africa, and also to invite more countries in the western RA II including the Panel Members of Bangladesh, Maldives, Pakistan and Sri Lanka.

6.4.11 A summary report on the 2003 training activities and future plan of Members is given in **Appendix XI**.

6.5 Research (agenda item 6.5)

6.5.1 The Panel recalled that the Fifth WMO International Workshop on Tropical Cyclones (IWTC-V) was successfully held in Cairns, Australia from 3 to 12 December 2002 and that the Panel was represented by the following at the workshop:

Mr Samarendra Karmakar (Bangladesh)
Dr Akhilesh Gupta (India)
Mr S.R. Kalsi (India)
Dr Qamar-uz-Zaman Chaudhry (Pakistan) (IC member)
Mr Ethige Sunil Silva (Sri Lanka)
Mr Kriengkrai Khovadhana (Thailand).

6.5.2 The Panel was informed that the final report of IWTC-V had been published and distributed to all concerned.

6.5.3 The Panel was informed that IWTC–VI would be scheduled to be held in Costa Rica in late 2006 and an International Committee (IC) for the IWTC–VI has been established. It was invited to nominate a regional representative from the Bay of Bengal and the Arabian Sea region as an IC member. The Panel decided to nominate Director of the RSMC New Delhi to serve as an IC member.

6.5.4 A summary report on the 2003 research activities and the future research activities is given in **Appendix XII**.

6.6 Publications (agenda item 6.6)

6.6.1 Publications issued under the programmes of the Panel fall into two categories (a) Panel News, and (b) the Annual Review of the Tropical Cyclones affecting the Bay of Bengal and the Arabian Sea. Information on the current status of each is presented below:

(a) Panel News

Panel News No.18 was published by TSU in March 2003.

Panel News No.19 was published by TSU in November 2003.

(b) Annual Review

The Panel on Tropical Cyclones Annual Review (PTCAR) for the year 2001 which was consolidated and finalized by the Chief Editor, Dr R.R. Kelkar (India) with contributions from the National Editors was published by WMO in 2003. In this regard, the Panel expressed its appreciation to the Chief Editor and the National Editors of the Review.

6.6.2 Mr S.R. Kalsi (India) has been nominated as the Chief Editor in place of Dr R.R. Kelkar. The Panel requested the Members to update the list of national editors of the Annual Review.

6.6.3 The Chief Editor has submitted the PTCAR for the year 2002 to be published by WMO shortly.

6.7 Storm surge project (agenda item 6.7)

6.7.1 The Panel discussed at length the project “storm-surge disaster reduction in the northern part of the Indian Ocean”, which had been revised by the Panel at its twenty-sixth session in 1998.

6.7.2 Noting with concern the very slow progress in the implementation of the above project proposal, the Panel again urged the Members of Bangladesh, Maldives, Myanmar and Thailand to obtain approval of their respective Government and to submit their national approval to WMO while India, Pakistan and Sri Lanka had already obtained a clearance from the Government.

6.7.3 The Panel was pleased that Permanent Representative of Pakistan with WMO, Dr Chaudhry, kindly offered to provide to the above Members with his assistance, upon request.

6.7.4 The Panel decided that the Coordinator of TSU, Dr Chaudhry, would serve as the focal point of the project proposal.

6.7.5 The Panel requested the Secretary-General of WMO to make efforts to assist in the implementation of the project.

7. REVIEW OF THE TROPICAL CYCLONE OPERATIONAL PLAN (Agenda item 7)

7.1 The basic purpose of the operational plan is to facilitate the most effective tropical cyclone warning system for the region with existing facilities. In doing so the plan defines the sharing of responsibilities among Panel countries for the various segments of the system and records the coordination and cooperation achieved. The plan records the agreed arrangements for standardization of operational procedures, efficient exchange of various data related to tropical cyclone warnings, archival of data and issue of a tropical weather outlook for the benefit of the region, from a central location having the required facilities for this purpose, that is RSMC-tropical cyclones New Delhi, as agreed upon by the Panel.

7.2 The operational plan contains an explicit formulation of the procedures adopted in the Bay of Bengal and the Arabian Sea region for the preparation, distribution and exchange of information and warnings pertaining to tropical cyclones. Experience has shown that it is a great advantage to have an explicit statement of the regional procedures to be followed in the event of a cyclone and this document is designed to serve as a valuable source of information to be readily available for reference by the forecaster and other users, particularly under operational conditions.

7.3 The Panel noted that a lot of changes have to be incorporated to the text of the Plan (2003 Edition). Mr S.K. Subramanian (India) kindly offered to serve as a focal point for the editorial changes or minor amendments necessary with a view to issuing an updated 2004 Edition of the Operational Plan as early as possible. To this effect, the Panel urged the Members to communicate their amendments to the focal point by 20 March 2004.

7.4 The Panel invited WMO to issue the year 2004 Edition as soon as possible.

8. Technical Support Unit (Agenda item 8)

8.1 The Panel expressed its gratitude to the Government of Pakistan for hosting the TSU and appreciated the services being rendered by Dr Qamar-uz-Zaman Chaudhry, Director-General of Pakistan Meteorological Department (PMD) in his capacity as the Coordinator and Mr Umar Hayat Ghalib as the TSU Meteorologist.

8.2 The Panel was briefed by the TSU Meteorologist on the activities of TSU during the past year. The Panel expressed its satisfaction with the work of the TSU.

8.3 TSU informed the session that it circulated to the Members in October 2003 an abridged copy of the action sheet on the decisions and recommendations of the thirtieth session of the Panel which was circulated by WMO in May 2003.

8.4 The Panel was informed that Panel News correspondents of the Members had been notified and reminded through their respective Permanent Representatives to send their contributions for the 20th issue by 31 March 2004.

8.5 The Panel recalled that TSU had ultimately succeeded in contacting Mr Smith Tumsaroch, Chairman, Board of Governors of Smith Tumsaroch Fund (STF) during January 2003 regarding approval of the guidelines for its operation and award. However, since there was poor response from the Chairman of the Board of Governors, the Panel decided to close the issue.

8.6 TSU provided the Panel with a detailed breakdown of its expenses incurred by the TSU during the Inter-sessional period (see **Appendix XIII**).

9. SUPPORT FOR THE PANEL'S PROGRAMME (Agenda item 9)

9.1 The Panel was briefed on the activities of the WMO's Technical Cooperation Programme (TCO). The Panel expressed its appreciation to the WMO Secretariat for its continued support to its Members by providing support through VCP and implementing

projects. It urged its Members to increase their support and give priority to the WMO/VCP and Technical Cooperation Among Developing Countries (TCDC).

9.2 The Panel was pleased to note with appreciation the continued activities implemented by the various Panel Members under the TCDC.

9.3 The Panel Members were encouraged to use the Strategic Plan for the Enhancement of National Meteorological Services (NMSs) in Regional Association II (Asia) for the period 2001-2004 for the development of assistance programmes and projects. The Panel was informed of some activities undertaken by WMO within the framework of the Strategic Plan.

9.4 The Panel encouraged its Members to approach the various national economic sectors in the effort to mobilize resources for the Panel's activities.

9.5 The Panel noted with appreciation that WMO and UNESCAP would continue to undertake activities in support of the Panel on Tropical Cyclones.

Panel on Tropical Cyclones Trust Fund (PTCTF)

9.6 The establishment of the Panel on Tropical Cyclones Trust Fund (PTCTF) indicated a step towards achieving self-reliance of the Panel. At the moment, the Fund is being used for provision of institutional support. It would be expected to play an important part in the Panel's programmes such as funding support to representatives of Panel Members attending training events and conferences.

9.7 Members were urged to continue to enhance their contributions to the Trust Fund as a substantial support for the Panel's activities.

9.8 The Panel endorsed the use of the Trust Fund for the following specific purposes from 7 March 2004 to 6 March 2005:

- (i) Operating costs of the TSU, including the printing of the Panel News, running cost of its Web site and monthly honorarium for the TSU Meteorologist (US\$ 4,000);
- (ii) Supplemental support for the attendance of two (2) tropical cyclone forecasters, at a two-week RA IV Training Workshop on Hurricane Forecasting and Warning to be held at RSMC Miami – Hurricane Center, tentatively April 2005 (US\$ 3,000);
- (iii) Support for attendance of one (1) representative of the Panel at the World Conference on Disaster Reduction (Kobe, Hyogo, Japan, 18 to 22 January 2005) (US\$ 2,500).

(Total: US\$ 9,500)

- (iv) Any other emergency expenditure that can be justified for the use of the PTCTF requires the concurrence of both the TSU Coordinator and the Panel on Tropical Cyclones Chairman.

9.9 A detailed financial report on the Trust Fund for the balance of the fund as at 31 December 2003 was submitted to the Thirty-first session of the Panel (see **Appendix XIV**).

10. TECHNICAL DISCUSSIONS (Agenda item 10)

10.1 A one-day technical conference on ***“Improved Cyclone-related Forecasting Services and Disaster Combating Strategies”*** was held in conjunction with the thirty-first session of the Panel. The programme of the technical conference is given in **Appendix XV**.

10.2 The Panel expressed its deep appreciation to the lecturers/presenters for their informative and scientific presentations. Some of the conclusions and recommendations were incorporated within this report under their related agenda items.

10.3 The Panel emphasized the importance of the Technical Conference as a forum for exchange of information related to advancement of work under the various components of the Panel and related experiences. It highlighted the need to focus on specific subjects, such as cyclone track prediction, storm surge prediction and experiences in interaction with the media.

10.4 With respect to possible participation in the World Conference on Disaster Reduction (WCDR) in Kobe in 2005, the Panel suggested to highlight the regional experiences on the implementation of the DPP components and the importance to mobilize commitment of all key stakeholders, especially the political, technical and financing parties, to the implementation mechanism on DPP. In this connection, the Panel identified the opportunity to link this subject to the ongoing efforts of ISDR regarding the platform on early warnings. The Panel also discussed the need to ensure substantial achievements on capacity building and suggested to identify clear priority of the training focus so as to facilitate mobilization of support to the work of the Panel at the WCDR. The Panel urged ISDR Secretariat to assist in mobilizing financial resources to enable the Panel to prepare relevant documents for the WCDR, especially the one on the platform for early warning and that on storm surge.

10.5 The Panel also took note of various proposals on capacity building of the Panel, including the need to organize study visits to learn from other Members on various aspects of cyclone-related disaster management. It identified the need to have an appropriate

mechanism to monitor progress of work in these priority areas. The Panel requested the Working Group on Coordinated Technical Plan to incorporate these recommendations in the new Plan.

10.6 The Panel decided to organize a similar technical conference during the next session and requested the Chairman of the Panel in consultation with the Members to select a suitable theme for the conference.

11. DATE AND PLACE OF THE THIRTY-SECOND SESSION (Agenda item 11)

11.1 The representatives of Bangladesh and India informed the Panel that their respective Government would be willing to host the thirty-second session in early 2005.

11.2 The Panel expressed its thanks and deep appreciation to the Government of Bangladesh and India for their kind invitation to host the Panel's session in 2005.

11.3 In view of an existing rotation basis in the Panel, it decided that India and Bangladesh would host its thirty-second session in 2005 and thirty-third session in 2006, respectively.

11.4 The exact dates and venue would be determined based on consultation between WMO, UNESCAP, India, Chairman of the Panel and TSU. WMO was invited to prepare the provisional agenda and documentation plan for the thirty-second session, in consultation with UNESCAP and TSU.

12. ADOPTION OF THE REPORT (Agenda item 12)

The report of the thirty-first session was adopted at 1050 hours on 6 March 2004.

13. CLOSURE OF THE SESSION

13.1 The Panel expressed its sincere appreciation to the Government of Sri Lanka, the host country, for providing excellent facilities, the venue, other arrangements and its warm hospitality for this year's session. The Panel also expressed its deep appreciation to Mr N.A. Amaradasa, the Chairman and Mr S.K. Subramanian, Vice Chairman of the Panel as well as Mr A.H.M. Al-Harthy, drafting committee Chairman, for their successful conduct of the session. The Panel wished to express its gratitude to Mr Lalith Chandrapala and his able staff for their hard work in producing a session report, which is definitely of high quality.

13.2 The Panel expressed its gratitude to Sri Lanka Department of Meteorology for arranging the visit to Ahungalle.

13.3 The thirty-first session of the Panel was concluded on 6 March 2004 at 1130 hours.

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APPENDIX I

LIST OF PARTICIPANTS

Members of Panel on Tropical Cyclones

BANGLADESH

Mr S. Karmakar

Deputy Director
Storm Warning Centre
Bangladesh Meteorological Department
Agargaon
Dhaka-1207
Bangladesh

Tel: 88 02 9114388
Fax: 88 02 8118230
E-mail: bmdswc@bdonline.com

INDIA

Mr S.K. Subramanian

Deputy Director General (Cyclone Warning)
India Meteorological Department
Lodi Road
New Delhi - 110003
India

Tel: 91 11 24611068
Fax: 91 11 24643128
E-mail: sksubra2002@yahoo.co.in

Mr V.P. Pasrija

Assistant Director (NDM)
National Disaster Management Division
Ministry of Home Affairs, Government of India
North Block
New Delhi 11001

Tel: 91 11 23094612
Fax: 91 11 23094612
E-mail: addm@mha.nic.in

MALDIVES

Mr Abdulla Algeen

Deputy Director
Department of Meteorology
Male 20-05
Maldives

Tel: 960 325766
Fax: 960 320021
E-mail: algeen@meteorology.gov.mv

APPENDIX I, p. 2

Mr Ali Shareef

Senior Meteorological Forecaster
Department of Meteorology
Male 20-05
Maldives

Tel: 960 323084
Fax: 960 315509
E-mail: shareef@meteorology.gov.mv

OMAN

Mr A.H.M. Al Harthy

Acting Director of Meteorology
P.O. Box 1, Code 111
Seeb International Airport
Muscat
Oman

Tel: 968 519360
Fax: 968 519363
E-mail: a.alharthy@met.gov.om

Mr B. Ali Badar Al Rumhi

Seeb International Airport
P.O. Box 1, Code 111
Muscat
Sultanate of Oman

Tel: 968 519610
Fax: 968 519363
E-mail: b.alrumhi@met.gov.om

Mr Khalid Ahmed Al Najar

Salalah International Airport
P.O. Box 1, Code 111
Muscat
Sultanate of Oman

Tel: 968 204185
Fax: 968 204205
E-mail: k.alnajar@met.gov.om

Pakistan

Dr Qamar-uz-Zaman Chaudhry

Director-General
Pakistan Meteorological Department
Sector H-8/2, P.O. Box 1214
Islamabad
Pakistan

Tel: 92 5192 57314
Fax: 92 5144 32588
E-mail: DGMETPAK@hotmail.com

SRI LANKA

Mr N.A. Amaradasa

Director-General
Department of Meteorology
Buddhaloka Mawatha
Colombo 7.
Sri Lanka

Tel: 94 112 694104
Fax: 94 11 2698311
E-mail: meteo1@sltnet.lk

Mr G.H.P. Dharmaratna

Deputy Director
Department of Meteorology
Buddhaloka Mawatha
Colombo 7.
Sri Lanka

Tel: 94 112 686499
Fax: 94 112 698311
E-mail: gdharmaratna@yahoo.com

Mr P.M. Jayatilaka Banda

Deputy Director
Department of Meteorology
Buddhaloka Mawatha
Colombo 7.
Sri Lanka

Tel: 94 112 692756
Fax: 94 112 698311
E-mail: jayatilakamet@hotmail.com

Mr K.R. Abhayasinghe Bandara

Deputy Director
Department of Meteorology
Buddhaloka Mawatha
Colombo 7.
Sri Lanka

Tel: 94 112 682041
Fax: 94 112 698311
E-mail: krabey@yahoo.com

Mr G.B. Samarasinghe

Deputy Director
Department of Meteorology
Buddhaloka Mawatha
Colombo 7.
Sri Lanka

Tel: 94 112 691443
Fax: 94 112 691443
E-mail: sbaladev@hotmail.com

THAILAND

Mr Anant Thensathit

Director General
Thai Meteorological Department
4353, Sukumvit Road,
Bangkok
Thailand

Tel: 662 399 1425
Fax: 662 399 1426
E-mail: anant@metnet.tmd.go.th

Mrs Muntana Brikshavana

Thai Meteorological Department
4353, Sukumvit Road,
Bangkok
Thailand

Tel: 662 3 989868
Fax: 662 3 991201
E-mail: muntana@tmd.go.th

Mr Thaikruawan Sampan

Thai Meteorological Department
4353, Sukumvit Road,
Bangkok
Thailand

Tel: 662 399 2354
Fax: 662 399 4020
E-mail: tmd_inter@tmd.go.th

Mr Pichaid Varoonchotikul

The Royal Irrigation Department
Samsen Road
Bangkok
Thailand

Tel: 662 2410953
Fax:
E-mail: PICHAIDV@yahoo.com

OBSERVERS

CHINA

Mr Xu Yinglong

National Meteorological Centre
China Meteorological Administration
No. 46, Zhong Guan Cun
NanDajie, Beijing
China (100081)

Tel: 86 10 6840 6514
Fax: 86 10 6217 2909
E-mail: xuyinong@sohu.com

SAUDI ARABIA

Mr Shaher A Al Hazmi

Presidency of Meteorology and Environment
P.O. Box 1358, Jeddah 21431
Kingdom of Saudi Arabia

Tel: 966 2653 2197
Fax: 966 2653 0197
E-mail: s_alhazmi01@hotmail.com

SRI LANKA

Mr E.S.Silva

Meteorologist in Charge
Meteorological Office
Bandaranaike International Airport
Katunayake
Sri Lanka

Tel: 94112 252721
Fax: 94112 252721
E-mail: Ethige8@hotmail.com

Mr S.H. Kariyawasam

Meteorologist in Charge
National Meteorological Centre
Department of Meteorology
Buddhaloka Mawatha
Colombo 7.
Sri Lanka

Tel: 94112 684746
Fax: 94112 691443
E-mail: kariyawasam_sunil@hotmail.com

APPENDIX I, p. 6

Lt. Col. A.L.D.M. Gunasekera

Army Head Quarters
Colombo 3
Sri Lanka

Tel: 94112 436615
Fax: 9411 2432862
E-mail: Lal_gunasekara@yahoo.com

Mr A.H. Jayaweera

Director/Field Services
National Water Resources Authority (Interim), 127,
BMICH
Colombo 7
Sri Lanka

Tel: 94 112 669132
Fax: 94 112 4718259
E-mail: ahjawa@sltnet.lk

Mr R.M.S. Bandara

Head, Landslide Studies and Services Division
National Building Research Organization
99/1, Jawatte Road
Colombo 5.
Sri Lanka

Tel: 9411 2588946
Fax: 94 11 2502611
E-mail: nbro@sltnet.lk

Mr L.A.S. Fernando

Deputy General Manager
Ceylon Electricity Board
Kent Road
Dematagoda
Colombo
Sri Lanka

Tel: 94 112 693675
E-mail: tgscm@slt.lk

Mr K.G. Kumarasiri

Deputy Inspector General of Police
101, Kew Road
Colombo 2
Sri Lanka

Tel: 94 112 441196
Fax: 94 11 2441411
E-mail : kumgamage@hotmail.com

APPENDIX I, p. 7

Mr A.L.M. Cassim

Chief Irrigation Engineer
Hydrology Division
Irrigation Department
P.O.Box 1138
Colombo 7
Sri Lanka

Tel: 94 112 500267
Fax: 94 112 581636
E-mail : aliyarcassim@yahoo.com

Wing Cmdr. W.L.R.P. Rodrigo

Chief Fire Officer
P.O.Box 594
Sri Lanka AirForce Head Quarters
Colombo 2.
Sri Lanka

Tel: 94 112 441044 Ext. 22247
Fax: 94 112 343969
E-mail: leonardrodrigo2002@yahoo.com

Mr M.M. Perera

Director/Disaster Management
Sri Lanka Red Cross Society
307 ½, T.B. Jayah Mawatha
Colombo 2
Sri Lanka

Tel: 94 112 691098
Fax: 94 112 695434
E-mail: strcs@srilanka.net

Commander A.A.P. Liyanage

Command Operations Officer (West)
SLNS Rangalla
Port of Colombo
Colombo
Sri Lanka

Tel: 94 112 433498
Fax: 94 11 2 333378
E-mail: Princely62@yahoo.com

Mr G.J.K. Gunawardena

Assistant Director
National Disaster Management Centre
Ministry of Social Welfare
Sethsiripaya
Battaramulla

Tel: 94 112 888054
Fax: 9411 2861145
E-mail: Janakagunawardana@yahoo.com

ASIAN DISASTER REDUCTION CENTER

Ms Etsuko Tsunozaki

Senior Researcher
Asian Disaster Reduction Center
1-5-2-5F, Wakinohamakaigan-dori
Chuo-ku, Kobe 651-0073 Japan

Tel: 81 78 262 5540
Fax: 8178 262 5546
E-mail: tsunozaki@adrc.or.jp

INTERNATIONAL CIVIL AVIATION ORGANIZATION (ICAO)

Mr Dimitar H. Ivanov

Regional Officer/Aeronautical Meteorology
ICAO Asia/Pacific Office
Bangkok
Thailand

Tel: 662 537 8189 ext 153
Fax: 662 5378199
E-mail: divanov@bangkok.icao.int

INDIAN INSTITUTE OF TECHNOLOGY

Prof. S.K. Dube

Director
Indian Institute Technology
Kharagpur 721302
India

Tel: 91 3222 282002
Fax: 91 3222 255239
E-mail: skdube@iitkgp.ernet.in

UN INTERNATIONAL STRATEGY FOR DISASTER REDUCTION

Dr Yuichi Ono

UN-ISDR
Palais des Nations
CH-1211 Geneva 10
Switzerland

Tel: 41 0 22 917 2794
Fax: 41 022 917 0563
E-mail: onoy@un.org

SECRETARIAT

WORLD METEOROLOGICAL ORGANIZATION (WMO)

Mr Katsuhiko Abe

7 bis, Avenue de La Paix
Case Postale 2300
CH-1211
Geneva 2
Switzerland

Tel: 41 22 7308543
Fax: 41 22 7308128
E-mail: kabe@wmo.int

UNITED NATIONS ECONOMIC AND SOCIAL COMMISSION FOR ASIA AND THE PACIFIC (UNESCAP)

Mr Le Huu Ti

Economic Affairs Officer
Rm 506, UN Building
Rajdamnern Avenue, Bangkok 10200
Thailand

Tel: 66 2 288 1450
Fax: 66 2 288 1059
E-mail: ti.unescap@un.org

TECHNICAL SUPPORT UNIT (TSU)

Dr Qamar-uz-Zaman Chaudhry

Coordinator TSU
Pakistan Meteorological Department
Sector H-8/2
Islamabad
Pakistan

Tel: 92 5192 57314
Fax: 92 5144 32588
E-mail: qamarc@hotmail.com

Mr U.H. Ghalib

Senior Meteorologist (TSU)
Pakistan Meteorological Department
Headquarters Office
Sector H-8/2
Islamabad
Pakistan

Tel: 92 5192 57314
Fax: 92 5144 32588
E-mail: tsupmd@hotmail.com

APPENDIX II

AGENDA

1. ORGANIZATION OF THE SESSION
 - 1.1 Opening of the session
 - 1.2 Election of the Chairman and Vice-Chairman
 - 1.3 Working arrangements
 2. ADOPTION OF THE AGENDA
 3. FOLLOW-UP ACTION ON PTC-30
 4. REVIEW OF THE 2003 CYCLONE SEASON
 5. COORDINATION WITH OTHER ACTIVITIES OF THE WMO TROPICAL CYCLONE PROGRAMME
 6. REVIEW OF THE COORDINATED TECHNICAL PLAN AND CONSIDERATION OF THE WORK PROGRAMME FOR THE NEXT FIVE YEARS
 - 6.1 Meteorological component
 - 6.2 Hydrological component
 - 6.3 Disaster prevention and preparedness component
 - 6.4 Training
 - 6.5 Research
 - 6.6 Publications
 - 6.7 Storm surge project
 7. REVIEW OF THE TROPICAL CYCLONE OPERATIONAL PLAN
 8. TECHNICAL SUPPORT UNIT
 9. SUPPORT FOR THE PANEL'S PROGRAMME
 10. TECHNICAL CONFERENCE
 11. DATE AND PLACE OF THE THIRTY-SECOND SESSION
 12. ADOPTION OF THE REPORT
 13. CLOSURE OF THE SESSION
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APPENDIX III

THE 2003 CYCLONE SEASON SUMMARY

Bangladesh

One pre-monsoon cyclonic storm (10-19 May, 2003) formed in the Bay of Bengal, which crossed Myanmar coast south of Akiyab. One post-monsoon severe cyclonic storm (12-16 December 2003) crossed Andhra coast between Ongole and Machilipatnam. Two monsoon depressions formed over the Bay of Bengal one of which (June 21-22, 2003) moved over Bangladesh and caused heavy rainfall all over the country. The other one (25-26 July, 2003) crossed West Bengal - Orissa coast near Baleshwar, which yielded heavy, to very heavy rain over Bangladesh. Besides, one depression (06-07 October 2003) and one deep depression (27-28 October 2003) formed in the Bay of Bengal.

Maldives

Combined effect of a trough of low-pressure and a low level circulation, Maldives experienced extremely hazardous weather during mid November. Heavy downpours were reported from several islands belong to central Maldives. Heavy rain was distributed in the following manner on 15 November. Apart from heavy rain, thunderstorms with different intensity were also continued for nearly 3 hours over Hanimaadhoo Island in the north. Floods, damage to properties and household items were reported from the affected atolls.

Oman

No cyclones were observed in the Arabian Sea during the cyclone season of 2003. However, there were a series of weak depressions occurred over the Arabian Sea during the month of July and early August which affected Oman.

Pakistan

No tropical cyclone activity was observed in Met area IX Comprising Arabian Sea north of 20°N, Gulf of Oman and the Persian Gulf.

A Western disturbance over SE Iran with its trough extending to west Balochistan was located on 14th February which persisted there for two days and intensified after picking moisture from Persian Gulf and the Gulf of Oman. It was the wettest spell during the last three decades. New records in terms of precipitation amount, intensity and duration were formed at a number of stations from 16th to 20th February. Because of heavy rains in the catchments of the rivers, in flow at Mangla Dam rose from 6500 cusecs on 17th February to 315568 cusecs on 18th February raising the dam level from 1040 ft to 1096 ft in just two days. Similarly, at Tarbele Dam, water level rose from 1376 ft on 17th to 1389 ft on 26th February.

This year, the main brunt of the monsoon spells, resulting from strong monsoon incursions, was borne by the Sindh and Balochistan provinces. Two spells of moderate to heavy rain hit this area on 8th and 17th July. Monsoon activity reached its climax on 25th July and persisted for 3 days.

Sri Lanka

Sri Lanka was fortunate in 2003 not to be affected directly by any cyclonic storms. However, due to the indirect influence of the cyclone TC01B, extremely heavy rain in southern Sri Lanka associated with the onset of the Southwest Monsoon caused severe flooding in

the district of Ratnapura, Kalutara, Galle, Matara and Hambantota during the third week of May 2003. Severe flooding, at places over 20 feet high, inundated large areas completely devastating agriculture, house and property and causing immense strain on the economy of Sri Lanka. Intensity of rain, reaching 130mm hour⁻¹ at times, caused many of the slope areas already identified as vulnerable to earth-slips in these districts and near by, to give away in massive landslides burying a number of houses together with their occupants. The total number of deaths was estimated at 235 while 17 people were reported missing. Most deaths have been reported from the hilly district of Ratnapura (122) while 64 deaths have been reported from Matara district. A total of 9,235 houses were completely destroyed and 24,003 houses partially damaged due to floods/landslides affecting a total of 13,7221 families,

As noted earlier, the havoc caused by heavy rain on 17th May 2003 was due to the indirect influence of the cyclonic storm (TC01B) located in the Central Bay of Bengal and the orographic effect of the Sabaragamuwa hills. The initial developing stage of the cyclone was identified on the 7th March in the SE Bay of Bengal about 900 km east of Pottuvil as a tropical disturbance. The disturbance gradually developed while moving in a WNWly direction. On the 11th it developed into a cyclonic storm and started moving in a more northerly direction. Thereafter, the storm became practically stationery for a few days and suddenly intensified in to a severe storm on the 16th and started moving in an easterly direction. With this sudden intensification of the storm, a southwesterly feeder band covering the entire island of Sri Lanka was formed on the 17th. Due to severe convergence within this feeder band and the orographic influence of the Sabaragamuwa hills, heaviest rainfalls were confined to a relatively small area over the southern slopes of Sabaragamuwa hills. The highest rainfall reported was 730 mm at Willie Group, Deniyaya. Number of places experienced falls over 500 mm. Since the heavier falls were concentrated over an area where rivers and streams originate, downstream areas of these water paths too were inundated.

The onset of the southwest monsoon 2003 was took place on 13th May approximately two weeks ahead of schedule due to the influence of the cyclonic storm TC01B. The rainfall during the Southwest monsoon season (May to September) was about average, while the rainfalls were below average over many parts during May, June and August. Convective evening thundershowers during the 1st Intermonsoon period (March/April) was widespread and ten (10) deaths have been reported due to lightning strikes. The actual number of deaths could have been more with some deaths not reported in the media.

Thailand

There were 2 tropical cyclones that had taken place and passed Thailand in 2003. The 1st one was a tropical storm named "KONI" (0308) and the other was a tropical depression (TD 23W). The brief description about both phenomena is shown below :

1.1 Tropical storm "KONI" (0308)

A low pressure cell over the western part of the North Pacific Ocean (east of the Philippines) had intensified into a tropical depression in the morning of 16th July. It had, at first, moved northwestward to traverse the Philippines on 17th July before it moved westward to the South China Sea in the following morning. On the same day, it developed into the tropical storm "KONI" with the center located in latitude 12.3 degree North and longitude 119.1 degree East. "KONI" had moved further to the Bay of Tonkin before it went ashore in the upper part of Vietnam and weakened into a tropical

depression over Laos PDR (about 300 km east of Chiang Rai Province, Thailand) at 01:00 a.m. on 23rd July. While moving further in the same direction, it entered Thailand over Chiang Rai Province and weakened into a low pressure cell before moving further inland to Myanmar and finally dissipated in the morning of the same day.

While “KONI” was situated near the Bay of Tonkin, the typhoon “IMBUDO” was also spotted in the South China Sea. Such situation increased the power of the southwest monsoon and induced its domination over the weather in Thailand. Due to combined effect of “KONI” and the active southwest monsoon, scattered to almost widespread rain with several heavy and very heavy rainfalls as well as floods were reported in upper Thailand during 20th – 25th July.

1.2 Tropical Depression (TD 23W)

An active low pressure cell in the Gulf of Thailand intensified into the tropical depression (TD 23W) in the evening of 22nd October with the center situated in latitude 10.2 degree North and longitude 101.0 degree East. It had been almost stationary at the beginning before taking on a more northerly direction on the following day. In the evening of 24th October, it landed on an area between Kui Buri District and Sam Roi Yod Sub-district, in Prachuap Khiri Khan Province (in the Southern Region of Thailand) before moving further to Myanmar, the Andaman Sea, and the Bay of Bengal, respectively, on the next day.

Heavy and very heavy rainfalls associated with this tropical depression caused serious flash floods, especially in Phetchaburi and Prachuap Khiri Khan Provinces. The economic loss was estimated to be more than 1 billion baht.

APPENDIX IV

INPUTS FOR A NEW TECHNICAL COOPERATION PLAN

1. METEOROLOGY

Broad Goal. What are expected broad goals of cooperation?

- (1) To exchange data, tropical cyclone forecast, reduce loss of lives and properties, develop skill, educate personnel, etc.
- (2) To establish an efficient observational network, to generate data for use as inputs in numerical models relating to tropical cyclones (intensity/track) and storm surge prediction models
- (3) To provide best accurate forecasts including enhanced roles of RSMC
- (4) To support/exchange of technology, software, training, processed products and establish a reliable communication system
- (5) To improve exchange of data, forecasts and warnings, to transfer technology and further strengthen collaboration
- (6) To further strengthen cooperation among Members through exchange of expertise and technologies towards better and accurate forecasts

Specific goals:

1.1 Expected goals in observing systems related to tropical cyclones.

- (1) To modernize the observing systems
- (2) To improve the observing systems, including establishment of additional buoys (40 by 2007), additional DWR stations, AWS and tide gauges
- (3) To improve the system for IDN-IOS disturbances, if possible mesoscale system
- (4) To establish reliable land and sea surface and upper air network including wx-radars
- (5) To launch ocean weather ships and efficient data exchange
- (6) To include satellite observing system for the Area and improve accuracy of the observing system

1.2 Expected goals in communication systems, especially those related to tropical cyclones:

- (1) To enhance speedy communication of data and forecasts on tropical cyclones
- (2) To modernize the communication system, using satellite broadcasting technologies
- (3) To increase the use of Internet/ftp facilities apart from GTS
- (4) To improve reliability of communication system means including Internet and video conference
- (5) To exchange latest information and warning through real-time for tropical cyclones
- (6) To upgrade the communication system to minimize communication errors

1.3 Expected goals in regional support, including services provided by RSMC New Delhi.

- (1) To improve forecasts and develop skilled personnel
- (2) To provide timely warnings and ensure speedy dissemination using NWP products and advanced communication technology
- (3) To timely disseminate real-time data and updates (hourly, 3 hourly and 6 hourly)
- (4) RSMC to be more active in Panel meetings and activities. (It is expected that RSMC Director to attend all Panel Sessions to ensure effective exchange of information and follow-up action)
- (5) To issue advisories at formative stage of cyclones
- (6) To assist Members in receiving INSAT imageries

1.4 Other expected goals in cooperation in meteorology.

- (1) To build up public awareness
- (2) To provide technical support in operational matters to all Members
- (3) To have more synoptic information, including monsoon surge especially in equatorial belt
- (4) RSMC to provide NWP on tropical cyclone tracts to all Members

2. HYDROLOGY

Broad Goal. What are expected broad goals of cooperation in hydrology?

- (1) To improve flood forecasting system with sufficient lead time and to have better storm surge forecasting system
- (2) To efficiently manage river floods by exchange of gauge data among Members
- (3) To provide best and accurate forecasts of storm surge and high waves
- (4) To improve the real-time data collection and flood forecasting system
- (5) To integrate regional observing and warning system and exchange experiences in this field

Specific goals:

2.1 Expected goals for regional cooperation in observing systems, including real-time monitoring of features related to tropical cyclones.

- (1) To increase observing system for storm surge forecasts
- (2) To strengthen real-time monitoring system
- (3) To enhance satellite and sea surface observing system
- (4) To improve the real-time measurement and communication system
- (5) To establish real-time database center for the regional for better rainfall estimation

2.2 Expected goals related flood-related forecasts and warnings, including storm surge and assessments of disaster risks for tropical cyclones.

- (1) To improve flood forecasting system for pilot catchment areas
- (2) To modernize systems for flood forecasts and storm surges for coastal zones
- (3) To enhance timely and frequent notice dissemination by RSMC
- (4) To improve accuracy of forecasts and warning and interaction with forecast users
- (5) To improve forecast accuracy and lead time

2.3 Expected goals in cooperation for better interaction with users.

- (1) To enhance public awareness
- (2) To exchange data and experience for better interaction among the Members
- (3) To enhance public awareness and improve warnings
- (4) To develop flood forecasting models
- (5) To enhance mutual understanding and cooperation among Members on cyclone-related disaster forecasts and warnings

3. DISASTER PREVENTION AND PREPAREDNESS (DPP)

Broad Goal. What are expected broad goals of cooperation in DPP?

- (1) To reduce loss of lives, to train people for enhanced awareness
- (2) To enhance awareness on DPP by organizing training workshops for Panel experts on DPP
- (3) To minimize impacts of cyclone-related disasters
- (4) To exchange national experiences on DPP including study visits
- (5) To improve accuracy and timeliness of warnings and enhanced public preparedness
- (6) To come up with better procedures on DPP

Specific goals:

3.1 Expected goals for regional cooperation in policies and strategies on DPP, especially those related to tropical cyclones.

- (1) To establish forums for regular exchange of national experiences
- (2) To enhance team work among Panel Members on DPP
- (3) To generate NWP TC tracks and support national NWP activities including training
- (4) To promote public awareness programmes
- (5) To set up mechanisms for regular exchange of experiences on DPP

3.2 Expected goals related DPP information exchange.

- (1) To exchange DPP information timely
- (2) To enhance dissemination of warnings and advisories among the Members
- (3) To improve relationship with the media

- (4) To enhance interaction between RSMC and Members as well as among Members on forecast products through improved communication infrastructure and Internet
 - (5) To provide warnings and advisories to public on timely manners
 - (6) To help develop or strengthen national strategies of the Members, if necessary
- 3.3 Expected goals in disaster risk management, especially those related to cyclone-related disaster preparedness.
- (1) To have a better disaster management system
 - (2) To take prompt action and provide immediate support to minimize impacts
 - (3) To exchange information on national DPP strategies and exchange experiences on the implementation of these strategies on a regular basis towards adopting complementary regional strategy on DPP for the Panel
 - (4) To prevent loss of lives on the rough seas and to evacuate people in danger
 - (5) To improve risk management in the region
- 3.4 Other Important Objectives to Consider.
- (1) To improve involvement of stakeholders
 - (2) To enhance participation of RSMC in regional activities on DPP
 - (3) To enhance interaction among DDP-related agencies
 - (4) To provide more opportunities on transfer of know-how and technology

4. TRAINING

Broad Goal. What are expected broad goals of cooperation in training?

- (1) To increase skills of meteorological personnel in forecasting
- (2) To organize training programmes, including workshops with involvement of RSMC regularly
- (3) To increase number of trained personnel
- (4) WMO/ESCAP to enhance support for training
- (5) To improve forecasting techniques for weather and floods
- (6) To increase number of trained officials

Specific goals:

- (1) To exchange scientists among the Members through cooperation programmes such as VCP/TCDC
- (2) To improve understanding of the phenomena and models and to improve interaction with public and agencies
- (3) To train officials dealing with disaster prevention
- (4) To organize annual training courses annually

5. RESEARCH

Broad Goal. What are expected broad goals of cooperation in training?

- (1) To develop better forecasting systems with sufficient lead time
- (2) To promote research on TC intensity and track prediction and development of storm surge models
- (3) To improve understanding of the phenomena
- (4) WMO/ESCAP to sponsor attachment of Panel experts to universities or RSMC
- (5) To improve forecasting methods for floods and strong winds
- (6) To establish standard models for TC forecasts and induced rainfalls

Specific goals:

- (1) To improve application of research results to real situation
- (2) To improve cyclone tracks accurately

APPENDIX V

PROPOSED FRAMEWORK FOR THE NEW COORDINATED TECHNICAL PLAN (2005-09)

1. METEOROLOGY

Broad Goal. To establish an efficient EXPANDED observational network, provide best accurate and timely forecasts and warnings to reduce loss of lives and properties that may be caused by tropical cyclones and associated phenomena. These goals are expected to be achieved through the use of the latest technology, improved exchange of data and development of skills of personnel of the Panel.

Specific objectives

- 1.1 To improve the observing systems related to tropical cyclones.
- 1.2 To improve the communication systems, especially those related to tropical cyclones.
- 1.3 To improve technical support to the Panel, especially the services provided by RSMC New Delhi.
- 1.4 To improve measures to cope with storm surge
- 1.5 To improve regional cooperation in meteorology.

2. HYDROLOGY

Broad Goal. To produce and disseminate accurate and timely forecasts and warnings on floods and other water-related disasters to better support the socio-economic development process. It is expected to achieve these goals through improvement of real-time monitoring, exchange of real-time data and transfer of related technologies.

Specific objectives

- 2.1 To improve regional cooperation in observing systems, including real-time monitoring of floods and other water-related disasters.
- 2.2 To improve flood-related forecasts and warnings, including assessments of disaster risks for tropical cyclones.
- 2.3 To improve regional cooperation for better interaction with users.

3. DISASTER PREVENTION AND PREPAREDNESS

Broad Goal. To improve disaster prevention and preparedness in the region including enhanced public awareness, institutional and legal framework and participation of stakeholders for more effective disaster management. These are expected to be achieved through improvement of standard procedures on DPP and exchange of national and international experiences and information on disaster management.

Specific objectives

- 3.1 To improve regional cooperation in policies and strategies on DPP, especially those related to tropical cyclones.

- 3.2 To strengthen regional cooperation on DPP information exchange and networking.
- 3.3 To improve disaster risk management, especially those related to cyclone-related disaster preparedness.
- 3.4 Other Important Objectives to Consider.

4. TRAINING

Broad Goal. To enhance capacity of all Members through strengthening skills and capability of related personnel in various aspects of cyclone-related disaster management, especially in the number of trained personnel in forecasting techniques. These can be achieved through training programmes including organization of workshops, seminars, training courses, sharing of experiences and exchange of experts.

Specific objectives

5. RESEARCH

Broad Goal. To collaborate on research activities related to updating forecasting technologies, including NWP, storm surge and flood forecasting models.

Specific objectives

APPENDIX VI

REVISED TERMS OF REFERENCE OF THE WORKING GROUP ON THE COORDINATED TECHNICAL PLAN AND WORK PROGRAMME FOR THE NEXT FIVE YEARS 2005-2009

Background

At its 28th session held in Bangkok in March 2001 requested WMO, ESCAP and TSU to arrange for technical discussions during the 29th session in order to enhance further interaction among the national and sub-regional institutions involved in the mitigation of tropical cyclone disasters. In line with this decision, the Panel at its 29th session decided to establish a Working Group to review the coordinated technical plan and work programme for the next five years (2002-2006) in order to enhance regional cooperation in all the five components of the Panel's work programme on tropical cyclones for the Bay of Bengal and the Arabian Sea.

In this connection, the Panel underlined the importance to build on the experience and strategic advantage of cooperation and collaboration within the subregion in dealing with tropical cyclones and the instrumental roles of RSMC and TSU of the Panel in order to achieve the following visions for all Panel Members:

- a. To provide high quality tropical cyclone forecasts and warnings by highly trained professionals using the best technology available to mitigate the effects of tropical cyclone disasters,
- b. To obtain through effective tropical cyclone disaster mitigation and water resource actions maximum humanitarian, social, and economic benefits to achieve sustainable development, and
- c. To derive maximum benefits to provide the high quality forecasts and warnings and effective mitigation actions through combining resources, sharing of meteorological and hydrological data, sharing experiences in disaster prevention and preparedness, and cooperative research and training.

In adopting the above visions, the Panel called on all Members, WMO, ESCAP, TSU, RSMC and cooperating international organizations to assist the Working Group in carrying out the following Terms of Reference.

Terms of Reference

The Working Group on the Plan shall:

In addition to the above vision, the Panel also adopted

In adopting the new framework for the Plan, the Panel recognized the need to coordinate efforts and to assist Members in the implementation of the Plan and therefore decided, at its 31th session, to re-establish the Working Group on The Plan with the following Terms of Reference.

- Review past achievements of the Panel and its strategic role in subregional cooperation in dealing with tropical cyclones so as to propose detailed priority activities along with target completion dates, success criteria and financial

resources requirement for the five components of the Coordinated Technical Plan: Meteorology, Hydrology, Disaster Prevention and Preparedness, Training, and Research.

- Within the context of the above proposed priority activities for the five components of the Plan, review past activities and ongoing projects, including the Storm Surge Project, with the aim to propose five priority programmes to meet the goals of the Panel.
- Coordinate with respective national focal points to identify mechanisms to implement and update the Plan to ensure its feasibility and practicality. If possible, identify potential donors to facilitate the achievements of priority goals.
- Report to the Panel at its 32th session for approval of the Plan.

Membership

Chairman of the Working Group on the Plan will be appointed by the Panel. The Working Group will consist of a small group of senior experts from the Members nominated by its Chairman for appointment by the Panel during each Panel session or by the Panel on Tropical Cyclones Chairman on its behalf.

The term in service of the Working Group is one year subject to extension authorized by the Panel. The current Chairman of the Working Group appointed by the Panel is Mr Ahmed Hamoud Mohamed Al-Harthy (Oman). The other members of the Working Group are as follows:

- Mr Md. Akram Hossain, Bangladesh
- Dr. Onkari Prasad, India
- Mr. Ali Shareef, Maldives
- U Ye Myint, Myanmar
- Mr. Hazrat Mir, Pakistan
- Mr. P. M. Jayatilakabanda, Sri Lanka
- Mr. Sampan Thaikruawan, Thailand

Operation modalities

In view of the limited financial resources of the Panel Trust Fund, the Working Group is expected to communicate through email and other means which require no financial resources from the Trust Fund. All submission for consideration by the Working Group will have to be made through the focal point of each Member. The TSU is requested to transmit all materials related to the Plan to the Working Group Chairman.

Reporting requirements

The Chairman of the Working Group on the Plan is required to submit an annual report to the Panel session for its consideration through the TSU on its activities, findings and recommendations to the Panel session for consideration.

APPENDIX VII

SUMMARY REPORT ON METEOROLOGICAL COMPONENT OF THE MEMBERS

Bangladesh

1. Surface and Upper-air Observation

Bangladesh Meteorological Department maintains a network of 35 Surface Observing Stations, 10 are in GTS connection, 10 Pilot Balloon Observing Stations, 3 Rawinsonde Stations for upper air observation throughout the whole country. Out of 3 Stations, 2 are obsolete and one is in partial operation due to shortage of necessary modern equipment and raw materials. The surface observatories are equipped with conventional equipment, if it could be equipped with modern equipment, accuracy of observation would be high.

2. Radar Observation

Bangladesh Meteorological Department is operating four 10 cm S-band radars at Dhaka, Cox's Bazar, Khepupara and Rangpur. Dhaka, Cox's Bazar and Khepupara radars are linked with the Storm Warning Centre by microwave and that of Rangpur is linked by VSAT reception and animation. Cox's Bazar and Khepupara radars are old and need replacement.

3. Radar Composite System

Radar Composite System has been installed. Composition of four radar images is being carried out with this system. It is fully operational now.

4. Ship Observations

Ship observations are scanty, attempts have been made to develop the data reception but no improvement is found. Steps should be taken for the acquisition of as much ship data as possible.

5. Satellite Observation

Bangladesh Meteorological Department is now receiving METEOSAT, INSAT satellite imageries through Internet.

6. Telecommunication System

Bangladesh Meteorological Department exchanges meteorological data, forecasts, warnings and other relevant information with RTH New Delhi on routine basis through WMO's GTS link. All the observatories of BMD are connected with NMCC Dhaka by TP, Telephone, SSB, etc. At present, Bangladesh Meteorological Department is using Centralized Message Switching System (CMSS) for HP-UNIX Workstation developed by the Bureau of Meteorology (BoM), Australia with Japanese assistance for telecommunication purposes. Dhaka- New Delhi X.25 GTS Link operating at 2400 bps may be upgraded to 64 kbps speed at the time of introduction of NWP in the BMD. RTH, New Delhi has offered for upgradation of the link to TCP/IP at speed 64 kbps.

India

OBSERVATIONAL NETWORK

Anchored buoy: Ten buoys are procured by National Institute of Ocean Technology and installed at East and West Coasts of India, one of the buoys is near Mumbai.

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All the four mechanical HWSR are replaced by ultrasonic type high wind speed systems. In addition to this four stations, India has installed sixteen numbers ultrasonic high wind speed systems at East and West Coasts of which ten are installed with World Bank Assistance. The network of twenty ultrasonic HWSRs is as follows:

East Coast : Balasore, Chand bali, Puri, Visakhapatnam, Machilipatnam, Ongole, Nellore, Pondicherry, Karaikal, Adirampattinam, Digha, Paradeep, Gopalpur, Kalingapatnam, Kakinada, Kavali and Chennai.

West Coast: Mumbai, Veraval and Okha.

FUTURE PLAN

Mobile Ships:

Installation of Automatic Weather Stations and making arrangements with coastal earth stations:

It is proposed to establish Automatic Weather Stations on VOFs in the year 2004-2006. Technical specifications are being finalised.

Installation of simple AWS in islands and reefs in Bay of Bengal and Arabian Sea: Preliminary possibility studies are being conducted.

Upper-air Network

One more upper Air Station will become operational at Jaipur during the year.

Telecommunication

India is in the process of upgrading our National and International links in a phased manner. Some of the metro cities links have already been upgraded to 64 Kbps and some are connected through internet. The AMSS Computer systems at Chennai, Kolkata, Mumbai and New Delhi have upgraded to New Computer systems, with new features for forecasters and aviation requirements.

International circuits Tokyo and Karachi have upgraded to 64Kbps link.

RTH New Delhi is keeping India's GTS data on ftp server which are being accessed by all NMC's.

India has replaced H/F based Regional, Territorial and Fax broadcast by digital data casting through World Space Asiastar satellite with effect from 1 July 2003. India in coordination with M/S World space and a few vendors has successfully carried out and implemented the design of a low cost integrated forecaster's workstation specifically tailored to the unreliable electricity supply situation of the developing countries of South-Asia by which the WMO/ESCAP Panel countries can greatly benefit by ensuring the reliable reception of raw data, satellite imagery, analysed charts during cyclone periods.

(A presentation on this was made by India at the PTC31)

Future plan

There is a plan for connecting Tokyo and Moscow through frame relay connectivity with RTH New Delhi.

India is planning to connect NMC's:- Male, Colombo and Yangon through Internet/ 64Kbps and the project is under implementation. We are also in the process of upgrading other international circuits to 64Kbps. Action has been initiated by RTH New Delhi and Coordination from, other RTH's and NMC's awaited.

Yangon has requested to intimate their readiness in respect of availability of H/W and S/W using internet and TCP/IP, socket communication. Their reply is awaited. Upgrading of New Delhi- Dhaka circuit :- Response from Dhaka is awaited.

Cyclone Warning Radar

The cyclone detection radars at Chennai and Kolkata, are replaced by state of the art Doppler Weather Radar supplied by M/S Gematronik, Germany

The Indigenous Doppler Weather Radar fabricated under ISRO -IMD joint collaboration has also been installed and made operational at SHAR Sriharikota, Andhra Pradesh in 2003.

Future plan

India is to replace 3 more existing S-band conventional radars by Doppler Weather Radar at Visakhapatnam, Machilipatnam & Paradeep. Out of these three, radars at Visakhapatnam & Visakhapatnam are expected to be to be commissioned by the end of 2004.

Satellite Programmes

An exclusive meteorological satellite KALPANA-I was launched on 12 Sept 2002. It gives satellite Imagery in three channels Vis-a-vis Visible, Infrared, and Water Vapour. The VHRR resolution of this satellite is 2.0 Km in Visible and 8 Km in Infrared and Water Vapour channels. Data from this satellite are being received and processed at IMD New Delhi. KALPANA-I is located at 74.0 deg. E longitude.

Another Satellite INSAT-3A was launched on 10 April 2003. It is also operational at IMD. It has three VHRR channels identical to KALPANA-I VHRR and in addition has three channels of CCD. It is located at 93.5 deg E .The three channels of CCD give Imagery in three channels namely visible, Near Infrared and Short wave Infrared. The resolution of CCD payload in all three channels is 1 Km.

The INSAT -3C, though a purely communication satellite, is also used for dissemination of cyclone warning and meteorological data to users in India

The HRPT data from U.S. polar orbiting satellites (NOAA series) are received by a ground reception and processing system at IMD, New Delhi. Imagery and the products are derived from the A VHRR data of HRPT stream. Vertical profiles of temperature and humidity are retrieved from TIP data. All these are good tools of weather forecasting and climate studies.

Another HRPT data receiving system is also operating at Chennai for reception and processing of A VHRR and TOVS data from some of the NOAA series of US satellites.

IMD also receives lower resolution processed data of METEOSAT-5 through a Primary Data Utilization system (PDUS).

Cyclone Warning Dissemination System (CWDS) through INSAT

Cyclone Warning Dissemination System (CWDS) is a dependable scheme for transmission of cyclone alert/warning message directly to the area likely to be affected by the cyclone using the S-band broadcast capabilities on board the Indian National Satellite (INSAT) .The system enables the cyclone warning center of IMD to directly and selectively address a particular area likely to be affected by cyclones. 250 CWDS receiver of analogue type and 100 Digital CWDS receivers have already been installed in the coastal areas on India. The effectiveness and performance of the CWDS system has been monitored during the past cyclones and it has been found to be good. The network of 100 Digital CWDS receivers is installed in the Andhra Pradesh during 2003 and it has been working satisfactorily. There is a plan to increase present network to 400 receivers of Digital technology by 2007.

Meteorological Data Dissemination (MDD)

Under this scheme, processed satellite imagery is being multiplexed with meteorological data and weather facsimile charts and up linked to INSAT in the C-band for reception at ground stations in the S-band. 35 MDD stations have been installed and they are operational, including one in the Maldives and one in Colombo, Sri Lanka. PC-based image processing workstations are available at 35 MDD stations.

Automatic Weather Stations (AWS)

IMD operates a network of 100 unmanned automatic Weather stations using

INSAT Data Relay Transponder services.

Future plans

There is a plan to increase present network of satellite based Digital CWDS to 400 by 2007.

A scheme for digital Meteorological Data dissemination (DMDD) is also being implemented to provide all the satellite imageries and Met products to the users in digital form all over India.

INSAT-3D will be launched in 2006, which will have imager as well as sounder as Meteorological payloads.

Maldives

Upper-air Observation

No observations were made last year. The WF100 and WF33 wind finding radars with the hydrogen generators donated by United States and Britain under the Voluntary Cooperation Program (VCP) remained unserviceable for several years and need to be replaced.

A survey has been conducted for installation of a new wind finding radar at Gan Meteorological Office. An expert sent by UK Met. Office for the purpose visited Gan Island during October 2003.

Upper air observations from south and as well as central Maldives are very important to us as well as the entire meteorological community in the region. Hence, Maldives request WMO and Panel members to assist us to re-function our upper air network in a near future.

Meteorological Satellites

The INSAT receiving system was operational for some time in the beginning of the year 2003 and now remains unserviceable.

Imageries from METEOSAT and satellite winds available in the internet are used daily for weather forecasting and analyzing.

Meteorological Telecommunications

The computer based telecommunication system between the local Meteorological Offices and the National Meteorological Centre (NMC), functioned very well during last year.

The 75- baud GTS link between Male' and New Delhi did not operate satisfactorily. The DMM has acquired a dedicated internet line during December 2003. Preliminary testing of an internet based TCP/IP GTS link is scheduled for February 2004.

Computer Network

The Analyzing, Forecasting, Data-processing and Operating System (AFDOS) need to be upgraded soon.

The official website of the Department of Meteorology www.meteorology.gov.mv was launched on the World Meteorological Day 23 March 2003. Forecasts, warnings, meteorological reports and aviation weather charts are readily available within this webpage.

Warning system

The Department of Meteorology issued timely and accurate severe weather or tropical cyclone warnings and disseminated them to the public through mass media. They were also published on the DMM web-page. It helped immensely to minimize the damages to property and loss of life due to floods/ landslides, risks to fishing vessels or passenger boats encountering stormy weather in the open seas. Like last year, these warnings were greatly appreciated by the community.

Oman

Meteorological Facilities

1. Upper Air Observation

The Sultanate of Oman operates two upper air-observing stations, viz. Muscat (41256) and Salalah (41316). Both these are equipped with Vaisala's Digicora GPS wind finding system. One flight is launched from each of these stations in a day.

2. Ship Weather Reports

Weather Reports from Ships are received through GTS as well as from Muscat Coastal Radio Station. In addition Ship reports are also received from the Royal Oman Navy.

3. Wave Measurements

One wave measurement station was installed offshore Sohar and the collected data is inserted on the GTS every three hours. Two more stations will be repaired and or replaced at Muscat and Salalah. One additional station is planned for Qalhat (Sur).

4. Synoptic Land Stations

The number of Synoptic Land Stations being inserted into the GTS still remained at 23 stations.

Three more additional stations have been installed in the Eastern region. These will soon be included in the RBSN also.

5. Telecommunication

All the meteorological stations operated by the Meteorological Department are connected to the MSS computer located at the Central Forecasting Office at Seeb International Airport by a reliable dial-up telephone link.

The MSS is connected to the RTH Jeddah by a dedicated link at 64 kbps based on TCP/IP protocol.

In addition a 128 kbs Internet leased line has been established as well as an e-mail and FTP Server. All these are protected by a firewall.

A bilateral Internet Circuit, which was established between New Delhi and Muscat for the exchange of meteorological data, has proved to be very effective and useful.

Another bilateral Internet circuit link was also established between Abu Dhabi and Muscat for the exchange of meteorological data.

6. Satellite reception

The Department installed ground-receiving stations for intercepting High Resolution images from Polar Orbiting satellites operated by NOAA as well as from geostationary satellites operated by EUMETSAT.

7. Computer Workstations

7.1 Data Processing System

Numerical Weather Products are received via MDD, GTS and Internet from Bracknell, Toulouse, Offenbuch and Washington. A Local Oman Regional Model (ORM) was established with the kind cooperation of the National Weather Service of Germany (DWD). We run three model versions as follows:-

- a] The ORM_28 covers the region 30.0 E, 07.0 N (Lower left corner) to 78.0 E, 35.25N (Upper right corner) with a mesh size of 0.25 degree (approx. 28km). There are 193 x 114 grid points and 31 layers. The model gives a 78-h forecast in the 12 processor E 4500 Sun Machine.
- b] The ORM_07 covers the region 51.0E, 16.5N(lower left corner) to 61.0E, 26.5N (Upper right corner) with a mesh size of 0.0625 degree (approx. 7KM). There are 161x161 grid points and 31 layers. The model gives a 78-h forecast in a 12 Processor E4500 Sun machine.
- c] A WAM based wave Model was established with the kind cooperation of GKSS of Germany, which covers the Arabian Sea, Gulf of Oman and Arabian Gulf.

7.2 Module Output Statistics (MOS)

The Department successfully established a MOS which is generated with each Model run. MOS is an approach to incorporate NWP forecasts information into statistical weather forecast. After installing MOS we noted improvement in Temperature and wind forecast. In addition we were able to get a probability forecast for thunderstorms and fog.

7.3 Verification Package

The Department managed successfully to develop its own verification package which was led by Computer Scientist Sultan Al Yahyai. The developed system verifies the continuous weather parameters such as T_2m, TD_2m and for the categorical weather parameters such as Total precipitation. The system generates different statistical scores such as Hit rate with a margin of error, Bias, Root Mean Squared Error (RMSE). The package provides a friendly UGI to allow the user to select different choices (Model type, stations list, observation time, weather element and statistical score) to be verified. This system will help find the systematic errors in the Model output which can be tuned.

8. Aeronautical Services

In order to meet ICAO recommended practices and to fulfill the requirements for Aviation the Department installed a SADIS workstation as early as 1996. Effective Last year the Department started to pay to the UK Met Office the annual contributions for obtaining SADIS data and Products. In addition all the SADIS data and products are also received thru an FTP Server from UK as a back up.

A new service was also established last year for the provision of en-route flight folders for all Airlines operating in the sultanate to be accessed on our web site.

Pakistan

a) Improvement of Facilities

- i. Regional Forecasting Centers were established at Quetta and Peshawar in Balochistan Province and NWFP respectively to ensure timely issue of weather forecasts, warnings and advisories to cater to the needs of general public, farming community and for the safety of civil aviation operations.
- ii. Four new meteorological observatories were established at Thatta, Mithi, Mirpur Khas and Dadu in the Sindh Province during the year, besides installation of rain gauges in Mithi, Diplo, Chachro and Nagarparkar Talukas of District Mirpur Khas. Moreover, four new Agromet Observatories were also established at Usta Muhammad, Khuzdar, Uthal and Joharabad which started functioning during the year.
- iii. It has further been planned to set up six more observatories in different parts of the NWFP and adjacent tribal areas for the collection of climatic and earthquake data. It has also been proposed to establish one Agromet Observatory each at Topi in Swabi and at the Agricultural Research Institute, Turnab near Peshawar or at Agriculture University, Peshawar to provide information to farmers about weather conditions. Furthermore, establishment of three Seismic Observatories, one each at Chitral, Gilgit and Cherat is under consideration for monitoring seismic activity originating from the Hindukush. Establishment of a Meteorological Observatory has also been

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proposed at Landi Kotal in Khyber Agency to provide information to the tourists for the promotion of tourism in the area.

- iv. One HRPT equipment has been installed at National Weather Forecasting Centre for Agriculture at Islamabad and the same has been put into operation since second half of January 2004.
- v. Government approved the Establishment of a Research & Development Division at Islamabad with an estimated cost of Rs.39.950 million, out of which Rs.7.23 million, released for the installation of the infrastructure during 2003, have been utilized.
- vi. Because of improved telecommunication facilities (internet, telephone, SSB sets etc.), reception of met. data (especially synoptic data) by NMCC Karachi and its exchange through 64 KBPS TCP/IP leased line between Karachi and New Delhi has improved.
- vii. Out of 28 Pilot Balloon Observatories, 12 stations are in operation taking 0600 and 1200 UTC observations only. This data is also being exchanged internationally through GTS link between Karachi and New Delhi. All the Radio Sonde / Rawin Sonde stations are still inoperative for want of consumables especially transmitters.

b. Technical Advancement

- i. Pakistan and India are examining the feasibility of converting the existing satellite based 64 KBPS TCP/IP leased line circuit between Karachi and New Delhi into marine based SMW-3 System.
- ii. The 50 baud T. P. link between Karachi and Tehran is being upgraded into a high speed 64 KBPS link and is expected to be operational very soon.

Sri Lanka

(a) Upper air Observation.

Radiosonde observations at Colombo were conducted three times a week at 1200 UTC and India continued to supply Radiosonde transmitters, accessories and consumables for these observations.

Radar wind observations were done at 0600 UTC and 1200 UTC using 100g balloons and 350g balloons at Colombo throughout the year.

Pilot balloon observations were conducted as usual at Colombo at 0001 UTC and at 0600 UTC and at 1200 UTC when the radar system was defective. The pilot balloon observations at Hambantota, Puttalam and Trincomalee were continued at 0001, 0600 and 1200 UTC.

Steps have been taken to obtain spare parts for Colombo WF33 radar from Maldives under a bilateral agreement.

A new surface meteorological data observing station was set up at the Horton Plains in the central hills at an altitude of 2160 meters above mean sea level.

(b) Collection of ship reports.

As usual ships weather reports were received through the coastal radio station "Colombo Radio" and transmitted to the National Meteorological Centre (NMC) via telephone/fax. During the non-real time monitoring period of 01st to 05th October 2003, no reports were received.

(c) Cyclone Detection Radar.

The cyclone detection (WSR74) installed at Trincomalee in 1982 is in working condition. However, its effective range has now decreased and more and more operational problems are encountered. A proposal has been submitted to the Japan International Cooperation Agency (JICA) for a micro-met radar capable of tracking intense rain falls.

(d) High Gust Anemometers.

The high gust anemometer at Trincomalee on the east coast, worked satisfactorily during the year 2003.

(e) Meteorological Satellite Data Reception.

Reception of HRPT imagery from NOAA series satellites was satisfactory throughout the year. The Meteorological data receiving system including the INSAT cloud imagery provided by the India Meteorological Department under Indo-Sri Lanka Joint Commission is operating well. Cloud imageries and various other meteorological information from the worldwide web are also received at the NMC for operational purposes.

Thailand

1. Improvement of Facilities:

1.1 (a) A new Geographic Information System (GIS) which has been installed at the TMD Headquarters enables to meet the requirements of the Department as it can be used to produce both meteorological and hydrological data maps in the GIS contexts for multipurpose application.

1.1 (b) The **3-Net** project (comprising Intranet, Internet, and Extranet) has been introduced and implemented with the aims to become the means to share meteorological hydrological information and services as well as any other relevant services within the internal organizations of the Department. Moreover, it is expected to serve international activities in meteorology and hydrology as well as the information center accessible by any other national agencies, responsible for comprehensive natural disaster monitoring and preparedness plan of the kingdom.

1.1 (c) A new web site, <http://www.weather.go.th> with the severe weather warning contents whenever one of this kind of phenomena is likely to occur, was constructed apart from the existing one (<http://www.tmd.go.th>).

1.1 (d) The new set of meteorological observation equipment for aviation is being installed at the New Bangkok International Airport (NBIA) which is scheduled to be officially opened in 2005.

1.1 (e) On 1st November 2003, the port speed of frame relay of two circuits – Bangkok and Tokyo, Japan as well as Bangkok and Kuala Lumpur – were upgraded to be 128/16 Kbps.

2. Technical Advancement:

2.1 (a) The existing satellite receiving system (GSC-REALPAK) at the TMD Headquarters was upgraded in order to obtain more NOAA series satellite data. Additionally, the upgrade of the hardware in the new satellite receiving system was completely conducted to ensure that it can receive and process the satellite data from MTSAT (Japan) before the satellite will be launched to its orbit.

2.2 (b) The Wave Forecast Model (WAM) has been continually used to forecast wave height. According to the latest structure of the Department, this operation has become under the supervision of the Meteorological Development Bureau. The outputs from the model are usually forwarded to support the weather forecasting tasks at the Weather Forecast Bureau.

APPENDIX VIII

TROPICAL CYCLONE NAMES FOR THE BAY OF BENGAL AND ARABIAN SEA

1. Background

1.1 The Panel at its twenty-seventh Session in Muscat, Sultanate of Oman agreed in principal to assign names to the tropical cyclones in the Bay of Bengal and the Arabian Sea. It therefore requested its Members to provide the Rapporteur at least ten names in accordance with the given criteria along with the meaning of each name, before the end of 2000. The Rapporteur would then submit a Report that should reflect any significant feedback from the Members to the 28th session of the Panel.

1.2 At the 28th session of the Panel which was held in Bangkok, Thailand from 14th to 20th March 2001 the Rapporteur presented a list of the proposed names received from seven Member countries. India was the only country that did not submit any list. The session studied and reviewed the submitted proposed names and felt that some of the names would not be appealing to the public and media. The session reiterated the need to assign names to the tropical cyclone in the Panel region. It therefore, requested once again all its Member countries to resubmit a new list which in addition to the criteria laid down by the Rapporteur should be appealing to the public and media alike.

1.3 At the 29th Session which was held in Rangoon, Myanmar, the Rapporteur reported a poor response from Members of the Panel and it was not possible to complete the task without the cooperation of all Members. The Panel was of a strong opinion that it was important to continue with this work and it urged all the Members to cooperate and submit their proposed names to the Rapporteur.

1.4 At the 30th Session which was held in Islamabad, Pakistan the Rapporteur reported that the Members submitted their proposed names except India. It may be recalled that India had earlier responded by stating that it had some reservation on assigning names to cyclones due to regional, cultural and linguistic diversity of the Member countries in the Panel.

1.4.1 It is not clear whether India has still the same reservation but it will be important for the Panel to urge India to also submit their proposed names.

1.4.2 The Session agreed that they will continue to urge India to submit the requested TC names. It also urged the countries that had not given the pronunciation to do so as soon as possible. It further requested the Member countries to submit an audio tape of their submitted TC names.

1.5 At a separate side line meeting of the Panel members while attending the XIV WMO Congress in Geneva, The Director General of India promised to cooperate and submit the requested TC names as soon as possible. However, till to date, India has not submitted as promised.

2. Conclusions

2.1 The proposed names that were submitted by the Panel countries have been included in Table 1. Apart from India the table is duly filled. Only eight names were selected from the list that was submitted by each member country.

2.2 Some of the member countries did not submit the pronunciation part of the proposed names. As such, this part of the table has been left blank. In addition not all Members submitted the meanings of the proposed names.

2.3 Never the less, it is felt that the attached table is ready to be used by the Panel Members. Should there be any reservations for not wanting to use the table then perhaps the Panel can still consider using it on a trial basis for a period of time.

2.4 A digitized recording of the submitted names will be presented to the session. It was recorded by Mr Hamed Al Brashdi a Meteorologist in the Department.

3. The importance for Naming Tropical Cyclones

Some of the advantages of naming tropical cyclones are:

3.1 It would help identify each individual tropical cyclone.

3.2 It helps the public to become fully aware of its development.

3.3 Local and International media become focused to the tropical cyclone.

3.4 It does not confuse the public when there is more than one tropical cyclone in the same area.

3.5 The name of the tropical cyclone is well remembered by million's of people as it is unforgettable event whose name will long be remembered.

3.6 Warnings reach a much wider audience very rapidly.

4. Recommendations

4.1 Noting the importance of tropical cyclones mentioned above and considering that the Bay of Bengal and Arabian Sea is the only area in the world that have yet to name their tropical cyclones, the Panel is hereby urged to consider the following recommendations and to take appropriate action.

4.1.1 The Panel endorses the attached Table 1 on the proposed names along with the foot note instructions.

4.1.2 Once India finally submits its proposed names then it will be added to the Table.

4.1.3 The Panel Agrees to commence using the Table as of this year's cyclone season; May/June 2004.

4.1.4 The table will not be used again in a cyclic manner rather it will be used once such that after six years, in 2009 a new Table will be prepared.

4.1.5 The next generation of table's should have a life term of ten years. Hence, it is expected to start in 2010 and to last for ten years that is until 2019. Then the next table starts from 2020 till 2029, etc.

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4.1.6 The RSMC tropical cyclone New Delhi will be responsible to issue the names to tropical cyclones once they have formed in either the Bay of Bengal or the Arabian Sea.

4.1.7 The RSMC tropical cyclone New Delhi will ensure that a tropical cyclone is not given a name until the sustained maximum wind speed reaches a threshold of 34 knots.

4.1.8 The tropical cyclones from the South China Sea, which crosses Thailand into the Bay of Bengal, should not be re-assigned with another name by the Panel Members.

Table Number: 1

Proposed table for naming tropical cyclones for the Bay of Bengal and Arabian Sea

Panel Members	Column one		Column two		Column three		Column four	
	Names	Pron'	Names	Pron'	Names	Pron'	Names	Pron'
Bangladesh	Onil	Onil	Ogni	Og-ni	Nisha	Ni-sha	Giri	Gi-ri
India	-	-	-	-	-	-	-	-
Maldives	Hibaru	-	Gonu	-	Aila	-	Keila	-
Myanmar	Pyarr	Pyarr	Yemyin	Ye-myin	Phyan	Phyan	Thane	Thane
Oman	Baaz	Ba-az	Sidr	Sidr'	Ward	War'd	Murjan	Mur'jaan
Pakistan	Fanoos	Fanoos	Nargis	Nar gis	Laila	Lai la	Nilam	Ni lam
Srilanka	Mala	-	Abe	-	Bandu	-	Mahase n	-
Thailand	Mukda	Muuk-dar	Khai Muk	Ki-muuk	Phet	Pet	Phailin	Pi-lin
Bangladesh	Helen	Helen	Chapala	Cho-po-la	Ockhi	Ok-khi	Fani	Foni
India	-	-	-	-	-	-	-	-
Maldives	Madi	-	Vaali	-	Baazu	-	Hikaa	-
Myanmar	Nanauk	Na-nauk	Kyant	Kyant	Daye	Da-ye	Kyarr	Kyarr
Oman	Hudhud	Hud'hud	Nada	N'nada	Luban	L'luban	Maha	M,maha
Pakistan	Nilofar	Ni lofar	Vardah	Var dah	Titli	Tit li	Bulbul	Bul bul
Srilanka	Priya	-	Sama	-	Das	-	Soba	-
Thailand	Komen	Goh-men	Mora	Moh-rar	Phetha i	Pay-ti	Amphan	Um-pun

Notes:

- 1] The Panel Member's names are listed alphabetically country wise.
 - 2] The names will be used sequentially column wise.
 - 3] The first name will start from the first row of column one and continue sequentially to the last row in column four.
 - 4] Example, this will be as Onil, Hibaru, Pyar, Baaz, ..., ..., ..., Amphan. 5]
- The Table will only be used once up to the end of 2009.

APPENDIX IX

SUMMARY OF COUNTRY ACTIVITIES IN THE HYDROLOGICAL COMPONENT

Bangladesh

The delegate from Bangladesh informed the Panel that Flood Forecasting and Warning Centre (FFWC) of Bangladesh Water Development Board (BWDB) is responsible for flood forecasting and warning. FFWC receives weather forecasts, rainfall data, Radar and Satellite imageries of Bangladesh Meteorological Department (BMD) on line and also receives rainfall and water level data of India through BMD. From 1991 and onwards the flood forecasting had been prepared based on the water modeling technology developed by the Danish Hydraulic Institute (DHI). Till recently, MIKE-11, a hydrodynamic model and FLOOD WATCH modeling systems have been used for the flood forecasting initially with 16 nos. of Forecast station, which was increased to 30 stations during 1995-99. Flood Forecasting model has recently been upgraded with updated version of MIKE Zero GIS capabilities extending to all flood prone areas of the country with 50 forecast and another 30 monitoring points. Currently, the lead time of forecast is 24 and 48 hours.

The delegate also informed that the existing arrangement of data transmission from Indian stations does not permit to achieve lead-time more than 24-48 hours for the central part of Bangladesh and it provides only few hours to the areas near the border. In order to increase the forecast lead time in Bangladesh, real time and forecast data on water level from further upstream stations and monsoon rainfall data irrespective of exceeding 50 mm are essential. It may be mentioned that a project has been taken up by the Government of Bangladesh to install a New Hydrological Doppler Radar at Moulvi Bazar in Sylhet under Bangladesh Meteorological Department. This Radar will be useful for flash flood forecasting. Government of Japan has given consent to provide financial assistance to implement this project at the end of this year but assistance is still awaiting.

India

During the flood season (June to September) of 2003 about 400 QPF were issued for Flood forecasting by FFD (Flood Forecasting Division of CWC (Central Water Commission)). Real time monitoring of districtwise daily rainfall of the country is done by collecting real-time collection of rainfall data from about 2500 rain-gauge stations and districtwise and subdivisionwise summaries were prepared every week. Design storm studies: Design Storm Studies are being conducted for use as main input for design engineers in estimating flood for hydraulic structures, irrigation projects, dams etc. The Probable Maximum Precipitation values are also evaluated for optimum utilization of water resources.

The Phase –I of the multi-agency Hydrology Project aided by World Bank has ended on 31 December 2003.

Storm Analysis Studies: Preparation of All India Atlas of isopluvial maps of different return periods has been taken up. These maps can be used to derive 24-hour rainfall estimates for specific return periods at any desired location. Inputs from Central Water Commission, Ministry of Water Resources, have not been included in this report.

Oman

One of the roles of the Ministry of Water Resources (MWR) is to act as the flood information authority of Oman. As well as collecting storm and flood data in its nation wide hydrological network, it provides a service of information on historic storms and floods, flood

risk maps, flood frequencies, design storm rainfall intensities and frequencies, design floods and drainage rates. It is also involved in tidal flooding aspects. These services are used by various Ministries and the public in the course of planning any housing infrastructure and other developments that may involve wadis in any way, either as wadi crossings, or any structures within wadis or flood plains. They are also used for general drainage design.

Pakistan

Pakistan informed that its Flood Forecasting Division (FFD) besides using telephone and fax, introduced internet for linking up main observatories and is now able to download required data from its website and conversely upload data, flood forecasts and satellite pictures. Under the revised Second Flood Protection Sector Project (FPSP-II), existing old 5 cm QPM radar at Sialkot is being replaced with a 10 cm Doppler radar while installation of another 10 cm Doppler radar at Mangla has been approved by the government. A computerized Flood Routing Model namely CLS is being used for Flood Forecasting. Besides already approved raising of the Mangla Dam, its Maximum Conservation Level (MCL) has also been raised this year from 1202 ft to 1206 ft, which was also achieved. Extra water thus stored would be available for power generation and crops during the winter season.

National Consultation Meeting on the Establishment of a Regional Flood Information System in the Hindu Kush Himalayan (HKH) region was organized by Flood Forecasting Division, Pakistan Meteorological Department with Support from US Agency for International Development/Office of Foreign Disaster Assistance and US Department of State/Regional Environmental Office for South Asia in Lahore-Islamabad, Pakistan from 8 to 11 February 2004.

Sri Lanka

Collection, archival and analysis of hydrological data on island-wide basis is performed by the Hydrology Division of the Irrigation Department. Hydrological division at present is collecting hourly water levels and calculating daily river discharges from 55 stream gauging stations situated in 17 major river basins. These 17 river basins account for over 60% of the total basin area in the island. The hydrological data thus collected is made available for water resource planning and research work. The division collects daily rainfall values from 20 rain gauges it has established, mostly in conjunction with stream gauging stations. It also maintains 10 evaporation pans and collects daily evaporations values. During the year, following civil works have been completed:

- Construction of seven cableways for current metering under ADB financed Water Resource Management Project
- Construction of two gauging station field offices
- Minor improvements to existing gauges

The division also operates a floods warning systems for Kelani Ganga for Colombo which continued to function well throughout the year. For this purpose several upstream river gauging and rainfall stations are connected to the Hydrology division by a UHF radio network. These stations provide real-time data enabling the division to operate the flood model and forecast the river level for Colombo area. This warning system is expected to be improved this year.

For hydrologic modeling and data processing, latest versions of the following computer application packages have been acquired:

- MIKE 11 hydraulic model
- HEC HMS
- HEC RAS
- HEC DSSVue

Regarding data collection, the Hydrology Division of the Irrigation Department faced severe shortage of staff at all levels, which affects also the processing of data. As the division is highly dependent on manual gauge reading, staff shortage at field level affects data collection badly. Out of a carder of 220 gauge readers, the division now has only less than half that number. A solution for that would be to install automatic water level recorders, so that depleting staff strength would not become an issue. However the cost of such instruments is high compared to the annual allocation received by the division. One automatic level recorder costs about Rs. 300,000/= (US \$ 3000.00) while the allocation for instruments is only Rs. 500,000/= (US \$ 5000.00) annually. Only a foreign funded project would be able to meet the need of the division in upgrading the instruments.

Water Resources Management Project, (WRMP), which was a project funded by an ADB loan through the National Water Resources Authority (NWRA), also aimed at improving the accuracy of surface water measurements and instrumentation. Unfortunately, the WRMP was suspended in October 2003 owing to the delays in passing certain enabling legislations. Thus the proposed improvements under the WRMP was limited to a few civil constructions only. Even these can not benefit the measurements without instrumentation. ADB planned to review the suspension in May 2004, provided the legislations were passed before March 2004. With the present situation of the country, the suspension may continue for a further period.

The Hydrology Division provides a flood forecasting service for Kelani Ganga, thus affording protection to the city of Colombo. Such a service is not available for any other river in the island. The devastating floods in May 2003 ravaged river valleys of Kalu Ganga, Gin Ganga and Nilwala Ganga. The need for flood warning systems in these rivers was acutely felt. The division is now studying the possibility of providing a forecasting system for these three rivers also.

Thailand

The second phase of telemetering network with 43 automatic stations has been implemented in 3 river basins in the South of Thailand and is expected to complete in March 2004, with 53 automatic stations in 5 river basins in upper Thailand.

Flood control measures such as

- (a) hydrodynamic flow measurement of the Chao Phraya River,
- (b) flood management system along the Chi River, and
- (c) telemetering system of Tha Taphao Rver Basin have been conducted by the Royal Irrigation Department for flood prevention and mitigation

Mike 11 model is being introduced to the Tapi River Basin for providing flood warning to communities. The feasibility study in setting up the flood warning system in other river basins is also being carried out.

SUMMARY OF COUNTRY ACTIVITIES IN DISASTER PREVENTION AND PREPAREDNESS (DPP)

Bangladesh

The delegate from Bangladesh informed the Panel that Disaster Management Bureau (DMB) of the Ministry of Disaster Management and Relief, Govt. of the People's Republic of Bangladesh is playing an important role in creating mass awareness by holding training seminars rallies, observing Disaster Days, etc. at national and local levels during appropriate time of probable disasters. Bangladesh Meteorological Department (BMD) also participates in different activities related to DPP. Cyclone Preparedness Programme (CPP) of Bangladesh Red Crescent Society with its 35,000 volunteers (including 2000 Female Volunteers) has been contributing tremendously to the reduction of damage and loss of lives and properties due to cyclones. The concerted efforts of BMD, DMB, CPP and other Government and Non-Government Organizations have made warning systems effective resulting in reduction of disasters, human casualties and loss of properties. Bangladesh Television, Bangladesh Betar (radio) and National Dailies are also actively involved in DPP.

India

As a pre-cyclone measure IMD and state government authorities take all necessary steps for better reception and dissemination of forecast and warnings on cyclonic storms. IMD officers participate in the state and district level pre-cyclone meetings conducted by the state governments and non-governmental organisations and explain the salient features and disastrous effect of the storm and precautions to be taken during the storm season. IMD conducts Annual Cyclone Review' meeting in the month of January /February. The tropical cyclone warnings are issued through satellite based CWDS to various state government agencies in local regional languages in a simple user-friendly form so that it is easily understood by common man. These warnings are also broadcast through AIR Doordharshan and telecast by private TV channel network in simple form so that the general public can easily understand the warnings. Before every cyclone season officers from IMD deliver talks in AIR and Doordharshan about the cyclone warnings and precautions to be taken by the people during the cyclone period.

About 1500 flood/cyclone shelters are constructed in the cyclone prone districts of east and west coast of India. Every effort is made to augment the observational network better forecast techniques to minimize the loss to property and life.

India Meteorology Department issued timely and accurate tropical cyclone warnings and disseminates them to the public through mass media. It helped immensely to minimize the damages to property and loss of life due to floods/ landslides, risks to fishing vessels or passenger boats encountering stormy weather in the open seas. These warnings were greatly appreciated by the community.

Based on the past experience, India is now focusing on disaster risk reduction in addition to strengthening the emergency response system. Disaster management occupies an important place in the country's policy framework as it is the poor and the under privileged who are worst affected on account of disasters. This approach has been translated in to a National Disaster Framework(a road map) covering institutional mechanisms, disaster prevention strategy, early warning system, disaster mitigation, preparedness , response , human resources development and public education & community participation. The broad initiatives taken in various areas of disaster management include:

Preparedness

- Inclusion of curricula on disaster management in training of Central Para Military Forces(CPMFs) and Police
- 14 Regional Response Centres of CPMFs identified and cache of equipment being built up
- In order to professionalise emergency response management, Incident Command System(ICS) is being introduced.
- India Disaster Resource Network(www.idrn.gov.in) , a Web-based and centralized data base established for quick access to inventory of resources by Disaster Managers in District/State/National level for minimizing emergency response time.
- States advised to enter pre-contract with suppliers, distributors and service providers for critical emergency supplies
- National Emergency Response Force being constituted with state -of -art training and equipment
- Eight Battalions of CRMFs, duly trained and equipped, have been earmarked for disaster response
- Four digit public utility phone number(1070) provided for Emergency Operation Centres (EOC) at National/State/District levels.
- Fire Services in the country being revamped as an all hazard response Units.
- Dog Squad being constituted for Search and Rescue Teams (SAR-Teams)
- As a part of strengthening the Institutional mechanism, Centre for disaster management established at the National and State levels
- States advised to set up SAR-Teams
- UNDP assisted Disaster Risk Management Programme for community based disaster preparedness through participation of local self government is being implemented
- USAID assisted Disaster Management Support Project is also being implanted for reducing vulnerability to disasters

Mitigation

- A separate chapter on the development perspective related to Disaster Management included in the Tenth Five Year Plan by the Planning Commission.
- Projects/Schemes addressing Disaster Mitigation to be given priority in development planning
- Disaster management being made an essential component of induction training for All India Civil Services
- Education Boards to include Disaster management inputs in the curricula in classes VIII, IX and X. The Chapter for Class VIII already included and for IX and X will be included from next Session in 2005.
- Earthquake engineering education being integrated with engineering curricula at the undergraduate level

Response and Relief

- Deployment of Rapid Response and Assessment Teams
- Timely release of assistance from Calamity Relief Fund and National Calamity Contingency Fund
- Constant contact is kept with the State authorities, in case of a disasters, for its effective management by extended all possible assistance
- Financial mechanism reviewed and revised after every five years

International Cooperation

- Indo-Swiss agreement signed for cooperation in Capacity building and disaster response
- Training partner ship with International Search and Rescue Advisory Group of United Nations(UN-INSARAG), Asian Disaster Preparedness Centre(ADPC), Bangkok, Thailand, Asian Disaster Reduction Centre(ADRC), Kobe, Japan, Programme for Emergency Response (PEER)- USAID

Oman

Disaster Prevention and Preparedness operates under the Directorate General of Civil Defense of the Royal Oman Police. On yearly basis, they run awareness programs, roving workshops, rehabilitation programs, etc. The Public Relation Office of the Royal Oman Police issues warnings and Advisories to the public through different Media channels. There is a very good coordination and cooperation between this entity and the Meteorological Department. The Ministry of Environment, Regional Municipality and Water Resources organized an International Workshop on Disaster Prevention, Preparedness, Mobilization, Rehabilitation and Co-ordination.

Pakistan

Pakistan informed that Tasman Spirit, an oil tanker with 67535 tons of crude oil, while cruising in the curve entry channel of Karachi Port Trust (KPT), was grounded under unfavourable weather conditions on 27th July 2003. The tanker broke on 13th August and by 18th August, 27000 tons of oil had spilled into the sea. Since a well defined Oil Spill Contingency Programme already existed, this hazard was handled quite efficiently. An area of about 40 km² was directly affected and the spill caused serious environmental problems, degradation of air quality contamination of beach and posed threat to marine resources and mangroves. The National Institute of Oceanography, with the collaboration of PCSIR and the Karachi University, has started a study to assess the impact of oil spill on ecosystem and the bioremedial action.

The severe monsoon spell during July in the Sindh Province damaged 75,000 houses and almost 80 – 90% paddy, sugar cane, cotton and beetle leaf crops, while 178 persons were reported killed and another 235 injured.

Sri Lanka

Disaster management is seen as a vital part of the national development process as it would mitigate adverse effects due to disasters on the society. Disasters have caused tremendous damage to people and property, disrupting economic development of Sri Lanka. Therefore in 1996 the National Disaster Management Centre was established under the purview of the Ministry of Social Welfare, fulfilling a long felt need of the country. The centre has prepared a Disaster Counter Measures Act and National Disaster Management Plan for Sri Lanka in collaboration with International disaster related organizations

- (a) During 2003, the National Disaster Management Centre (NDMC) conducted several awareness programmes on disaster management under its education and training programme for the benefits of government officials, general public and school children.
- (b) Many awareness courses were conducted by the Centre.
- (c) Under the disaster mitigation programme, funds were allocated to construct six agro-wells to mitigate the effect of drought in the dry zone of the island.
- (d) Central data bank is maintained at the NDMC to meet national as well as international obligation on disaster related information. Data on Disasters from all district secretariats are collected and archived on monthly basis.
- (e) Action was taken to issue publications on disasters, making general public aware of such incidents.
- (f) The Government of Sri Lanka has spent approximately Rs. 141.1 million (US\$ 1.44 million) for providing immediate relief to the victims of 17th May 2003 flood and landslide disaster. In addition to this, rapid relief and rehabilitation programmes were implemented for the benefit of those affected with the assistance of international community, organizations and NGOO.
- (g) A technical committee was set up at the NDMC, comprising experts who possess specialized knowledge in related fields under the chairmanship of the Secretary to the Ministry of Social Welfare. The task of the committee is to prepare plans to mitigate disaster effects in future and this committee meets regularly once every two months.
- (h) In addition to this community based disaster management committees at village levels were set up at Lunugamvehera, Sooriyawewa and Hambantota divisional secretariat divisions where people suffer frequently by dry spells and droughts.
- (i) During the May flood, a special cabinet sub committee was setup with the Chairmanship of the Hon. Minister of Power and Energy. The sub committee collaborating with the NDMC of the Ministry of Social Welfare, managed to bring the livelihood of 90% of the victims to normalcy within a short period of 14 days by providing immediate relief.

Thailand

The Departmental Operational Centre (DOC) to integrate significant and severe weather situations for the comprehensive disaster warning of the nation has been established at the Thai Meteorological Department Headquarters, and three new doppler radars will be installed in the remote and flood-prone areas for more effective disaster prevention.

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The Introduction of Information and Communication Technology (ICT) System for Disaster Management, Strengthening disaster preparedness and prevention capacity of people at local level and encouraging local level participation and generating public awareness, and the Installation of rain gauges and Siren warning project have been implemented by the Department of Disaster Prevention and Mitigation (DDPM)

APPENDIX XI

SUMMARY REPORT ON TRAINING ACTIVITIES OF THE MEMBERS

Bangladesh

The delegate of Bangladesh informed the Panel that Bangladesh is a disaster prone country. So, Bangladesh Meteorological Department needs skilled meteorologists for timely and accurate forecasting of disastrous weather phenomena like tropical cyclones and associated storm surge. Bangladesh Meteorological Department feels that at least four to five meteorologists need to be trained specially in storm surge and storm track modeling and NWP techniques. Also higher training is needed for computer system analysis and management. It may be noted that BMD needs well qualified meteorologists, at least two to three Ph.D degree holders, three to five M.Sc degree holders and six to eight Diploma holders in Meteorology. In this respect BMD needs external assistance from WMO or any foreign organizations.

Bangladesh Meteorological Department has a Meteorological Training Institute which conducts scheduled courses: Class II Forecaster's course, Class II Forecaster Refresher's Course, Class III Assistant's Course, Class IV Observer's Course, Balloon Maker's course and other non-scheduled courses on meteorology, disaster preparedness and management as and when required. The scheduled courses are mainly for the meteorological personnel. BMD is going to conduct a training course on storm surge model developed and transferred by Dr. S.K. Dube for the young meteorologists of the department to build up their capacity in storm surge forecasting.

Maldives

For 2004/2005, the Department of Meteorology urgently needs to train staff in the field of marine, aviation and synoptic meteorology. Training of technicians and or computer personnel for AFDOS, INSAT, CLICOM, SADIS and other meteorological instruments are also highly important for a smooth functioning of our National Met. Service. Therefore, we call upon WMO and Panel Members for their cooperation and considerations.

India

Eight IMD officers have undergone training in Doppler Weather Radar system at the premises of M/S Gematronik, Neuss, Germany for 6 weeks on hardware and software maintenance and for 12 weeks on source code from November, 2003.

Five IMD officers were trained in the maintenance of Automatic Message Switching Computer System (AMSS) at the premises of M/S Netsys International (P) Ltd. in Pretoria, South Africa for a period of four weeks from 25.11.2002.

Five IMD officers were trained in Radio Theodolites System in USA for six weeks from 9.12.2002.

One officer from IMD was trained in Seismology and Earthquake Engineering from 27.8.2002 to 20.7.2003 at Group Training Course/Seminar organized by Govt. of Japan under Bilateral Assistance Programme.

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Training requirements are considered/processed after receipt of formal request from WMO, concerned Country/ Department. India has been providing training facilities at its RMTTC to foreign candidates from ESCAP Panel members under VCP/ITEC, Bilateral Cooperation, WMO Fellowship etc.

During 2003 Trainees from panel members like Sri Lanka, Maldives and Myanmar have undergone training in various fields like, Instrumentation, Telecommunication and General Meteorology.

The following foreign candidates were trained in various fields of Meteorology at RMTTC, New Delhi/ Pune :-

1. Two nominees from Govt. of Myanmar (one each in advanced course in Meteorological Telecommunication and other in Meteorological Instrumentation) under bilateral cooperation have undergone training for 6 month duration in 2003 in New Delhi.
2. Three nominees from Govt. of Sri Lanka have undergone 4 months Intermediate training at RMTTC, New *Delhi / Pune* (two in Met Instrumentation and one in General Meteorology) under VCP in 2003.
3. Three nominees from Govt. of Maldives under WMO Fellowship have undergone 4 months Intermediate Course in General Meteorology at RMTTC, Pune during 2003.

Two more nominees from Govt. of Maldives undergone one month training in Seismology at New Delhi in March, 2003 under UNDP / WMO Fellowship programme.

Oman

Workshops, Seminars and Training Courses attended by the Met personnel during the year 2002 were as follows:-

Workshop/Seminar/Training Course	Country	No. of Persons
Ph.D. in NWP	UK	1
NWP Training for Scientists and Programmers	Germany	1
Meteorological Equipment maintenance	China	2
Climate Data Base on Job Training	Jordan	2
Climate Data Base on Job Training	Oman	6
Weather Modification Workshop	Syria	1
Cloud Seeding Experiment Project	UAE	1
ICAO GRIB/BUFR Workshop	Oman	4
Fundamental Meteorological Courses for three government Agencies	Oman	4

Pakistan

PMD is in the process of affiliation of its Institute of Meteorology and Geophysics (IMG) with the Karachi University for the award of PGD in Meteorology and later MS degree in Meteorology. PMD also informed WMO Secretariat of its willingness to provide free of cost training facilities up to WMO Class-II level course to the Met. Personnel of LDC's. Of course, Maldives and Sri Lanka can benefit from this offer as in the past.

Sri Lanka

Representative of Sri Lanka requested funding for at least one Meteorologist to follow a post graduate training leading to M.Sc in Meteorology program during 2004/5. A placement at the University of Philippines for M.Sc in Meteorology program has already been obtained. Possibility of providing fellowships under WMO/VCP program to train senior meteorological observers at the Regional Meteorological Training Centre in India for 4-month period each is to be explored.

Thailand

Thailand informed the Panel that Thai Meteorological Department plans for training activities in the year 2004-2005 on the refresh training courses on Meteorology for their meteorological observers, and a training course on the application of MM5 Model for junior meteorologists to make them familiarize with the NWP Model for short and medium range forecasts.

Request for Training Courses

Training course on flash-flood forecast technique with respect to river basin profile is required.

APPENDIX XII

SUMMARY REPORT ON RESEARCH ACTIVITIES OF THE PANEL

Bangladesh

Concerted efforts should be made to carry out research on tropical cyclone (TC) motion and its associated surges.

Storm Surge Project

Special thanks are due to Prof. S.K. Dube in this connection for taking giant steps in conducting training of storm surge modeling to the meteorologists of this region and finally transferring technology to the respective countries. BMD installed the IIT Storm Surge Model of Prof. Dube in one HP Unix Workstation and one Linux PC. It is running well on both the computers.

Publications

Bangladesh Abhawa (Meteorological) Karmakarta Parishad (BAKP), Bangladesh Meteorological Department (BMD) Published a journal known as 'The Atmosphere'. Another publication of the journal is now in progress.

India

Research on topics related to Tropical Cyclone are being taken by different offices/officers as a routine.

Publications:

"Orissa Super Cyclonic Storm of 29 October 1999 – A Review " by S.R. Kalsi published in December 2003 IMD report.

"A review of different storm surge models and estimated storm surge height in respect of Orissa Super Cyclonic Storm of 29 October 1999" by S.R. Kalsi, N. Jayanthi and S.K. Roy Bhowmik – Published as Meteorological Monograph No 1/2004, January 2004.

Pakistan

1. The Wind Mapping Project was started about a year ago in the Coastal Areas of Sindh and Balochistan for assessing power generation potential. Processing of one year data of 41 stations is in hand. A wind turbine power calculator namely "PMD Calculator" has been developed indigenously. On account of its importance, the project has been extended for another one year.
2. A National Centre for Drought/Environment Monitoring and Early Warning has been approved by the Govt. during 2003-2004 in view of the history's worst drought during 1999-2001 which caused low economic growth rate of 2.6% during 2002 and economic losses of about Rs. 20 billion to the national exchequer. Under this project, besides the National Centre at Islamabad, one Centre each would be established in all the four provinces and the existing rainfall network of 100 stations would be expanded up to 500 stations or more.

3. In order to carryout research in Meteorology and other related disciplines, aimed at boosting up agricultural productivity and betterment in other national Socio-economic Sectors, Govt. has recently approved the establishment of Research and Development Division (R&D Division) at Islamabad.
4. In the area of DPP, UNDP has submitted its report for the strengthening of Pakistan's Disaster Management Capacity at the Federal, Provincial and District Levels. In the light of comments from all the concerned quarters, a draft summary has been prepared for obtaining Govt. approval.

Sri Lanka

Future Research

The representative of Sri Lanka informed that they are expecting to develop a Numerical Weather Prediction Model (NWP) for Sri Lanka area and neighborhood in the near future to improve medium range weather forecasting capabilities with the active support from several overseas institutes. In addition, research efforts would also concentrate on the identification of fishing grounds and soil moisture estimations using HRPT imageries.

Thailand

Thailand reported to the Panel that Thai Meteorological Department has continually collaborated with the National Research Council of Thailand (NRCT) and Japan on GAME-T Project (Phase II) during 2003 to 2005. For the 2005 fiscal year, TMD has requested the Thai Government to allocate the budget for the implementation of:

1. Tropical Cyclone Research Project
2. The Development on Climate Prediction Project

Request for Research Activities

In order to achieve the research project in Tropical Cyclone Research, Thailand needs assistance in expertise from WMO for the project.

APPENDIX XIII

STATEMENT OF TSU ACCOUNTS

1.	Balance after 30 th Session	Pak. Rs. 148,450.00
2.	Receipts	NIL
	Total	<u>Pak. Rs. 148,450.00</u>

EXPENDITURES

1.	(a) Running cost of the TSU Website for 2 years.	Pak. Rs. 10,000.00
	(b) Honorarium to TSU-Meteorologist	Pak. Rs. 45,840.00
2.	(a) Expenses incurred on the printing of 18 th & 19 th Issue of the Panel News	Pak. Rs. 45,540.00
	(b) Honorarium to technical staff	Pak. Rs. 9,000.00
3.	(a) Purchase of stationery for TSU use	Pak. Rs. 5,000.00
	(b) Expenditure on postage, fax messages etc.	Pak. Rs. 13,000.00
	Total	<u>Pak. Rs. 128,380.00</u>

Balance in hand Pak. Rs. 20,070.00

APPENDIX XIV

PANEL ON TROPICAL CYCLONE TRUST FUND
Interim Statement of Account
as at 31 December 2003

	\$	\$
Balance of fund at 1 January 2002	34,781	
Contributions	17,978	
Interest	860	
Total revenue	<u>860</u>	53,619
Less: Expenditure		
Local administrative support to the TSU for 2002		
printing of Panel News and development of TSU website	4,000	
Lump sum support towards expenses of Q.Z.Chaudry - 3rd World Water Forum (Kyoto, Japan, 17 to 19 March 2003)	2,700	
Additional Support to Q. Z. Chaudry - 3rd World Water Forum (Kyoto, Japan, 17 to 19 March 2003)	700	
Support costs (13%)	<u>962</u>	8,362
Balance at 31 December 2003	\$	<u><u>45,257</u></u>
Represented by:		
Cash in Bank	\$	<u><u>45,257</u></u>

Country	Contributions			Total
	2001*	2002	2003	
Bangladesh	1,000	1,000	-	1,000
India		1,980	2,000	3,980
Maldives		1,000	1,000	2,000
Myanmar		-	-	-
Oman		1,000	-	1,000
Pakistan **		2,000	-	2,000
Saudi Arabia***		-	1,998	1,998
Sri Lanka		1,000	2,000	3,000
Thailand		1,000	1,000	2,000
Total	<u>1,000</u>	<u>8,980</u>	<u>7,998</u>	<u>17,978</u>

*contribution for 2001 received in 2002

**\$2,000 (\$1,000 x 2)

***Non Member of the Panel on Tropical Cyclones

APPENDIX XV

PROGRAMME OF THE TECHNICAL CONFERENCE ON 5TH MARCH 2004

***Theme: Improved Cyclone Related Forecasting Services
and Disaster Combating Strategies***

Morning Session: 0900 – 1300 hours

Technical presentation:

1. "Towards the World Conference on Disaster Reduction, Kobe, Hyogo, Japan" by Yuichi Ono, UN/ISDR Secretariat
2. "Storm Surge Mitigation in the Bay of Bengal" by S.K. Dube, India
3. "Cyclone Related Forecasting Services & Disaster Combating Strategies" by P.M. Jayatilaka Banda, Sri Lanka
4. "Problem areas in Disaster Management – A Meteorologist's Experience" by S.K. Subramaniam, India
5. "Unusual Behaviour of a Tropical Cyclone in Bay of Bengal" by S.Karmakar, Bangladesh
6. "Strategies to Improve Cyclone Forecasting" by T. Sampan, Thailand
7. "Impacts of Tropical Cyclones & Warning System in China" by Xu Ying Long, China
8. "Disaster Management Practices – India" by V.P. Pasrija, India
9. "Disaster Management Strategies in Sri Lanka", by G.B. Samarasinghe, Sri Lanka

Afternoon Session: 1430-1700 hours

Synthesis Session on future direction and contribution to the World Conference on Disaster Reduction, January 2005.

- Discussion
 - Conclusions and recommendations
-