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PEOPLE'S REPUBLIC OF BANGLADESH

Ministry of Irrigation, Water Development and Flood Control
Bangladesh Water Development Board



**CYCLONE PROTECTION PROJECT II - FAP 7
FEASIBILITY AND DESIGN STUDIES**



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**FINAL PROJECT PREPARATION REPORT
APPENDIX G - CYCLONE EARLY WARNING SYSTEM**

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May 1992

Joint Venture of
KAMPSAX INTERNATIONAL A/S,
BCEOM
DANISH HYDRAULIC INSTITUTE
in association with
DEVELOPMENT DESIGN CONSULTANTS LTD

Financed by European Community - Project No. ALA/87/05

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REPORT VOLUMES

The present Report Volume is part of the

**CYCLONE PROTECTION PROJECT II - FAP 7
FEASIBILITY AND DESIGN STUDIES
BWDB COMPONENT
FINAL PROJECT PREPARATION REPORT**

Consisting of the following Volumes :

- Volume 1 - Main Report
- Volume 2 - Annexes I - XI, XIII
- Volume 3 - Annex XII - Polder Data
- Appendix A - Hydraulic Studies
- Appendix B - Field Surveys and Soil Investigations
- Appendix C - Embankment Design
- Appendix D - Agriculture
- Appendix E - Socio-Economics
- Appendix F - Operation & Maintenance
- Appendix G - Cyclone Early Warning System
- Appendix H - Afforestation
- Appendix I - Feasibility Study on Patenga Project.
- Appendix J - Fisheries.

1. INTRODUCTION

One of the main reasons that cyclone surges are so disastrous is that they build up suddenly, within hours, and not during several days as floods caused by precipitation. The damages and especially the loss of lives can therefore be greatly reduced by a reliable early warning system informing about the advent of cyclonic storms early enough to enable people in the likely affected areas to prepare for the event and be evacuated if necessary before the cyclone strikes.

This report presents a review of the early warning system presently in operation in Bangladesh.

The cyclone early warning system in Bangladesh was incepted after the disastrous cyclone November 1970 and has two main components:

- i) The meteorological forecasting of the cyclone in Special Weather Bulletins issued by the Storm Warning Center of Meteorological Department in Dhaka.
- ii) The communication system broadcasting and transmitting the Special Weather Bulletins to all the affected areas operated under the Cyclone Preparedness Programme.

2. WARNING SIGNALS

Bangladesh Government has given topmost priority in dealing with cyclonic disaster situations. Various measures have been formulated to minimise the loss of human lives and properties. Standing orders have been issued to all Government departments and other agencies to keep them fully prepared when the cyclonic situation arises. The meteorological department explores the causes of depression, locates the centre of depression, follows the track of the cyclone and issues regular bulletins as to the location of the cyclone, wind speed and the probable areas it may hit. These bulletins are circulated through the press, radio and television. They explain the phenomenon of cyclone and the maritime and river port warning signals.

Brief interpretations of the signals are given in below :

2.1 Maritime Port Warning Signals

There are 11 cyclone storm warning signals for the maritime ports of Chittagong, Cox's Bazar and Mongla which are given below :



Signals

Interpretations

Distant cautionary signal no. 1	There is a region of squally weather on the distant sea where a storm may develop.
Distant Warning signal no. 2	A storm has developed on the sea
Local cautionary signal No.3	The port is threatened by squally weather.
Local warning signal no. 4	The port is threatened by a storm but it appears that the danger is not yet at a range justifying extreme precautionary measures.
Danger signal no. 5	The port will experience severe weather from a storm of slight or moderate intensity which is expected to cross the coast to the south of the port in case of Chittagong and Cox's Bazar and east of the port in case of Mongla.
Danger signal no. 6	The port will experience a severe weather from a storm of slight or moderate intensity which is expected to cross the coast to the north of the port in case of Chittagong and Cox's Bazar and to the west of the port in case of Mongla.
Danger signal no. 7	The port will experience severe weather from a storm of great intensity which is expected to cross over or near the Port.
Great Danger signal no. 8	The Port will experience severe weather from a storm of great intensity which is expected to cross the coast to the south of the port in case of Chittagong and Cox's Bazar and to the east of the Port in case of Mongla.
Great Danger signal no. 9	The port will experience severe weather from a storm of great intensity which is expected to cross the coast to the north of the Port in case of Chittagong and Cox's Bazar and to the west of the Port in case of Mongla.

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Great danger signal no. 10	The Port will experience severe weather from a storm of great intensity which is expected to cross over or near to the port.
Failure of communication no.11	Communications with the Meteorological Warning Centre have broken down and the local officers consider that a devastating cyclone is following.

2.2 River Port Warning Signals

There are 4 signals for the river ports as shown below :

Signal no.	Interpretation
Cautionary signal no. 1	The area is threatened by squally winds of transient nature.
Warning signal no. 2	A storm is likely to strike the area (vessels of 65 ft. length and under are to seek shelter immediately)
Danger signal no. 3	A storm will strike the area (all vessels will seek shelter immediately)
Great danger signal no. 4	A violent storm will soon strike the area (all vessels will take shelter immediately)

3. NATIONAL COMMITTEES

At the National level there is a National Co-ordination Committee for cyclone emergency. The composition of the committee is determined by the President of the country.

The committee meets as and when deemed necessary by the chairman of the committee for reviewing the over all preparedness measures and direct concerned authorities to take steps as considered necessary by the committee.

The functions of the committee are as follows :

- i) To assess the overall cyclone situation and damage
- ii) To co-ordinate, direct and supervise relief and rehabilitation measures taken by the concerned Ministries/Agencies and provide necessary assistance to them.

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- iii) Assessment of resources at national level and allocate them for relief and rehabilitation. The sanction of resources by the national committee during the periods of cyclone is final and no further reference to Finance Ministry will be required.
 - iv) To set up small sub-committees to examine and recommend measures to the National Co-ordination committee.
 - v) To review implementation of emergency standing orders on cyclone.
 - vi) To keep the nation posted with information of cyclonic disaster situations.
 - vii) To take such measures as considered necessary in case of relief operations.

4. **STANDING ORDERS**

There are disaster committees at every tier or administration at Divisional level, District level, Upazilla level and Union level.

There are standing orders laid down to ensure that all concerned ministries, departments, agencies etc. are able to discharge their functions speedily, systematically and efficiently. Each of these Ministries/Divisions/-Departments/Agencies has to prepare its own action plan as per standing order and implement it during emergency period. Action plans include training of the employees at union and village levels to take appropriate steps during the various stages of emergencies so that these trained people can be mobilized for motivating people, carrying out emergency works, shifting marooned people, distributing relief materials etc.

4.1 **Action Stages**

Actions under the standing orders for various Ministries, Departments and Organisations will normally fall into the following stages;

- i) Pre-disaster stage (off cyclone season)
- ii) Alert stage (signal no 1, 2 and 3)
- iii) Warning stage (signal no. 4)
- iv) Disaster stage (signal no. 5, 6, 7, 8, 9, and 10)
- v) Post disaster stage (immediately after the cyclone till normalcy is attained)

4.2

Executing Departments and Agencies

Motivation of people and informing the real situation is the most important job for those who are concerned at village and union levels. Spreading of panic must be stopped among the masses and people should be posted with correct information and stage of the cyclone from time to time during the emergency.

The main departments and agencies who will carry out the standing orders are : i) Meteorological Department, ii) Bangladesh Space Research and Remote Sensing Organization (SPARRSO), iii) Ministry of Relief and Rehabilitation, iv) Directorate General, Relief and Rehabilitation, v) Ministry of Information, vi) Radio Bangladesh, vii) Bangladesh Television, viii) Ministry of Health and Population Control, ix) Ministry of Food, x) Ministry of Agriculture and xi) Ministry of Fisheries and Livestock.

Different departments and agencies have different duties consistent with their normal functioning and activities. These have been categorically laid down in the instructions for each Department/Agency on the separate actions mentioned above.

4.3

Directorate of Meteorology

The actions under the responsibility of the Directorate of Meteorology are listed below.

4.3.1

Pre disaster stage

- i) Popularise signals for maritime port and river ports
- ii) Give talks and hold discussion forums in radio/television
- iii) Hold and organise meetings and seminars at national and upazilla levels to arouse public attention.
- iv) Issue directives to field level meteorologists to have frequent meetings with the local people to popularise signals.
- v) Co-ordinate with Directorate of Education to include a chapter in the education curriculum of secondary stage on meteorological aspects.
- vi) Publicise warning signals by posters and distribution of pamphlets, projecting documentary films at important public places and markets.

4.3.2

Alert Stage

In addition to normal functions the Directorate of Meteorology will ensure the following :

- i) Shall issue early warning for cyclone as early as possible but shall endeavour to do so between 24 hours and 36 hours as soon as depression forms in the Bay of Bengal
- ii) Shall inform the Cyclone Preparedness Programme (CPP) over telephone/teleprinter about the existence of a depression in the Bay of Bengal so as to allow CPP to take appropriate actions including dissemination of information to concerned senior officials of Ministry of Relief and Rehabilitation, Directorate of Relief and Rehabilitation etc.
- iii) Shall issue alert messages on telephone/teleprinter/telegraph to the listed officials under code address whirl wind.
- iv) Shall issue suitable special weather bulletins to the Radio Bangladesh and the Bangladesh Television to broadcast and telecast from all stations and also to the national press for the benefit of people. Adequate and constant co-ordination for broadcast and telecast beyond normal transmission hours shall be established between the Meteorology Department on the one hand and Radio Bangladesh and Bangladesh Television on the other as soon as signal no. 3 is hoisted.
- v) Shall pass special weather bulletins to the control room of Relief and Rehabilitation Ministry, Directorate of Relief and Rehabilitation, Cyclone Preparedness Programme and Bangladesh Red Cross Society for taking necessary action.

4.3.2

Warning and Disaster Stage

Shall issue warning messages for the following stages at the time specified against each.

- i) Warning - 24 hours in advance
- ii) Danger - Minimum 10 hours in advance
- iii) Great danger - Minimum 10 hours in advance

Warning Messages shall be issued with the following information:

- a) Positions of storm centre
- b) Direction and rate of movement
- c) Area likely to be affected specifying upazillas, if possible
- d) Approximate time of commencement of gale winds (speed more



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- than 51 km p.h.)
 - e) Maximum wind speed expected
 - f) Storm surge/tide approximate height and the areas likely to be affected specifying the upazillas

Warning Messages shall be issued to Radio Bangladesh to broadcast from all stations of Radio Bangladesh and Bangladesh Television as given below:

- a) Early warning - Immediately on receipt, if the radio station is operating and subsequently at 6-45, 12-10, 17-55 and 23-25 hrs. BST.
- b) Warning - immediately on receipt and every one hour after
- c) Danger/Great danger - Frequently or as advised by the Meteorological Department.

Pass on warning messages to control rooms of Ministry of Relief and Rehabilitation, Cyclone Preparedness Programme and Bangladesh Red Cross Society.

4.3.3 Post Disaster Stage

- i) Evaluate the impact of the cyclone and its conformity with the warnings issued.
- ii) Collect data from the devastated area for research
- iii) Evaluate opinion of the people of the area about signals issued.

4.4 Other Government Bodies and Agencies

Similar orders related to the functions of each Ministry/Division/Directorate/Agency etc. have been given to take necessary steps at different stages of the cyclone. The role of SPARRSO is described in Annex XI to the Main Report.

5. CYCLONE PREPAREDNESS PROGRAMME (CPP)

The CPP has been established and self reliant works programme is being implemented on the basis of villages as units.

5.1 Brief History

In the year 1966 league of red cross and red crescent societies in league with the Swedish Red Cross Society took up a predisaster programme of works as a pilot project on the coastal belt of the then East Pakistan. The purpose of the project was to warn the people before the cyclone and to conduct emergency relief works in the cyclone hit areas. About 5 million

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people in the bigger districts of Chittagong, Noakhali, Barisal, Patuakhali and Khulna were under the jurisdiction of this programme. The programme was arranged for implementation by 473 team leaders (ansars) trained and supplied with signalling equipment at 299 warning centres at the union level.

✓ The Programme of 1966 was doubtlessly praiseworthy but the lack of village based organisation, control, supervision and communication with top tiers of the Government was the cause of ineffectiveness of the programme. The failure of the 1966 works programme was felt after the great cyclone of Nov. 12-13 of 1970. After that great disaster at the initiative of the general assembly of the United Nations, the Cyclone Preparedness Programme was established with the active co-operation of the league of red cross and red crescent societies.

5.2

Field Organisation

At present 2089 units of 207 unions under 24 upazillas in 8 Districts of the coastal area are under jurisdiction of this programme. At the rate of 10 for each unit 20,890 trained volunteers are doing their jobs. Requisite nos. of essential equipment viz, transistor radio, megaphone, siren, signal light, first aid equipment etc. are supplied to each unit so that they can do their duties properly. The command area of CPP and the wireless net work are shown in fig. 1 & fig. 2.

5.3

Activities during Cyclone of April 29-30, 1991

During the disastrous cyclone of April 29-30 1991 the Storm Warning Centre (SWC) of the Meteorological Department issued 29 special weather bulletins within April 25-30, 1991. The control room of the CPP transmitted all the bulletins to the Upazilla Head Quarters by liaison volunteers. The Union Team Leaders passed the messages to the Unit Team Leaders.

? It was observed that the storm warning centres (SWC) of the Meteorological Department took four hours time to issue bulletins of danger signals from the time of their observation. The volunteers alerted people by megaphones and house to house contact. They shifted endangered people to safe places and cyclone shelters. They evacuated 350,000 people to cyclone shelters and other safe places before the cyclone struck during April 29-30, 1991. During the process 23 volunteers lost their lives and 776 received grievous injuries. Following the cyclone for several days the CPP's wireless units were the only link of communication with the coastal areas.

6.

CYCLONE SHELTERS

The cyclone shelters are the most important infrastructures to accommodate the distressed people during the cyclone. At present there are a little

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more than 300 nos. of cyclone shelters scattered throughout the whole coastal areas of the country (table 1 and attached map). 157 killas were made in the '70s by the Govt. and the red crescent society. The Swiss disaster relief committee made six killas after the cyclone of 1985.

7. **VIEWS AND COMMENTS ON THE CYCLONE EARLY WARNING SYSTEM**

Issue of regular warning signals by the Meteorological department as soon as there is formation of depression in the Bay of Bengal till it forms into a cyclone and hits the coast is very important. Storm warning centre of the Meteorological department should disseminate the warning messages to all concerned Ministries/Departments/Agencies including the organisation of cyclone preparedness programme very quickly so that they can carry the message to the areas likely to be affected by the cyclone. Even small delays in carrying the messages to people can cause great damages whereas expeditious supply of information can save lot of people and property.

The following suggestions may be of significance in the warning systems and their dissemination to the people of the affected areas.

- a) Motivation of people in the coastal area : Volunteers and selected departmental staff should be given extensive training to help people realise the meanings of the warnings disseminated by the storm warning centres as well as weather bulletins broadcast in the Radio/Television.
- b) While keeping people informed about the impending calamity of cyclone volunteers/departmental staff must see that unnecessary panic is not created among the masses. All works will be done with determination to save people and property when situation demands.
- ✓ c) Standing order of time gap between observation of depression and issue of special weather bulletins by the storm warning centre of the Meteorological Department should be strictly adhered to.
- d) Location and course of movement of depression should be circulated through radio/television and press.
- e) Distance of the outer edge of the cyclone along with distance of the centre should be announced through bulletins of the SWC and press.
- f) People of the coastal areas should to be fully conversant with the maritime signals. For this, the volunteers under the cyclone preparedness programme and the trained departmental staff should hold meetings with the villagers and educated people, school

why children
not school?

teachers etc of the area.

- g) Sufficient supply of field equipment viz radio, megaphones/sirens etc. and maintenance of the same should be ensured.
- h) Regular training to be imparted to field staff namely, volunteers of CPP and departmental staff.
- i) Number of existing cyclone shelters is not consistent with the number of people in the area. There exists slightly more than 300 cyclone shelters in the whole coastal belt which can accommodate about 500,000 people compared to the total population of more than 5 millions. So, there is a strong need for more cyclone shelters.
- j) Wireless communication with the upazilla head quarters needs improvement for proper dissemination of warning messages to the affected areas. Road network may be established in the whole coastal area and in the offshore islands to facilitate quick evacuation during emergencies and distribution of relief goods after the cyclone.
- k) Jetties could be constructed at suitable points in the offshore islands for embarkation facilities of seagoing vessels and carrying relief goods during emergencies. These may be used for normal communication of people with the mainlands during normal period.
- l) People of the coastal area should learn the meaning of warning signals and pay proper heed to the impending disaster. They should evacuate to cyclone shelters or other safe places when emergency situation so demands. Some time even after the highest danger signal issued by the Meteorological Department the cyclone may die down or change its course but people should not sit idle depending on their fate.
- m) It becomes a real problem for people to evacuate to the shelters when their house hold articles are stolen during their absence. To stop such a situation the administration may engage police and volunteers immediately after the cyclone.

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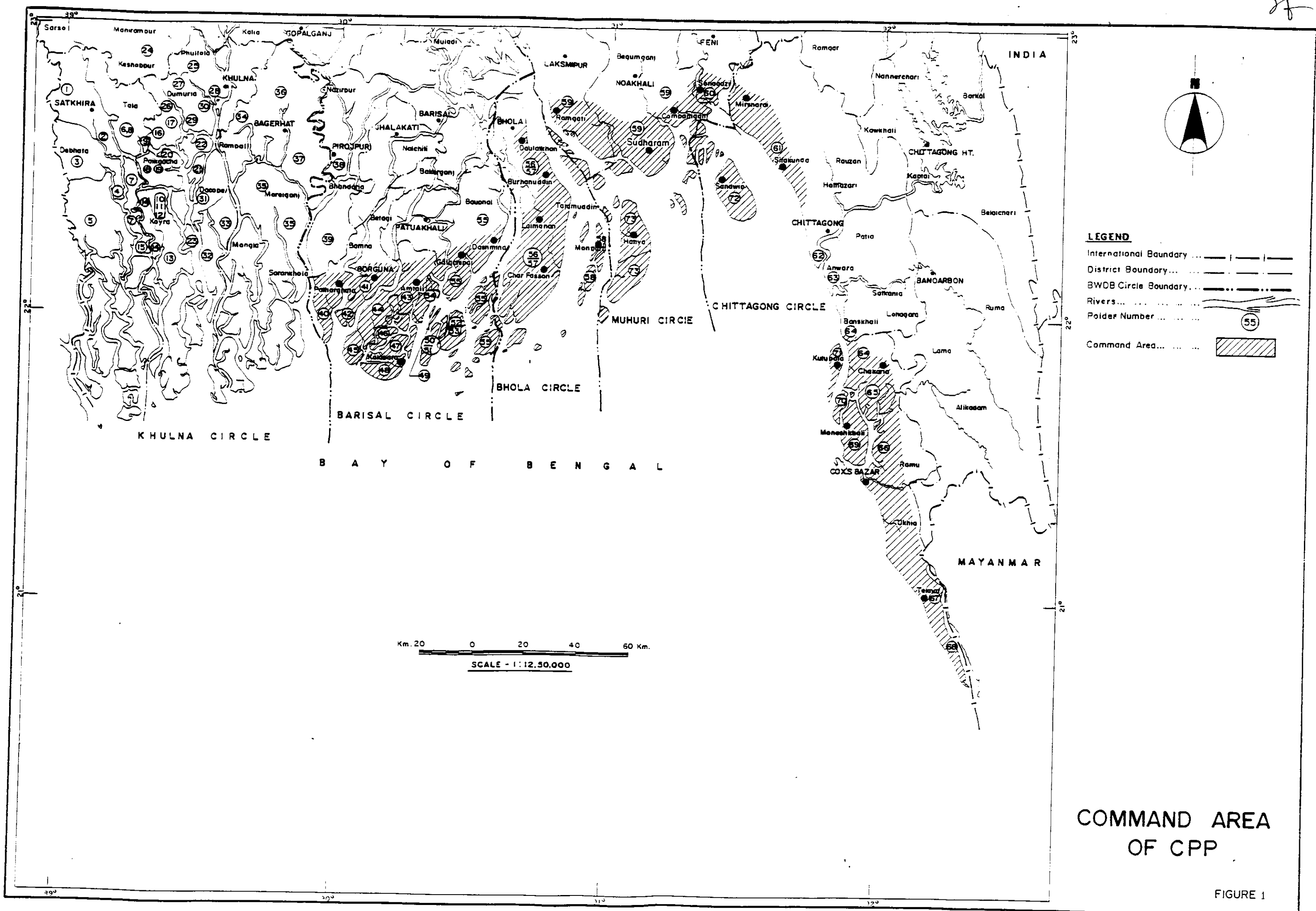


TABLE - 1
LIST OF CYCLONE SHELTERS

Division	Polder No.	No. of Cyclone Shelters
Noakhali O&M Division	60	12
	73/1A	5
	73/1B	11
	73/2A	12
	59/1A	5
	59/3C	7
	59/3A	3
	59/3B	21
Total		76
Laxmipur O&M Division	59/2	12
	Comprehensive Drainage Scheme	4
Total		16
Chittagong O&M Division-I	62	2
Total		2
Chittagong O&M Division-II	72	18
	64/1A	3
	64/1B	1
	63/1A	5
	61/1	3
	61/2	1
Total		31
Satkhira O&M Division-I	-	Nil
Satkhira O&M Division-II	-	Nil
Jessore O&M Division-I	-	Nil
Khulna O&M Division-II	-	Nil
Patuakhali O&M Division	Sadar	1
	43/2D	1
	41/7	1
	43/2B	2

Division	Polder No.	No. of Cyclone Shelters
Patuakhali O&M Division	55/1	8
	55/2B	5
	55/2C	5
	43/2C	1
	55/3	6
	55/4	2
	52/53A	2
	52/53B	2
	50/51	2
	43/1	3
	47/4	3
	46	2
	47/5	3
	48	5
	44	1
	54	1
	47/1	1
	47/2	1
	47/3	1
	43/2A	2
Total		61
Barguna O&M Division	39/1	4
	40/2	1
	42	1
	41/2	1
	44	5
	54	2
Total		14
Cox's Bazar O&M Division	71	7
	70	1
	69	3
	66/3	3

Division	Polder No.	No. of Cyclone Shelters
Cox's Bazar O&M Division	66/4	1
	64/2B	4
	68	4
Total		23
Bhola O&M Division	58/1	2
	58/2	2
	58/3	2
	56/57	73
Total		79
Grand Total		302



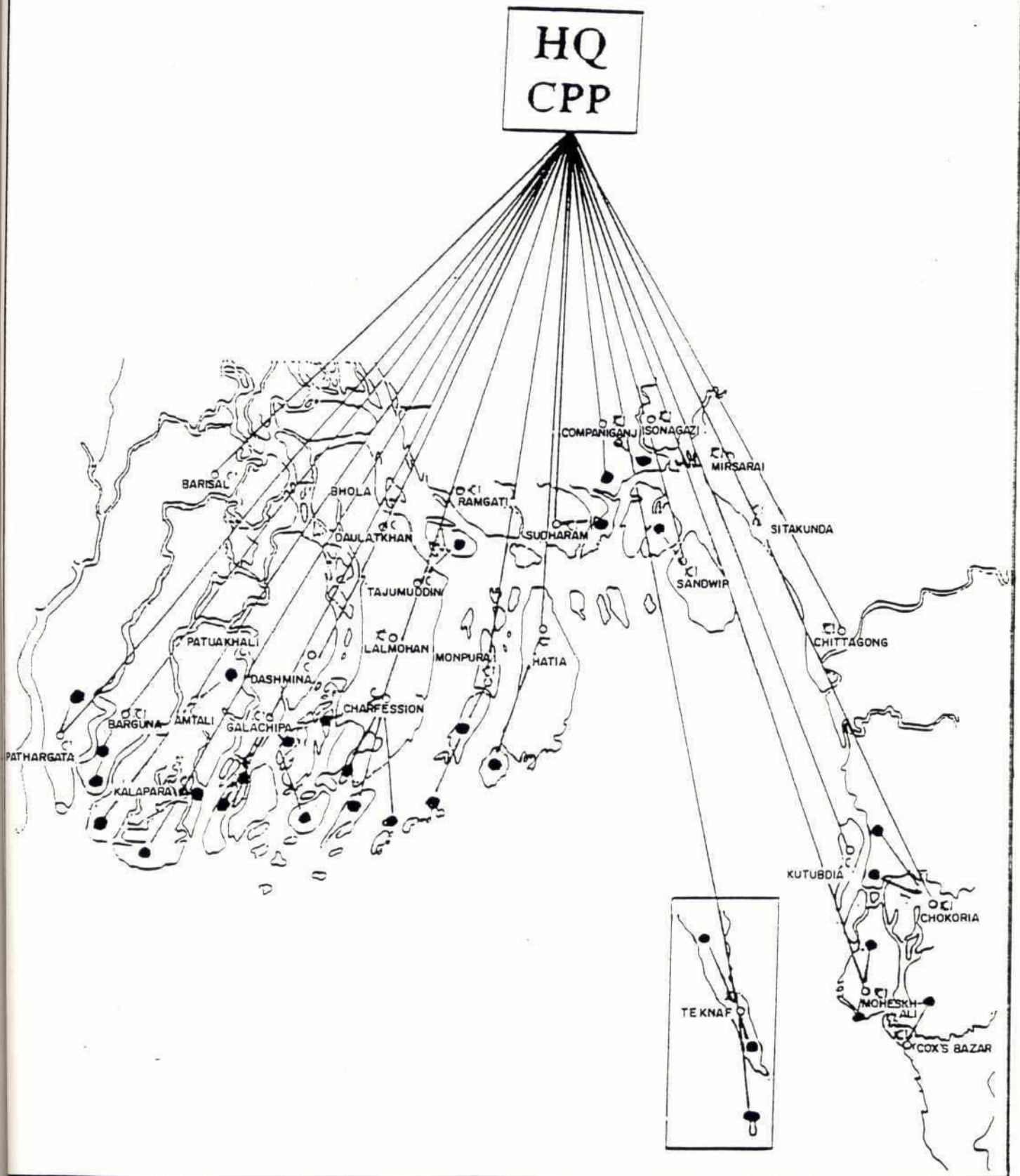
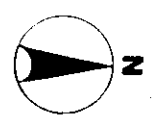
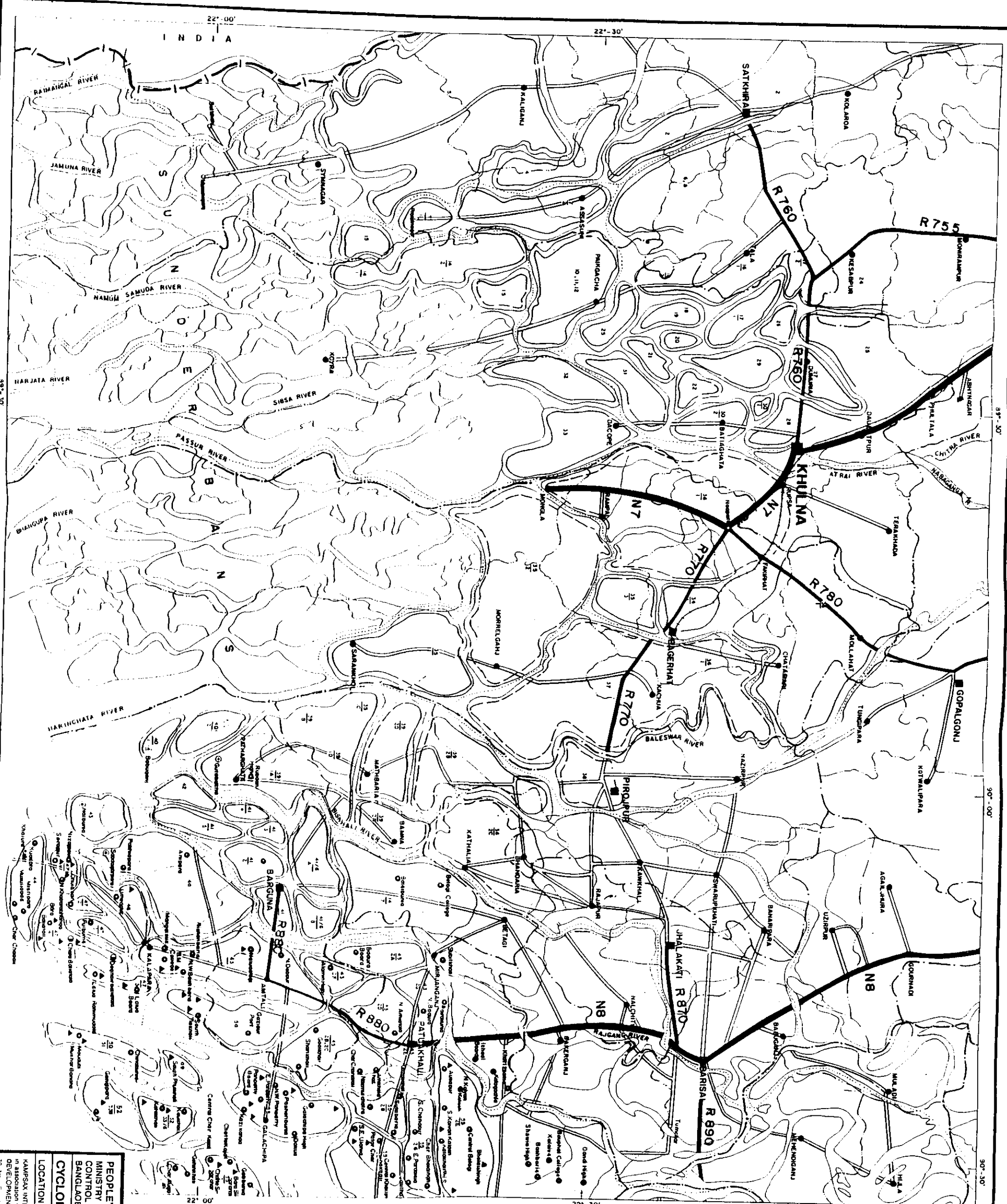


Figure 2 : CPP WIRELESS NETWORK



LEGEND

- International Boundary
- District Boundary
- Upazila Boundary
- National Highway
- Regional Highway
- Feeder Road
- Railway Line
- River & Canal
- Power Embankment with number
- Proposed Polder/Embankment
- District H.Q.
- Upazila H.Q.
- Navigational Route
- System Shelters:
 - P.W.D.
 - BORCS
 - CANALS
 - Killa



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BANGLADESH WATER DEVELOPMENT BOARD
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LOCATION MAP OF CYCLONE SHELTERS
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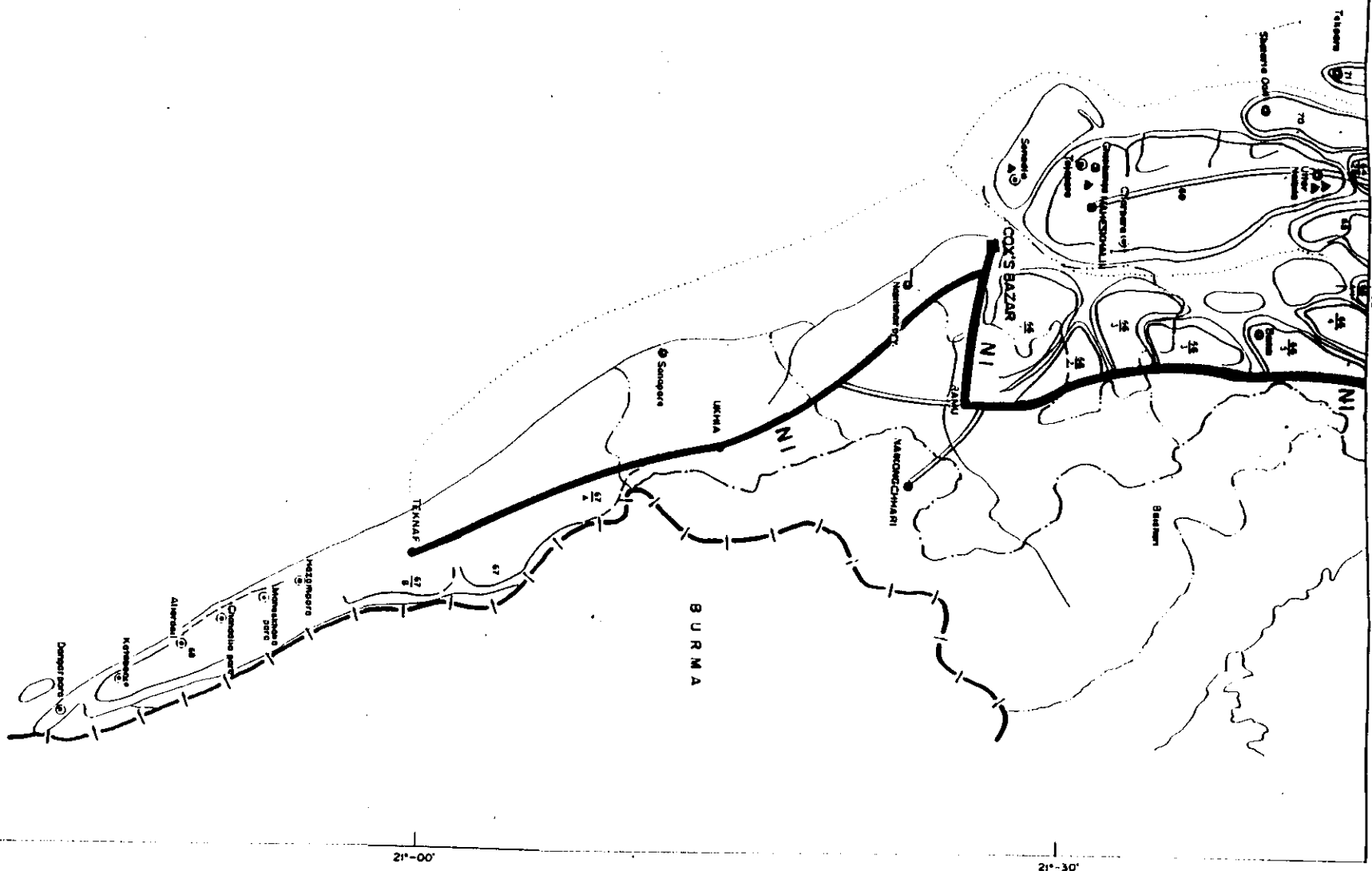


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MINISTRY OF IRRIGATION, WATER DEVELOPMENT AND
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BANGLADESH WATER DEVELOPMENT BOARD

LOCATION MAP OF CYCLONE SHELTERS

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LEGEND-REFER TO SHEET NO. 1



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BANGLADESH WATER DEVELOPMENT BOARD
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