১

বি.এম.ডি আবহাওয়া বার্তা

মেঘদূত
ওহহো,দেখেছো মনে তো হচ্ছে আজকের আবহাওয়া খুব খারাপ যাবে। সবদিক থেকে দেখতো কেমন কাল মেঘে এসে জড়ো হচ্ছে।

২

মেঘদূত
কে জানে, স্কুলের বাচ্চারা আজকের আবহাওয়া পূর্বাভাস জেনে এসেছে কিনা! কারণ আজকের আবহাওয়ার পূর্বাভাস এ বৃষ্টি আর বজ্রপাতের সম্ভাবনা আছে। চলতো দেখে আসি ওরা প্রস্তুত হয়ে এসেছে কিনা।

৩

মেঘদূত
দেখ! শিলাতো দেখছি প্রস্তুত হয়েই এসেছে, ও নিশ্চয় আজকের আবহাওয়ার পূর্বাভাস শুনেই এসেছে। আহ!

৪

মেঘদূত
বাহ! বাদলও দেখছি তৈরি হয়েই এসেছে।

৫

মেঘদূত
হায় হায়, একজন দেখছি একদম প্রস্তুত না!

৬

মেঘদূত
হুম! তিমুল তো দেখছি আজকের আবহাওয়ার পূর্বাভাস একদম শুনে আসেনি। আমাদের জীবনযাপনের জন্য আবহাওয়ার পূর্বাভাস খুব গুরুত্বপূর্ণ একটা বিষয়।
আমার তো মনে হয় আজকে ওরা ক্লাসে এটা নিয়েই কথা বলবে। চল না আমরা দেখে আসি ওরা কি নিয়ে কথা বলছে।

৭ 

শিক্ষক
তিমুল, কি অবস্থা তোমার? তুমি ছাতা নিয়ে আসো নি কেন? আজকের আবহাওয়ার পূর্বাভাস শোন নি?

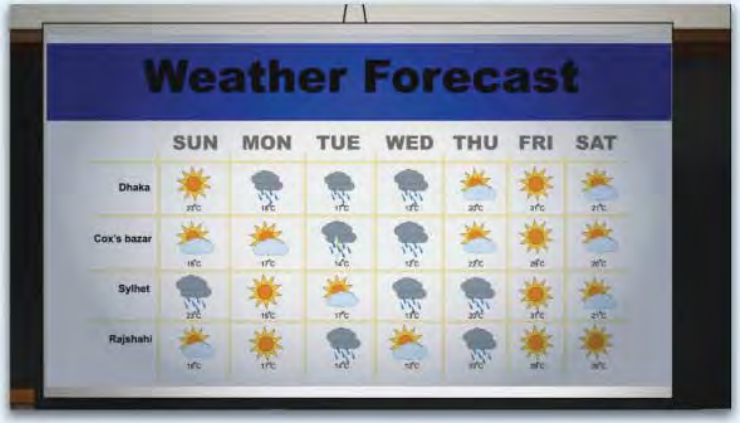
৮ 

তিমুল
পুউউরবাভাস? এটা আবার কি?

৯ 

শিক্ষক
হুম, বুঝছি আসলে আজকেই আবহাওয়ার পূর্বাভাস নিয়ে কিছু শেখানো দরকার তোমাদের। প্রজেক্টরটা দেখছো না? সবাইকে এটা দিয়ে যে ছবি গুলো দেখাবো সেগুলো একটু মনোযোগ দিয়ে দেখ। সবাই তৈরি তো?

১০-১



১০-২

১০-৩

শিক্ষক

আবহাওয়ার পূর্বাভাস বলতে বোঝায় আগামী দিন, আগামী সপ্তাহ কিংবা আগামী মৌসুমে আবহাওয়া কি রকম হতে পারে সেটা অনুমান করা। এটা আমাদেরকে আগে থেকেই আবহাওয়া সম্পর্কে সচেতন করে আর তার ফলে আমরা সিদ্ধান্ত নিতে পারি যে ছাতা আনা দরকার কি না, কৃষকরা সিদ্ধান্ত নিতে পারে কখন ফসলে সেচ দেয়া দরকার,আর জেলেরা বুঝতে পারে যে নৌকা চালানো নিরাপদ না কি নিরাপদ না ।

১১

তিমুল
পূর্বাভাস... উমমম... এটা কোথায় পাওয়া যায়? আমি তো জীবনেও এটা দেখিনি...

১২

শিক্ষক
তিমুল, আমরা অনেক ভাবেই আবহাওয়া পূর্বাভাস পেতে পারি। প্রতিদিন আমরা এটা রেডিও থেকে শুনতে পারি, টেলিভিশন এ দেখতে পারি অথবা খবরের কাগজ বা ইন্টারনেট থেকে দেখে নিতে পারি।

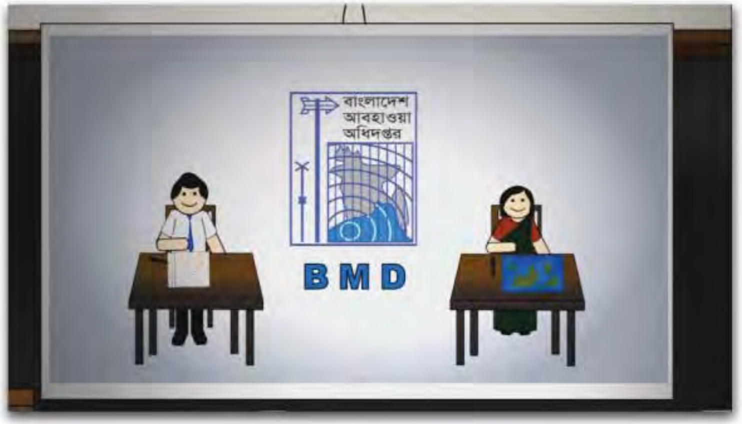
১৩

বাদল
আচ্ছা, আবহাওয়ার পূর্বাভাস কারা তৈরি করে?

১৪-১

শিক্ষক
বাংলাদেশে আবহাওয়ার পূর্বাভাস তৈরি করে বাংলাদেশ আবহাওয়া অধিদপ্তর বা বিএমডি। বিএমডি যে শুধু প্রতিদিনের পূর্বাভাস তৈরি করে তা না, তারা ভয়ানক সব দুর্যোগ যেমন ঘুর্ণিঝড় বা বজ্রবৃষ্টির সম্বন্ধে আমাদের আগে থেকে সতর্ক করে। বিএমডি তে আবহাওয়া নিয়ে বিশেষজ্ঞরা কাজ করেন যাদেরকে বলা হয় আবহাওয়াবিদ ।

১৪-২



১৫

তিমুল
আবহাওয়াবিদরা কিভাবে পরের দিনের আবহাওয়া জানতে পারে? উনারা কি জাদু জানে নাকি?

১৬-১

শিক্ষক
না না, তা না! আবহাওয়ার পূর্বাভাস তৈরির বিভিন্ন ধাপ আছে। ভবিষ্যতের আবহাওয়া জানার জন্য আগে বর্তমানের আবহাওয়ার অবস্থা জানতে হয়। এ কারণে আবহাওয়াবিদরা প্রতিদিনের তাপমাত্রা, বায়ুপ্রবাহ, বৃষ্টিপাত এবং আরও অনেক আবহাওয়ার উপাদান মাটি থেকে আকাশ পর্যন্ত পর্যবেক্ষণ করেন।

১৬-২

১৭

শিলা
কিন্তু, তারা আকাশের এতো উপরের আবহাওয়া কিভাবে বুঝতে পারেন?

১৮

তিমুল
আমার মনে হয় ওরা রকেট টকেট এ চড়ে উপরে যায়.

১৯-১

শিক্ষক
সেটা না তিমুল, আবহাওয়াবিদরা আবহাওয়া বেলুন দিয়ে আকাশের অবস্থা পর্যবেক্ষণ করে। এটাকে এই যে এরকম দেখায়। এটা দিয়ে বাতাসের তাপমাত্রা, বায়ুপ্রবাহ, আর্দ্রতা... এসব মাপা যায়।

১৯-২

শিক্ষক
তাছাড়া আকাশ পর্যবেক্ষনের আরেকটা খুবই ভাল একটি যন্ত্র হল রাডার । রাডার দিয়ে কয়েকশ কি.মি. পর্যন্ত মেঘের সৃষ্টি ও গতিবিধি পর্যবেক্ষন করা যায় ।

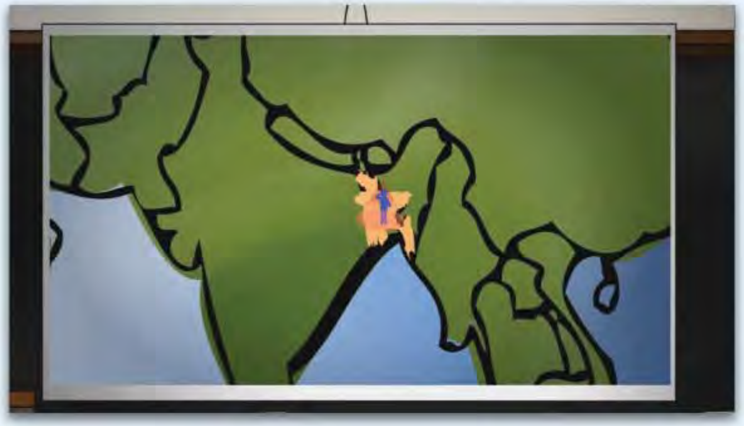
১৯-৩

শিক্ষক
এছাড়াও আবহাওয়াবিদরা মহাশূণ্যে স্যাটেলাইটও ব্যবহার করে।

২০

তিমুল
হাহা, বোকা নাকি এরা!! আবহাওয়া দেখার জন্য অত উপরে যাওয়ার কি দরকার? আমি তো নিচে থেকেই সবকিছু দেখতে পারি!

২১-১



শিক্ষক
তিমুল, বিস্তীর্ণ এলাকার আবহাওয়ার অবস্থা জানার জন্য এটা বেশ উপর থেকে দেখতে হয়। কারণ কখনো কখনো দেখা যায় যে আমাদের দেশের উত্তর পশ্চিমে ভারত থেকে কালবৈশাখী ঝড়ের মেঘগুলো উড়ে আসে কিংবা ১০০০ কি.মি. দূরে বঙ্গোপসাগরে তৈরি হওয়া ঘূর্ণিঝড় এখানে আঘাত হানে।

২১-২

শিক্ষক
সেজন্যই অনেক দুরের আবহাওয়া না জেনে সঠিক ভাবে কখনো আবহাওয়ার পূর্বাভাস করা যায় না।

২১-৩

শিক্ষক
কারণ আকাশের কোনও ভৌগলিক সীমারেখা নেই । তাই আবহাওয়ার কোথাও যাতায়াত করতে কোন পাসপোর্ট লাগেনা ।

২২

বাদল
কিন্তু, আমরা অতো দূরের আবহাওয়া কিভাবে জানবো?

২৩-১

শিক্ষক

ভালো প্রশ্ন বাদল। আগে বলেছি জানার একটা উপায় স্যাটেলাইট, যা মহাশূন্যে ঘুরে ঘুরে বিস্তৃত এলাকার ঘূর্ণিঝড়ের গতি প্রকৃতি আর মেঘের অবস্থা পর্যবেক্ষণ করে। আরেকটা উপায় হল তথ্য আদান প্রদান। প্রত্যেকটা দেশই অন্য দেশকে তাদের আবহাওয়া পর্যবেক্ষনের তথ্য দিয়ে আবহাওয়ার পূর্বাভাস তৈরি করতে সাহায্য করে।

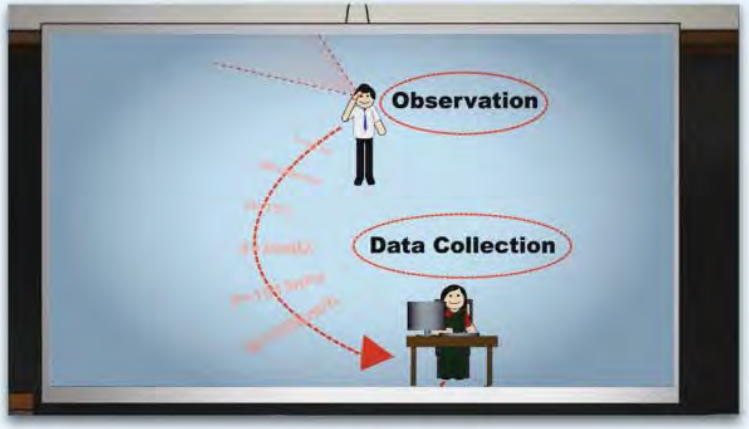
২৩-২

২৪

শিলা

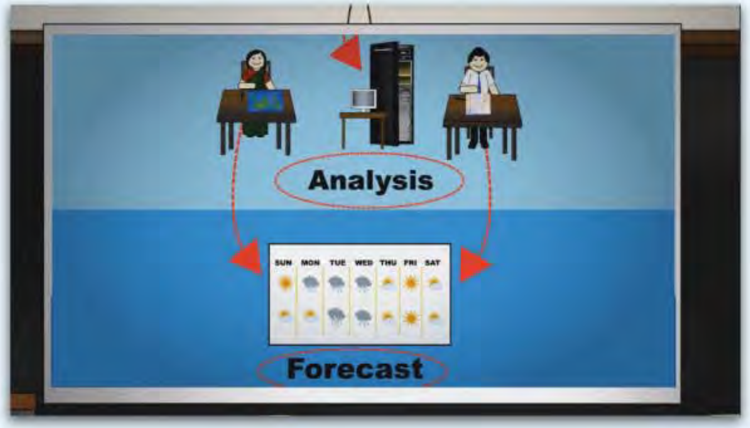
আচ্ছা স্যার, এরপরে এসব তথ্য দিয়ে কি করা হয়?

২৫-১



২৫-২

২৫-৩



শিক্ষক

এরপরে এই তথ্যগুলো দিয়ে আবহাওয়াবিদরা আবহাওয়া সংশ্লিষ্ট নানা চার্ট তৈরি করে। আবহাওবিদরা এই চার্ট এবং তথ্য, শক্তিশালী কম্পিউটার দিয়ে বিশেষণ করেন আর এভাবেই তারা আবহাওয়ার পূর্বাভাস তৈরি করেন।

২৬

তিমুল

হায় হায় তাহলে কি আবহাওয়ার পূর্বাভাস জানার জন্য আমার প্রতিদিন বিএমডি তে যেতে হবে?

২৭

শিক্ষক

না না তিমুল। আগেই তো বলেছি, অনেক ভাবেই আবহাওয়ার পূর্বাভাস জানা যায়। কারণ পূর্বাভাস তৈরি করার পর বিএমডি এগুলো প্রচারের ব্যবস্থা করে অর্থাৎ মানুষকে জানানোর জন্য এগুলো বিভিন্ন সংবাদ মাধ্যম যেমন রেডিও, টিভি, ইন্টারনেট ও সংবাদপত্রে পাঠানো হয় যাতে আমরা যে কোন জায়গা থেকে যখন খুশি আবহাওয়ার পূর্বাভাস জানতে পারি ।

২৮

বাদল

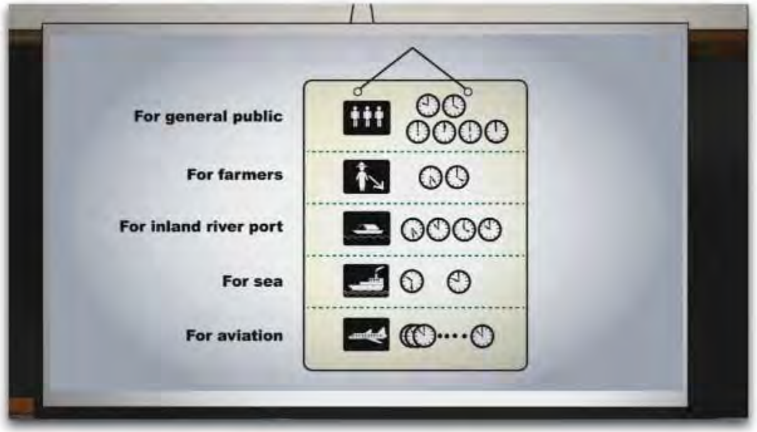
বাহ ! আবহাওয়াবিদরা তো আমাদের জন্য অনেক কিছু করছে!

বি.এম.ডি আবহাওয়া বার্তা

২৯-১

শিক্ষক
হ্যাঁ বাদল, একদম ঠিক, আমাদের জন্য তারা দিনরাত ২৪ ঘন্টা কাজ করছেন। এই যে চার্টটা দেখছ, আবহাওয়াবিদরা প্রতিদিন ভিন্ন ভিন্ন ক্ষেত্রের জন্য আলাদা পূর্বাভাস নির্দিষ্ট সময়ে তৈরি করেন। তা ছাড়াও তারা খারাপ আবহাওয়ার জন্য আমাদের সতর্ক করে দেন, যাতে আমরা নিরাপদে থাকতে পারি।আজকের মত ক্লাস তাহলে এ পর্যন্তই। আশা করি তোমরা আজকে থেকে নিয়মিত আবহাওয়া পূর্বাভাস শুনবে আর সে অনুযায়ী প্রস্তুত থাকবে। ঠিক কি না তিমুল?

২৯-২



৩০

শিক্ষক
আবার কি করছ তিমুল?!

৩১


তিমুল
স্যার, আমি আবার আগের মতো ওভাবে ভিজতে চাইনা, তাই, না ভেজার জন্য ব্যবস্থা করছি।

৩২


শিক্ষক
তিমুল, তুমি যদি আজকের পূর্বাভাস শুনতে তাহলে কিন্তু তুমি জানতে যে আজকে বিকালে অনেক সুন্দর রোদ ওঠার কথা।

৩৩


মেঘদূত
দেখলে ? আমাদের সবার উচিত প্রতিদিনের আবহাওয়া পূর্বাভাস শোনা। এটা যে শুধু আমাদের নিরাপদ রাখে তা না, এটা আমাদের জীবনযাপন সহজ করে তোলে। যাই তাহলে? ভালো থেকো সবাই!

— খরা —

১-১


মেঘদূত
উফফফ!কি গরম একটা দিন !আশপাশটা কেমন শুকনো লাগছে। সবকিছুই যেন পানি চাচ্ছে !আমি ভাবছি এমন কেন হচ্ছে ?আশা করি টিচার আর ক্লাসের বাচ্চারা ভালই আছে। দেখো! বাদল বাসে করে কথায় যেন যাচ্ছে!

১-২


২


বাদল
আসসালামুয়ালাইকুম স্যার!আজকের দিনটা কি প্রচন্ড গরম ....

3

শিক্ষক
ঠিকই বাদল সবকিছু কেমন শুকনা।

4

বাদল
হ্যা স্যার!কিছুদিন আগে আমি বাসে করে আসছিলাম,তখন একটা মরমরা খামার দেখলাম। দেখলাম যে মাটিতে ফাটল ধরা আর গাছগুলো শুকানো। আর একটা চাষী কেও দেখলাম , খুব কষ্টে আছে। কি হযেছে ?

5

শিক্ষক
ক্লাস শুরু করার সময় হয়েছে, চল ভিতরে যাই তারপর আমি তোমাদেরকে বলব কেন গাছপালা শুকিয়ে যাচ্ছে আর মাটি ফেটে যাচ্ছে।

6-1

6-2

শিক্ষক
কি খবর তোমরা হয়তোবা এইকদিন অনেক শুকনা গাছ ও ফাটল ধরা মাটি দেখতে পাবে। আর আমি জানি প্রচণ্ড এই গরমে তোমাদের সবার অসহ্য লাগছে।

6-3

শিক্ষক
আর সে জন্য আমরা এ সম্পর্কে আজকে জানব। আমরা বেশ কদিন ধরে গরম আর শুষ্ক আবহাওয়া অনুভব করছি একটা অবস্থার কারণে। যাকে বলা হয় খরা।

7-1

শিক্ষক

প্রতিবছরই বিশ্বের বেশ কিছু দেশ খরার সম্মুখীন হয়।

7-2

শিক্ষক

খরা তখনই হয় যখন বহু সময় ধরে কোন বৃষ্টি হয়না, ফলে মাটি শুকিয়ে যায়, কুয়া শুকিয়ে যায়, ভূ-গর্ভস্থ পানি কমে যায়, আর যে কারণে ফসল শুকিয়ে যায়।ফলে গবাদি পশুর খাদ্যে টান পরে।

7-3

শিক্ষক

যেহেতু পানি আর খাবারের পরিমান কমে যায় তাই মানুষ আর গবাদি পশু প্রচণ্ড কষ্টে থাকে। বাংলাদেশ বিশ্বের অন্যতম ঘূর্ণিঝড় আর বন্যা প্রবণ দেশ। কিন্তু খরার ক্ষয়ক্ষতি ঘূর্ণিঝড় বা বন্যা থেকে অনেক অনেক বেশি হতে পারে।

8

বাদল

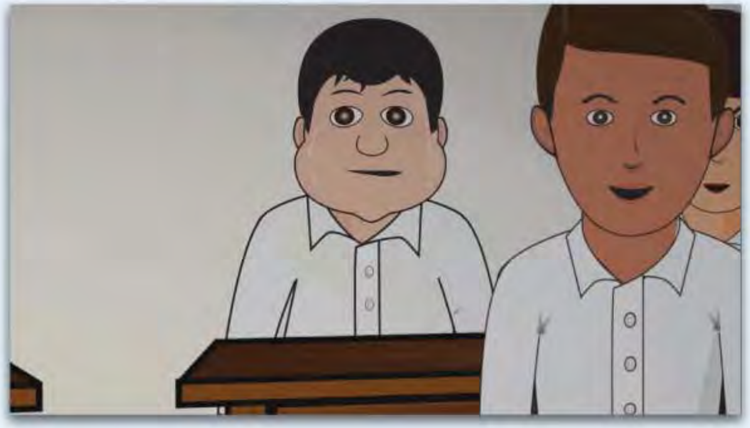
হমমম......বাংলাদেশতো কৃষি প্রধান দেশ। খরা তো তাহলে আমাদের সবারই ক্ষতি করতে পারে......

9

শিক্ষক

ঠিক বলেছ বাদল বাংলাদেশের একটা বড় অংশ ক্ষরায় আক্রান্ত হতে পারে। বাংলাদেশের পশ্চিম ও বিশেষ করে উত্তর-পশ্চিম দিকে প্রায়ই ক্ষরা হয়ে থাকে।

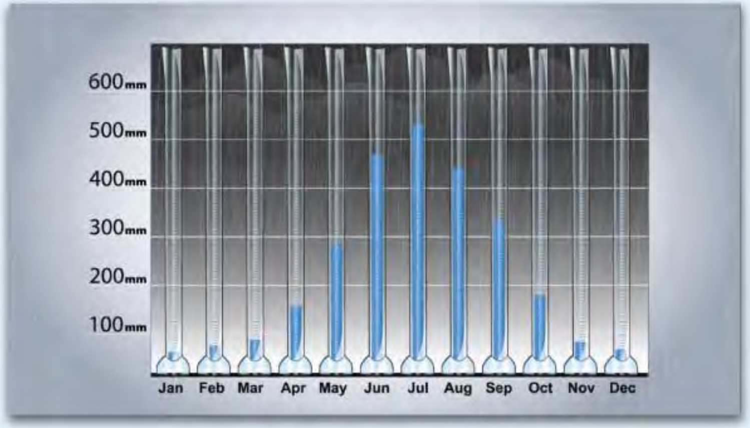
10



তিমুল

হেঃ .....এত বন্যার,বৃষ্টির দেশে খরা প্রায় কিভাবে হয় ?

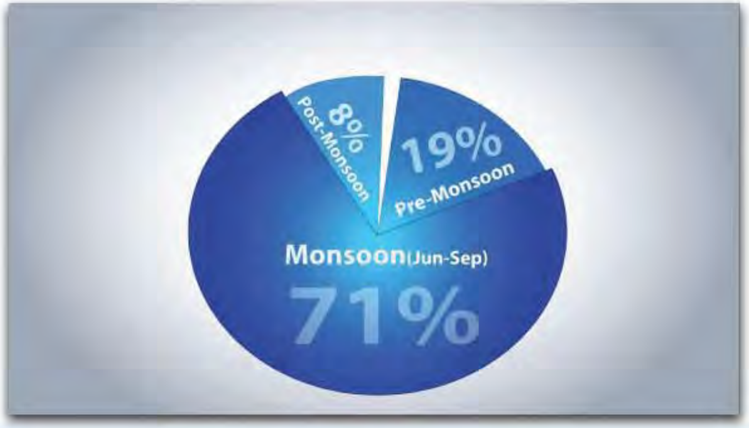
11



শিক্ষক

ভালো জিনিস বলেছ , কিন্তু এই চার্টের দিকে তাকিয়ে দেখলে তুমি বুঝতে পারবে কেন আমাদের দেশে এত বৃষ্টি হওয়ার সত্তেও ক্ষরা হয়।

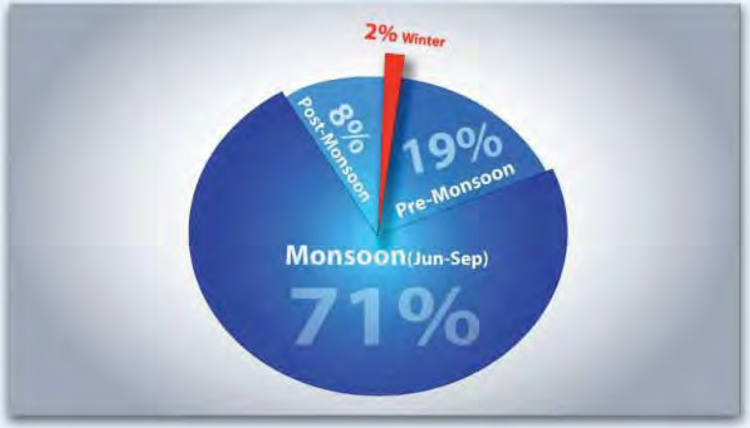
12



শিক্ষক

বাংলাদেশের পানি বা পানি প্রবাহজনিত জলবায়ুর অবস্থা এমনই যে বর্ষা মৌসুমে আমরা অতিরিক্ত পানি পাই অথচ শীতকালে পানিই থাকেনা । এই কারণে ক্ষরার সৃষ্টি হয়।

13



শিক্ষক

আমাদের ঋতুগুলো যেভাবে একের পর এক আসে তাও ক্ষরার একটা কারণ। আমাদের দেশে শীতকলে সারাবছরে মাত্র ২ শতাশং বৃষ্টিপাত হয়। আর বেশীর ভাগ বৃষ্টিই বর্ষা কালে সীমাবদ্ধ থাকে।

14

তিমুল

হুহ .....পানি পাওয়া কোনো বাপর নাকি?আমরা তো মাটির নিচ থেকে যত ইচ্ছা তত পানি পাই

15-1

শিক্ষক

না তিমুল খরার প্রকপ কমাতে হলে আমাদের পরিবেশ বাচাতে হবে। আর তার একটা উপায় হলো ভূ-গর্ভস্থ পানি সংরক্ষণ। আমরা যদি ইচ্ছামত এই পানি খরার সময় ব্যবহার করি তাহলে আমরা পরিবেশের খুব ক্ষতি করবো।

15-2

শিক্ষক

কালকে আমরা একটা খামারে যাব। ঐ খামারে আমরা রহিম চাষির সাথে দেখা করব। উনি আমাদের কিছু উপকারি পন্থার কথা বলবেন, যা কিনা আমাদের খরার সময় সাহায্য করবে।

16-1

শিক্ষক

সবাই শোন, ইনি রহিম ভাই ইনি এই খামারের মালিক। আর তোমরা নিশ্চই দেখছ যদিও এখন খরার সময় তারপরও রহিম ভাইয়ের খামার কিন্তু অন্য খামারগুলোর চেয়ে অনেক ভালো অবস্থায় আছে।

16-2

17

রহিম চাষী

হ.....মাঝে মাঝে ফেব্রুয়ারী মাস থেইকা আমরা খরা দেখতে পাই যা জুন মাস পর্যন্ত চলে। ভাগ্য ভালো আমার খামারের অবস্থা খরার মধ্যেও ভালো।এর কারণ আমরা কিসু নির্দিষ্ট পন্থা মাইনা চলি।যা আমাদের খরার ক্ষতি থেকে রক্ষা করে ।

18

শিলা

এই পদ্ধতি অবলম্বন করে কি আমরা খরা এড়াতে পারি ?

19

রহিম চাষী

না,তা করা যায় না ।আসলে দেখো আমদের ঋতুর উপর তো আমাদের কোন হাত নাই ।খরা তো হবেই ।কিন্তু খরার সময় ভালোভাবে থাকার উপায় আসে আমাদের ।আমি যেমন খরার সময় ফসল বনার ক্ষেত্রে বাংলাদেশ আবহাওয়া অধিদপ্তরের কৃষি আবহাওয়ার বুলেটিন দেইখা নেই।

20

রহিম চাষী

এই বুলেটিন আমারে অনেক সাহায্য করে ।খরা মোকাবেলার কিসু উপায় হলো -পরিবেশ,চাষাবাদ,খবর আর সেচ ব্যবস্থা । আমি যখন তোমাদের উপায় গুলা দেখাবো তখন তোমরা দেখবা ,যে এই খামারে আমরা এই নিয়ম গুলো মাইনা চলসি। চারিদিকে তাকায় দেখত কি দেখো?

21-1

বাচ্চারা

গাছ!অনেক গাছ!

21-2

22

রহিম চাষী

খরা মোকাবেলায় সবচেয়ে প্রয়োজনীয় যে কাজটা আমরা করতে পারি তা হিল পরিবেশের যত্ন নেয়া। এই জন্য সবচেয়ে প্রথমে বন উজার করা বন্ধ করতে হবে বা গাছ কাটা বন্ধ করতে হবে ।আর গাছ রোপন করা শুরু করতে হবে ।পরিবেশকে সাহায্য করার আরেকটা উপায় হলো ,এলাকা ভিত্তিক বায়োগ্যাস প্ল্যান্ট ব্যবহার করা ।ঐ যে ঐখানের ঘরটা দেখো।

23

রহিম চাষী

ঐ জায়গায় আমাদের খামারের জৈব পচনশীল আবর্জনা থেইকা গ্যাস তৈরী হয় ।আমরা এই গ্যাস জালানি হিসেবে এই খামারের কাজে লাগাই ।

24

শিক্ষক

বাচ্চরা তোমরা কি বুঝতে পারছো, বায়োগ্যাস ব্যবহরের সুবিধা কি, আর এতে কিভাবে পরিবেশ উপকৃত হয়?

25

বাদল

আমার মনে হয় এই উপায়ে আমরা গাছ না কেটেই যে জ্বলানী দরকার তা পেতে পারি

26

শিক্ষক

একদম ঠিক বাদল, বায়োগ্যাস প্ল্যান্ট প্রতিদিনকার আবর্জনাকে গ্যাসে রূপান্তরিত করে।

27-1

রহিম চাষী

চারদিকে তাকায় দেখো আমার খামারে কিভাবে গাছ লাগানো হইসে ।

27-2

রহিম চাষী

দেখবা কিরকম বিভিন্ন প্রজাতির গাছ লাগানো হইসে।

28

শিলা

এটা কেন করআ হয়?কি হয় এতে?

29

রহিম চাষী

কারণ ,আমরা যদি বিভিন্ন প্রজাতির ফসল লাগাই তাহলে খামারের সব ফসল নষ্ট হওয়ার সম্ভাবনা কম থাকে।যদি শুধু এক প্রজাতির ফসল লাগাই সব এক সাথে মইরা যাইতে পারে ।এছাড়া খরার সময় আমাদের খরা সহনীয় আর স্বল্প মেয়াদী বিভিন্ন ফসল বাসার আঙ্গিনায় লাগানো উচিৎ।

30

বাদল

চাষীরা কিভাবে জানবে যে খরা হতে পারে ?

31 

রহিম চাষী
এই যে বাংলাদেশ অধিদপ্তরের দেয়া এই কৃষি বুলেটিন থেকা জানা সম্ভব।এইটাতে যথেষ্ট তথ্য আসে যা থেকা বোঝা যায় খরা হইতে পারে কিনা।

32 

33 

শিক্ষক
রহিম ভাই আপনি ওদের আপনার সেচ ব্যবস্থা সমন্ধে কিছুবলেন। ওটাতো আপনার খরার সময় সাহায্য করেছে তাইনা?

34-1

রহিম চাষী

ওহ...হ্যা !এই খামারে খুব ভালো ভাবে বৃষ্টির সম্ভাবনা অনুযাই সেচ বেবস্থা সার বা কীটনাশক দেবার ব্যবস্থা আসে।ঐযে ঐ জায়গায় দেখো আমরা একটা ছোট্ট পুকুর করসি বৃষ্টির পানি জমানোর জন্য ।আমরা ঐ পুকুর থেকা আবার খামারের সব দিকে খাল ছোট্ট কাটছি ।

34-2

রহিম চাষী

দেখস খালে কি সুন্দর পানি বৈতাসে !এইটা আমাদের ফসলের জন্য পানির যোগান দেয় ।এইভাবে আমরা বৃষ্টির পানি জমিন থেকেই পাইতে পারি ।ফলে জমিনের নিচের পানি আমরা ভবিষ্যতের জন্য রক্ষা করতে পারি ।

35

বাদল

বাহ!ওখানে মাছও আছে !

তিমুল

মাছ!কই?!কই?!

36

রহিম চাষী

হ...আমরা ঐ পুকুরে মাছের চাষও করি। তাতে আমাদের জমির ভালো ব্যবহার হয়।

শিক্ষক

আপনার খামারটা খুব চমৎকার রহিম ভাই। আর এটাতো পরিবেশের জন্য খুব ভাল আপনার সময়ের জন্য অসংখ্য ধন্যবাদ রহিম ভাই।

37

শিলা

এখানে বেড়াতে এসে ভালো লাগলো। আমরা অনেক কিছু শিখলাম আজকে। আশা করি আসার সময় যে খামার গুলো দেখলাম ,তারা খরার সময় এই সেচ পদ্ধতি ব্যবহার করবে ।

38

রহিম চাষী

যাক ,খুশি হইলাম তোমরা অনেক কিসু শিখসো। তোমরা খরে মোকাবেলার এই উপায় গুলা সবাইরে বইলা ছড়ায় দিও।

শিক্ষক

অসংখ্য ধন্যবাদ রহিম ভাই। কি তোমাকে বলেছিলাম না এখানে এস তুমি অনেক কিছু শিক্ষতে পা....। তিমুল!

39-1

39-2

39-3

তিমুল

জি স্যার .....মাছ!

40-1

40-2

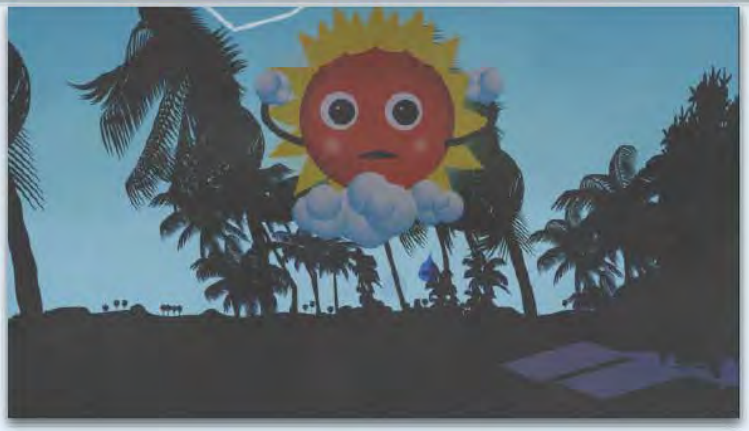
40-3

মেঘদূত

বাচ্চারা মনে হয় মজাই পেয়েছে। বিশেষ করে তিমুল। আমার মনে হয় তোমরাও খরা সন্মন্ধে অনেক কিছু জেনেছ। আশা করি তোমরা রহিম চাষীর উপদেশ গুলো মনে রাখবে আর তোমাদের অভিবাবকদের জানাবে । তাহলেই আমরা সবাই একসাথে খরা মোকাবেলা করতে পারব।

1-1

1-2



1-3

ঘূর্ণি ঝড় এবং জলোচ্ছাস

মেঘদূত

ওহ! কি প্রচন্ড বাতাস আজকে। তোমরা জানো আমরা এখন কোথায়? আমরা এখন বাংলাদেশের ঘুর্নিজর এর আশ্রয় কেন্দ্রে কাছা কাছি। যখন জোর ঝড় আসে তখন মানুষজন নিরাপত্তার জন্য এইখানে আসে । ওহ! প্রচন্ড জোরে বাতাস বইছে, চল নিরাপত আশ্রয় যাই!

2

শিলা

হায় হায় তীমুল বাদল তোমরাও এইখানে? বাহ! তোমাদের এইখানে পেয়া ভালই হলো! তোমাদের পরিবারো কি এইখানে আশ্রয় নিয়েছে?

3

বাদল

আরে শিলা ! হ্যা, যখন আমার বাবা মা বিপদ সংকেত শুনলো, তখনি আমরা কিছু খাবার, প্রাথমিক শিক্ষার জিনিস নিয়া এইখানে চলে আসলাম।

4

তিমুল

হুহ.... আমি বুঝি না! আমরা কেনো এরকম একটা জায়গায় আসলাম? চলো ঐখানে যাই খেলি। জায়গাটা খুব বেশি ঘিঞ্জি।

5

রেডিও ঘোষক

শুভ অপরাহ্ন। এক ভয়ংকর ভূমিকম্প "জেড" গত ২০ কিলোমিটার বেগে আমাদের উপকূলের দিকে ধেয়ে আসছে। অতন্ত্য শক্তিশালী ঘূর্ণিঝড়টিতেই বজ্রপাত, সহ ভারী বর্ষণ হবার সম্ভাবনা রয়েছে। সবাইকে সরকারী ঘূর্ণিঝড় আশ্রয় কেন্দ্রে আশ্রয় নিতে পরামর্শ দেওয়া হচ্ছে। ঘূর্ণিঝড় আর সঙ্গে প্রবল জলোচ্ছাস।

6

রেডিও ঘোষক

আশংকা রয়ছে উপকূলের নিমনালচল এবং নদনদী তিরোবর্তী স্থানে বসবাসকারীদের কে ঝড় না থামার পূর্ব পর্যন্ত তাদের বাসস্থানে কোনো নিরাপদ স্থানে অথবা ঘূর্ণিঝড় আশ্রয় কেন্দ্রে আশ্রয় নেওয়ার পরামর্শ দেওয়া হচ্ছে। আশা করি সবাই এই ভয়াবহ পরিস্থিথির বিষয়টি ভালো ভাবে জেনে এবং সতর্ক থেকে নিরাপদে থাকবেন, এখন পর্যন্ত সবাই নিরাপদে সুস্থ থেকে পরবর্তী ঘোষণার অপেক্ষা করুন। ধন্যবাদ।

7

শিলা

ও!! এই ভয়ংকর ঘূর্ণিঝড় খুব শক্তিশালী! আমাদের সাবধান থাকা উচিত .....

তিমুল

ধুর আমি বুঝি না ঘূর্ণিঝড় নিয়ে এতো চিন্তার কি হলো . কি এমন বিষয়?.... আমি এইখানে এসেছি কারণ আমাদের এলাকার থেকে সবাই এখানে চলে আসছে তাই....

8

বাদল
হমম, তিমুল, তুমি যদি ক্লাসে ঘূর্ণিঝড় সমন্ধে সার এর লকচার শুনতে তাহলে বুঝতে ঘূর্ণিঝড় কী ভয়াবহ হতে পারে.....

9

তিমুল
হাহ? তাই? কখন? আমার তো মনে পরে না সির কোনো ঘূর্ণিঝড় নিয়ে বলে ছিল.....

10

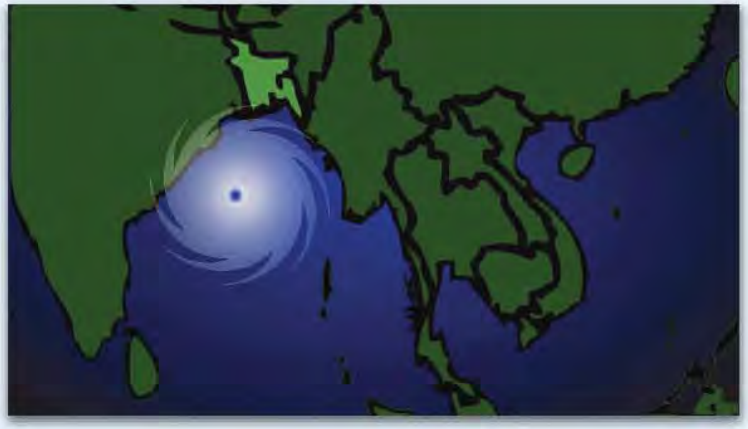
শিলা
হ্যাঁ বলে ছিলো, তুমি শুনছিলেনা, মনে হয় তুমি ক্লাসে ঘুমিয়ে পরেছিলে। মনে আছে বাদল?

বাদল
ও ভালই ঘুম দিয় ছিলো ।

শিলা
আমার ক্লাসটা খুব ভালো করে মনে আছে.....

11-1

11-2



11-3

শিক্ষক

ঘূর্ণিঝড় হচ্ছে সবচেয়ে ধ্বংসাত্বক প্রাকৃতিক দূর্যোগের একটি যার সৃষ্টি সমুদ্র থেকে এবং তা প্রায়ই আমারে দেশে আঘাত হানে। বঙ্গোপোসাগর থেকে প্রতি বছর প্রায় ৫টি ঘূর্ণিঝড়রের উৎপত্তি হয় যার মধ্যে কয়েকটি আমাদের দেশকে ক্ষতিগ্রস্থ করে। মূলত দুইটি ঋতুতে ঘূর্ণিঝড় বেশী হয় যার একটি এপ্রিল থেকে মে এবং আর একটি অক্টোবর থেকে নভেম্বর পযর্ন্ত। এখানে তোমরা দেখতে পাচ্ছো যে ঘূর্নায়মান মেঘের নিচে ভারি বৃষ্টি এবং প্রবল বাতাস হয় এবং সাথে থাকে উত্তাল সমুদ্রের ঢেউ।

12

বাদল
এইটা তো দেখতে বিশাল, স্যার.....

13

শিলা
হ্যাঁ এইটা দেখতে বিশাল আর ভয়ংকর ।

14

শিক্ষক
হ্যা ঘূর্নিঝড় সত্যিই ভয়ের কারণ এগুলো বিসাল। প্রায় ১০০০ হাজার কি.মি. প্রশস্থ এবং অনেক বিধ্বংসী। আর তোমরা জানো ঘূর্ণিঝড় কতটা শক্তিশালী তা বর্ননা করার শ্রেণীবিভাগ আছে।

15-1

শিক্ষক

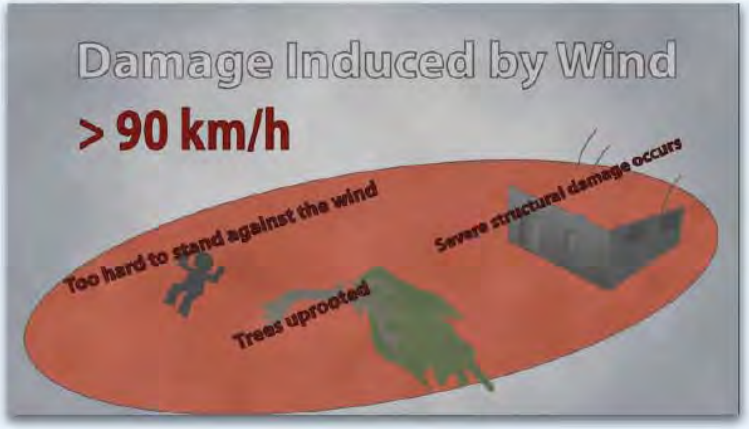
ঘূর্ণিঝড় যে বাতাস বহন করে তা খুব শক্তিশালী হয়। একটি ঘূর্ণিঝড়ের গতি যদি ঘন্টায় ৫৪ থেকে ৭২ কি. মি. হয় তাহলে এ সময় হাটা খুব কষ্টকর। কোন কিছু ধরে না থাকলে যে কেউ এসময় আছড়ে পড়ে যেতে পারে। এছাড়া গাছের ছোট ছোট ডালপালা ভেঙ্গে পরতে পারে।

15-2

শিক্ষক

আর যদি ঘূর্ণিঝড়ের গতি ঘন্টায় ৭২-৯০ কি.মি. হয় তবে এসময় দাড়িয়ে থাকাও কষ্টকর এবং স্থাপনার ব্যপক ক্ষয়ক্ষতি হতে পারে।

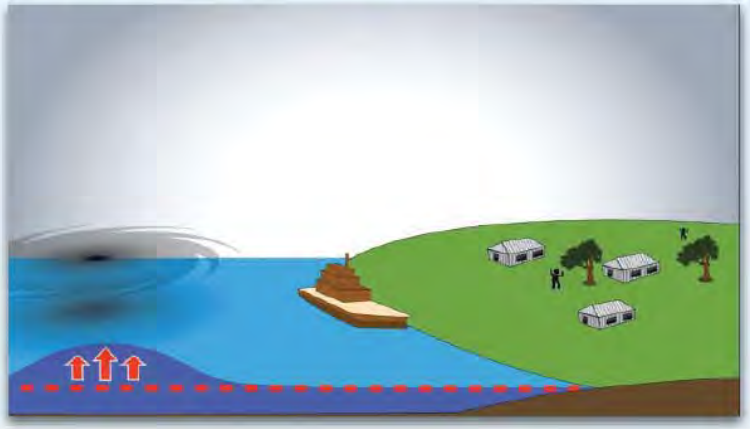
15-3



শিক্ষক

যখন ঘূর্ণিঝড়ের গতি ঘন্টায় ৯০ কিলোমিটারের উপরে থাকে তখন গাছপালা উপরে যায় এবং স্থাপনার ব্যপক ক্ষয়ক্ষতি হয়। এগুলো বাদেও ঘূর্ণিঝড় ভারি বৃষ্টিপাত এবং জলোচ্ছাসের মতো বিপদও নিয়ে আসে।

16



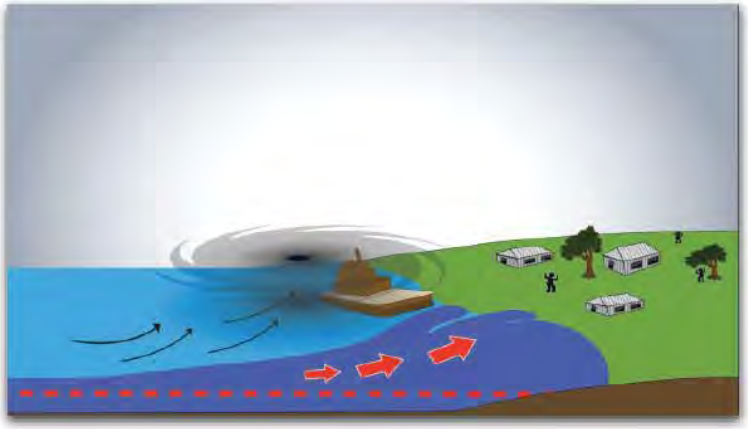
বাদল

জলোচ্ছাস ? সেটা কী, স্যার ?

শিক্ষক

আসলে জলোচ্ছাস তীব্র বাতাস অথবা ভারি বৃষ্টির চেয়ে আরও বেশী বিপদজনক।

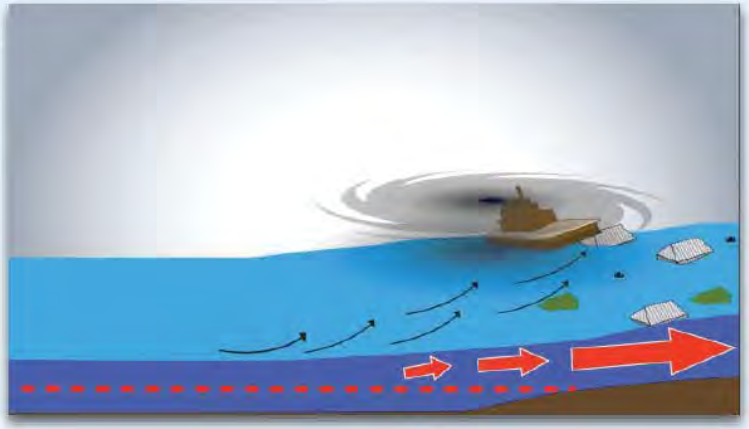
17-1



শিক্ষক

কারণ এটি অনেক মানুকে ডুবিয়ে নিয়ে যায় যেমনটি হয়েছিল ১৯৭০ সালে প্রায় ৩ লক্ষ মানুষ জলোচ্ছাসের কারণে মারা গিয়েছিল।

17-2



শিক্ষক

সঠিক তথ্য না থাকায় মানুষ ডুবে গিয়েছিল এই উত্তাল সামুদ্রিক ঢেউয়ের তরে যা মূলত প্রচন্ড বাতাস থেকে সৃষ্টি হয়েছিল সুতরাং আবহাওয়া পূর্বাবাসের খবর রাখাটা খুবই গুরুত্বপূর্ণ। তাই আমি আশা করি তোমরা এ জিনিসটা ভুলবেনা। এটি সত্যিই তোমাদেরকে রক্ষা করবে।

18-1

তিমুল

স্যার যেগুলা বলে সিলো সেগুলা তো ভুলে গেছি..... কারণ সারা বছর তো আর ঘূর্ণিঝড় হয় না.....

18-2

শিলা

হ্যাঁ, তিমুল, স্যার আমাদের বলে ছিলো না, আমাদের দেশে সাধারণত এপ্রিল আর মে মাসে, ঘূর্ণিঝড় আঘাত করে আর তার পর অক্টোবার আর নভেম্বরে। তাই, আমাদের এই সময় গুলো তে সাবধান থাকতে হবে.....

19

বাদল

আমার বাবা মা তো সবসময় তৈরী, ঠিক স্যার যেভাবে বলে ছিলো সেভাবে। আমার মা আমাকে প্রাথমিক চিকিত্সার জিনিস, ঔষুদ, টর্চলইট আর খাবার ব্যাগে ভোরে দিয়েছে । এই নাও, তোমরাও খাও...

শিলা

ধন্যবাদ বাদল। আমারও কিছু কাঁথা আর জরুরি জিনিস পত্র নিয়ে এসেছি। তোমার খবর কী তীমুল তুমি কী আনেচো?

20

তিমুল
আ.....আমার খেলনা গাড়িটা আসে আর .....

তিমুল
ওহ.....দেখো ঝড় শেষ .....চল বাইরে গিয়ে খেলি ।

21

শিলা
তিমুল থাম!হয়তবা ঝড় এখনো শেষ হয়নি .এটাত সাইক্লোনের চোখও হতে পারে ।

22

তিমুল
চোখ!ঘুর্নিঝড়ের চোখ আছে নাকি?ওটাতো কোনো দৈত্য না।

বাদল
ওহ...স্যার তো ঘুর্নিঝড়ের চোখ সন্মন্ধে বলেছিল ।

তিমুল
চোখ ?....চোখ...চোখ....ঘূর্ণিঝড় দেখতে পারেনাকি?

শিলা
হ্যা..টিচার তো চিখ সন্মন্ধে বলেছিল ।

23

শিক্ষক

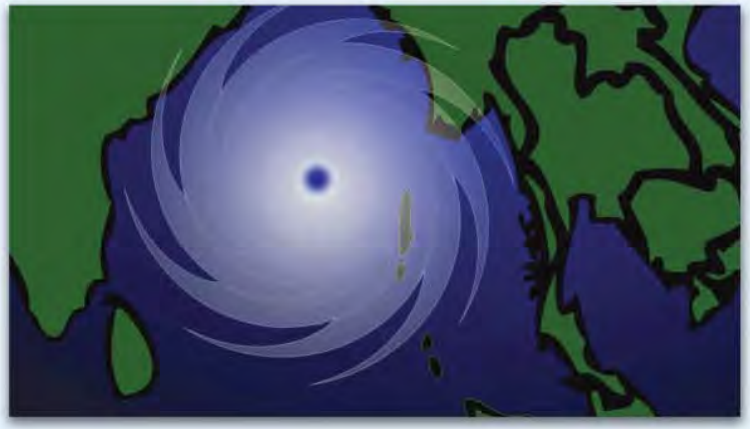
উপরের উপগ্রহের নেওয়া ছবি থেকে বাংলাদেশ আবহাওয়া বিভাগ বিভিন্ন তথ্য পায়। এটি একটি ঘূর্ণিঝড় এখানে তোমরা দেখতে পাচ্ছো যে ঘূর্ণায়মান মেঘ যার মাঝের অংশে অনেক সময় একটি গর্ত থাকে যেখানটায় মেঘ নেই। মাঝের এই গর্তটাকে চোখ বলা হয়।

24

বাদল

চোখ!ওটা কি স্যার ?

25

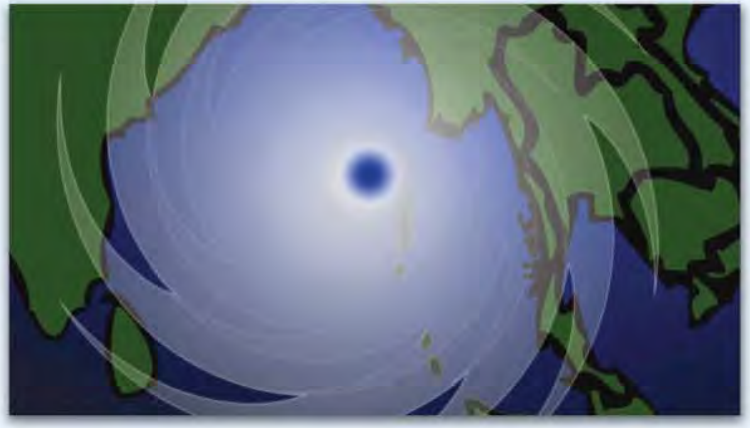


শিক্ষক

যেখানে বাতাস এবং মেঘ কম থাকে এর ফলে যখন চোখ কোন এলাকা দিয়ে যায় তখন হঠাৎ সব শান্ত হয়ে যায় এবং অনেক সময় রোদও উঠে।

26

27-1

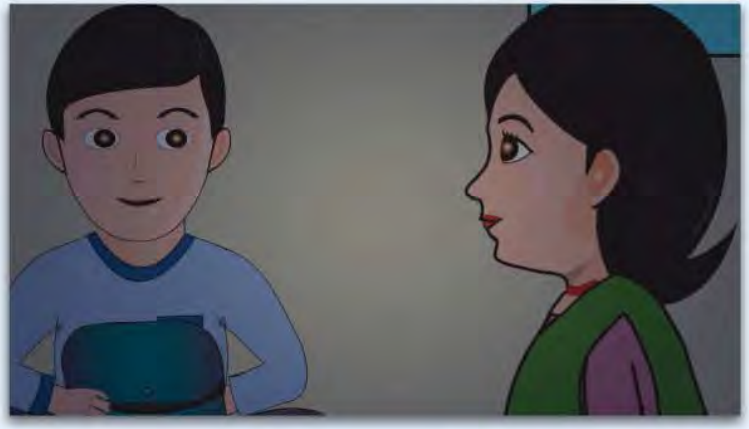


27-2

শিক্ষক

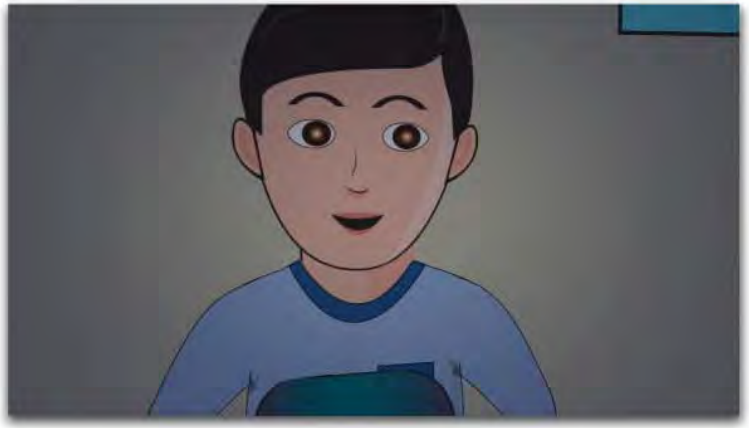
যাইহোক এই সময় মানুষের উচিৎ তাদের আবাসস্থল থেকে বাইরে বের না হওয়া। কারণ তখন বের হওয়াটা নিরাপদ না। ঘূর্ণিঝড়ের চোখ কোন এলাকা পাড় হওয়ার পরে হঠাৎ করে ঝড়ো আবহাওয়া আবার ফেরত আসে। এখানে তোমরা দেখতে পাচ্ছো যে ঝড় প্রথমদিকে ধীরে ধীরে আবির্ভূত হয় কিন্তু ঝড়ের চোখ পার হবার হবার সাথে সাথেই করেই আবার প্রবল বাতাস এবং ভারি বৃষ্টি আমাদেরকে আঘত হানে। এ কারনে আমাদের উচিৎ খুব সতর্ক থাকা যে পযন্ত না.....

28



শিলা
দেখো!আবহাওয়া আবার খারাপ হে যাচ্ছে। নিশ্চই সাইক্লোনটার চোখ পার হে গেছে। এখন ঝড়ের অন্যদিকটা আঘাত করছে।

29



বাদল
হ্যা...আমরা অপেক্ষা করি।আশা করি ঝড়টা তারাতরি শেষ হয়ে যাবে।

30

তিমুল
হেঃ ...তাও ভালো আমি বাইরে যাইনাই।

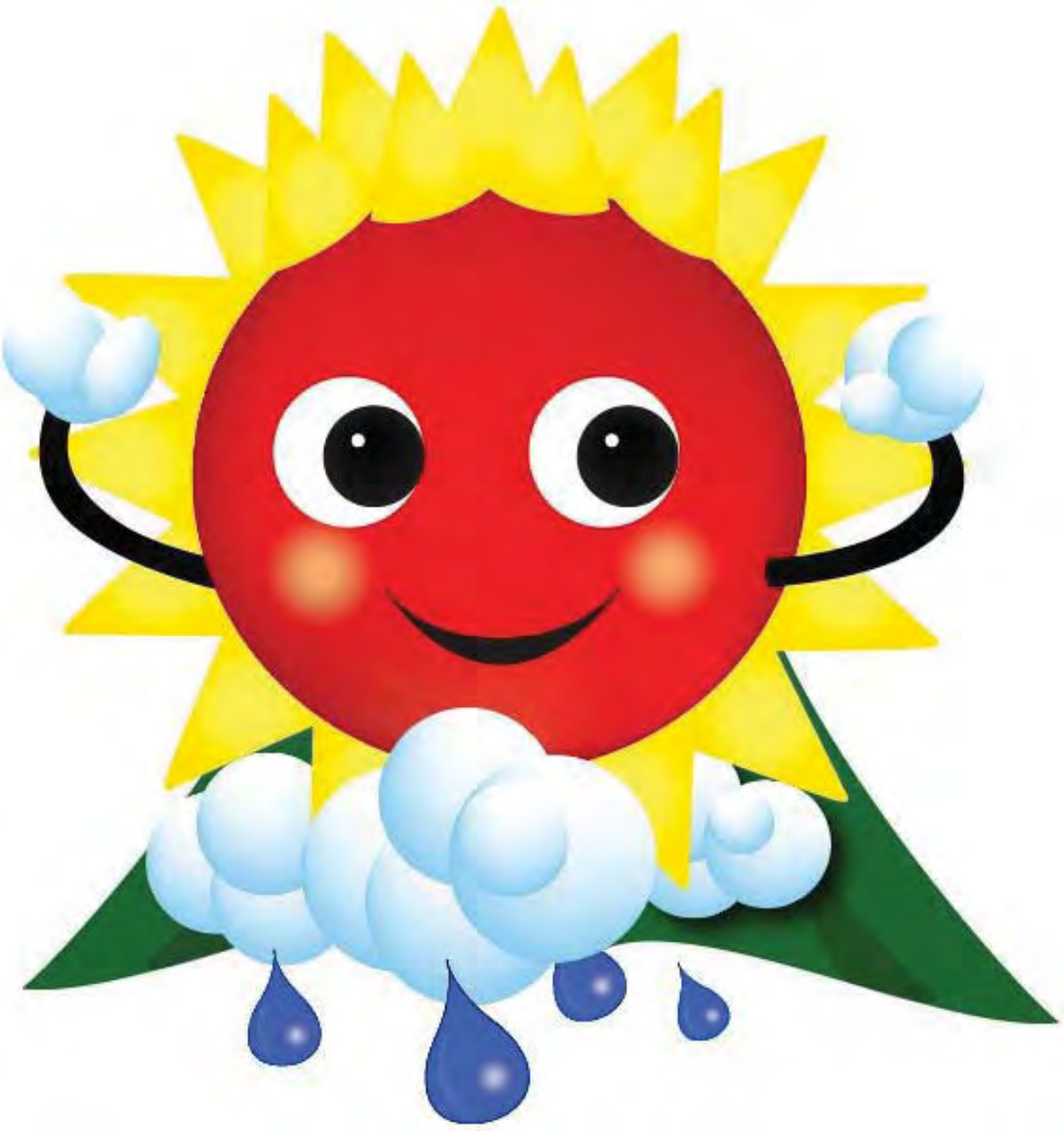
35

36

37

মেঘদূত

দেখেছ .....ঘুর্নিঝড়ের ক্ষয়ক্ষতি কি ভয়ংকর ....তবে খুশির খবর এই যে বাচ্চারা নিরাপদে আছে।দুর্যোগের সময় খবর জানা থাকা খুবই জরুরি।আশাকরি তোমরা আজকে অনেক কিছু শিখেছ।মনে রেখো সবসময় নিরাপদ থাকতে হবে।আজকে তাহলে যাই ঠিক আছে ।



BMD Character

Mascot of BMD Character

বাংলাদেশ আবহাওয়া অধিদপ্তর

Govt. of the People's Republic of Bangladesh
Bangladesh Meteorological Department
Storm Warning Center
Agargaon, Dhaka-1207

Phone: 9135742, 9141437
FAX : 8118230
Email: info@bmd.gov.bd
swc@bmd.gov.bd
Web site: www.bmd.gov.bd

BMD SPECIAL WEATHER BULLETIN: NO. 1 (ONE) DATE: 16-05-2013

Storm Category	Cyclonic Storm			
Storm Name	MAHASEN			
Central Pressure	996 hPa			
Last Location	Westcentral & adjoining Eastcentral Bay of Bengal			
Direction	Moved East-Northeastward			
Center Position & Distance	At 12 noon	Today (16-05-2013)	Lat. 22.6°N & Long. 91.7°E	
	221 km from Khulna		217 km from Mongla	
	137 km from Barisal		31 km from Chittagong	
	141 km from Cox's Bazar		178 km from Dhaka	
Outlook				
Max. Sustained Wind				
Sea Condition				
Weather Condition				
Storm Surge				
Boats/Trawers				

Category	Super Cyclonic Storm	Severe Cyclonic Storm with Hurricane Wind	Severe Cyclonic Storm	Cyclonic Storm	Deep Depression	Depression
Symbol						
Wind Speed (km/h)	≥ 220	219 - 118	117 - 89	88 - 62	61 - 52	51 - 41

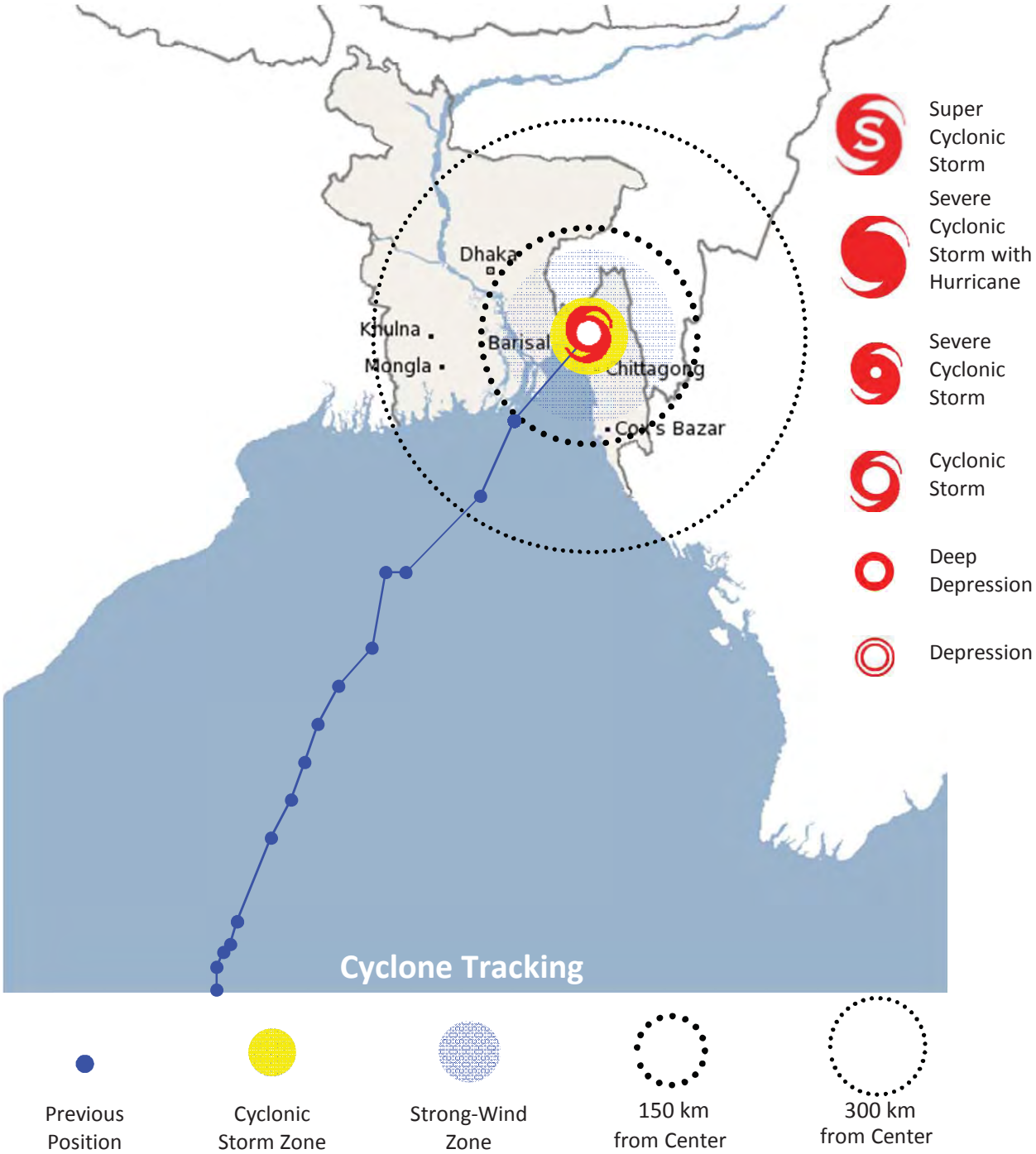
Supported by JICA

Govt. of the People's Republic of Bangladesh
Bangladesh Meteorological Department
Storm Warning Center
Agargaon, Dhaka-1207

Phone: 8113071, 8116634
FAX : 8118230
Email: info@bmd.gov.bd
swc@bmd.gov.bd
Web site: www.bmd.gov.bd

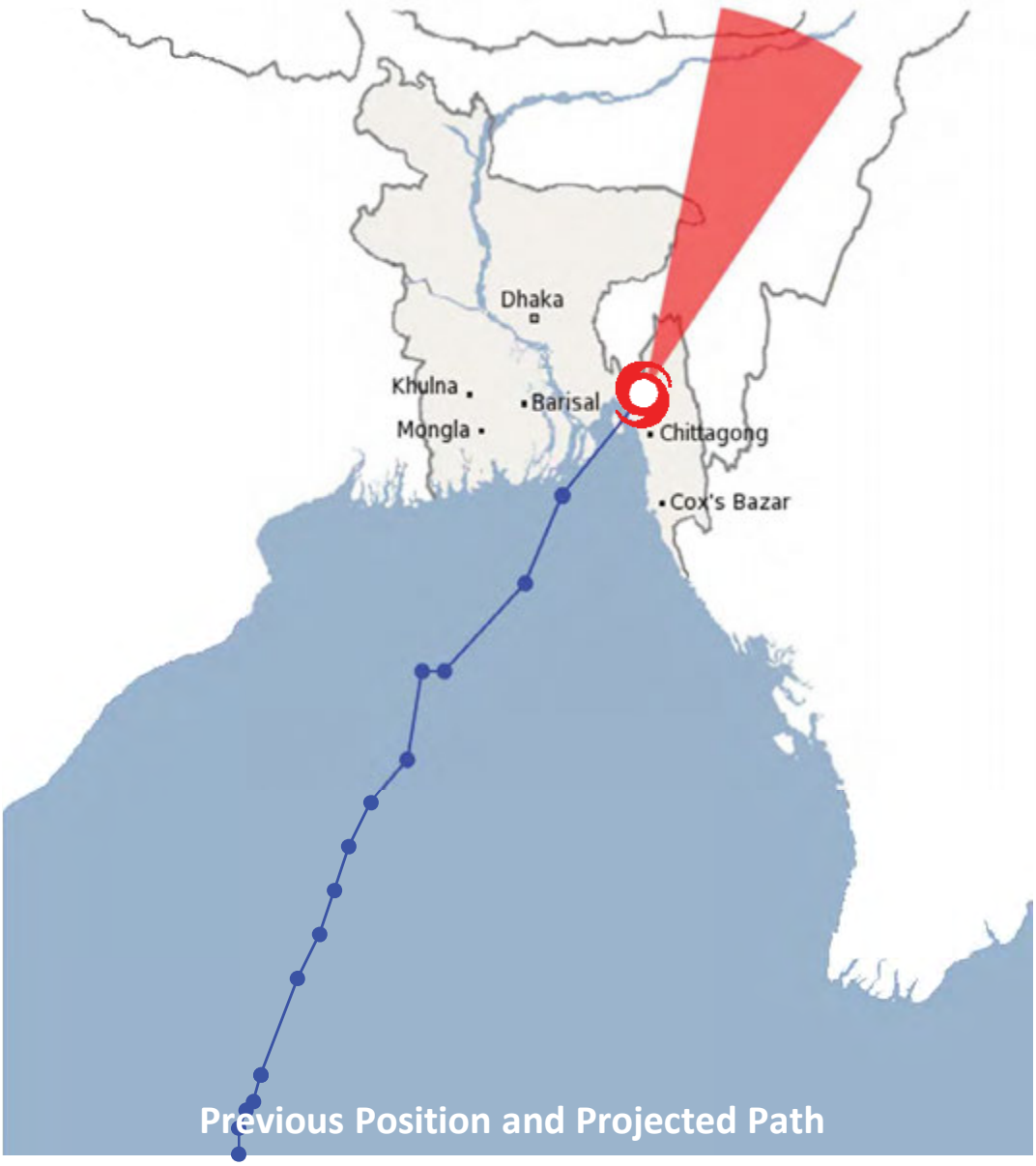
BMD SPECIAL WEATHER BULLETIN: NO. 1 (ONE) DATE: 16-05-2013

Storm Category	Cyclonic Storm	
Storm Name	MAHASEN	
Observed Centre Position	Lat. 22.63°N & Long. 91.70°E	At 12 noon (16-05-2013)
Central Pressure	996 hPa	
Last Location	Westcentral & adjoining Eastcentral Bay of Bengal	
Projected Direction	North-Northeastward	Speed: 169 km/h
Wind Zone	Cyclonic Storm Zone: 54km	Strong-Wind Zone: 120km



Supported by JICA

BMD SPECIAL WEATHER BULLETIN: NO. 1 (ONE) DATE: 16-05-2013

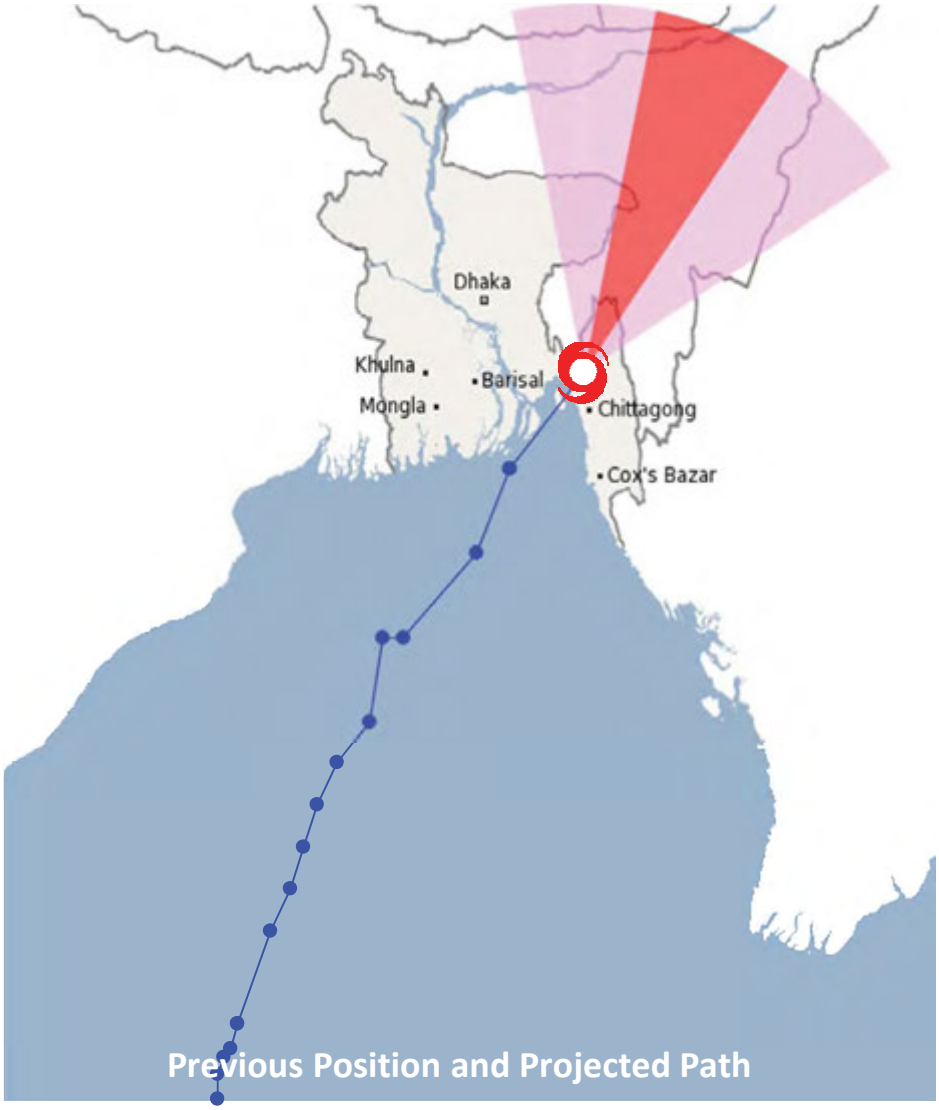


Storm Category	Cyclonic Storm

Super Cyclonic Storm | Severe Cyclonic Storm with Hurricane Wind | Severe Cyclonic Storm | Cyclonic Storm | Deep Depression | Depression | Previous Position | Projected Path

Supported by JICA

BMD SPECIAL WEATHER BULLETIN: NO. 33 (THIRTY-THREE) DATE: 16-05-2013



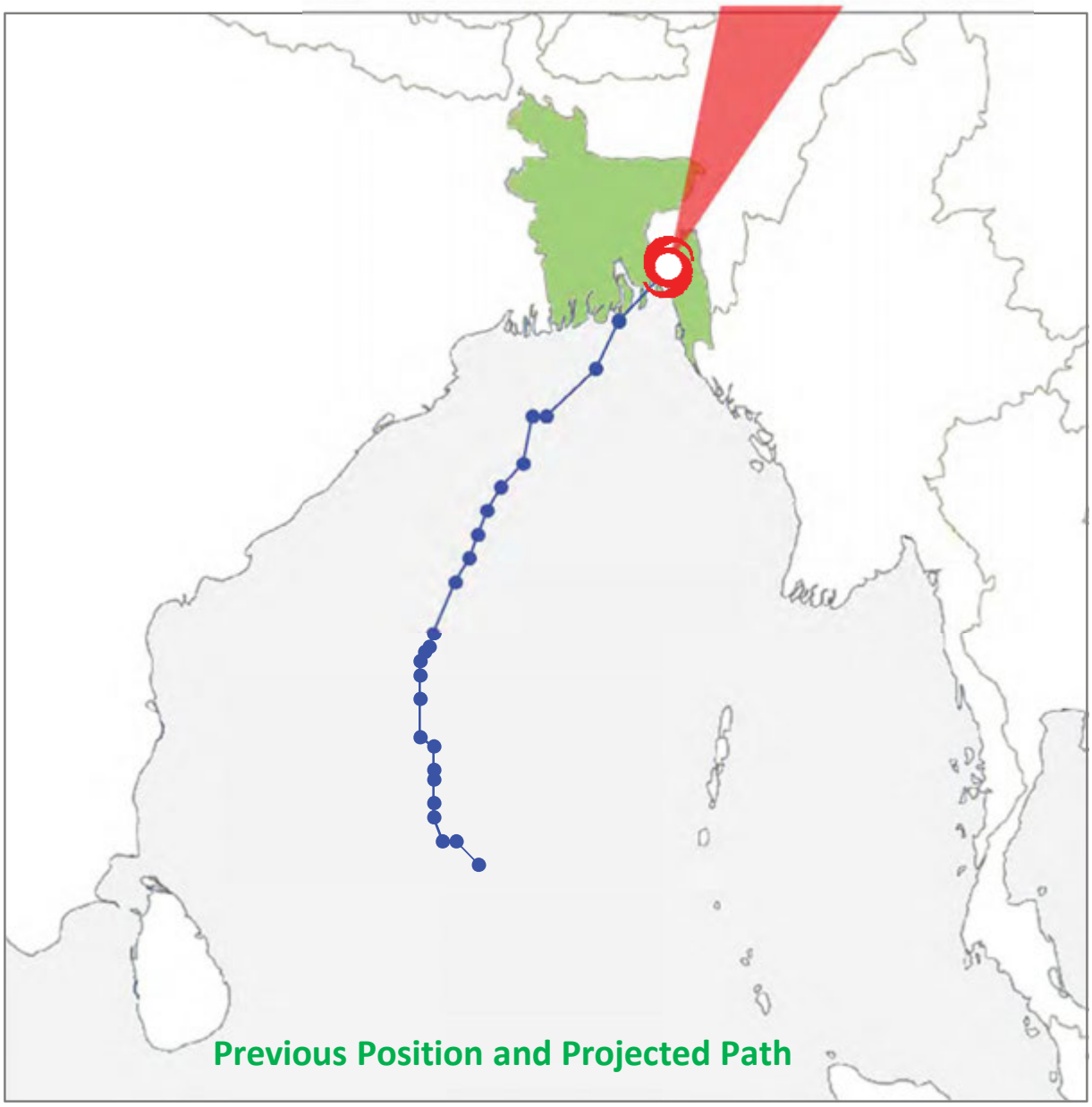
Storm Category	Cyclonic Storm

Super Cyclonic | Severe Cyclonic Storm with Hurricane Wind | Severe Cyclonic Storm | Cyclonic Storm | Deep Depression | Depression | Previous Position | Projected Path

Supported by JICA

BMD SPECIAL WEATHER BULLETIN: NO. 1 (ONE) DATE: 16-05-2013

Storm Category	Cyclonic Storm	
Storm Name	MAHASEN	
Observed Centre Position	Lat. 22.63°N & Long. 91.70°E	At 12 noon (16-05-2013)
Central Pressure	996 hPa	
Last Location	Westcentral & adjoining Eastcentral Bay of Bengal	
Projected Direction	North-Northeastward	Speed: 169 km/h
Wind Zone	Cyclonic Storm Zone: 54km	Strong-Wind Zone: 120km



Previous Position and Projected Path

Storm Category	Cyclonic Storm

Super Cyclonic Storm

Severe Cyclonic Storm with Hurricane Wind

Severe Cyclonic Storm

Cyclonic Storm

Deep Depression

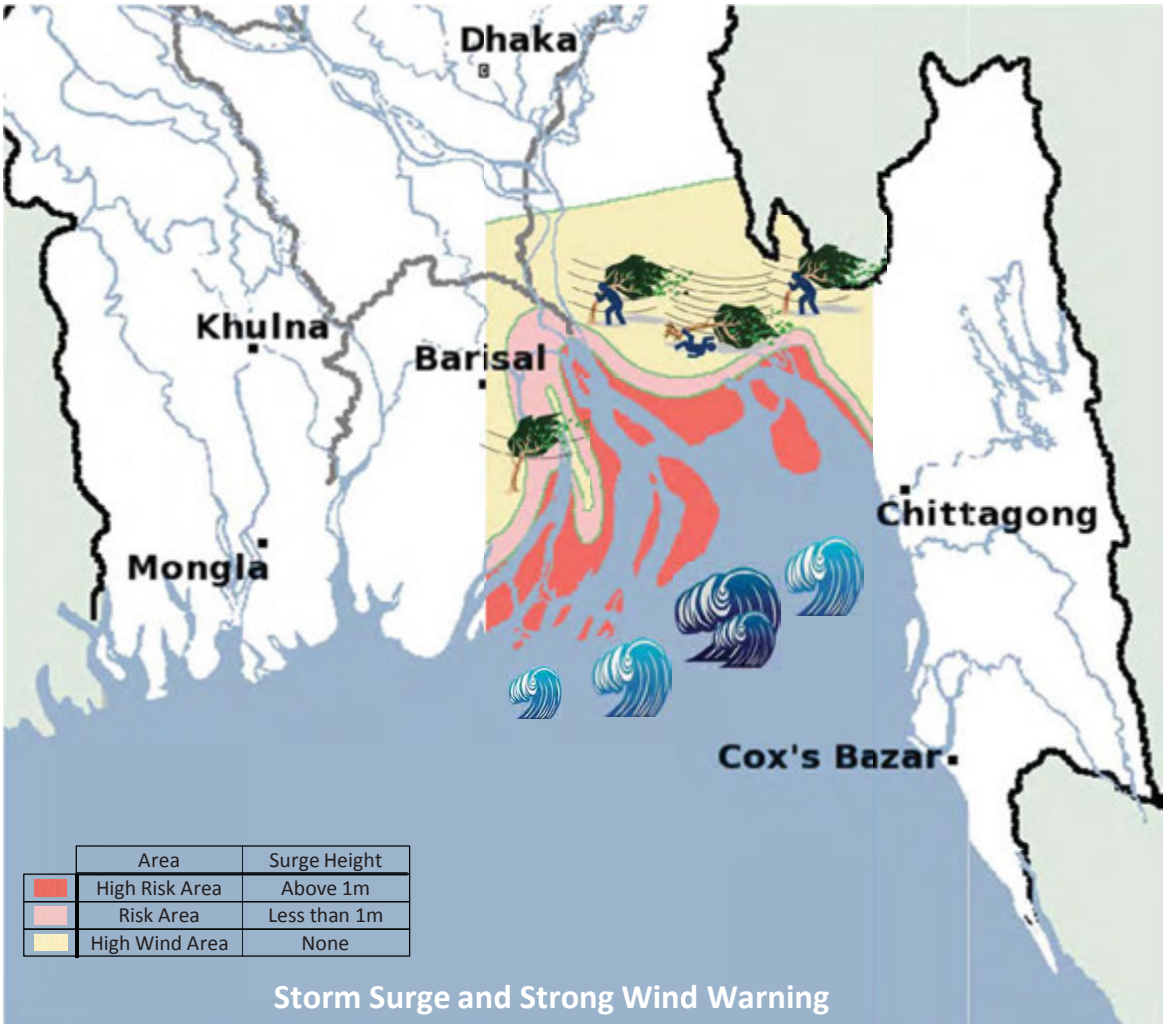
Depression

Previous Position

Projected Path

Supported by JICA

BMD SPECIAL WEATHER BULLETIN: NO. 1 (ONE) DATE:16-05-2013



Surge Height (feet)

7 - 10 4 - 6 1 - 3

Wind Speed (km/h)

90 or more 89 - 72 71 - 54

Warning Level

Cyclone Signal

Wind	Rain	Strom Surge	District/Port Name	for Maritime Port	for Coastal Maritime Ports	for Inland Riverports
			Cox's Bazar			
			Chittagong			
			Noakhali			
			Feni			
			Laxmipur			
			Bhola			
			Barisal			
			Patuakhali			
			Borguna			
			Chandpur			
			Pirozpur			
			Jhalokathi			
			Bagerhat			
			Khulna			
			Jessore			
			Sakhira			
			Mongla			

Supported by JICA

Table: Major Dissemination Activity of Animated Cartoon for Natural Disaster Awareness named “Save Yourself and Reduce Risk”

Date	Visitor	Meeting Place with the Visitor	JICA Expert	BMD	Summary	Provision of the Project Products
June 5-6, 2012	World Meteorological Organization (WMO), Secretary General • Mr. Michel Jarraud	Director’s Room in BMD Head Office	-	• Ms. Arjumand Habib • Mr. Md. Ahmed Arif Rashid	Main purpose of visit to Bangladesh: participation of the World Environment Day Ceremony and discussion with the Prime Ministry for BMD reorganization	• Animated Cartoon DVD: 2 • BMD Mascot: 2
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
September 10, 2012	Channel i • Mr. Shykh Seraj (Director & Head of News) • Mr. Taufique Ahmed (Research Analyst & International Correspondent)	Channel i Head Office	• Yoshihisa Uchida • Yoshiyuki Yagiri	• Ms. Arjumand Habib • Mr. Md. Ahmed Arif Rashid	• In order to promote TV broadcasting the animated cartoon for Natural Disaster Awareness, the discussion with Channel i was held. • Channel i indicated that it was difficult to adjust the time for TV broadcasting the animated cartoon (9 topics for totally approx. 1.5 hours) in the broadcasting schedule now since the schedule was fixed well in advance. • In addition, Channel i mentioned that if a sponsor for the animated cartoon is available, TV broadcasting may be possible. • As per our request, Channel i decided to provide a very short time in a News program to introduce the animated cartoon and inform the viewers that the cartoon DVD is available in BMD for collecting, if viewers are interested with the animated cartoon, they can collect it from BMD. • Immediately after the discussion, Channel i took the video of the animated cartoon DVD and the Book and prepared the program. • In the News at 21:30 on September 10, 2012, the animated cartoon was introduced.	• Animated Cartoon DVD: 3 • Animation Detail Book (Bengali): 3 • BMD Mascot: 2 • Sample of Visualized and Graphical BMD Special Weather Bulletin: 15
Date	Visitor	Meeting Place with the Visitor	JICA Expert	BMD	Summary	Provision of the Project Products
September 11, 2012	Bangladesh NGOs Network for Radio and Communication (BNNRC) • Mr. AHM Bazlur	Director’s Room in BMD Head Office	• Yoshihisa Uchida • Yoshiyuki Yagiri	• Ms. Arjumand Habib • Mr. Md. Ahmed Arif Rashid	• According the information by the Channel i News, BNNRC came to BMD to collect the animated cartoon DVDs and the Books. • BNNRC indicated the DVDs would be distributed to 14 radio stations in the community radio network for	• Animated Cartoon DVD: 15 • Animation Detail Book (Bengali): 2 • BMD Mascot: 2 • Beaufort Scale: 15

	Rahman (MSS in Government & Politics Chief Executive Officer) • Mr. Zahidul Haque Khan (MSS in Social Welfare Program Officer)				accelerating dissemination of the natural disaster awareness by using the DVD through radio programs.	• Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 15
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
September 19, 2012	JITA Bangladesh (An existing NGO which dedicates to empowering women through a network enterprises creating employment opportunities and improving access to markets for Bottom of the Pyramid (BOP) consumers) • Mr. Saif Rashid (CEO)	JITA Bangladesh Head Office	• Yoshihisa Uchida • Soushi Iwata • Yoshiyuki Yagiri	• Ms. Mahnaz Khan	• In order to collaborate with JITA Bangladesh for dissemination of our products for Natural Disaster Awareness to the stakeholders, discussion with JITA Bangladesh was held. • Since JITA Bangladesh is very interested with our weather information dissemination activity, JITA indicated to support us for dissemination of our products. • JITA Bangladesh dedicates to empowering women who do not have a DVD player. Therefore JITS suggested us Brochures are better than the animated cartoon DVDs for Natural Disaster Awareness. • JITA Bangladesh agreed on provision of their support for dissemination of our products for Natural Disaster Awareness.	• Animated Cartoon DVD: 10 • Animation Detail Book (Bengali): 10 • BMD Mascot: 12 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (Bengali): 25 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1
Date	Visitor	Meeting Place with the Visitor	JICA Expert	BMD	Summary	Provision of the Project Products
October 7, 2012	Mitsubishi Corporation • Mr. Asif Ahmad (Assistant General Manager)	Director's Room in BMD Head Office	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Ms. Arjumand Habib	• Permission from the Director to distribute Animated cartoon DVD for JITA Bangladesh was obtained. • 100 DVDs for JITA were received.	• Animated Cartoon DVD: 100
October 7, 2012	The World Bank • Mr. Poonam Pillai (Senior Environment Specialist)	Director's Room in BMD Head Office	-	• Ms. Arjumand Habib	Main purpose of visit to Bangladesh: Technical analysis to inform modernization of Hydrological information systems and services in Bangladesh	• Animated Cartoon DVD: 3 • Animation Detail Book (English): 1
Date	Meeting Attendant	Place where	JICA Expert	BMD	Summary	Provision of the Project Products

		JICA Experts & BMD visited				
October 7, 2012	Residential Model Government School and College	Residential Model Government School and College	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • School indicated that implementation of Open class in 2012 would be difficult and it would be possible to conduct from January in 2013.	• Animated Cartoon DVD: 2 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
October 7, 2012	Mohammad Preparatory Girl's School • Mr. Belaet Hossain (Headmaster)	Mohammad Preparatory Girl's School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on October 11 was obtained.	• Animated Cartoon DVD: 2 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 8, 2012	Rajuk Uttara Model College • Mr. Brig Gen Md Imamul Huda (Headmaster)	Rajuk Uttara Model College	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Ms. Taslima Imam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • School indicated that the schedule of implementation of Open Class would be informed us after consultation with teachers.	• Animated Cartoon DVD: 2 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
October 8, 2012	Maasranga Television • Mr. Md. Rashed Nizam (Assistant Producer News)	Maasranga Television	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Ms. Taslima Imam	• In order to request to broadcast the animated cartoon for Natural Disaster Awareness in the broadcasting schedule, the visit was implemented. • Maasranga Television indicated that the meeting would be prepared after consultation with CEO.	• Animated Cartoon DVD: 2 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 10, 2012	Sher-e-Bangla Nagar Govt. Boy's High School • Ms. Syda Jinnatun	Sher-e-Bangla Nagar Govt. Boy's High	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Ms. Taslima Imam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1

	Noor (Headmaster)	School			October 14 was obtained.	• BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
October 10, 2012	Sher-e-Bangla Nagar Govt. Girl's High School • Ms. Nazmun Nahar Shaheen (Headmaster)	Sher-e-Bangla Nagar Govt. Girl's High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Ms. Taslima Imam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on October 13 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
October 10, 2012	Gonobaban High School • Ms. Fouzia Ahmed (Headmaster)	Gonobaban High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Ms. Taslima Imam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on October 15 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
October 10, 2012	Mohammad Preparatory Secondary High School • Ms. Mursheda Shaheen Islam (Vice Principal)	Mohammad Preparatory Secondary High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Ms. Taslima Imam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on October 17 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
October 10, 2012	Mohammad Preparatory Girl's School • Mr. Belaet Hossain (Headmaster)	Mohammad Preparatory Girl's School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Ms. Taslima Imam	• Preliminary inspection for Open Class was implemented.	-
October 10, 2012	Rajuk Uttara Model College • Mr. Brig Gen Md Imamul Huda (Headmaster)	-	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Ms. Taslima Imam	• School contacted us, and permission for implementation of Open Class on October 18 was obtained.	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 11, 2012	-	Mohammad Preparatory Girl's School	• Yoshiyuki Yagiri • Mr. Nasir Uddin	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted.	• Animated Cartoon DVD: 790 • Animation Detail Book (Bengali): 3

			Bhuiyan	• Ms. Taslima Imam • Mr. Md. Rashaduzzaman • Mr. Milon Howloder	• Number of classes: Bengali3 / English2 • Number of students Bengali class: 508 / English class: 248	• BMD Mascot: 790
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 13, 2012	-	Sher-e-Bangla Nagar Govt. Girl's High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Ms. Taslima Imam • Mr. Md. Rashaduzzaman • Mr. Milon Howloder • Mr. Md. Abu Sayeed Mia	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students Morning class: 213 / Afternoon class: 202	• Animated Cartoon DVD: 438 • Animation Detail Book (Bengali): 5 • BMD Mascot: 438
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 14, 2012	-	Sher-e-Bangla Nagar Govt. Boy's High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Ms. Taslima Imam • Mr. Milon Howloder • Mr. Sahidull Hassan • Mr. Zillur Rahman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students Morning class: 180 / Afternoon class: 190	• Animated Cartoon DVD: 430 • Animation Detail Book (Bengali): 4 • BMD Mascot: 430
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 15, 2012	-	Gonobaban High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Ms. Taslima Imam • Mr. Milon Howloder • Mr. Md. Jalal Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students Morning class: 68 / Afternoon class: 67	• Animated Cartoon DVD: 142 • Animation Detail Book (Bengali): 5 • BMD Mascot: 142
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 16,	St. Joseph Higher	St. Joseph	• Yoshiyuki Yagiri	• Mr. Md. Shameem	• The Open Class activity using the animated cartoon for	• Animated Cartoon DVD: 1

2012	Secondary School • Mr. Dr. Harold Bijoy Rodrigues (Principal)	Higher Secondary School	• Mr. Nasir Uddin Bhuiyan	Hassan Bhuiyan	Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on November 5 was obtained.	• Animation Detail Book (Bengali): 1 • Animation Detail Book (English): 1 • BMD Mascot: 1
October 16, 2012	SFX Greenherald International School • Ms. Sr. Asha Virginia Gomes (Principal)	SFX Greenherald International School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on November 4 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (English): 1 • BMD Mascot: 1
October 16, 2012	Sunbeam International School	Sunbeam International School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Sunbeam International School indicated that the meeting would be prepared after consultation with personnel responsible.	• Animated Cartoon DVD: 1 • Animation Detail Book (English): 1 • BMD Mascot: 1
October 16, 2012	Oxford International School	Oxford International School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Oxford International School indicated that the meeting would be prepared after consultation with personnel responsible.	• Animated Cartoon DVD: 1 • Animation Detail Book (English): 1 • BMD Mascot: 1
October 16, 2012	Mohammad Preparatory Secondary High School • Ms. Mursheda Shaheen Islam (Vice Principal)	Mohammad Preparatory Secondary High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan	• Preliminary inspection for Open Class was implemented.	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 17, 2012	-	Mohammad Preparatory Secondary High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Ms. Taslima Imam • Mr. Milon Howloder • Mr. Md. Jalal Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students Bengali class: 152 / English class: 57	• Animated Cartoon DVD: 279 • Animation Detail Book (Bengali): 3 • Animation Detail Book (English): 1 • BMD Mascot: 279 • Disaster Calendar: 2
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
October 18, 2012	-	Rajuk Uttara Model College	• Yoshiyuki Yagiri • Mr. Nasir Uddin	• Ms. Taslima Imam • Mr. Md.	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted.	• Animated Cartoon DVD: 893 • Animation Detail Book (Bengali): 5

			Bhuiyan	Rashaduzzaman • Mr. Milon Howloder	• Number of classes: 4 • Number of students (Morning) Bengali class: 227 / English class: 161 (Afternoon) Bengali class: 211 / English class: 156	• Animation Detail Book (English): 5 • BMD Mascot: 893 • Disaster Calendar: 5
Since all the schools in Bangladesh were holidays during the Eid between Oct 19 and Nov 3, Dissemination Activity of Animated Cartoon for Natural Disaster Awareness was not conducted.						
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
November 4, 2012	-	SFX Greenherald International School	• Yoshiyuki Yagiri	• Mr. Md. Rashaduzzaman • Mr. Milon Howloder • Mr. Sahidull Hassan • Mr. Md. Akram Hossain	• As per the request from the school, the implementation of Open Class was postponed.	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
November 5, 2012	-	St. Joseph Higher Secondary School	• Yoshiyuki Yagiri	• Mr. Md. Rashaduzzaman • Mr. Milon Howloder • Mr. Sahidull Hassan • Mr. Md. Akram Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students Morning class: 158 / Afternoon class: 154	• Animated Cartoon DVD: 348 • Animation Detail Book (Bengali): 5 • Animation Detail Book (English): 5 • BMD Mascot: 348 • Disaster Calendar: 2 • Beaufort Scale: 2 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 2 • Positive & Visible Impacts in Bangladesh: 2
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products

November 6, 2012	Oxford International School • Ms. Mereena A. Chaity (Manager of Business Development & Public Relations)	Oxford International School	• Yoshiyuki Yagiri	• Mr. Md. Shameem Hassan Bhuiyan	• Since a responsible person for the Open Class was not available on Oct 16, 2012, the school re-visit was conducted. • A responsible person indicated that an acceptable date for the Open Class would be informed to BMD after receiving the consultation of the principal.	• Animated Cartoon DVD: 1 • Animation Detail Book (English): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Rick" (English): 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
November 18, 2012	-	Barab Kund High School	• Yoshiyuki Yagiri	• Mr. Md. Rashaduzzaman • Mr. Milon Howloder	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 154	• Animated Cartoon DVD: 190 • Animation Detail Book (Bengali): 10 • Animation Detail Book (English): 5 • BMD Mascot: 190 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
November 19, 2012	-	Latifpur Alhaj Abdul Jalil High School	• Yoshiyuki Yagiri	• Mr. Md. Rashaduzzaman • Mr. Milon Howloder	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students: 273	• Animated Cartoon DVD: 330 • Animation Detail Book (Bengali): 14 • Animation Detail Book (English): 1 • BMD Mascot: 330 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5

Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
November 26, 2012	Sunbeam International School	-	Yoshiyuki Yagiri	Mr. Md. Shameem Hassan Bhuiyan	As per telephone contact from school, permission for implementation of Open Class on December 11 was obtained.	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
December 5, 2012	Sunbeam International School	-	Yoshiyuki Yagiri	Mr. Md. Shameem Hassan Bhuiyan	As per the request from the school, the implementation of Open Class on December 11 was postponed.	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
December 6, 2012	Pledge Harbor School and Sports Academy	Pledge Harbor School and Sports Academy	Yoshiyuki Yagiri	Mr. Md. Shameem Hassan Bhuiyan	The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. A responsible person indicated that an acceptable date for the Open Class would be informed to BMD after receiving the consultation of the principal.	Animated Cartoon DVD: 1 Animation Detail Book (English): 1 BMD Mascot: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
December 9, 2012	Kite Bangladesh Limited Mr. Taku Furukawa (CEO) Mr.Syed Khaled Saifullah Ms. Nurun Nahar Momo	Kite Bangladesh Limited	Yoshihisa Uchida Soushi Iwata Yoshiyuki Yagiri	-	Discussion with Kite Bangladesh Ltd. was held in order for looking for possibilities of collaboration with Kite Bangladesh Ltd. which is a sole leading Japanese-affiliated company in education business in Bangladesh for dissemination of our products for Natural Disaster Awareness to the stakeholders. In order to create further understanding of Kite Bangladesh Ltd. on our activities, the project products were introduced (showing Animated Cartoon for Natural Disaster Awareness, etc.). Since Kite Bangladesh Ltd. was very interested with our activity, Kite Bangladesh Ltd. proposed to introduce the schools where Kite Bangladesh Ltd. has conducted some events for children & students for conducting Open Class. Since Mr. Syed, a member of Kite Bangladesh Ltd., has	Animated Cartoon DVD: 10 Animation Detail Book (Bengali): 5 Animation Detail Book (English): 5 BMD Mascot: 10 Beaufort Scale: 2

					arranged that “introduction of our activities (Technical Cooperation Project)” is the main theme of his TV talk-show (ATN News Young Nite) tomorrow (Mr. Syed is a presenter), a BMD personnel who is one of main counterparts of the Weather Information Dissemination Activity was appointed a guest for the TV talk-show. • Permission of the Director to the BMD personnel for appearing on TV talk-show was issued.	
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
December 10, 2012	Kite Bangladesh Limited • Mr. Taku Furukawa (CEO) • Mr.Syed Khaled Saifullah • Ms. Nurun Nahar Momo	Kite Bangladesh Limited	• Yoshihisa Uchida • Soushi Iwata • Yoshiyuki Yagiri	• Mr. Md. Rashaduzzaman (TV personality)	• The appointed BMD personnel appeared on the TV talk-show (ATN News Young Nite). • TV talk-show (ATN News Young Nite) for “introduction of our activities (Technical Cooperation Project)” was broadcast 2 times (1:15-1:55 AM and PM) on December 10, 2012. • Activities of BMD counterparts and JICA experts in the Weather Information Dissemination Activity of the Technical Cooperation Project such as Open Classes, Animated Cartoon for Natural Disaster Awareness, BMD mascot, etc. were introduced by the BMD personnel in the TV talk-show. • Animated Cartoon for Natural Disaster Awareness was broadcast for approx. 5 minutes in the TV talk-show.	-
Dissemination Activity of Animated Cartoon for Natural Disaster Awareness in the 5th fiscal year was started on March 25, 2013.						
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
March 25, 2013	Kishaloy Girls' School & College • Mr. Biman Chakrabortty	Kishaloy Girls' School & College	• Yoshiyuki Yagiri	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on March 29 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure “Natural Disaster-Save Yourself and Reduce Risk” (English): 1
March 25, 2013	Lalmatia Girls' High School	Lalmatia Girls' High School	• Yoshiyuki Yagiri	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced.	• Animated Cartoon DVD: 1 • Animation Detail Book

	• Mr. Md. Kamruzzaman				• Permission for implementation of Open Class on March 27 was obtained.	(Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Risk" (English): 1
March 25, 2013	Lalmatia Housing Society School & College • Mr. Kazi Mahmudul Haque (Principal)	Lalmatia Housing Society School & College	• Yoshiyuki Yagiri	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on April 4 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Brochure "Natural Disaster-Save Yourself and Reduce Risk" (English): 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
March 27, 2013	Lalmatia Girls' High School • Mr. Md. Kamruzzaman	-	• Yoshiyuki Yagiri	• Mr. Md. Shameem Hassan Bhuiyan	• The implementation of Open Class on March 27 was postponed due to the political strike (Hartal).	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
March 29, 2013	-	Kishaloy Girls' School & College	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan • Mr. Milon Howloder	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students: 115	• Animated Cartoon DVD: 127 • Brochure (Bengali): 127 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 127 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5
March 29, 2013	1st International Animation Cartoon Festival Bangladesh • Mr. Syeed Milky (Chair Person)	1st International Animation Cartoon Festival Bangladesh	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	-	• Showing the animated cartoon for "Natural Disaster Awareness" at the theater and introduction of the JICA Project were requested to the event promoter. • Showing 2 episodes (Flood and Thunderstorm in English Showing version) out of 9 episodes of the	• Animated Cartoon DVD: 400 • Brochure (Bengali): 331 • BMD Mascot: 400

	• Mr. Rabiul Islam Rony (Director)				animated cartoon at the theater were conducted. • Distribution of the Project products to the visitors was implemented.	
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
March 30 and 31, 2013	1st International Animation Cartoon Festival Bangladesh • Mr. Syeed Milky (Chair Person) • Mr. Rabiul Islam Rony (Director)	1st International Animation Cartoon Festival Bangladesh	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	-	• As with 29th, showing the animated cartoon for "Natural Disaster Awareness" and introduction of the JICA Project were requested to the event promoter.. • Showing 1 episode (Earthquake in Bengali version) out of 9 episodes of the animated cartoon at the theater was conducted. • Distribution of the Project products to the visitors (including school teachers) was implemented.	• Animated Cartoon DVD: 400 • Brochure (Bengali): 331 • BMD Mascot: 400 • Animation Detail Book (Bengali): 3 • Animation Detail Book (English): 3
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 4, 2013	-	Lalmatia Housing Society School & College	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Rashaduzzaman • Mr. Milon Howloder	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 5 • Number of students: 101	• Animated Cartoon DVD: 102 • Brochure (Bengali): 102 • Animation Detail Book (Bengali): 12 • Animation Detail Book (English): 3 • BMD Mascot: 102 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
April 4, 2013	Lalmatia Girls' High School • Mr. Md. Kamruzzaman	Lalmatia Girls' High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Rashaduzzaman	• Since the implementation of Open Class on March 27 was postponed due to the political strike (Hartal), the school visit was conducted again. • Permission for implementation of Open Class on April 9 was obtained.	-
April 4, 2013	Mohammadpur Govt. Boys School	Mohammadpur Govt. Boys	• Yoshiyuki Yagiri	• Mr. Md.	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced.	• Animated cartoon DVD: 1 • Brochure (Bengali): 1

	• Ms. Rowshon Aknter • Mr. Azharal Islam	School	• Mr. Nasir Uddin Bhuiyan	Rashaduzzaman	• Permission for implementation of Open Class on April 18 was obtained.	• BMD Mascot: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 7, 2013	Kingshuk Participatory High School • Mr. Muhammad Abdus Samad (Headmaster)	Kingshuk Participatory High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on April 13 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1
April 7, 2013	Monipur High School • Mr. Huwayun Rersuel (P A to Principal)	Monipur High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Shameem Hassan Bhuiyan	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Monipur High School indicated that the meeting would be prepared after consultation with Principal.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 9, 2013	Lalmatia Girls' High School • Mr. Md. Kamruzzaman	-	• Yoshiyuki Yagiri	• Mr. Md. Shameem Hassan Bhuiyan	• The implementation of Open Class on April 9 was postponed due to the political strike (Hartal).	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 13, 2013	-	Kingshuk Participatory High School	• Yoshiyuki Yagiri	• Mr. Md. Rashaduzzaman • Mr. Milon Howloder	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students: 53	• Animated Cartoon DVD: 75 • Brochure (Bengali): 75 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 75 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)

Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 15, 2013	• Mr. Md. Nur Hossain Talukder (Director General, Additional Secretary) • Mr. Md. Mizanur Rahman (Director) • Mr. Md. Zillur Rahman (Deputy Director) • Mr. Md. Harunor Rashid (Jr. Librarian)	Department of Public Libraries, Ministry of Cultural Affaires	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• A request for utilization of the Project Products at Dhaka Library Children Section and Local Libraries of the Department of Public Libraries was made. • Appreciation for donation of the Project Products to the Department of Public Libraries was expressed. • Our request indicated above was accepted by the Department of Public Libraries.	• Animated Cartoon DVD: 4 • Brochure (Bengali): 4 • Animation Detail Book (Bengali): 4 • BMD Mascot: 4
April 15, 2013	• Mr. Md. Nuruzzaman (Director, Joint Secretary) • Mr. Md. Amir Hossain Khan (Assistant Director)	Bangladesh Shishu Academy	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• A request for utilization of the Project Products at Dhaka Library and 64 Local Libraries of the Bangladesh Shishu Academy was made. • Appreciation for donation of the Project Products to the Bangladesh Shishu Academy was expressed. • Our request indicated above was accepted by the Bangladesh Shishu Academy.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 16, 2013	• Mr. Md. Harunor Rashid (Jr. Librarian)	Department of Public Libraries, Ministry of Cultural Affaires	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• Physical delivery of the Project Products to the Department of Public Libraries for Dhaka Library Children Section and 70 Local Libraries was made. ■ Dhaka Library Children Section: Brochure (Bengali)×4, Brochure (English)×1, Animation Detail Book (Bengali)×4, Animation Detail Book (English)×1, Animated Cartoon DVD×5, Hanging Poster×1, Large Banner×1, Rolled Banner×1 ■ Local Library: Brochure (Bengali)×4, Brochure (English)×1, Animation Detail Book (Bengali)×4, Animation Detail Book (English)×1, Animated Cartoon DVD×5, Hanging Poster×1	• Animated Cartoon DVD: 355 • Brochure (Bengali): 284 • Brochure (English): 71 • Animation Detail Book (Bengali): 284 • Animation Detail Book (English): 71 • Hanging Poster: 71 sets (4/set) • Large Banner: 1 set (5/set) • Rolled Banner: 1 set (27/set)

April 16, 2013	• Mr. Md. Amir Hossain Khan (Assistant Director)	Bangladesh Shishu Academy	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• Physical delivery of the Project Products to the Bangladesh Shishu Academy for Dhaka Library was made. • Courier service delivery of the Project Products to 64 Local Libraries was arranged. ■ Dhaka Library: Brochure (Bengali)×4, Brochure (English)×1, Animation Detail Book (Bengali)×4, Animation Detail Book (English)×1, Animated Cartoon DVD×5, Hanging Poster×1, Large Banner×1, Rolled Banner×1 ■ Local Library: Brochure (Bengali)×4, Brochure (English)×1, Animation Detail Book (Bengali)×4, Animation Detail Book (English)×1, Animated Cartoon DVD×5, Hanging Poster×1	• Animated Cartoon DVD: 325 • Brochure (Bengali): 260 • Brochure (English): 65 • Animation Detail Book (Bengali): 260 • Animation Detail Book (English): 65 • Hanging Poster: 65 sets (4/set) • Large Banner: 1 set (5/set) • Rolled Banner: 1 set (27/set)
April 16, 2013	• Mr. Shahabuddin Khan (Deputy Director)	The National Library of Bangladesh, Directorate of Achieves and Library	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• Animation Detail Book and Brochure (Bengali) in Bengali reading section and Animation Detail Book and Brochure (English) in English reading section were decided. • Copy right registration for the Project Products (Animation Detail Book and Brochure (Bengali)) was made by the Copy Right Section of the National Library of Bangladesh.	• Animated Cartoon DVD: 4 • Brochure (Bengali): 3 • Brochure (English): 1 • Animation Detail Book (Bengali): 3 • Animation Detail Book (English): 1
April 16, 2013	• Mr. Anisur Rahman (Junior Technical Assistant)	National Archives of Bangladesh, Directorate of Achieves and Library	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• Archiving Animation Detail Book and Brochure (Bengali) in the National Archives of Bangladesh was made.	• Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1
April 16, 2013	• Mr. Prokash Chandra Das (Director General, Additional Secretary)	Bangladesh National Museum	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• Negotiation with the Bangladesh National Museum for utilization of the Project Products was made.	• Animated Cartoon DVD: 2 • Brochure (Bengali): 2 • Animation Detail Book (Bengali): 2 • BMD Mascot: 2
April 16, 2013	• Mr. Sharif Md. Mashud (Deputy Team Leader, Developing the Reading Habit)	Shahitto Kendro	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan		• Utilization of Animation Detail Books and Brochures (Bengali & English) at Dhaka Library was accepted. • Utilization of Animation Detail Books and Brochures (Bengali & English) for 11 Mobile Libraries located in	• Animated Cartoon DVD: 3 • Brochure (Bengali): 3 • Animation Detail Book (Bengali): 2

					Dhaka and 30 Mobile Libraries located in other Districts was accepted.	• BMD Mascot: 3
April 16, 2013	• Mr. Sharif Md. Mashud (Deputy Team Leader, Developing the Reading Habit)	Bishwo Shahitto Kendro	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• Physical delivery of the Project Products to the Bishwo Shahitto Kendro for Dhaka Library and Mobile Libraries was made. ■ Dhaka Library: Brochure (Bengali)×3, Brochure (English)×3, Animation Detail Book (Bengali)×3, Animation Detail Book (English)×3, Animated Cartoon DVD×3 ■ 11 Mobile Libraries located in Dhaka: Brochure (Bengali)×3, Brochure (English)×2, Animation Detail Book (Bengali)×3, Animation Detail Book (English)×2 ■ 30 Mobile Libraries located in other Districts: Brochure (Bengali)×4, Animation Detail Book (Bengali)×4	• Animated Cartoon DVD: 3 • Brochure (Bengali): 156 • Brochure (English): 25 • Animation Detail Book (Bengali): 156 • Animation Detail Book (English): 25
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 17, 2013	• Mr. Ekram Elahi Chowdhury (Director, Operation, CPP)	Bangladesh Red Crescent Society	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• Discussion with the Bangladesh Red Crescent Society for utilization of the Project Products in their activities was made. • After discussions among the Society members, they mentioned that the required number the Project Products would be informed to us.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1
April 17, 2013	• Mr. M. A. Halim (Director, Disaster Risk Management Department)	Bangladesh Red Crescent Society	• Yoshihisa Uchida • Soshi Iwata • Mr. Nasir Uddin Bhuiyan	-	• Discussion with the Bangladesh Red Crescent Society for utilization of the Project Products in their activities was made. • After discussions among the Society members, they mentioned that the required number the Project Products would be informed to us.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • Hanging Poster: 1 set (3/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 18, 2013	-	Mohammadpur Govt. Boys School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Rashaduzzaman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2	• Animated Cartoon DVD: 429 • Brochure (Bengali): 429 • Animation Detail Book

					• Number of students: 340	(Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 419 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 20, 2013	-	Lalmatia Girls' High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Shahidul Islam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students: 128	• Animated Cartoon DVD: 155 • Brochure (Bengali): 155 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 155 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 21, 2013	• Patcal High School	-	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam	• The implementation of Open Class on April 21 was postponed due to the political strike (Hartal). •	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products

April 22, 2013	-	Belghoria Abdus Sattar High School	Yoshiyuki Yagiri	Mr. Md. Ashraful Alam	The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. Number of classes: 3 Number of students: 271	Animated Cartoon DVD: 295 Brochure (Bengali): 295 Animation Detail Book (Bengali): 8 Animation Detail Book (English): 2 BMD Mascot: 295 Disaster Calendar: 5 Beaufort Scale: 5 Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 Positive & Visible Impacts in Bangladesh: 5 Hanging Poster: 1 set (5/set)
April 22, 2013	Maskatadighi High School	-	Yoshiyuki Yagiri	Mr. Md. Ashraful Alam	The implementation of Open Class on April 22 was postponed due to the political strike (Hartal).	-
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 23, 2013	-	Shyampur High School	Yoshiyuki Yagiri	Mr. Md. Ashraful Alam Mr. Md. Najrul Islam Mr. Md. Shahidul Islam Mr. Md. Abdur Rashid	The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. Number of classes: 3 Number of students: 280	Animated Cartoon DVD: 301 Brochure (Bengali): 301 Animation Detail Book (Bengali): 8 Animation Detail Book (English): 2 BMD Mascot: 301 Disaster Calendar: 5 Beaufort Scale: 5 Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 Positive & Visible Impacts in Bangladesh: 5 Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 24, 2013	Pn Govt. High School	-	Yoshiyuki Yagiri	Mr. Md. Ashraful	The implementation of Open Class on April 24 was postponed due to the political strike (Hartal).	-

				Alam	• After discussions with the Headmaster, permission for implementation of Open Class on April 29 was obtained.	
April 24, 2013	Dasmary High School • Mr. Abul Kalam Ajad (Headmaster)	Dasmary High School	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam • Mr. Md. Shahidul Islam • Mr. Md. Abdur Rashid	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • School indicated that the schedule of implementation of Open Class would be informed us after consultation with teachers.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Disaster Calendar: 1 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1 • Positive & Visible Impacts in Bangladesh: 1
April 24, 2013	Hirjapur High School & College • Mr. Najmul Haque (Headmaster)	Hirjapur High School & College	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam • Mr. Md. Shahidul Islam • Mr. Md. Abdur Rashid	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on April 26 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Disaster Calendar: 1 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1 • Positive & Visible Impacts in Bangladesh: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 25, 2013	-	Collegiate School	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam • Mr. Md. Shahidul Islam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 324	• Animated Cartoon DVD: 417 • Brochure (Bengali): 404 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 404 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for

						Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 26, 2013	River View High School • Mr. Md. Harun-up Rashid	River View High School	• Yoshiyuki Yagiri	-	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • School indicated that the schedule of implementation of Open Class would be informed us after consultation with Headmaster.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Disaster Calendar: 1 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1 • Positive & Visible Impacts in Bangladesh: 1
April 26, 2013	Shahid Nazmul Haque Girls' High School • Mr. Babul Ahmed (Teacher)	Shahid Nazmul Haque Girls' High School	• Yoshiyuki Yagiri	-	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • School indicated that the schedule of implementation of Open Class would be informed us after consultation with Headmaster.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Disaster Calendar: 1 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1 • Positive & Visible Impacts in Bangladesh: 1
April 26, 2013	-	Mirjapur High School & College	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 5 • Number of students: 105	• Animated Cartoon DVD: 154 • Brochure (Bengali): 154 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 154 • Disaster Calendar: 5

						• Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 27, 2013	-	Agrani High School & College	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 490	• Animated Cartoon DVD: 593 • Brochure (Bengali): 593 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 593 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 28, 2013	-	Maskatadighi High School	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam • Mr. Md. Shahidul Islam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 107	• Animated Cartoon DVD: 138 • Brochure (Bengali): 138 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 138 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5

						• Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
April 29, 2013	-	Dasmari High School	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam • Mr. Md. Shahidul Islam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 129	• Animated Cartoon DVD: 151 • Brochure (Bengali):151 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 153 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
April 29 2013	-	Pn Govt. High School	• Yoshiyuki Yagiri	• Mr. Md. Ashraful Alam • Mr. Md. Shahidul Islam	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 265	• Animated Cartoon DVD: 375 • Brochure (Bengali): 375 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 375 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products

April 30, 2013	Ram Kishore High School • Mr. Gopal Chandra Nath (Headmaster)	Ram Kishore High School	• Yoshiyuki Yagiri	-	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on May 7 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Disaster Calendar: 1 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1 • Positive & Visible Impacts in Bangladesh: 1
April 30, 2013	Nogendra Narayan Pilot Girls' High School • Mr. Ashutosh Sarker (Headmaster)	Nogendra Narayan Pilot Girls' High School	• Yoshiyuki Yagiri	-	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on May 7 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali):1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Disaster Calendar: 1 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1 • Positive & Visible Impacts in Bangladesh: 1
April 30, 2013	Abdul Khaleque High School • Mr. Zahirul Haque (Headmaster)	Abdul Khaleque High School	• Yoshiyuki Yagiri	-	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on May 8 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1 • Disaster Calendar: 1 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1 • Positive & Visible Impacts in Bangladesh: 1
April 30, 2013	Mokul Niketon High School • Mr. Raton Komer mozomder	Mokul Niketon High School	• Yoshiyuki Yagiri	-	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class in May 14-16 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali):1 • Animation Detail Book (Bengali): 1

	(Headmaster)					• BMD Mascot: 1 • Disaster Calendar: 1 • Beaufort Scale: 1 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 1 • Positive & Visible Impacts in Bangladesh: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 2, 2013	• Mr. M. A. Halim (Director, Disaster Risk Management Department) • Mr. Md. Shahjahan (Program Officer/JAD, CCA Project)	Bangladesh Red Crescent Society (Disaster Risk Management Department)	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	-	• Physical delivery of the Project Products to the Bangladesh Red Crescent Society for Disaster Risk Management Department was made. • Additional order of the Project Products for Disaster Risk Management Department was obtained.	• Animated Cartoon DVD: 12 • Brochure (Bengali):12 • Brochure (English):12 • Animation Detail Book (Bengali): 12 • Animation Detail Book (English): 12
May 2, 2013	• Mr. Ekram Elahi Chowdhury (Director, Operation, CPP)	Bangladesh Red Crescent Society (CPP)	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	-	• Physical delivery of the Project Products to the Bangladesh Red Crescent Society for CPP Head Quarter was made. • Meeting concerning delivery method to active bases under CPP was made..	• Animated Cartoon DVD: 15 • Brochure (Bengali):15 • Brochure (English):15 • Animation Detail Book (Bengali): 15 • Animation Detail Book (English): 15
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 4, 2013	-	Premier Idial High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 248	• Animated Cartoon DVD: 294 • Brochure (Bengali): 294 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 294 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5

						• Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 5, 2013	-	Udyoun Mahila Samiti High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 5 • Number of students: 140	• Animated Cartoon DVD: 168 • Brochure (Bengali): 153 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 168 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 6, 2013	-	Parangonj High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 4 • Number of students: 259	• Animated Cartoon DVD: 284 • Brochure (Bengali): 274 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 284 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)

May 6, 2013	-	Kazi Nazrul Islam Model High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 134	• Animated Cartoon DVD: 150 • Brochure (Bengali): 143 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 150 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 7, 2013	-	Abdul Khaleque High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 167	• Animated Cartoon DVD: 185 • Brochure (Bengali): 175 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 185 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
May 7, 2013	-	Ram Kishore High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 335	• Animated Cartoon DVD: 368 • Brochure (Bengali): 358 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 368

						• Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 9, 2013	-	Bororchar High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 365	• Animated Cartoon DVD: 447 • Brochure (Bengali): 437 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 447 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
May 9, 2013	-	Mir Kandapara High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 87	• Animated Cartoon DVD: 102 • Brochure (Bengali): 102 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 102 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5

						• Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 11, 2013	-	Mritunjoy High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Md. Moniruzzaman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 95	• Animated Cartoon DVD: 115 • Brochure (Bengali): 115 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 115 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
May 11, 2013	Renaissance Girls' School • Mr. Kamrunnaher (Headmaster)	Renaissance Girls' School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Md. Moniruzzaman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on May 12 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • BMD Mascot: 1
May 11, 2013	Char Kharicha High School • Mr. Shahidul Islam (Headmaster)	Char Kharicha High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Md. Moniruzzaman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on May 12 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • BMD Mascot: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 12, 2013	-	Renaissance Girls' School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 226	• Animated Cartoon DVD: 241 • Brochure (Bengali): 241 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 241 • Disaster Calendar: 5

						• Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
May 12, 2013	-	Char Kharicha High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 320	• Animated Cartoon DVD: 349 • Brochure (Bengali): 349 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 349 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 13, 2013	-	Nogendra Narayan Pilot Girls' High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 258	• Animated Cartoon DVD: 295 • Brochure (Bengali): 295 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 295 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)

Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 14, 2013	-	Zihiruddin High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 288	• Animated Cartoon DVD: 300 • Brochure (Bengali): 300 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 300 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5 • Hanging Poster: 1 set (5/set)
May 14, 2013	Kalir Bazar High School • Mr. A.H.M. Shahid Ullah (Headmaster)	Kalir Bazar High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on May 15 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • BMD Mascot: 1
May 14, 2013	Fatemanagar High School • Mr. Ranjar Kumar Tarafder (Headmaster)	Fatemanagar High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on May 15 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • BMD Mascot: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 15, 2013	-	Kalir Bazar High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 4 • Number of students: 486	• Animated Cartoon DVD: 505 • Brochure (Bengali): 505 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 505 • Disaster Calendar: 5

						• Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5
May 15, 2013	-	Fatemanagar High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 315	• Animated Cartoon DVD: 345 • Brochure (Bengali): 345 • Animation Detail Book (Bengali): 8 • Animation Detail Book (English): 2 • BMD Mascot: 345 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 16, 2013	-	Mokul Niketon High School	• Yoshiyuki Yagiri	• Mr. A. F. M. Anisur Rahman • Mr. Md. Mohsin Uddin	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 1 • Number of students: 253	• Animated Cartoon DVD: 289 • Brochure (Bengali): 289 • Animation Detail Book (Bengali): 5 • Animation Detail Book (English): 5 • BMD Mascot: 289 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in

						Bangladesh: 5 • Hanging Poster: 1 set (5/set)
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
May 28, 2013	• Mr. Md. Shahjahan (Program Officer/JAD, CCA Project)	Bangladesh Red Crescent Society (Disaster Risk Management Department)	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	-	• Physical delivery of the Project Products to the Bangladesh Red Crescent Society for Disaster Risk Management Department was made.	• Animated Cartoon DVD: 12 • Brochure (Bengali): 12 • Brochure (English): 12 • Animation Detail Book (Bengali): 12 • Animation Detail Book (English): 12 • Hanging Poster: 12 set (5/set)
May 28, 2013	• Mr. Ekram Elahi Chowdhury (Director, Operation, CPP)	Bangladesh Red Crescent Society (CPP)	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	-	• Courier service delivery of the Project Products to 40 Thanas and 322 Unions was arranged. ▪ Thana: Brochure (Bengali)×3, Animation Detail Book (Bengali)×3 ▪ Union: Brochure (Bengali)×2	• Brochure (Bengali): 764 • Animation Detail Book (Bengali): 120
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
June 11, 2013	Gandabpur High School • Mr. Narayan Chandra Saha (Headmaster)	Gandabpur High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on June 29 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1
June 11, 2013	Rupshi New Model School • Mr. Md. Monzur Rahman (Headmaster)	Rupshi New Model School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on June 27 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1
June 11, 2013	Hazi Nuruddin Hmed High School • Mr. Jawhar Lal Ghosh (Headmaster)	Hazi Nuruddin Hmed High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on June 26 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1
June 11, 2013	Parab High School • Mr. Md. Atikur Rahmal Dewan (Headmaster)	Parab High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on June	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1

					30 was obtained.	
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
June 16, 2013	Kurmitola High School & College • Mr. Md. Abul Hossain (Chairman)	Kurmitola High School & College	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on June 20 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1 • BMD Mascot: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
June 20, 2013	-	Kurmitola High School & College	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 729	• Animated Cartoon DVD: 761 • Animation Detail Book (Bengali): 760 • BMD Mascot: 770 • Disaster Calendar: 5 • Beaufort Scale: 5 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 5 • Positive & Visible Impacts in Bangladesh: 5
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
June 26, 2013	-	Hazi Nuruddin Hmed High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 4 • Number of students: 315	• Animated Cartoon DVD: 341 • Animation Detail Book (Bengali): 341 • Animation Detail Book (English): 5 • BMD Mascot: 340 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3

						• Positive & Visible Impacts in Bangladesh: 3
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
June 27, 2013	-	Rupshi New Model School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 4 • Number of students: 158	• Animated Cartoon DVD: 178 • Animation Detail Book (Bengali): 178 • Animation Detail Book (English): 5 • BMD Mascot: 181 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3 • Positive & Visible Impacts in Bangladesh: 3
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
June 29, 2013	-	Gandabpur High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 5 • Number of students: 273	• Animated Cartoon DVD: 305 • Animation Detail Book (Bengali): 305 • Animation Detail Book (English): 5 • BMD Mascot: 307 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3 • Positive & Visible Impacts in Bangladesh: 3
Date	Meeting Attendant	Place where JICA Experts &	JICA Expert	BMD	Summary	Provision of the Project Products

		BMD visited				
June 30, 2013	-	Parab High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Abul Hossain	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 441	• Animated Cartoon DVD: 480 • Animation Detail Book (Bengali): 480 • Animation Detail Book (English): 5 • BMD Mascot: 475 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3 • Positive & Visible Impacts in Bangladesh: 3
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
July 2, 2013	-	Khulna Model School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Amirul Azad	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students: 236	• Animated Cartoon DVD: 283 • Brochure (Bengali): 282 • Brochure (English): 10 • Animation Detail Book (Bengali): 20 • Animation Detail Book (English): 10 • BMD Mascot: 294 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3 • Positive & Visible Impacts in Bangladesh: 3
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products

July 4, 2013	-	Khulna Zila School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Amirul Azad	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 4 • Number of students: 395	• Animated Cartoon DVD: 431 • Brochure (Bengali): 431 • Brochure (English): 10 • Animation Detail Book (Bengali): 20 • Animation Detail Book (English): 10 • BMD Mascot: 431 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3 • Positive & Visible Impacts in Bangladesh: 3
July 4, 2013	Govt. Coronation Girls' High School • Ms. Laila Arjuman (Assistant Headmaster)	Govt. Coronation Girls' High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Amirul Azad	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on July 6 was obtained.	• Animated Cartoon DVD: 1 • Brochure (Bengali): 1 • BMD Mascot: 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
July 6, 2013	-	Govt. Coronation Girls' High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Amirul Azad	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 2 • Number of students: 312	• Animated Cartoon DVD: 392 • Brochure (Bengali): 391 • Brochure (English): 10 • Animation Detail Book (Bengali): 20 • Animation Detail Book (English): 10 • BMD Mascot: 382 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3

						• Positive & Visible Impacts in Bangladesh: 3
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
July 7, 2013	-	Sofiulla High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Abdul Halim Mia	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 4 • Number of students: 375	• Animated Cartoon DVD: 400 • Brochure (Bengali): 400 • Brochure (English): 10 • Animation Detail Book (Bengali): 20 • Animation Detail Book (English): 10 • BMD Mascot: 400 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3 • Positive & Visible Impacts in Bangladesh: 3
July 7, 2013	Soyoda Mazidunnesa High School • Mr. Gious Uddin (Assistant Teacher)	Soyoda Mazidunnesa High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Abdul Halim Mia	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on July 9 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1
July 7, 2013	BM School Barisal • Mr. S.M Fakhruzzaman (Headmaster)	BM School Barisal	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Abdul Halim Mia	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was introduced. • Permission for implementation of Open Class on July 8 was obtained.	• Animated Cartoon DVD: 1 • Animation Detail Book (Bengali): 1
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
July 8, 2013	-	BM School Barisal	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Abdul Halim Mia • Mr. Md. Anisur Rahman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 5 • Number of students: 231	• Animated Cartoon DVD: 282 • Brochure (Bengali): 30 • Brochure (English): 10 • Animation Detail Book (Bengali): 280

						• Animation Detail Book (English): 10 • Disaster Calendar: 3 • Beaufort Scale: 3 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 3 • Positive & Visible Impacts in Bangladesh: 3
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
July 9, 2013	-	Soyoda Mazidunnesa High School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Abdul Halim Mia	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 5 • Number of students: 186	• Animated Cartoon DVD: 230 • Brochure (Bengali): 30 • Brochure (English): 10 • Animation Detail Book (Bengali): 228 • Animation Detail Book (English): 10 • Disaster Calendar: 2 • Beaufort Scale: 2 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 2 • Positive & Visible Impacts in Bangladesh: 2
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
July 11, 2013	-	Khepupara Model School & College	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Pradip Kumar Chakraborty	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 3 • Number of students: 361	• Animated Cartoon DVD: 390 • Brochure (Bengali): 390 • Brochure (English): 10 • Animation Detail Book (Bengali): 40 • Animation Detail Book (English): 10

						• BMD Mascot: 386 • Disaster Calendar: 2 • Beaufort Scale: 2 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 2 • Positive & Visible Impacts in Bangladesh: 2
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
July 13, 2013	-	Nooria Secondary School	• Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	• Mr. Md. Anisur Rahman	• The Open Class activity using the animated cartoon for Natural Disaster Awareness was conducted. • Number of classes: 5 • Number of students: 228	• Animated Cartoon DVD: 261 • Brochure (Bengali): 261 • Brochure (English): 10 • Animation Detail Book (Bengali): 40 • Animation Detail Book (English): 10 • Disaster Calendar: 2 • Beaufort Scale: 2 • Impact of Japan's Grant Aid for Meteorological Services in Bangladesh: 2 • Positive & Visible Impacts in Bangladesh: 2
Date	Meeting Attendant	Place where JICA Experts & BMD visited	JICA Expert	BMD	Summary	Provision of the Project Products
December 13-14, 2013	-	Bashundhara City Shopping Mall	• Yoshihisa Uchida • Toshihide Endo • Soshi Iwata • Yoshiyuki Yagiri • Mr. Nasir Uddin Bhuiyan	-	• The promotion activity for obtaining more access to the Web Page of the Animated Cartoon named "Save Yourself" as the final event of the Project was conducted at the Bashundhara City Shopping Mall on December 13 and 14.	• Printed Tag: 10,000 • Animated Cartoon DVD: 852 • Brochure (Bengali): 123 • Brochure (English): 491 • Animation Detail Book (Bengali): 70 • Animation Detail Book

						(English): 911 • BMD Mascot: 104

Result of Open Class Activity

Date	City Name	School Name	Number of Classes		Number of Students	Average Score	
						Pre-Test	Post-Test
September 19, 2010	Tangail	Bindu Bashini Gov't Boy's High School	Bengali Class	4	310	33	91
September 20, 2010	Tangail	Bindu Bashini Gov't Girl's High School	Bengali Class	2	206	33	86
September 22, 2010	Rangpur	Rangpur Zila School	Bengali Class	1	255	48	92
September 23, 2010	Rangpur	Rangpur Govt Girl's High School	Bengali Class	2	164	33	90
September 26, 2010	Dhaka	Dhaka Residential Model School & College	Bengali Class	2	354	36	90
			English Class			37	89
September 27, 2010	Dhaka	Rajuk Uttara Model School & College	Bengali Class	1	261	44	97
			English Class			31	94
September 28, 2010	Dhaka	Viqarunnessa Noon Girl's School & College	Bengali Class	1	295	44	95
September 29, 2010	Dhaka	Dhanmondi Gov't Boy's High School	Bengali Class	2	220	38	92
September 30, 2010	Dhaka	Sher-e-Bangla Nagar Gov't Girl's High School	Bengali Class	1	220	25	92
March 7, 2012	Sylhet	Scholarshome Boy's High School	Bengali Class	1	219	49	80
March 7, 2012	Sylhet	Blue Bird School & College	Bengali Class	1	165	49	87
September 16, 2012	Chittagong	Radiant School & College	Bengali Class	1	54	48	82
September 16, 2012	Chittagong	Chittagong Development Authority Public School & College	Bengali Class	1	192	48	97
September 17, 2012	Chittagong	Bangladesh Elementary School	Bengali Class	1	157	38	91
October 11, 2012	Dhaka	Mohammad Preparatory Girl's School	Bengali Class	3	508	51	97
			English Class	2	248	57	98
October 13, 2012	Dhaka	Sher-e-Bangla Nagar Gov't Girl's High School	Bengali Class	2	213	52	73
					202	58	80
October 14, 2012	Dhaka	Sher-e-Bangla Nagar Gov't Boy's High School	Bengali Class	2	180	50	88
					190	50	97
October 15, 2012	Dhaka	Gonobaban High School	Bengali Class	2	68	43	93
					67	40	96
October 17, 2012	Dhaka	Mohammad Preparatory Secondary High School	Bengali Class	1	152	52	81
			English Class	1	57	42	74
October 18, 2012	Dhaka	Rajuk Uttara Model College	Bengali Class (1st)	2	227	53	96
			English Class (1st)		161	49	91
			Bengali Class (2nd)	2	211	60	97
			English Class (2nd)		156	48	98
November 5, 2012	Dhaka	St. Joseph Higher Secondary School	Bengali Class	2	158	48	83
					154	62	92
November 18, 2012	Sitakunda	Barab Kund High School	Bengali Class	3	154	54	93
November 19, 2012	Sitakunda	Latifpur Alhaj Abdul Jalil High School	Bengali Class	2	273	46	85
March 29, 2013	Dhaka	Kishaloy Girls' School & College	Bengali Class	2	115	49	98
April 4, 2013	Dhaka	Lalmatia Housing Society School & College	Bengali Class	5	101	50	92
April 13, 2013	Dhaka	Kingshuk Participatory High School	Bengali Class	2	53	35	94
April 18, 2013	Dhaka	Mohammadpur Govt. Boys School	Bengali Class	2	173	48	83
					167	43	89
April 20, 2013	Dhaka	Lalmatia Girls' High School	Bengali Class	2	128	58	92
April 22, 2013	Rajshahi	Belghoria Abdus Sattar High School	Bengali Class	3	271	43	76
April 23, 2013	Rajshahi	Shyampur High School	Bengali Class	3	158	45	77
					122	42	80
April 25, 2013	Rajshahi	Collegiate School	Bengali Class	3	119	57	92
					205	58	95
April 26, 2013	Rajshahi	Mirjapur High School & College	Bengali Class	5	105	44	89
April 27, 2013	Rajshahi	Agrani High School & College	Bengali Class	3	143	46	88
					169	48	92
					178	53	94
April 28, 2013	Rajshahi	Maskatadighi High School	Bengali Class	3	107	54	88
April 29, 2013	Rajshahi	Dasmari High School	Bengali Class	1	129	49	91
April 29, 2013	Rajshahi	Pn Govt. High School	Bengali Class	3	265	61	95
May 4, 2013	Mymensingh	Premier Idial High School	Bengali Class	3	248	53	87
May 5, 2013	Mymensingh	Udyoun Mahila Samiti High School	Bengali Class	5	140	56	86
May 6, 2013	Mymensingh	Parangonj High School	Bengali Class	4	139	43	83
					120	53	87
May 6, 2013	Mymensingh	Kazi Nazrul Islam Model High School	Bengali Class	3	134	45	83
May 7, 2013	Mymensingh	Abdul Khaleque High School	Bengali Class	3	167	40	82
May 7, 2013	Mymensingh	Ram Kishore High School	Bengali Class	3	335	50	77
May 9, 2013	Mymensingh	Bororchar High School	Bengali Class	3	365	51	82
May 9, 2013	Mymensingh	Mir Kandapara High School	Bengali Class	3	87	49	95
May 11, 2013	Mymensingh	Mritunjoy High School	Bengali Class	3	95	44	86
May 12, 2013	Mymensingh	Renaissance Girls' School	Bengali Class	3	226	51	96
May 12, 2013	Mymensingh	Char Kharicha High School	Bengali Class	3	182	52	96
					138	57	96
May 13, 2013	Mymensingh	Nogendra Narayan Pilot Girls' High School	Bengali Class	3	258	50	94
May 14, 2013	Mymensingh	Zihiruddin High School	Bengali Class	3	170	41	96
					118	54	93
May 15, 2013	Mymensingh	Kalir Bazar High School	Bengali Class	4	245	41	89
					241	53	98
May 15, 2013	Mymensingh	Fatemanagar High School	Bengali Class	3	315	47	95
May 16, 2013	Mymensingh	Mokul Niketon High School	Bengali Class	1	253	46	92
June 20, 2013	Dhaka	Kurmitola High School & College	Bengali Class	3	219	55	86
					273	49	81
					237	59	90
June 26, 2013	Dhaka	Hazi Nuruddin Hmed High School	Bengali Class	4	162	49	90
					153	57	93
June 27, 2013	Dhaka	Rupshi New Model School	Bengali Class	4	158	50	87
June 29, 2013	Dhaka	Gandabpur High School	Bengali Class	5	163	45	90
					110	56	96
June 30, 2013	Dhaka	Parab High School	Bengali Class	3	441	53	85
July 2, 2013	Khulna	Khulna Model School	Bengali Class	2	236	51	92
July 4, 2013	Khulna	Khulna Zila School	Bengali Class	4	217	52	98
					178	56	97
July 6, 2013	Khulna	Govt. Coronation Girl's High School	Bengali Class	2	312	62	94
July 7, 2013	Barisal	Sofiulla High School	Bengali Class	4	375	46	81
July 8, 2013	Barisal	BM School Barisal	Bengali Class	5	231	50	94
July 9, 2013	Barisal	Soyoda Mazidunnesa High School	Bengali Class	5	186	59	99
July 11, 2013	Khepupara	Khepupara Model School & College	Bengali Class	3	361	51	91
July 13, 2013	Barisal	Nooria Secondary School	Bengali Class	5	228	52	97
		Total		196	17375	48	90

Technical Cooperation Project
for
Development of Human Capacity on 0peration
of Weather Analysis and Forecasting
in
The People's Republic of Bangladesh

SAFETY PRECAUTION

1. Word Definition

The words that designate a degree or level of Hazard seriousness are used in the manual for product safety.

(1) Danger:

It indicates a potentially hazardous situation which, if not avoided, will result in death or serious injury

(2) Warning:

It indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.
It also contains a serious situation which, if not avoided could affect serious damage to the related devices and result in radar operation stop.

(3) Caution

It indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. Is also contains a potential situation which, if not avoided, may affects normal radar operation

2. Safety Precaution in Related Devices
Transmitter/ATU (TX/ATU) and Antenna (initial component) and Antenna Controller (AC)

(1) Since the TX/ATU operate not only in high voltage which remains charged for a while after shutdown but also contains heavy components etc., precautionary are shown for each treatment.
(2) A lot of precautions are also described for the antenna handling due to the safety.
(3) It is essential that the safety and precautionary notes contained in the manual

should be read and fully understood before touching any TX/ATU, AC and Antenna internal component.

(4) When working in the radar site, a second person should be stand-by to assist and summon help in case of accident.

3. Keep Clean and Cool (Air-conditioned)

(1) Environmental conditions should remain suitable cool and clean.

(2) The room to buffer for preventing foreign mud and debris from entering into the room should be prepared in the case when the entrance is near to the outside.

(3) The equipment room in the radar site should be treated under the rile that any person should remove shoes before entering and change the inner shoes.

(4) Keep the inside of each device especially the TX/ATU clean.

4. Trouble shooting

Whenever any fault will occur in the system, what maintenance crews should firstly have to do is to go the radar site to settle the trouble.

(1) Since the restoration manner after the fault indication is different among each device, you should get enough understanding of each device.

(2) TX and AC have the function of Reset among every device. Even if the AC has this function, you should go to the radar site in the event of OVERLOAD. Because OVERLOAD seldom works and is usually issued due to the trouble in the Antenna.

(3) Since the TX/ATU provides self- restoration function, fault indication may sometimes be recovered in the case when fault will happen in the threshold zone of any performance.

The Digital Receiver Signal Processor (DRSP) is not so dangerous compared to the TX/ATU, because the DRSP doesn't contain any high voltage units.

When a fault keeps indicating with restoring, you must go to the radar site for checking troubles.

Technical Cooperation Project
for
Development of Human Capacity on Operation
of Weather Analysis and Forecasting
in
The People's Republic of Bangladesh

Necessary of Periodic Maintenance of Radar System

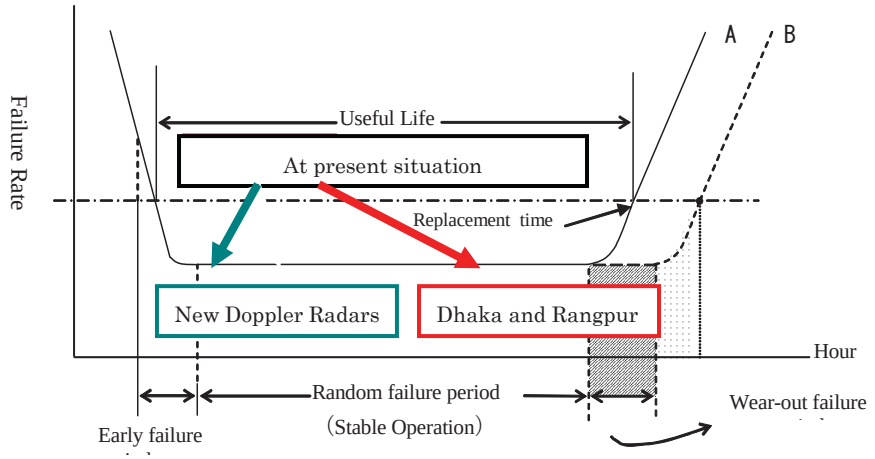
1. Main purpose of periodic maintenance

The periodic maintenance of the meteorological radar including Check and Adjustment is the following two themes:

1) To keep the system operation performance constant and stable to provide the constant, high quality meteorological information for users.
2) To prevent from a fault occurrence through preventive check and maintenance. Especially, keeping operation records of the equipment is very important as suggested in the maintenance instructions because it is necessary to immediately identify any change in each device when failures occur.

2. Failure distribution in the Life time of Electric equipment based on Reliability Management

The failure distribution Curve in the life time is shown the following Figure.
The distribution of the failure is divided into three periods, that is 1) Early failure, 2) Random failure and 3) Wear-out failure. The curve is named "Bathtub Curve".



Failure Rate Curve for Electric Equipment

1) Early failure period

In this period, failure is mainly caused by the flaws in design and manufacturing in the factory or mishandling of the equipment. Failure is decreasing by screening, barn-in, aging and debugging of parts used in the equipment or the equipment itself.

2) Random failure period

This period called useful life. The operation of equipment is stable in this period. Failure rate is very low and keep constant. In order to prevent the equipment from failure, periodic preventive maintenance is necessary.

3) Wear-out failure period

The failure rate is increasing due to degradation default of electric parts and wear of mechanical parts. As secondary failure is also increasing, it is important to accumulate a regular record of each device and equipment.

3. Preventive Check and Maintenance

1) The scheduled periodic check and maintenance will help to ensure optimum system performance and may serve to detect certain potential minor malfunction prior to them developing into a major fault.
2) There is no practical way of detecting a system impending fault or malfunction associated with each device except the Antenna.
3) Most faults don't emerge as a mechanical trouble in the Antenna has usually sent a message or sign in the form of unusual sound.
4) It is important to accumulate record pf each device, as suggested in the maintenance instructions, o order that any change in each device is readily identified.
   If any indication will significantly differ from the typical value, the cause should be investigated.
5) The key performance item concerning the transmitter is important is to check and keep records the Klystron performance.
6) A lot of protective measures are provided for early stage detection of a potential fault which may result in the Klystron
   The following two items are important to maintain the Transmitter correctly.
   (1) To keep records and to pay attention to a slight variation.
   (2) To make a careful observation on both peak current and detected RF waveform. Those waveform sometime give us a signal of a creeping discharge in any place.

You may observe a slight fluctuation on the leading edge of waveform with an expected time axis range of the Oscilloscope.

7) You should not fail to notice a slight variation from the usual value in the case of the Klystron handing, especially.

4. System Status Check

All operation status of the system is displayed on the Radar Status window of Workstation.

Check the system operation status on the “Radar Status Menu” of the workstation everyday as the regular check.

Technical Cooperation Project
for
Development of Human Capacity on 0peration
of Weather Analysis and Forecasting
in
The People's Republic of Bangladesh

Techniques used in Doppler radar

1. Doppler Effect and Doppler Velocity

Modern Doppler radar provides not only very useful information on the position of storms, their movement, development and other properties, but also direct measurements of the speed of storms as cyclone by using the Doppler effect.

Doppler Effect, discovered by J. Doppler, is that a moving object will shift the frequency of the sound in proportion to the speed of movement.
Doppler Effect caused by sound was confirmed by C.Buys Ballot. The famous experiment is that of the train whistle approaching a stationary observer. If the train blows its whistle while approaching and continues blowing it as it passes and goes off in the other direction, anyone listening to the sound will hear the pitch of the whistle decrease when the train pass by.

The same effect happens with electromagnetic radiation.
Doppler radars make use of the Doppler Effect or the apparent change in frequency or wavelength of a wave that is perceived by an observer moving relative to the source of waves radiated by the radar transmitter. In the case of radar, the situation is to have stationary radar observing moving targets. Each target that is moving will shift the frequency of the radar signal an amount which depends on its speed.
For example, let's consider a single target at distance r from radar. A radar wave will travel to the target $2r$ since the wave has to go out the target and back to the radar. This distance can be measured in term of the number of wavelengths from the radar to the target and is equal to as $2r/\lambda$ where λ the wavelength of the radar signal is. As one wavelength in radians is 2π radians. So, the distance in radians becomes $(2r/\lambda)2\pi$, that is $4\pi r/\lambda$.
The phase of an electromagnetic wave is essentially the fraction of a full wavelength a particular point is from some reference point measured in radians (or degrees) shown in Figure 1.
Figure 1 show that the transmitting wave traveled to a target and was reflected to the radar, that is, the wave made round trip over $2r$ distance between the radar to the target moving at range r.

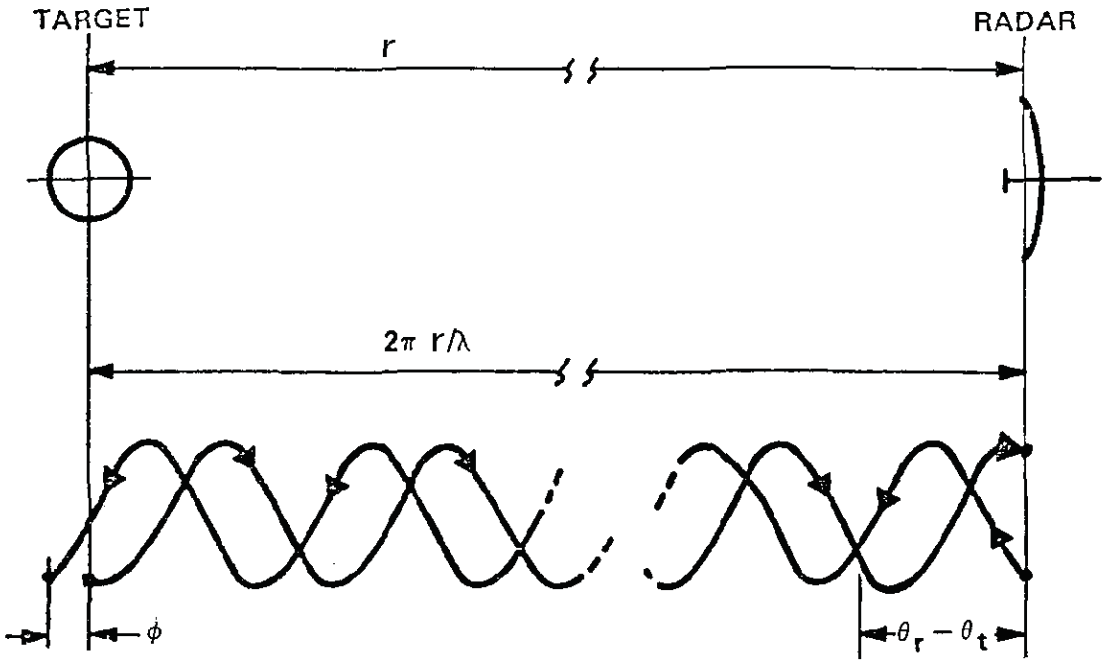


Figure 1 Doppler Effect (From D.V.Payne (1979)

The reference point of a wave is usually the point on sine wave where the cosine is one and zero. For the sine wave, its phase is zero. If it is a quarter of the way from the start of the wave toward the next wave, its phase is 2π/4=π/2 radians (90˚). Phase shifts can be either positive or negative but are always less than 2π radians (360˚). In fact, if the phase shift is more than **π** radians (180˚) we usually consider the phase difference to be the difference in angle between the point of interest and the nearest zero point. That way the phase shift will never be more than ±π radians (180˚).

If a radar signal is transmitted with an initial phase ϕ_0, the phase of the returned signal ϕ is given by

$$\phi = \phi_0 + \frac{4\pi \times r}{\lambda}$$

The change of phase with time from one pulse to next is given

$$\frac{d\phi}{dt} = \frac{4\pi}{\lambda}\frac{dr}{dt}$$

, where $d(\ )/dt$ is the time derivative or time rate of change of parameter.

The velocity of the target is given by

$$V = \frac{dr}{dt}$$

Angular frequency Ω is the time rate of change of angle (or phase) and is defined by

$$\Omega = \frac{d\phi}{dt} = 2\pi f$$

Where f is the frequency shift in cycles per second (hertz)

$$2\pi \cdot f = \frac{4\pi}{\lambda} V$$

$$f = \frac{2V}{\lambda}$$

The frequency shift f is caused by a target moving relative to a radar and is linearly proportional to velocity and inversely proportional to wavelength. As the wavelength of the given radar is fixed, the frequency shift is dependent only upon velocity of target. Table 1 explains description of the terms and equations described above.

Table 1.1 Description of the terms and the equations

Terms and Equations	Description
$2r$	Total distance traveled by radar wave to target
λ	The wavelength of the radar
$\frac{2r}{\lambda}$	Distance measured in term of number of wavelengths from the radar to the target
$\frac{2r}{\lambda} \times 2\pi = \frac{4\pi \cdot r}{\lambda}$	Distance measured in radians
$\phi = \phi_0 + \frac{4\pi \times r}{\lambda}$	The phase of the returned signal
ϕ_0	The initial phase of the transmitting waves
$\frac{d\phi}{dt} = \frac{4\pi}{\lambda}\frac{dr}{dt}$	The change of phase with time from one pulse to next Pulse
$V = \frac{dr}{dt}$	Velocity of an object
$\Omega = \frac{d\phi}{dt} = 2\pi f$	Angular frequency
$f = \frac{2V}{\lambda}$	Frequency shift in cycle per second (hertz) (V : Doppler velocity) (f : Doppler frequency)

2. Simple block diagram of a Conventional radar and a typical Doppler radar

Figure 2.1 and Figure2.2 (Ronald E. Rinehart 1992) and Figure2.3 (Hamazu.2002) show the block diagram of each of the conventional pulsed radar and a pulsed Doppler radar. (Ronald E. Rinehart, 1992) The components used in Doppler radar are more complex than those of the conventional radar.

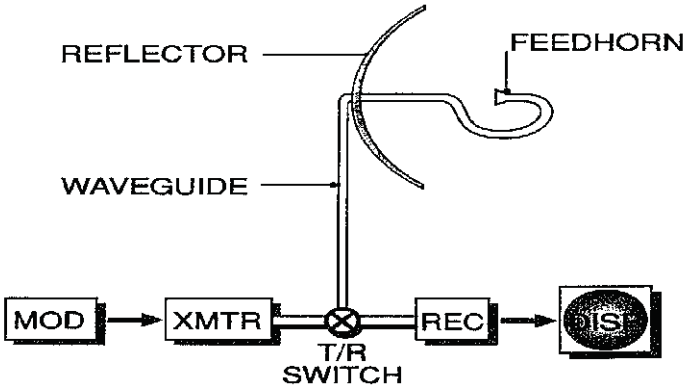


Fig 2.1 Block diagram of simple conventional radar

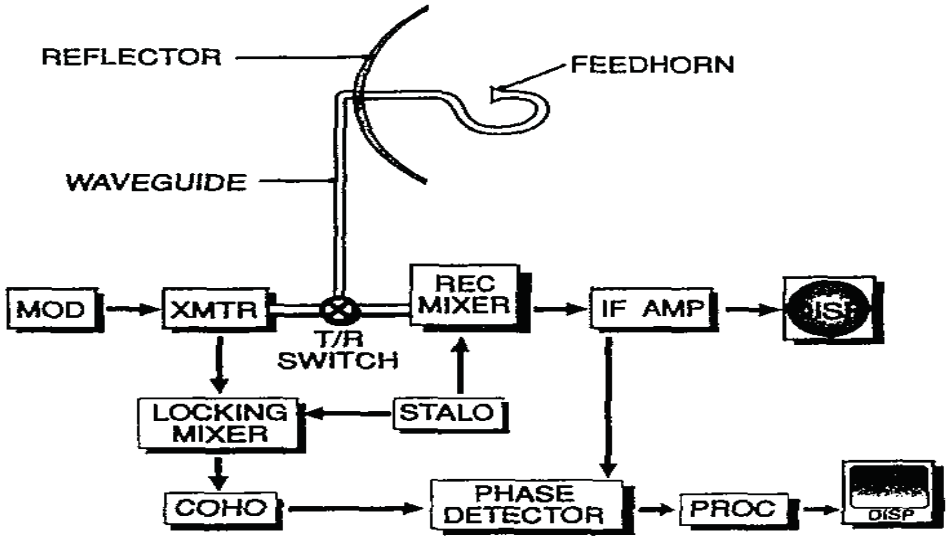


Fig.2.2 Block diagram of simple Doppler radar

MOD:	Modulator
XMTR:	Transmitter
REC MIXER:	Receiver and mixer

T/R switch:	Transmit/receiver switch
REC:	Receiver including mixer, local Oscillator ,and Per-IF amplifier ,Logarithmic IF amplifier
IF Amp:	Intermediate frequency amplifier
STALO:	Stable local oscillator
Coho:	Coherent oscillator
Proc:	Processor

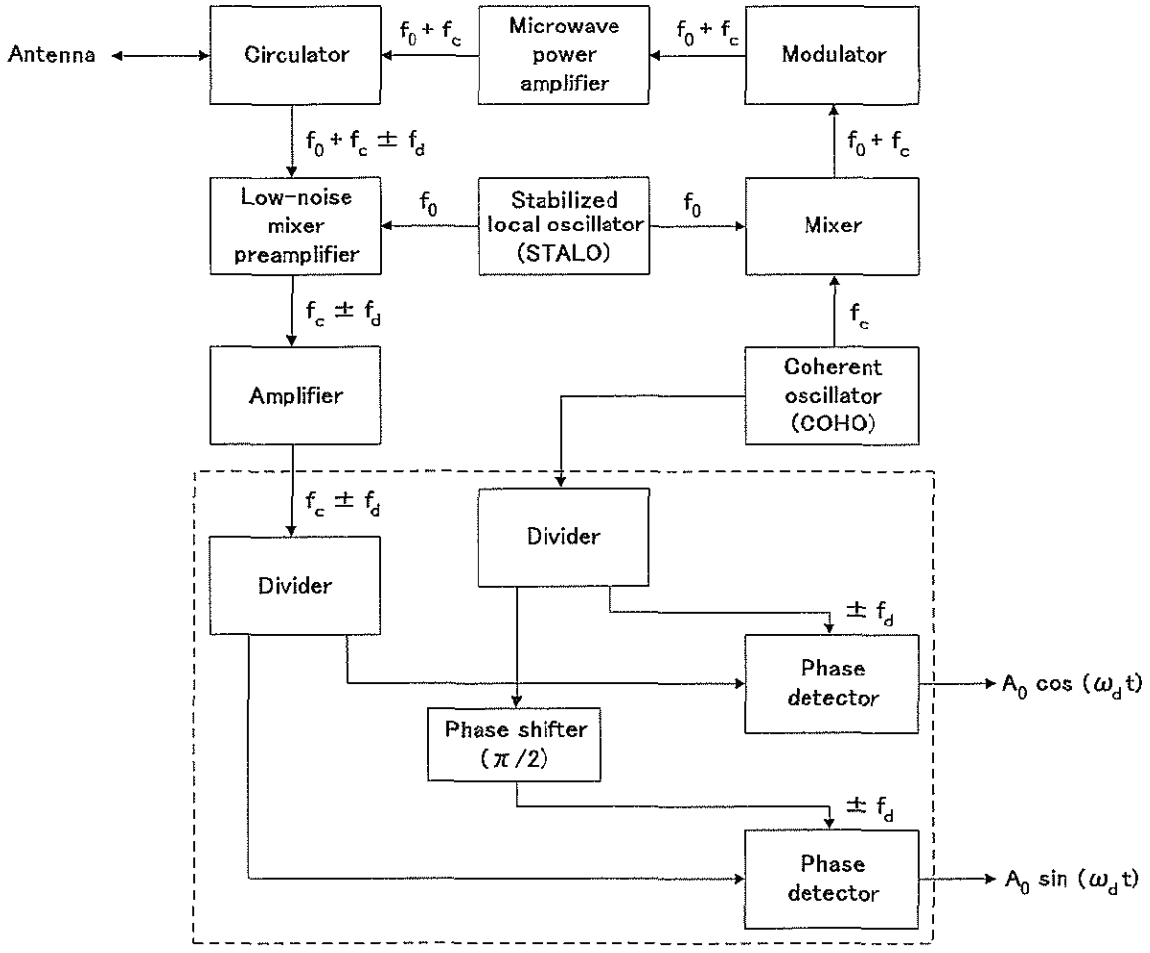


Figure 2.3 Block diagram of the principal components of a simplified pulsed Doppler radar

3. Ability of a Doppler radar

In order to detect slight phase shifts, it depends critically upon the system maintaining a transmission frequency and phase relationship from one pulse to the next. Many Doppler radars use coherent transmitters using klystron tubes, instead of using magnetron, because a klystron Doppler radar transmit exactly the same frequency and initial phase from one pulse to the next. For other Doppler radars, using magnetron tubes, it is difficult to maintain the same frequency and phase stability. The radars have special components which sample and remember the phase and frequency of each pulse so that it can be compared with the received signal.
There are limitations in the velocities and ranges that the radar can resolve unambiguously.

3.1 Velocity ambiguities

When a target is not moving toward or away from the radar, it will have zero radial velocity.
This does not necessarily mean that the target is stationary. It simply means that the target is remaining at a constant distance from the radar. It could be moving quite rapidly in fact, but any movement it has must be perpendicular to the radar beam. Since the only velocity a Doppler radar can detect using phase-shift principles is the radial velocity.

If the velocity of a target is zero relative to the radar, there will be zero phase shift in the frequency of the received signal relative to the frequency of the transmitted signal. If the target is moving slightly away or toward the radar, there will be a slight phase shift. As the speed of the target increases, the phase shift will also increase, producing an increasing Doppler frequency shift. There is a limit, however, in how large a phase shift the radar can detect. For example if a target were moving away from a radar just fast enough that it traveled 1/2 a wavelength between two consecutive radar pulses, it would produce a phase shift of π radians. If it were moving toward the radar at the same velocity, it would also produce exactly the same shift of π radian, and we could not tell the difference in their velocities. As another example, if a target were moving so fast that it traveled exactly a whole wavelength between two consecutive pulses, the radar would detect zero phase shift and think that the target was stationary.

3.2 Nyquist velocity

The maximum velocity a Doppler radar can detect correctly or unambiguously is given by the velocity which just produces a phase shift of π radians. This is also called the Nyquist frequency or Nyquist velocity, depending upon whether we are referring to the maximum unambiguous frequency or velocity, respectively. Mathematically, we can express this as

$$V_{max} = \frac{f_{max}\lambda}{2},$$

, where the maximum frequency f_{max} is given following by the sampling theory

$$f_{max} = \frac{PRF}{2}$$

and PRF is the pulse repetition frequency of the radar. Thus, radar is

$$V_{max} = \frac{PRF \times \lambda}{4} \qquad (1)$$

This is an important result. It says that if we want to be able to detect high velocities, we must use long wavelength, large PRF 's or both.

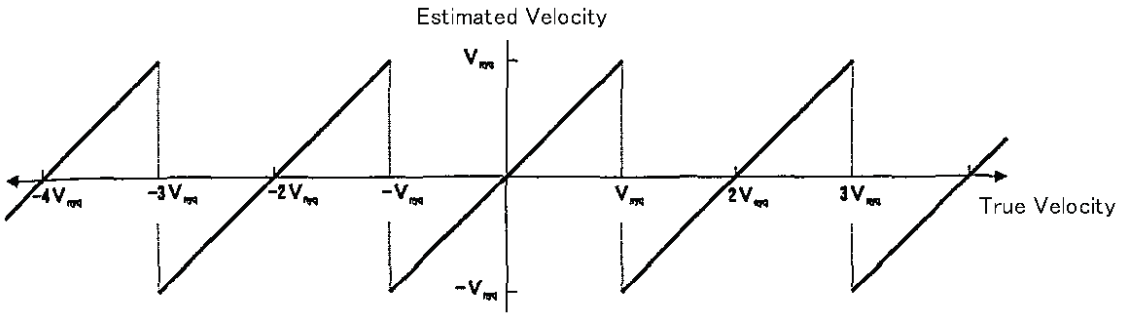


Figure 3.1 Expected estimated velocity V_{nyq} versus the true velocity

(From Ishihara, 2001)

4. The limitations of Range

Now, what about the limitation on range?

It is known that a transmitted pulse and any returned echo travel at the speed of light. The time it takes for a signal to go out and back from a target is t=2r/c, where c is the speed of light, r is the range and t is time. The 2 accounts for the distance out and back from the target. If a radar transmitted a shingle pulse and waited forever for a returning echo, there would be no limit to the distance at which the correct range to a target could be determined. In the real world, we do not wait very long before sending out a second pulse.

(1) There are a number of reasons for this. One is that we cannot detect targets at extremely long range or we are not interested in them. For meteorological target that exist relatively close to the earth's surface, the maximum range of detection is limited by earth's curvature. Even though the radar waves bend downward somewhat in their travel through the atmosphere, the earth's surface curves away even faster, so the radar beam usually gets so high above the earth's surface that storms are not detectable beyond 400 to 500km from a ground-based radar. Figure 4.1 shows the line of sight of the earth curvature.

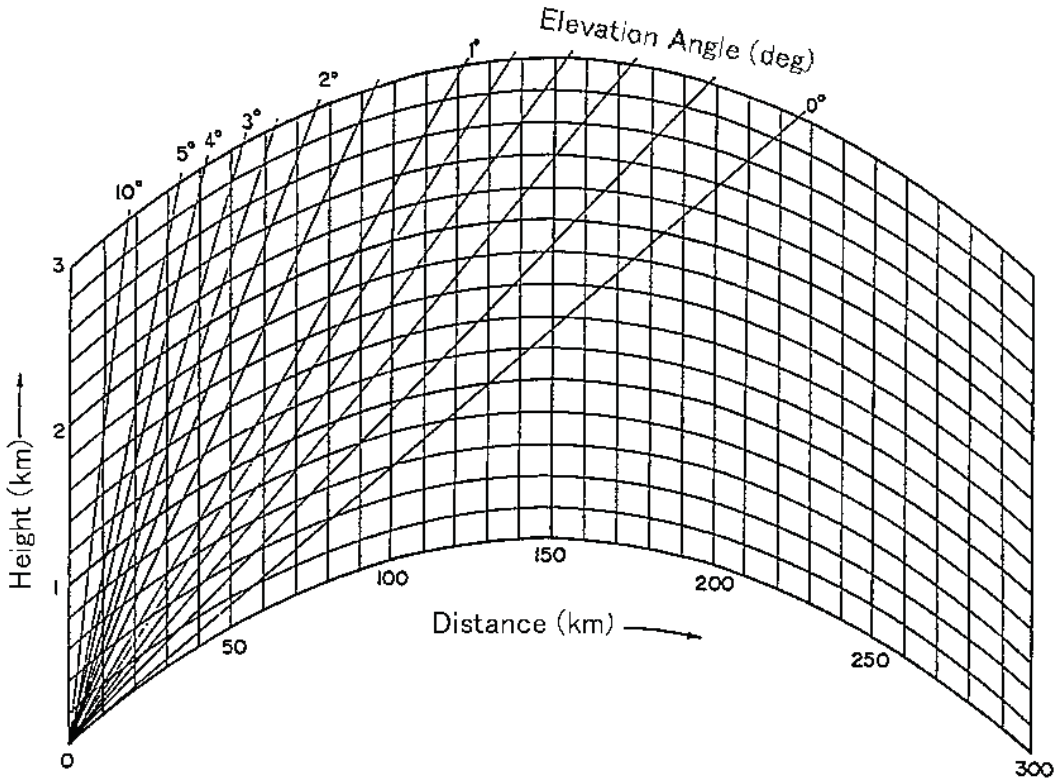


Figure 4.1 Line of sight diagram (From JICA and JMA, 1979)

(2) Another reason we are not interested in distant targets is that the inverse square low decreases the power received from a meteorological target according to $1/r^2$. If a target is too far away, the power received from it will be so weak that the radar will be unable to detect it.
For these and other reasons, radars are designed to send out subsequent pulses of energy at fairly frequent interval.

4.1 Determination of *PRF*

The interval between pulses T is determined by the pulse-repetition frequency and is given by

$$T = \frac{1}{PRF}$$

Now, the given T can determine the maximum range a radar signal can travel and return before the next pulse is sent out.

$$r_{max} = \frac{CT}{2} = \frac{C}{2PRF} \qquad (2)$$

The combination of maximum unambiguous velocity and maximum unambiguous range form two constraints which must be considered in choosing the PRF for us with a Doppler radar.
Notice that non-Doppler radars are only constrained by that maximum unambiguous range; since they cannot measure velocity, the velocity constraint does not apply.

By equations (1) and (2), we find

$$V_{max}\, r_{max} = \frac{C\lambda}{8}$$

If we want to have a large V_{max}, we must have a small r_{max}, since the right side of the equation is a constant for the given radar.
Conversely, if we want to detect echoes correctly to long ranges, we can only detect small velocity.

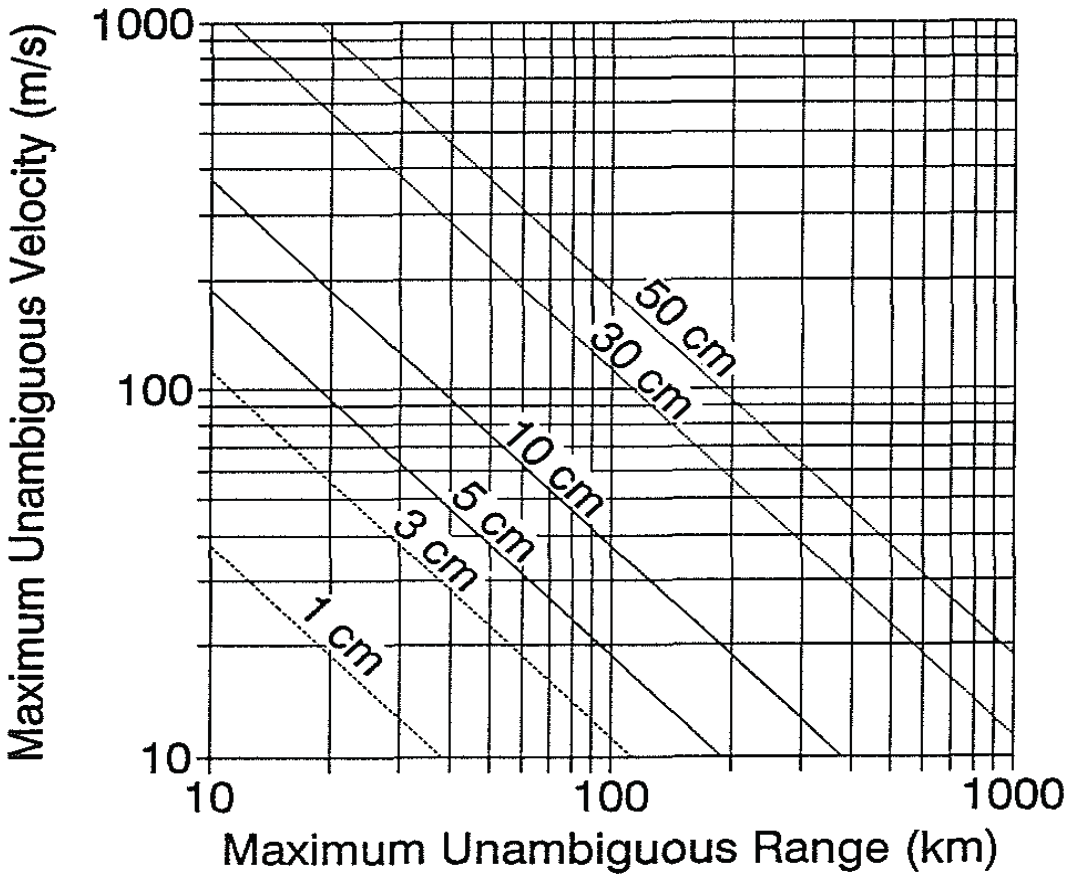


Figure 4.2 Summary of conditions for range and velocity folding
(From Gossard and Strauch, 1983)

Table 4.1 Example of typical unambiguous range and velocity for a variety of radar frequency band and *PRF*

Frequency Band	Wavelength λ (m)	*PRF* 750Hz		*PRF* 1000		*PRF* 2000	
		r_{max} (km)	V_{max} (m/s)	r_{max} (km)	V_{max} (m/s)	r_{max} (km)	V_{max} (m/s)
X	3	200	±5.6	150	±7.5	75	±15
C	5		±9.37		±12.5		±25
S	10		±18.75		±25.0		±50

Table 4.2 Unambiguous range and velocity of Bangladesh Meteorological Radar

Frequency (MHz) C-band	Wavelength λ (m)	*PRF* 576Hz		*PRF* 720	
		r_{max} (km)	V_{max} (m/s)	r_{max} (km)	V_{max} (m/s)
2850	10.5	384	±15.12	208	±18.9

5. Technique of Improvement of Nyquist maximum velocity

For a radar of wavelength (λ) operating at fixed sampling period(T), the unambiguous (Nyquist maximum) velocity (V_{max}) and range (r_{max}) are given by

$$V_{max} = \frac{PRF \times \lambda}{4} \qquad V_{max} = \frac{C \times T}{2} = \frac{C}{2 \times PRF} \qquad T = \frac{1}{PRF}$$

Often these intervals do not fully cover the span of velocity and range that one would like to measure. The problem is generally worse for short wavelength radar, since that unambiguous velocity span is directly proportional to λ for a given T. If the unambiguous range interval is made sufficiently large by increasing T, then the resulting velocity span may be unacceptably small. The technique, called Dual PRF velocity unfolding, provides extension of the unambiguous velocity span by a factor of either two or three beyond that given above. The technique uses two pulse periods rather than one, and relies on the extra information obtained to correct the mean velocity measurement from each individual period. The Dual PRF trigger pattern consists of alternating (N+k)-pulse intervals where the period in each interval is either T_l (for the low PRF) or T_h (for the high PRF). Here "N" is the same size, and "k" represents a delay that permits the clutter filter to equilibrate to the new PRF after each change. The two PRF periods T_l and T_h must be chosen in either 3:2, 4:3, or 5:4 ratio. These ratios give factors of two, three, and four times velocity expansion over the T_h period alone.

The unfolding algorithm makes use of the following results. The measured phase angles for the r_1 autocorrelations at the two PRF's are:

$$\theta_l = \frac{4\pi V T_l}{\lambda} \qquad \text{and} \qquad \theta_h = \frac{4\pi V T_h}{\lambda}$$

where angles outside the basic [-π, π] interval are returned to that interval by appropriate additions of ±2π uncertainties reflects the that each measurement is folded into its own unambiguous interval:

$$V_{l\ max} = \frac{\lambda}{4T_l} \qquad V_{h\ max} = \frac{\lambda}{4T_h}$$

If ϕ is defined to be the difference between the two measured phases then

$$\phi = \theta_l - \theta_h = \frac{4\pi}{\lambda}\left[T_l - T_h\right]$$

which can be interpreted as a phase angle within the unfolded interval:

$$V_{u\,unfold} = \frac{\lambda}{4(T_l - T_h)}$$

Now if T_l and T_h are in 5:4 ratio, then

$$T_l - T_h = \frac{T_l}{5} = \frac{T_h}{4}$$

Nyquist Velocity of T_h $\quad V_{h\max} = \dfrac{\lambda \times f_1}{4} = \dfrac{10.5 \times 720}{4} = 18.9$ m/s

Nyquist Velocity of T_l $\quad V_{l\max} = \dfrac{\lambda \times f_2}{4} = \dfrac{10.5 \times 576}{4} = 15.12$ m/s

$$V_{unfold} = V_{h\max} \times N2 = V_{l\max} \times N1 = 18.9 \times 4 = 15.12 \times 5 = 75.6 \text{ m/sc}$$

The Figure 5 shown the expected estimated velocity processed by the two PRF technique.
A velocity estimate V_{unfold} is obtained from echo samples spaced T_l, whereas a second velocity estimate obtained from samples spaced by T_h.The uniform velocity of spacing T_l is used during one scan, and the scan is repeated continuously with uniform sampling spacing T_h. The two different Nyquist interval scan is caused by two different Nyquist interval and can make the scan significantly different velocity aliasing.

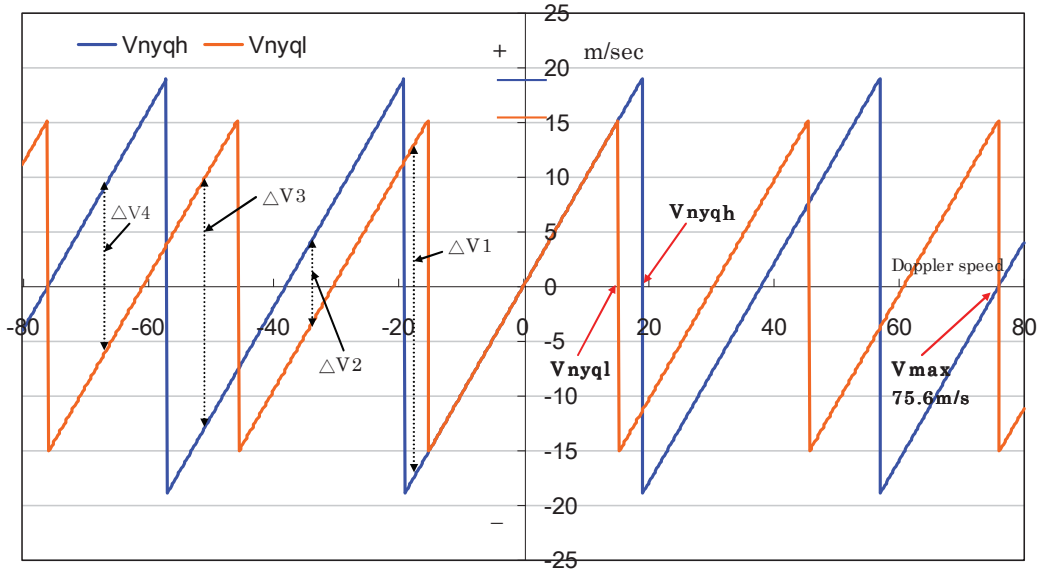
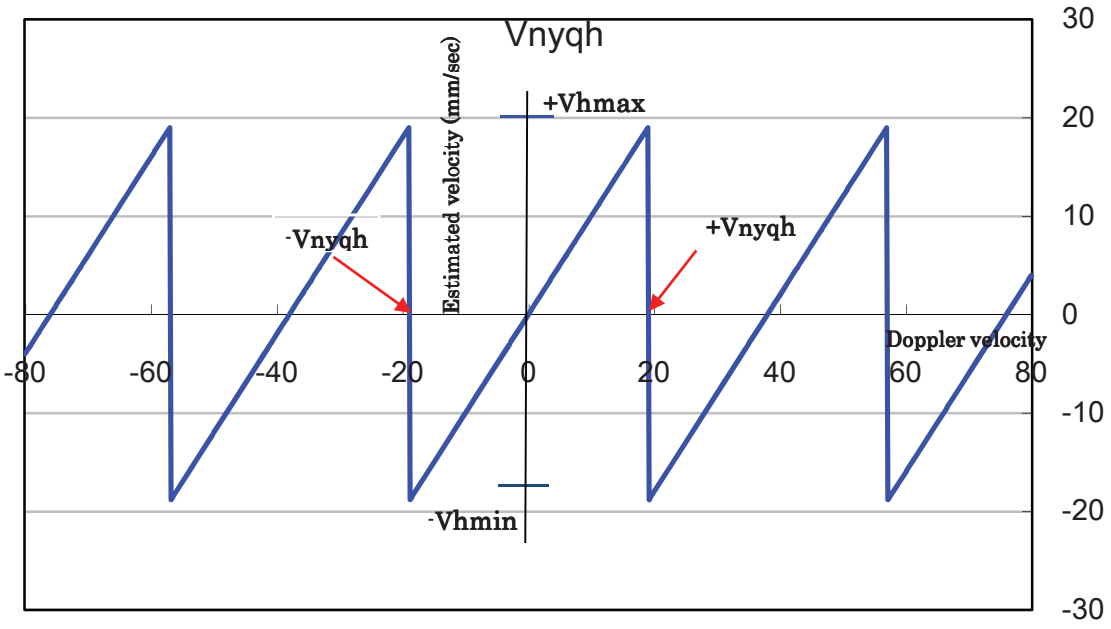
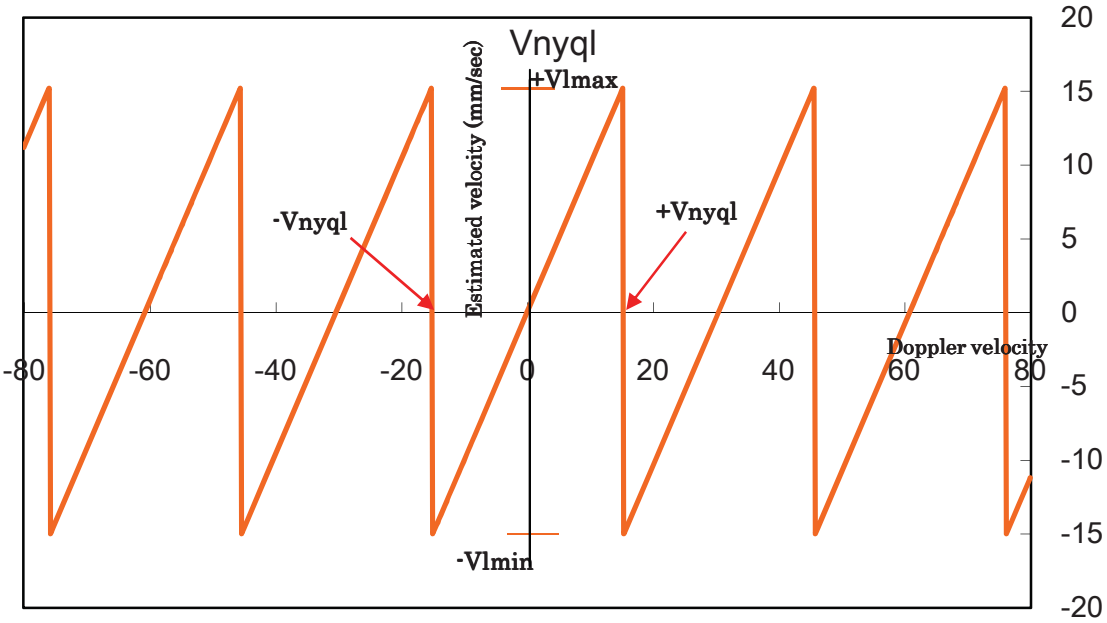


Figure5 Expected estimated velocities ($Vnyql$, $Vnyqh$) versus the velocity for T_h/T_l =5/4

Conception of Single PRF



PRF h: 720Hz　Vhmax=Vnyqh=±18.9m/sec

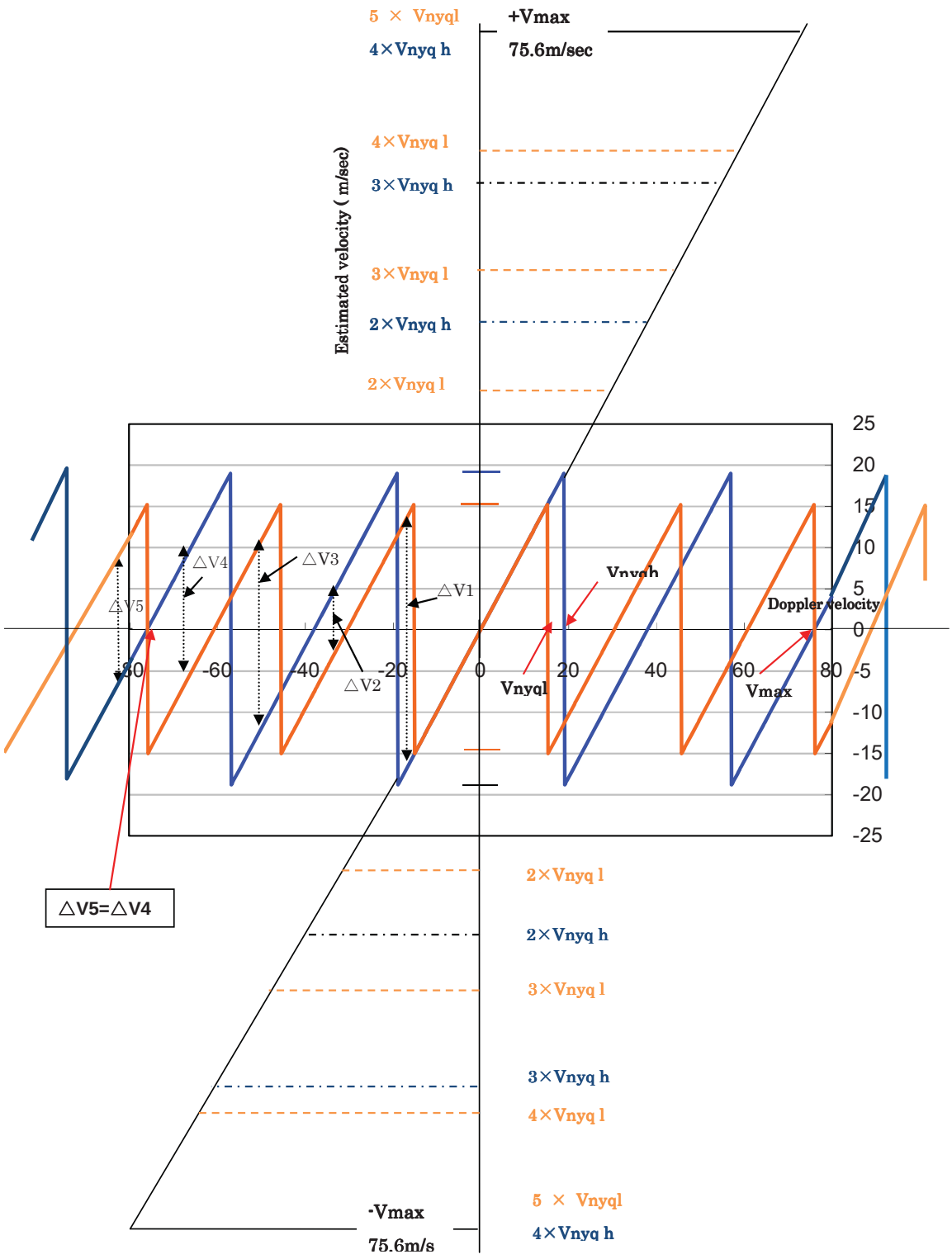


PRF l: 576Hz　Vmaxl=Vnyql=±15.12m/sec

Conception of Dual PRF

PRF ratio : 5 to 4

Vmax= 4 ×Vnyq h=5×Vnyq l



MINUTES OF MEETING
ON
TECHNICAL COOPERATION PROJECT
FOR
DEVELOPMENT OF HUMAN CAPACITY ON OPERATION OF WEATHER ANALYSIS AND FORECASTING
IN THE PEOPLE'S REPUBLIC OF BANGLADESH

The 1st Joint Coordination Committee (Here in after 'JCC') meeting on the captioned project among the concerned officials of the Government of Bangladesh and Japan International Cooperation Agency (JICA) Bangladesh Office has been conducted under chairmanship of Ms. Arjumand Habib, Director of the Bangladesh Meteorological Department (BMD).The results of the discussion, both sides have confirmed and agreed the main items described in the attached sheets.

Dhaka, October 07, 2009

TODA Takao
Chief Representative
Japan International Cooperation Agency
Bangladesh Office

Arjumand Habib
Director
Bangladesh Meteorological Department

ATTACHMENT

1. Project Name:

Technical Cooperation Project for Development of Human Capacity on Operation of Weather Analysis and Forecasting in the People's Republic of Bangladesh

2. Implementing Agency:

Japan Side: Japan International Cooperation Agency (JICA)
Bangladesh Side: Bangladesh Meteorological Department (BMD)

3. Relevant Items discussed:

A) Confirmation of the role of Joint Coordination Committee (hereinafter referred to as "JCC") and its composition:

By all the attendants named in Annex-1), the role and components of JCC were confirmed as Annex-2 attached herewith.

B) Confirmation of the Project Design Matrix (PDM):

JICA Bangladesh Office mentioned that the sentence indicated in ANNEX-3 of the PDM in the column "Important Assumption of Project Purpose" is not appropriate. JICA Bangladesh Office recommended to delete the sentence and it was agreed by all the member of JCC.

C) Publishing a Brochure to Explain Project details and effectiveness:

The CR of JICA Bangladesh office has emphasized on the necessity of concise brochure prepared by BMD. The brochure will sensitize the related stakeholders on the benefit of forecasting system of BMD. JCC members agreed on this point and requested to BMD to prepare the brochure as early basis.

D) Inclusion of Weather Forecasting and Warning Issues into the school Curriculum:

The CR of JICA Bangladesh office has mentioned the importance of knowledge development for students on the weather system and information through the text books of primary school level. JCC members are agreed and requested to the chairperson to take necessary initiative (consultation with Ministry of Education) regarding this matter.

E) Preparation of Baseline data for comparative study after Project:

The CR of JICA Bangladesh office has mentioned the importance to analyze the effectiveness of project by comparing with existing baseline data. JCC members agreed on this point and requested

to BMD to prepare the baseline data.

F) Confirmation of the Work Schedule

The team leader of JICA expert's explained that the period of the Project is planned up to the end of December, 2012 and the Work Schedule of Japanese Fiscal Year 2009 attached as ANNEX-4, and it was confirmed by JCC.

G) Assignment of Bangladesh Counterparts

All of the BMD Counterparts selected by the Project Director and JICA Experts were confirmed and approved by JCC. The Executive Engineer of Flood Forecasting and Warning Centre (FFWC-BWDB) indicated necessity of inclusion of the FFWC personnel in the project. JICA expert members welcomed the suggestion and selected 3 personnel as counterpart from FFWC. The finalized List of Counterpart is attached as ANNEX-5.

H) Necessity of Equipment

The BMD strongly expressed the necessity of the equipment to be procured under the Project in the FY 2010 by JICA Bangladesh Office mentioned in ANNEX-6. The BMD also explained the location of the equipment as ANNEX-7. Furthermore, the BMD expressed that in order to satisfy the PDM originally prepared in the stage of the Minutes of Meeting signed among JICA Preparatory Study Team, Economic Relation Division (ERD) and BMD on November 12, 2008, the required equipment is indispensable. JICA Expert Team mentioned that the equipment indicated by BMD is very much required for project implementation and is included their proposal which has been officially submitted to the JICA Head Office. The JICA Bangladesh mentioned that the JICA preparatory study team did not consider the modernization of equipment but technical improvement of BMD staff and also suggested the upgrade of equipment could be proposed by future project of Grant Aid. Understanding the issue the JCC confirmed that necessity of equipment must be discussed further with a clear explanation from BMD.

Annex-1 List of Attendants of JCC

Annex-2 Joint Coordination Committee

Annex-3 Project Indicators of the Project Design Matrix (PDM)

Annex-4 Work Schedule

Annex-5 List of Counterpart Participants on Different Fields under TA Project of JICA

Annex-6 List of the Equipment to be procured under the Project in the FY 2010 by JICA Bangladesh Office

Annex-7 Location Map of the Project Site

Annex-1

LIST OF ATTENDANTS

JOINT COORDINATION COMMITTEE (JCC)
FOR
TECHNICAL COOPERATION PROJECT FOR
DEVELOPMENT OF HUMAN CAPACITY ON OPERATION OF WEATHER ANALYSIS AND FORECASTING
IN THE PEOPLE'S REPUBLIC OF BANGLADESH

Location: Bangladesh Meteorology Department (BMD), Head Office
Time: 12:00, October 07, 2009

No.	Name	Position	Signature
1	Takao TODA	CR, JICA	
2	Hideki Katayama	PFA JICA	
3	Anisuzzaman Chowdhury	Program officer JICA	
4	Yoshihisa UCHIDA	Team Leader JICA Expert	
5	Nobutaka NOGUCHI	NWP JICA EXPERT	
6	Soshi IWATA	Weather Information Dissemination JICA expert	
7	Takayuki OTSU	Radar Calibration JICA expert	
8	Nasreen Akhtar Chowdhury	Deputy Secretary ERD	7.10.09
9	Md. Abu Bakar Siddique	Deputy Director DMB	
10	AHMED ARIF RASHID	Senior Mech Engr Project Co-ordinator	
11	MD. SAIFUL HOSSAIN	EXECUTIVE ENGINEER. FFWC, BWDB.	7/10/09

12	M. Shamimuzzaman	Assistant Chief Ministry of Defence	8/10/09
13	Arjumand Hasin	Director BIN D.	07-10-09
14	Takayuki MOTOYA	Data Quality Control JICA Expert	
15			
16			
17			
18			
19			
20			
21			
22			
23			
24			
25			

Annex-2

Function and Composition of Joint Coordinating Committee

1. Function

- To discuss and approve of the annual work plan of the project based on the approved annual budget in line with the tentative schedule of the implementation formed under the framework of the Record of Discussion;
- To review the overall progress and annual expenditure of the Project as well as the achievement of the annual work plan mentioned above;
- To review and exchange views on major issues arising from or in connection with the Project.

2. Composition

(1) Chairperson
Director of Bangladesh Meteorological Department (BMD)

(2) Co-Chairperson
Chief Representative, JICA Bangladesh Office

(3) Members

a. Deputy Secretary, Japan Branch, Economic Relation Division
b. Senior Assistant Chief/Assistant Chief, Ministry of Defence
c. Executive Engineer, Flood Forecasting and Warning Centre (FFWC), BWDB
d. Director (Training & Planning), Disaster Management Bureau (DMB)
e. Official(s) in charge, JICA Bangladesh Office
f. Project Coordinator, Bangladesh Meteorological Department (BMD)
g. Japanese Experts of the Project
h. Other appointed by the Chairperson and the Co- Chairperson as need basis

Annex-3

PROJECT DESIGN MATRIX (PDM)

Project on Development of Human Capacity on Operation of Weather Analysis and Forecasting (October 07, 2009)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Highly precise weather and climate information is utilized for natural disaster management which contributes to the reduction of the natural disaster losses.	Utilization of weather and climate information by organizations related to natural disaster management	Interview to the person in charge in organizations related to natural disaster management	
Project Purpose Weather information for natural disaster management is strengthened in terms of time and quality through human capacity development and dissemination of weather information among various stakeholders.	1. Rainfall data of the optimized radar ZR relation parameter for rainfall calculation being provided to FFWC. 2. Accurate and easily understandable forecasting and warning to organizations related to natural disaster management and Mass Media are timely issued.	1. Data distribution record 2. Weather forecasting and warning prepared by BMD for organizations related to natural disaster management and Mass Media	~~Weather data, forecasting and warning of BMD are utilized by organizations related to natural disaster management and Mass Media.~~ (Deleted)
Outputs			
1. Capacity of BMD for observation and forecasting is improved.	1.1. Enable to acquire and archive accurate observed data: 6 existing meteorological observatories 1.2. Training for field observers and data inspectors on observed data acquisition and data quality control: 6 times 1.3. Briefing in SWC: at least 1 time/day	1.1. Database in BMD Head Office 1.2. Report of the Project 1.3. Briefing records	State policy of weather services in the Government of Bangladesh remains unchanged.
2. Quantitative rainfall estimation by using Doppler Radars is implemented.	2.1. Correlation of radar rainfall data observed by the optimized radar ZR relation parameter for rainfall calculation and surface observation being corroborated. 2.2. Binary data of rainfall intensity composite picture created by rainfall data of 5 existing radar systems	2.1. Correlation chart of rainfall data of radar and surface observations 2.2. Computers in SWC	

	optimized ZR relation parameter for radar rainfall calculation is distributed to FFWC.		
3. Climate data is utilized for the trend analysis of climate change.	3.1. Summary of Climate statistical analysis is shared with the SAARC Countries.	3.1. BMD web page Regional Workshop of SAARC Countries opened	
4. Capacity of BMD personnel for 1 to 5 days weather forecasting using basic techniques of Numerical Weather Prediction (NWP) is established.	4.1. Enable to use the basic techniques of Numerical Weather Prediction (NWP): 5 staff of BMD	4.1. Report of the Project	
5. Understanding about weather and climate information among stakeholders related to natural disaster are deepened.	5.1. Implementation of seminars for stakeholders related to natural disaster: 8 times, 70% of the participants understood the contents 5.2. Booklets of weather, climate and natural disaster to be distributed to stakeholders related to natural disaster including elementary schools and residents in disaster affected area: 3	5.1. List of participants of seminar Questionnaires to the participants of seminar 5.2. Booklets	
6. Weather observation and monitoring equipment such as meteorological radar system etc. are operated and maintained properly.	6.1. Enable to implement regular maintenance and trouble shooting for the meteorological Doppler radar systems: 9 staff of BMD 6.2. Operation/maintenance manuals being utilized in each existing Meteorological Radar Station	6.1. Report of the Project 6.2. Record sheet of regular check	

Activities	Inputs		Pre-conditions
1.1. To rehabilitate the existing meteorological observatories in the targeted areas 1.2. To prepare the field observation guideline 1.3. To provide the training for field observers and data inspectors on observed data acquisition and data quality control 1.4. To prepare the operation and maintenance manuals for observation fields and instruments 1.5. To provide the training for field observers and instrument inspectors on maintenance and control of observation fields and observation instruments 1.6. To prepare the briefing flowchart and record 2.1. To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation 2.2. To prepare correlation charts of rainfall data of radar and surface observations in the observation range of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation 2.3. To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC 3.1. To develop daily observation data input sheet for	(Bangladesh Side) 1. Provision of the project office for the project experts in BMD Head Office 2. Allocation of the required counterpart personnel 3. Provision of training spaces 4. Provision of installation spaces for the equipment to be procured under the Project 5. Security of the equipment for the Project 6. Operation and maintenance expenses of the equipment for the Project 7. Tax exemption, custom clearance and other procedures required for importing the equipment for the Project	(Japan Side) 1. Dispatch of experts - Weather Forecasting & Warning Service and Organization Management - Weather Observation - Weather Service Infrastructure - Meteorological Radar Calibration - Data Quality Control and Statistical Analysis - Web Site Design - Numerical Weather Prediction - Weather Information Dissemination - Meteorological Radar Operation and Maintenance 2. Equipment Supply 3. Provision of training in Japan	To be able to obtain cooperation of organizations related to natural disaster management

easy statistical processing and data quality control of observed data 3.2. To conduct climate data statistical analysis 3.3. To publish the summarized result of climate data statistical analysis to BMD Web page 4.1. To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP) 4.2. To conduct the basic training on Numerical Weather Prediction (NWP) 4.3 To conduct the training on Numerical Weather Prediction (NWP) guidance 4.4. To operate the Meso Scale Model (MSM) by using PC (Linux) on trial base 5.1. To conduct the seminars for the stakeholders related to natural disaster 5.2. To prepare the booklets of weather, climate and natural disaster 6.1. To conduct the training on operation and maintenance of the meteorological radar systems 6.2. To prepare the operation and maintenance manuals for the meteorological radar system			

Annex-4

Work Schedule of Japanese Fiscal Year 2009

	1st FY						
	FY2009						
	9	10	11	12	1	2	3
Improvement of BDM's capacity for observation & forecasting							
Site survey at the existing observatories				■		■	
Preparation of field observation procedures						■	
Preparation of field observation manual							
Implementation of training on observation data acquisition & quality control							
Inspection of field observation manual utilization							
Preparation of observation field and instrument maintenance and management procedures						■	
Preparation of observatory maintenance and management record book							
Preparation of observation field & instrument maintenance and management manual							
Implementation of training for observation field & instrument maintenance and management							
Inspection of utilization of observation field & instrument maintenance and management manual							
Training for forecast briefing				■		■	
Preparation of forecast briefing flowchart and record book		■				■	
Revision of forecast briefing flowchart and record book							
Finalization of forecast briefing flowchart and record book							
Implementation of quantitative rainfall estimation by using the existing Doppler Radars							
Collection and study of the existing data and materials		■					
Analysis of correlations between surface and radar observation data							
Study of the constants B and β in the radar equation for calculating rainfall amount by all the existing radars and selection of the optimal constants for the radar observation							
Optimization of rainfall amount calculating parameter of all the existing radars							
Study on archive of velocity data & products made by the existing Doppler Radars							
Preparation of composite pictures of the 5 existing radar systems, rainfall amount calculating parameter optimized, in SWC							
Climate change analysis using the existing climate data							
Implementation of statistical processing				■		■	
Analysis of statistical processing result							
Quality evaluation of the existing climate data							
Study on observation guideline and database of the existing climate data		■		■			
Preparation of daily observation data input format						■	
Procurement support of the equipment required for posting the climate data on Web site				■		■	
Review of Web site design							
Posting the summary of climate data statistical analysis on Web site							
Preparation of the workshop with SAARC							
Implementation of the workshop with SAARC							
Establishment of BMD personnel's capability for 1 – 5 days weather forecast using NWP basic knowledge							
Training on NWP technique		■				■	
PC training for BMD							
Technical discussion and practical training on NWP model							
Study and evaluation on NWP products calculated by other countries							
Concept and theory of NWP Guidance							
Basic practical training on NWP Guidance using PC							
Applicative practical training on NWP Guidance using PC							
Trial operation of Meso scale NWP model							
Expanding comprehension of stakeholders related to natural disasters on weather and climate information							
Preparation of activity plan on weather information dissemination		■					
Implementation of questionnaire							
Implementation of Flood seminar and distribution of booklet to local residents, pupils and students							
Implementation of Tropical Cyclone seminar and distribution of booklet to local residents, pupils and students							
Implementation of Climate Change seminar and distribution of booklet to local residents, pupils and students							
Preparation of booklet on Flood						■	
Preparation of booklet on Tropical Cyclone							
Preparation of booklet on Climate Change							
Implementation of Open House							
Proper operation and maintenance of weather observation & monitoring equipment including meteorological radar systems							
Works in Japan	□						
Implementation of technical		■	■				
Implementation of meteorological radar operation training		■	■				
Implementation of meteorological radar maintenance training				■	■	■	
Preparation of manual summary							
Preparation of operation & maintenance record book							
Preparation of consumables & spare parts list and procurement plan							
Report and project evalution studies							
Preparation of Inception Report (IC/R) Draft version	□						
Preparation/ explanation/ discussion on Inception Report (IC/R)		■					
Preparation/ explanation/ discussion on Progress Report 1 (P/R1)						■	
Preparation/ explanation/ discussion on Progress Report 2 (P/R2)							
Preparation/ explanation/ discussion on Progress Report 3 (P/R3)							
Preparation/ explanation/ discussion on Final Report (F/R)							
Project evalution study by JICA							
Project evalution study by JICA							

■ Bangladesh □ Japan

Annex-5

List of Counterpart Participants on Different Fields under Technical Cooperation Project of JICA

Name	Position	Weather Observation	Briefing	Radar Calibration	Data Quality Control	NWP	Web	Weather Information Dissemination
Ms. Mahnaz Khan	Assistant Director							○
Ms. Ayesha Khatoon	Assistant Director		○					○
Mr. S.M. Mahmudul Huq	Meteorologist		○					
Mr. Syed Abul Hasanat	Meteorologist		○					○
Mr. Md. Sanaul Haque Mondal	Meteorologist		○					
Mr. Md. Shadekul Alam	Meteorologist		○	○	○	○		
Ms. Taslima Imam	Meteorologist		○					○
Ms. Farah Deeba	Meteorologist		○		○			
Mr. Sheikh Shajahan Alam	Meteorologist		○					
Mr. Md. Shameem Hassan Bhuiyan	Meteorologist					○		○
Mr. Md. Abdul Mannan	Meteorologist		○		○	○		
Mr. S.M. Quamrul Hassan	Meteorologist		○	○	○	○	○	
Mr. Md. Rashaduzzamman	Assistant Meteorologist		○			○	○	
Mr. Md. AbdurRahman Khan	Assistant Meteorologist		○			○		
Mr. Md. Bazlur Rashid	Assistant Meteorologist		○			○		
Mr. Kh. Hafizur Rahman	Assistant Meteorologist		○			○		

Name	Position	Weather Observation	Briefing	Radar Calibration	Data Quality Control	NWP	Web	Weather Information Dissemination
Mr. Md. Muzammel Haque Tarafder	Senior Communication Engineer			○				
Mr. Md. Ahmed Arif Rashid	Senior Mechanical Engineer			○		○		
Mr. Md. Abdul Matin	Assistant Communication Engineer	○		○		○	○	○
Mr. Md. Sazzad Hossain	Assistant Communication Engineer	○		○		○	○	○
Mr. Murad Ahmed	Assistant Communication Engineer	○				○		○
Mr. Abu Shazzad Chowdhury	Assistant Mechanical Engineer	○				○		
Ms. Halima Khanam	Assistant Electronic Engineer	○						
Mr. Md. Ali Hayder	Assistant Electronic Engineer	○		○				

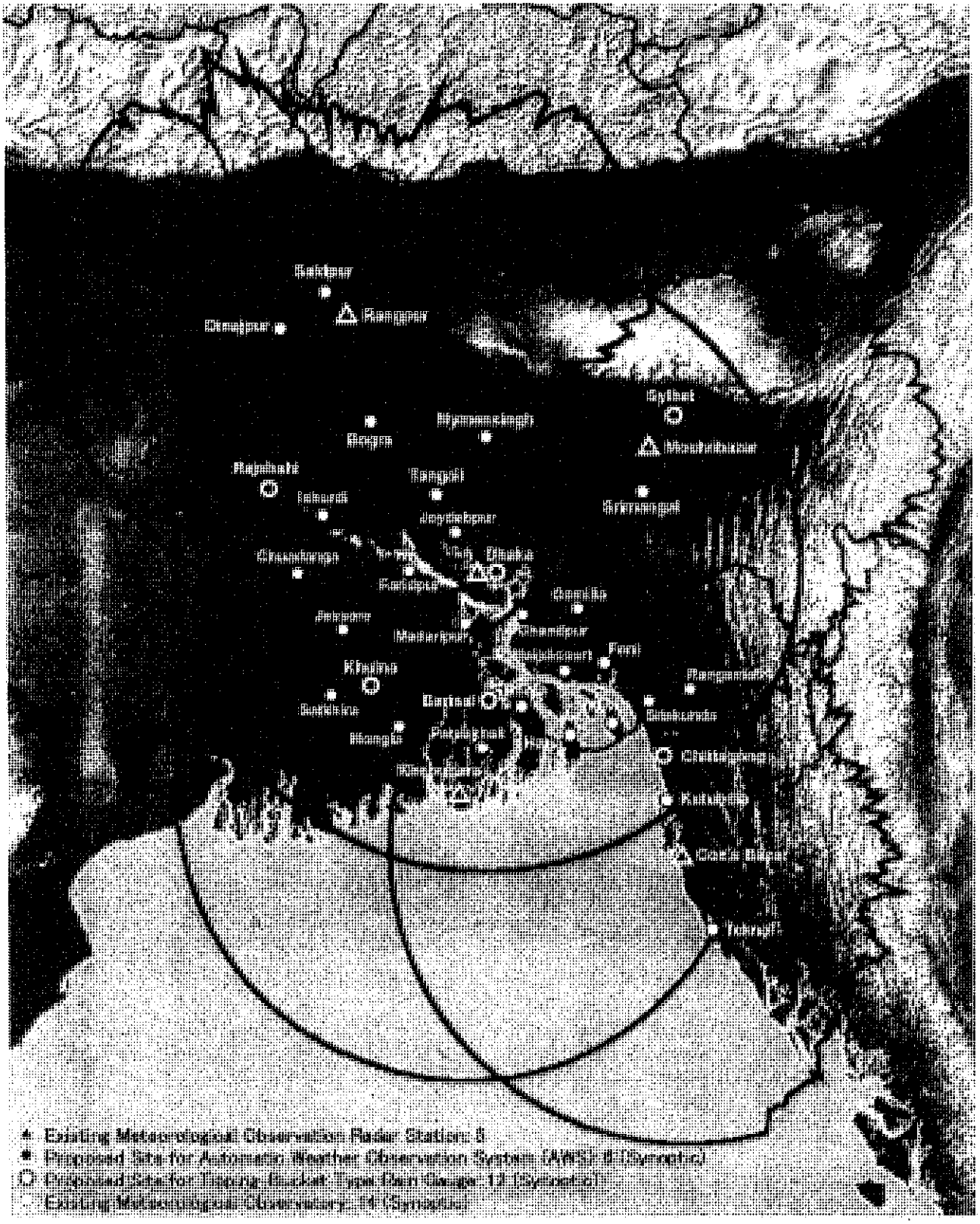
Name	Position	Weather Observation	Briefing	Radar Calibration	Data Quality Control	NWP	Web	Weather Information Dissemination
Mr. Md. Saiful Hossain	FFWC, Executive Engineer		○					○
Mr. Md. Abul Bashar	FFWC, Assistant Engineer			○		○		
Mr. Md. Ariful Islam Bhuiyan	FFWC, Assistant Engineer			○		○		

Annex-6

List of the Equipment to be procured under the Project in the FY 2010 by JICA Bangladesh Office
(Item, Quantity etc. will be decided in the Planning Phase of FY2009)

Equipment	Specification	Quantity	Purpose
Automatic Weather Observation System (AWS)	Wind speed & direction, Thermometer, Humidity sensor, Rain gauge, Barometer, Sunshine Duration Sensor, Data logger unit, 10m height Tripod, Data display unit (PC), Power supply unit, Data transmitter	6	For meteorological observation
Spare Parts for AWS	Each sensor, Solar panel, Data Transmitter	1	For maintenance of the system
Data Collection & Storage Unit	Data Receiving Unit, Data transmitter	1	For data collection & storage at BMD Head Office
Hard Disk for Data Storage	500GB, Potable Type, USB 2.0	2	For radar calibration data storage
Rain Gauge and Data Logger	Data Transmitter, Power Supply	12	For acquisition of rainfall data
Cluster PC for Basic Training on Numerical Weather Prediction	Cluster (5 Node), OS: Linux	1	For numerical analysis
UPS	1kVA	5	For supplying back-up AC power to PC

Annex-7



Location Map of the Project Site

Government of the People's Republic of Bangladesh
Ministry of Finance
Economic Relations Division
Japan-2 Branch
www.erd.gov.bd

No-09.160.024.03.02.006.2008-129 Dated: 07/03/2011

Subject: Minutes of Meeting (M/M) on the joint evaluation report for the mid-term review of the project "Development Human Capacity on Operation of Weather Analysis and Forecasting".

A mid-term review mission from Japan International Cooperation Agency has visited Bangladesh to prepare the joint evaluation report (JER) for the "Development Human Capacity on Operation of Weather Analysis and Forecasting" project of the Ministry of Defence. In this regard, a Minutes of Meeting (M/M) is signed on 06/03/2011 which is sent herewith for kind information and necessary action.

Yours sincerely
7.3.2011
(Khadiza Begum)
Deputy Secretary
Phone: 9116822

1. Secretary, Ministry of Defence,
   Ganabhabon Complex, Sher-e-Bangla Nagar, Agargaon, Dhaka.
   (Atten. Mr. Shamimuzzaman, Senior Assistant Chief)
2. Director, Bangladesh Meteorological, Agargaon, Dhaka.
3. M. Hiroyuki Tomita, Leader, JICA Bangladesh office,
   Uday Tower, 7th floor 57&57A, Gulshan Avenue (South) Circle-1,
   Dhaka-1212.

MINUTES OF MEETING BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY AND
AUTHORITIES CONCERNED OF THE PEOPLE'S REPUBLIC OF BANGLADESH
AND BANGLADEDH METEOROLOGICAL DEPARTMENT
ON
THE PROJECT FOR DEVELOPMENT OF HUMAN CAPACITY
ON OPERATION OF WEATHER ANALYSIS AND FORECASTING

The Japanese Mid-term Review Team, organized by the Japan International Cooperation Agency and headed by Mr. Hiroyuki Tomita, stayed in the People's Republic of Bangladesh (hereinafter referred to as "Bangladesh") from February 2nd to February 18th, 2011 for the purpose of conducting the joint mid-term review on the Project for Development of Human Capacity on Operation of Weather Analysis and Forecasting.

The Bangladesh Evaluation Team, which consists of members from the Ministry of Defense and Bangladesh Meteorological Department, was also assigned for the purpose of conducting this review.

After intensive study and discussion on the achievement of the project and its activities by both teams, the Joint Evaluation Team, both parties agreed upon the Joint Mid-term Evaluation Report attached hereto.

Dhaka, March 6th, 2011

Mr. Hiroyuki Tomita
Leader
Japanese Mid-term Review Team
Japan International Cooperation Agency
Japan

Ms. Khadiza Begum
Deputy Secretary
Economic Relations Division
Ministry of Finance
Bangladesh

Ms. Arjumand Habib
Director
Bangladesh Meteorological Department

Mr. Shamimuzzaman
Senior Assistant Chief
Ministry of Defense

Attachment: Joint Mid-term Review Report

JOINT MID-TERM REVIEW REPORT
ON JAPANESE TECHNICAL COOPERATION PROJECT
FOR
DEVELOPMENT OF HUMAN CAPACITY ON OPERATION OF WEATHER ANALYSIS AND FORECASTING
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH

JOINT EVALUATION TEAM

FEBRUARY 2011

TABLES OF CONTENTS

1. INTRODUCTION 1

1.1 BACKGROUND AND OBJECTIVE OF THE EVALUATION MISSION 1
1.2 EVALUATORS 2
1.3 SCHEDULE 2
1.4 STAKEHOLDERS CONSULTED/INTERVIEWED 2
1.5 METHODOLOGY OF EVALUATION 2

2. RECORD OF PROJECT IMPLEMENTATION 4

2.1 IMPLEMENTATION PROCESS 4
2.2 INPUTS 5
2.3 ACHIEVEMENT 6
2.4 EVALUATION BY FIVE CRITERIA 11

3. MODIFICATION OF THE PDM 16

4. CONCLUSIONS 21

5. RECOMMENDATIONS 22

6. LESSONS LEARNED/GOOD PRACTICE 23

ANNEX LIST

Annex 1	Mid-term Review Schedule
Annex 2	List of stakeholders consulted/interviewed
Annex 3	PDM 0 (November 2008)
Annex 4	Master Plan as PDM 1 (May 2009)
Annex 5	PDM 2 (October 2009)
Annex 6	List of Grant Aid Projects for the Radar Systems in Bangladesh
Annex 7	List of training in Japan outside this Project
Annex 8	Dispatch of Experts (Actual)
Annex 9	List of Equipment Provided
Annex 10	Location maps of the Project sites
Annex 11	Expenses by the Japanese side
Annex 12	List of Counterparts
Annex 13	Standing Orders on Disaster 2010
Annex 14	Relationships between each output and contribution of outputs to the Project Purpose
Annex 15	Impact of Japan's Grant Aid for the Meteorological Services in Bangladesh
Annex 16	Organizational Structure of BMD
Annex 17	PDM 3 (February 2011)

ABBREVIATIONS

AWS	Automatic Weather Station
BMD	Bangladesh Meteorological Department
C/Ps	Counterparts
CPPs	Cyclone Preparedness Programme
JCC	Joint Coordination Committee
DMB	Disaster Management Bureau
FFWC	Flood Forecasting and Warning Centre
JICA	Japan International Cooperation Agency
JMA	Japan Meteorological Agency
M/M	Minutes of Meetings
NWP	Numerical Weather Prediction
PDM	Project Design Matrix
PO	Plan of Operation
R/D	Record of Discussions
RIC	Regional Instruments Centre
SWC	Storm Warning Centre
SAARC	South Asia Association for Regional Cooperation
TPP	Technical Project Proposal
WMO	World Meteorological Organization

1. INTRODUCTION

1.1 Background and Objective of the Evaluation Mission

The People's Republic of Bangladesh (hereinafter referred to as "Bangladesh") is located on the delta of major rivers like the Gandes, the Brahmaputra and the Meghna with 20% of its landmass being flooded annually. During March to November, it is constantly hammered by tropical cyclones, storm surges, local severe storms etc. and these common scenarios of Bangladesh requires the effective role of Meteorological services to save the lives and livelihood of the vulnerable people.

Since 1988, Japan has the long history of cooperation for improving the meteorological services in Bangladesh. Japan's grant aid projects have contributed to establish infrastructures for data communication and weather observation including 5 radar stations covering the all territory of Bangladesh. These infrastructures however have, not contributed enough to weather forecasting and analysis since data calibration of the radar data and actual rainfall amount is yet conducted. In addition, new technology of weather analysis such as Numerical Weather Prediction is being required for the proper weather alert dissemination of BMD.

Based on the request of Technical cooperation for BMD, Japan International Cooperation Agency (hereinafter referred to as "JICA") has collaborated with the Bangladesh Meteorological Department (hereinafter referred to as "BMD") in implementing the Project for Development of Human Capacity on Operation of Weather Analysis and Forecasting (hereinafter referred to as "the Project") for Bangladesh. The Project was launched in October 2009, and will be completed in December 2012.

JICA dispatched an evaluation mission to Bangladesh from 2nd to 18th of February 2011 to conduct a Mid-term Review for the project. The entire process was a joint undertaking by the Bangladeshi and the Japanese sides, with full cooperation from BMD and other relevant authorities.

The objectives of the evaluation mission were as follows:

1. To review the past inputs, activities, and outputs of the Project;
2. To evaluate the overall achievement of the Project since its commencement in 2009, using JICA's standard project evaluation criteria of relevance, effectiveness, efficiency, impact and sustainability;
3. To discuss the Project implementation and highlight constraints if any;
4. To summarize recommendations for the remaining period of the Project, and to draw lessons learned for the benefit of both Bangladeshi and Japanese Governments.

1.2 Evaluators

The following are the members of the Evaluation Team.

	Name	Position	Designation, Organisation
1	Ms. Khadiza Begum	Deputy Secretary	Economic Relations Division, Ministry of Finance
2	Mr. Shamimuzzaman	Senior Assistant Chief	Ministry of Defence
3	Ms. Arjumand Habib	Director	BMD
4	Mr. Hiroyuki Tomita	Japanese Team Leader	Senior Representative, JICA Bangladesh Office
5	Mr. Hideki Katayama	Cooperation Planning 1	Advisor, JICA Bangladesh Office
6	Mr. Md. Anisuzzaman	Cooperation Planning 2	Program Officer, JICA Bangladesh Office
7	Mr. Yoshitomo Kojoh	Technical Evaluation	Japan Meteorological Agency
8	Ms. Junko Miura	Evaluation Analysis	Researcher, Social Development Department, Global Link Management, Inc.

* Mr. Yoshihisa Uchida participated in the Joint Evaluation Meeting as observers.

1.3 Schedule

The Mid-term Review was conducted from the 2nd to the 18th February 2011 and the schedule is attached as **ANNEX 1.**

1.4 Stakeholders Consulted/Interviewed

The stakeholders who were consulted or interviewed by the Evaluation Mission consisted mainly of the following:

- Counterparts of the Project
- Japanese experts assigned to the Project and local staff employed by the Project
- Representatives of other partner institutions

The list of the parties consulted by the Team is included in **ANNEX 2.**

1.5 Methodology of Evaluation

In accordance with the latest JICA Project Evaluation Guideline of 2010, the Mid-term Review of the Project was conducted in the following process.

Step 1: Project Design Matrix (PDM) 2, which was signed at the first Joint Coordination Committee (JCC) on the 7th October, 2009, was used as the basic tool of the Mid-term Review. The Project achievements were assessed vis-à-vis respective Objectively Verifiable Indicators. The level of inputs and activities were evaluated in comparison with the output levels. PDM 0 which was signed at the end of the project formulation mission on the 12th November 2008 (attached to the Minutes of Meeting), PDM1 which was signed on the 5th May, 2009 (attached to the Record of Discussions), and PDM2 (current PDM) are shown in **ANNEX 3,4 and 5.**

Step 2: Analysis was conducted on the factors that promoted or inhibited the achievement levels including matters relating to both the project design and project implementation process.

Step 3: An assessment of the Project results was conducted based on the five evaluation criteria: "relevance", "effectiveness", "efficiency", "impact", and, "sustainability".

Step 4: Recommendations for the Project stakeholders for the remaining implementation period were formulated for future projects to be implemented by both Bangladeshi and Japanese Governments.

Definition[1] of the five evaluation criteria that were applied in the analysis for the Mid-term Review is given in Table 1 below.

削除:

Table 1 Definition of the Five Evaluation Criteria for Evaluation

Five Evaluation Criteria	Definitions as per the JICA Evaluation Guideline
1. **Relevance**	Relevance of the Project is reviewed by the validity of the Project Purpose and Overall Goal in connection with the Government development policy and the needs of the target group and/or ultimate beneficiaries
2. **Effectiveness**	Effectiveness is assessed to what extent the Project has achieved its Project Purpose, clarifying the relationship between the Project Purpose and Outputs.
3. **Efficiency**	Efficiency of the Project implementation is analyzed with emphasis on the relationship between Outputs and Inputs in terms of timing, quality and quantity.
4. **Impact**	Impact of the Project is assessed in terms of positive/negative, and intended/unintended influence caused by the Project.
5. **Sustainability**	Sustainability of the Project is assessed in terms of institutional, financial and technical aspects by examining the extent to which the achievements of the Project will be sustained after the Project is completed.

Both quantitative and qualitative data were gathered and utilized for analysis. Data collection methods used by the Team were as follows:

- Literature/Documentation Review;
- Questionnaires (Counterparts and experts);
- Key Informant Interviews (Counterparts in Dhaka, Cox's Bazar Radar Station and Chittagong Meteorological Station, Japanese experts, partner agencies and organizations);
- Direct Observations (Dhaka Electrical Equipment Laboratory, Cox's Bazar Radar Station, Chittagong Meteorological Station and Comilla Regional Centre).

1 "JICA Project Evaluation Guideline (revised: January 2004)," Office for Evaluation and Post-Project Monitoring, JICA.

2. RECORD OF PROJECT IMPLEMENTATION

2.1 Implementation Process

The project activities have been going on steadily except those under Output 1 and 2. The belated approval of Technical Assistance Project Proposal (TPP) delayed the procurement process of the equipment (which was additionally requested after the Project started), then affected some activities under Output 1 and 2.

In spite of the delay of some activities, communication between the experts and the C/Ps and the institutional setting for implementation and is good in general. According to the questionnaire surveys and interviews both with the C/Ps and experts, there is a general view that communication was smooth. During the absence of experts, C/Ps communicated through e-mails when necessary. Working groups were established as recommended in the project formulation mission in 2008. The working groups are listed as below. In addition to the planned four groups, three others were added in order to implement the activities more efficiently.

Table 2 Working Groups

No.	Plan in 2008	Actual in 2011
1	Weather observation	Weather observation
2	NA	Briefing
3	Radar Calibration	Radar Calibration
4	Climate data management	Data Quality Control
5	NWP	NWP
6	NA	Web
7	NA	Weather Info dissemination

However, the mission noted that the decision-making process could be more transparent if arena for discussion among working groups such as a project implementation committee in BMD is established.

Several factors for smooth technical transfer were identified. First, BMD has appointed suitable C/Ps with certain level of knowledge and skills for technical transfer. Second, some staff had already exposure to the technical transfer from Japanese experts through the series of the Grant Aid Projects since 1988 (See **ANNEX6**) as well as the training in Japan outside this Project (See **ANNEX 7**)[2]. Finally, but not least, these cooperation had already built strong mutual trust between the C/Ps and the Japanese experts.

As per overall monitoring of the Project, Joint Coordination Committee (JCC) was convened twice in order to discuss the plan for future and to see the progress, but it has not convened since last February. Drastic modifications to the PDM 1, particularly the activities and the indicators for Outputs, were made and approved by the first JCC in October 2009. Project activities have generally been carried out orderly in reference to the PDM 2. However, the Plan of Operations (PO) has not updated along with the PDM 2. PDM as well as PO have not been well referred to by the C/Ps.

[2] Between FY2002 and 2010, ten C/Ps participated in JICA Group Training, C/P training for the Grant Aid Projects or JMA/WMO training.

2.2 Inputs

2.2.1 Japanese Side

a) Experts Dispatched

Since the beginning of the Project, a total of nine short-term experts listed in the PDM 2 were dispatched[3]. Their fields of expertise are shown in the table below. The actual details are shown in **ANNEX 8.**

Table 3 List of experts

No.	Field of Expertise
1	Team Leader/ Weather Forecasting & Warning Service and Organization Management
2	Weather Observation
3	Weather Service Infrastructure
4	Meteorological radar calibration
5	Data quality control and Statistical analysis
6	Web site Design
7	Numerical Weather Prediction
8	Weather Information Dissemination
9	Meteorological radar operation and Maintenance

b) Equipment Provided

Up to date, the equipment equivalent to JPY 32,218,000 in total was provided. The list of equipment is shown in **ANNEX 9**. Most of the equipment is fully utilized. The display systems for the briefing room can be utilized as soon as the BMD's budget is disbursed for internet security. Due to the delay of the Technical Assistance Project Proposal (TPP), which was approved in December 2010, the procurement of the following equipment was also delayed. The planned and revised timing of the procurement of the three items are listed in the following table.

Table 4 Timing of procurement (Plan and Revised)

No.	Types of Equipment	Planned timing of procurement	Revised timing of procurement
1	Automatic rain gauges	November 2010	May 2011
2	PC cluster	October 2010	March 2011
3	AWSs	September 2010	May 2011

Location maps of the stations where AWSs and rain-gauges will be installed are shown in **ANNEX 10.**

c) Training in Japan

In the Fiscal Year (FY) 2010, the three kinds of training were planned: 1) NWP, 2) Meteorological Information Service, and 3) Climate Observation Data Management. However, due to the delay of the approval of the TPP, the above training will be carried over to the FY2011.

d) Operational Expenses

Until the mid-term review in February 2011, a total of 178 million equivalent was disbursed against the

[3] According to the Ex-Ante Evaluation Summary in March 2009, it was planned to dispatch seven short-term experts in total of 80M/M in the following expertise areas: weather observation, weather forecasting, radar calibration techniques, climate data management, statistical analysis techniques, NWP, and Radar operation and maintenance.

total budget of 280 million JPY for the total project period[4]. The disbursed expenses were mainly used for the dispatch of experts, purchase of the equipment and administrative costs of the Project. The details of the operational expenses are shown in **ANNEX 11.**

2.2.2 Bangladeshi Side

a) Appointment of Counterpart Personnel

At the beginning of the Project in 2009, a total of 26 BMD staff (excluding Project Director) was assigned as the counterpart. As of now, a total of 27 BMD personnel (excluding Project Director) are assigned as the C/Ps. The list of C/Ps is shown in **ANNEX 12.**

b) Cost-sharing of Operational Expenses

BMD provided logistical support and supplemental budget necessary for the seminars and open-class. The Technical Assistance Project Proposal (TPP) for this Project was approved by the Government of Bangladesh in December 2010, but the budget has not been disbursed. The budget for this Project in the TPP is a total of 231 Lakh Taka for the total project period. Its breakdown is shown in the following table.

Table 5 Budget proposal for this Project (unit: Lakh Taka)

Fiscal Year	Budget
Year 1 (2009-2010)	0
Year 2 (2010-2011)	88.50
Year 3 (2011-2012)	116.50
Year 4 (2012-2013)	26.00
Total	231.00

c) Other support

BMD provided a Project Office/joint working space with C/Ps. It also provided a generator replacing the commercial power supply so that the black-out do not negatively affect the project activities.

2.3 Achievement

2.3.1 Result of Activities

The activities in the PDM carried out until the time of the mid-term evaluation are summarized in the following table. The Team reviewed activities and recognized that the project activities have been going on steadily except those under Output 1 and 2. The delay of activities under Output 1 and 2 are caused by the delay of the equipment.

Table 6 Progress of Activities

	Activities	Current Progress
Output 1: Capacity of BMD for observation and forecasting is improved.		
1-1	To rehabilitate the existing meteorological observatories in the targeted areas	The procurement of AWSs is now in the process.
1-2	To prepare the field observation guideline	Draft field observation guidelines reflecting the Bangladesh meteorological context was developed jointly by the CPs and experts in accordance with the WMO latest policy. Upon the arrival of AWSs/rain gauges, some sections related to AWSs are to be added.

[4] Ex-Ante Evaluation Summary in March 2009.

1-3	To provide the training for field observers and data inspectors on observed data acquisition and data quality control	Data quality control training for forecasters was conducted several times over the last year. Training for field observers on data acquisition is to be conducted upon the finalization of the revised field observation guidelines (which is developed under Activity1-2) and the daily observation data input sheet (which is developed under Activity3-1).
1-4	To prepare the operation and maintenance manuals for observation fields and instruments	Draft operation and maintenance manuals for observation fields and instruments are under preparation. Upon the arrival of AWSs/rain gauges, some sections related to AWSs are to be added.
1-5	To provide the training for field observers and instruments inspectors on maintenance and control of observation fields and observation instruments	The training is to be conducted upon the installation of AWSs/ rain gauges.
1-6	To prepare the briefing flowchart and record	Briefing flowchart and record are under preparation.
Output 2: Quantitative rainfall estimation by using Doppler Radars is implemented.		
2-1	To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation	Computers for training were procured. Training on radar calibration was conducted in September 2010.
2-2	To prepare correlation charts of rainfall data of radar and surface observations in the observation range of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation	Not prepared yet. To be prepared after acquiring the real-time rainfall data upon the installation of the rain gauges.
2-3	To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC	It is planned for the latter half of the project period. To be composed after acquiring the real-time rainfall data upon the installation of the rain gauges.
Output 3: Climate data is utilized for the trend analysis of climate change.		
3-1	To develop daily observation data input sheet for easy statistical processing and data quality control of observed data	Draft daily observation data input sheet was developed through the full consultation between the CPs and experts. It is planned to be finalized in May-June. Upon the finalization of this sheet as well as the revised field observation guidelines, the training for field observers on data acquisition (including how to fill in the sheet) is to be conducted.
3-2	To conduct climate data statistical analysis	Statistical processing of the rainfall data and temperature data in the last 30 years was conducted once, and the approximate trend was generally understood. Continuous quality control to be conducted.
3-3	To publish the summarized result of climate data statistical analysis to BMD Web page	Not published yet. However, the training on website design was conducted.
Output 4: Capacity of BMD personnel for 1 to 5 days weather forecasting using basic techniques of Numerical Weather Prediction (NWP) is established.		
4-1	To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP)	PC cluster was provided.
4-2	To conduct the basic training on Numerical Weather Prediction (NWP).	A total of sixty hours training was conducted for more than six trainees each time.
4-3	To conduct the training on Numerical Weather Prediction (NWP) guidance	It is planned for the latter half of the project period.
4-4	To operate the Meso Scale Model (MSM) by using PC (Linux) on trial base	It is planned for the latter half of the project period.
Output5: Understanding about weather and climate information among stakeholders related to natural disaster is deepened.		
5-1	To conduct the seminars for the stakeholders related to natural disaster	2 seminars targeting various stakeholders were conducted in Tangail and Rangpur. One seminar targeting various ministries and agencies was conducted in Dhaka. 14 open-classes targeting Grade-8 students was conducted in 2 schools in Tangail, 2 schools in Rangpur and 5 schools in Dhaka.

5-2	To prepare the booklets of weather, climate and natural disaster	Booklets were prepared in Bengali and English. The booklets include the weather information such as thunderstorm, drought, tornados, etc. Information regarding flood, cyclones and climate change are to be prepared.
Output 6: Weather observation and monitoring equipment such as meteorological Radar system etc. are operated and maintained properly.		
6-1	To conduct the training on operation and maintenance of the Meteorological Radar Systems.	The training was conducted at all the five Radar Systems. The training was participated by 38 staff (10 in Dhaka, 5 in Cox's Bazar, 6 in Rangpur, 8 in Khepupara, and 9 in Moulvibazar).
6-2	To prepare the operation and maintenance (O&M) manuals for meteorological Radar System	User-friendly and summarized O&M manuals were prepared based on the lengthy O&M manuals prepared by the suppliers in the Grant Aid Projects. O&M record was also developed and being used.

2.3.2 Result of Outputs (Output 1-6)

Output 1

Capacity of BMD for observation and forecasting is improved.

For the achievements of Indicators for Output 1 so far, see below.

	Objectively Verifiable Indicators	Baseline before the Project started	Achievement as of February 2011
1.1	Able to acquire and archive accurate observed data: 6 existing meteorological observatories	Cannot be judged.	Degree of accuracy can be judged after the quality control by comparing the data acquired with the existing equipment and that of AWSs.
1.2	Training for field observers and data inspectors on observed data acquisition and data quality control: 6 times	NA	Data quality control training for forecasters was conducted several times over the last year.
1.3	Briefing in SWC: at least 1 time/day	Not conducted as such. Discussions are held irregularly.	Not conducted yet as such. Discussions are held irregularly.

Output 2

Quantitative rainfall estimation by using Doppler Radars is implemented.

For the achievements of Indicators for Output 2, see below.

	Objectively Verifiable Indicators	Baseline before the Project started	Achievement as of February 2011
2.1	Correlation of radar rainfall data observed by the optimized radar ZR relation parameter for rainfall calculation and surface observation is corroborated.	No	Not yet. It is possible after the real-time rainfall data is obtained by the AWSs and automatic rain gauges which are planned to be installed in May 2011.
2.2	Binary data of rainfall intensity composite picture created by rainfall data of 5 existing radar systems optimized ZR relation parameter for radar rainfall calculation is distributed to Flood Forecasting and Warning Centre	No	Same as above.

	(FFWC)		

Output 3

Climate data is utilized for the trend analysis of climate change.

For the achievements of Indicators for Output 3, see below.

	Objectively Verifiable Indicators	Baseline before the Project started	Achievement as of February 2011
3.1	Summary of climate statistical analysis is shared with the SAARC countries	NA	Climate statistical analysis has been in the progress.

Output 4

Capacity of BMD personnel for 1 to 5 days weather forecasting using basic techniques of Numerical Weather Prediction (NWP) is established.

For the achievements of Indicators for Output 4, see below.

	Objectively Verifiable Indicators	Baseline before the Project started	Achievement as of February 2011
4.1	Able to use the basic techniques of Numerical Weather Prediction (NWP): 5 staff of BMD	0	Too early to make judgment. 8 staff is attending the training. The achievement test result revealed that more than 70% participants understood the contents.

Output 5

Understanding about weather and climate information among stakeholders related to natural disaster is deepened.

For the achievements of Indicators for Output 5, see below.

	Objectively Verifiable Indicators	Baseline before the Project started	Achievement as of February 2011
5.1	Implementation of seminars for stakeholders related to natural disaster: 8 times, 70% of the participants understood the contents	NA	The target was achieved. 71% to 80% of the participants of three seminars understood the contents. 86% and 96% of the participants of the fourteen open-classes understood the contents.
5.2	Booklets of weather, climate and natural disaster to be distributed to stakeholders related to natural disaster including elementary schools and residents in disaster affected area : 3	NA	The target was achieved. Booklets on the weather information such as thunderstorm, drought, tornados, etc. were distributed to junior high schools [5] and residents in the disaster-prone areas, Tangail, Rangpur and Dhaka. Information regarding flood, cyclones and climate change are to be prepared.

Output 6

Weather observation and monitoring equipment such as meteorological Radar system etc. are operated

[5] Considering the contents of the booklets, the target group for the booklets was changed from the elementary school students to the junior high school students.

and maintained properly.

For the achievements of Indicators for Output 6, see below.

	Objectively Verifiable Indicators	Baseline before the Project started	Achievement as of February 2011
6.1	Able to implement regular maintenance and trouble shooting for the meteorological Doppler radar systems[6]: 9 staff of BMD	Regular maintenance only Cox's Bazar: 2 Khepupara: 2 Moulvibazar: 1 Dhaka (Note1): 2 Rangpur: 2 Both regular and trouble shooting (Note 2) Cox's Bazar: 1 Khepupara: 1 Moulvibazar: 1 Dhaka: 1 Rangpur: 1	Regular maintenance only Cox's Bazar: 3-4 (Note 3) Khepupara: 4 Moulvibazar: 1 Dhaka: 2 Rangpur: 2 Both regular and trouble shooting Cox's Bazar: 1-3 Khepupara: 2 Moulvibazar: 1 Dhaka : 2 Rangpur: 2
6.2	Operation/maintenance manuals is utilized in each existing Meteorological Radar Station	Lengthy O&M manuals which were provided by the manufacturer during the Grant Aid projects were utilized.	O&M manuals which were developed by this Project are utilized in each Radar Station[7].

Note1: Although the Radar Systems in Dhaka and Rangpur are not Doppler Radars, the mission surveyed those two systems in order to overview the whole systems.
Note 2: Except the serious troubles which require the repair by manufacturers.
Note 3: The number for Cox's Bazar varies among the respondents of the questionnaire survey and interviews.

2.3.3 Achievement of Project Purpose

Project Purpose: Weather information for natural disaster management is strengthened in terms of time and quality through human capacity development and dissemination of weather information among various stakeholders

The achievement of Objectively Verifiable Indicators for Project Purpose observed so far is as follows.

	Objectively Verifiable Indicators	Achievement as of February 2011
1	Rainfall data of the optimized radar ZR relation parameter for rainfall calculation is provided to FFWC	Not provided yet.
2	Accurate and easily understanding forecasting and warning to organizations related to natural disaster management and mass media are timely issued	Easily-understanding daily weather bulletin has been timely issued. Warnings were issued 57 hours ahead and 30 hours ahead of the Cyclone GIRI's landing in Myanmar (in October 2010). No cyclone has landed after the Project started (October 2009). In order to judge the accuracy and timeliness of the warning issuance, more cases for analysis are required. Furthermore, accuracy and timeliness should be defined more clearly to make precise judgment.

As shown above, Indicator 1 has not been achieved yet. It is also difficult to judge the achievement level of Indicator 2 due to the lack of precise definition of "accuracy". Taking cyclone as an example, if we

[6] Doppler Radar Systems are those in Cox's Bazar, Khepupara and Moulvibazar.
[7] Due to the time constraint, the evaluation team confirmed through the direct observation only at the Cox's Bazar Radar Station. Regarding other stations, it is judged based on the information provided by the experts.

define Indicator 2 as "Accurate and easy-understanding forecast and warning *such as cyclone track forecast in accordance with the Standing Orders on Disaster (SOD) 2010*(**ANNEX 13**)[8] are timely issued to the organizations related to natural disaster management and mass media", then, it can be judged that the SWC's warning issuance was accurate and timely. For example, the SWC's recent cyclone forecasts[9] cover the following items instructed by SOD 2010: 1) position of the storm centre, 2) velocity and direction of the storm, 3) mention of the thanas of the districts likely to be affected (if possible), and 4)appropriate time of commencement of gale wind at different places.

2.4 Evaluation by Five Criteria

2.4.1 Relevance

The relevance of the Project is high in reference to the needs and policies of Bangladesh as well as Japanese Official Development Assistance (ODA) policy for Bangladesh.

Bangladesh is located in a sub-tropical zone and its climate condition is influenced by tropical cyclones, storm surges, local severe storms, heavy rainfall, river erosion, major floods, flash floods and other natural phenomena. These phenomena have constantly caused a great number of damages and affected people's lives and properties and eventually setback the socio-economic development of the country.

According to the Standing Orders on Disaster of the Government of Bangladesh, BMD is sole organization in the country responsible for disseminating meteorological information, forecasts and alerts/warnings to the concerned. The establishment of the five Meteorological Radar Stations by the Grant Aid Projects by the Government of Japan from 1999 to 2009 has assisted BMD to obtain more accurate estimates of rainfall and its time of occurrence, which made possible the issuance of timely forecast for disaster risk reduction in cooperation with related disaster management organizations. However, in order to issue more accurate forecast in timely manner, modern and objective technologies such as radar rainfall analysis and NWP were required. This Project has been consistent with such needs since the Project started.

In light of the national policy, one of the Action Agenda in the National Plan for Disaster Management (2010-2015) is the technical and technological capacity building of BMD, FFWC and other related organizations to a) improve the accuracy of early warning information generated and b) increase the lead time for flood forecast. Thus, this Project is also consistent with the national policy.

In view of the policy of the Government of Japan, this Project can be considered as one of the Disaster Prevention Program, which the Government of Japan gives a high priority among its various ODA programs. The latest Japan's ODA policy towards Bangladesh (2006) emphasises the following three areas: 1) economic growth, 2) social development and human security, and 3) governance. Disaster management is one of the priority sectors under the human security area. As the Project's Overall Goal is aimed at the reduction of the natural disaster losses, this Project is expected to contribute to the Japan's ODA policy towards Bangladesh.

---

[8] According to the SOD2010, warning: 24 hours before, danger at least 18 hours before, and Great Danger at least 10 hours before.

[9] SIDR (November 2007), AILA (May 2009) and GIRI (October 2010).

2.4.2 Effectiveness

1) Achievement of the Project Purpose

The weather information for natural disaster management is gradually strengthened in terms of time and quality. However, based on the indicators and means of verification in the current PDM, it is difficult to judge the effectiveness. Therefore, it is recommended that the indicators and means of verification be revised and effectiveness be judged based on the revised ones. Regarding the means of verification, more cases for analysis are required.

2) Relationships between each output and contribution of outputs to the Project Purpose

Six Outputs are closely related each other and have been directly contributing to the Project Purpose. In this sense, the Project is heading for the right direction.

As shown in the diagram (**Annex 14**), each output is closely related each other. First, surface observations with the existing equipment will be conducted in accordance with the observation guidelines which are being developed under Output1, and the observed data will be entered in the data input sheet which is being developed under Output 3. In parallel, the major meteorological real-time data will be acquired at the six meteorological observatories with the Automatic Weather Systems (AWSs) under Output1. By comparing the above two kinds of data, the data quality control will be conducted (Output1). The quality of the archived data will be controlled and used for the climate data statistical analysis (Output 3).

Under Output 2, the radar calibration will be implemented with the data from the twelve automatic (real-time) rain gauges which will be installed by this Project and the data from the five Radar Systems which were established by the Grant Aid Projects. The operation and maintenance capacity of the Radar Systems has been further strengthened under Output 6 based on the existing capacity which had been developed through the implementation of the Grand Aid Projects as well as the On-the-Job Training (OJT) among the staff. The estimated rain amount from the radar calibration will be provided to FFWC under Output 2.

Based on the observed data from thirty five field observatories with the existing equipment and the data from the six AWSs (Output 1) as well as the estimated rain amount (Output 2), briefing for understanding and sharing the meteorological situations will be conducted at the Storm Warning Centre (SWC) under Output 1.

Under Output 4, by continuously using the product from the Japan Meteorology Agency (JMA) global model as input data, BMD will operate the Meso Scale Model (MSM) for NWP forecasting on trial by using the PC cluster.

Finally, based on the meteorological information improved in terms of accuracy and timeliness through the Output 1,2,3,4 and 6, BMD's capacity to promote understandings about meteorological information among the stakeholders has been developed under Output 5.

According to the questionnaire survey, neither extra Output nor Output to be added were identified.

3) Inhibiting factors to achieve the Project Purpose

The belated approval of the TPP has forced the Project to postpone some of activities to be conducted under Output 1 and Output 2 at the beginning of next fiscal year. Considering that the Government of Japan

has been reviewing budget allocation not only for Bangladesh but also for other countries particularly since last year, this may continuously serve as the inhibiting factor to achieve the project purpose.

4) Contributing factors to achieve the Project Purpose

This Project commenced in timely manner just after the fifth Radar System in Bangladesh was established by the Japan's grant aid project in March 2009. The real-time data by the five radar systems is vital to the success of the project.

Regarding the Important Assumptions from the Outputs to the Project Purpose, there is no significant change with the policy of weather services in the Government of Bangladesh. In addition, most trained staff remains on the duty, which has not affected the achievement of the Project Purpose.

2.4.3 Efficiency

The delay of the procurement of the equipment affected the overall efficiency of the Project. Considering the relationship between the invested inputs so far and the current achievement levels of the Outputs, the efficiency is judged medium at the time of mid-term review. However, considering the strong commitment and technical capacity of the CPs and the experts, it is possible that the efficiency will improve by the end of the Project if some activities related to AWSs make progress upon the arrival of the equipment.

Japanese side

This Project was planned in a way of fully utilizing the Radar data acquired at the five Radar Systems. As such, it was planned to efficiently implementing the project activities with limited resources by combining the dispatch of short-term experts, provision of minimum equipment and the training in Japan.

The dispatched experts were highly qualified and have rich experiences in implementing meteorological Technical Cooperation Projects in other countries. When the assignment of the experts was planned, meteorological events in Bangladesh was taken into account because the counterparts are busy with their duties during the events. It is noted that the Team Leader has a profound knowledge of the meteorological context in Bangladesh and mutual trust with the BMD based on his constant efforts through his involvement in establishing the five Radar Systems by the Japan's Grant Aid.

The provision of the equipment such as AWSs, rain gauges and PC cluster was not planned at the time of planning stage in November 2008. However, it was found that the real-time data of AWSs and rain gauges were indispensable to obtain estimated rain fall data through the calibration with the radar data under Output 2. PC cluster was also found necessary to conduct NWP forecasting on trial under Output 4. Direct links between these additional inputs and Outputs justify the additional inputs.

All the subjects of the C/P training, which will be carried over to the FY2011, are consistent with the Outputs. Climate Observation Data Management matches with Output 3, NWP matches with Output 4, and meteorological information service match with Output 5. However, according to the inception report, the planned training contents about the climate observation data management are too general. The contents need to be reviewed in a way to directly link with the statistical analysis of climate trend.

Bangladeshi Side

BMD assigned the sufficient number of appropriate CPs for receiving technical transfer from the Japanese experts. The number of the CPs is currently twenty seven persons against twenty six persons at the time of commencement. The number of staff for the five Radar Systems is forty persons, thus the total CPs including the Radar Systems is sixty seven persons. Although some CPs left BMD due to the retirement or other reasons, this has not seriously affected the Project activities. Some CPs are assigned to receive trainings in several different fields from Japanese experts. In spite of the heavy workload, they are actively obtaining knowledge and skills with the strong intention of accomplishment.

BMD provided a Project Office at the opposite side of the Office of the Project Director, which facilitated the close communication between the Project Director and the experts. As the Project Office is spacious, the CPs and the experts can use it as the joint working space. BMD has provided a generator in addition to the commercial power, thus black-out does not affect the experts' activities.

BMD also provided supplemental budget and logistics necessary for the seminars and open-class at schools in Dhaka, Tangail and Ranpur. All the above human, physical and financial resources which BMD provided facilitated the smooth implementation of the Project activities.

2.4.4 Impact

The Overall Goal is defined as follows.

Highly precise weather and climate information is utilized for Natural Disaster Management and contributed to the reduction of the Natural Disaster Losses.

During the project implementation period, a large scale natural disaster such as cyclones and flood has not hit Bangladesh. Therefore, there is no specific case which illustrate that the BMD's weather information contributed to the reduction of the natural disaster losses. However, weather information has been utilized by the related organizations of natural disaster management. For example, the Sea Port Authority utilizes BMD's weather information daily in order to make judgments when issuing sailing permissions. When Cyclone GIRI landed in Myanmar in October 2010, SWC issued warnings 30 hours ahead[10].

From the following observations, there is a high possibility that the overall goal is achieved if a large scale natural disaster hit Bangladesh, but it may be achieved not only by this Project including the Radar Systems. According to the analysis which was conducted by the Japanese experts (See **ANNEX 15**), the increase of the Radar Systems is one of the contributing factors to the fact the number of casualties in the last two decades has not reached to that of the 1991 cyclone, which brought about 140,000 casualties. For example, in November 2007, when a large scale cyclone with the maximum wind speed of 61-67m/s, SIDR, landed in Bangladesh, SWC could issue warning 18 hours ahead[11]. The number of the casualties was 3,363 persons. When AILA landed in Myanmar in May 2009, SWC issued cyclone warning 21 hours ahead. The number of the casualties in Bangladesh was 120 persons. For the latter, the data acquired from the

[10] There is no report on the casualties in Bangladesh.

[11] At 18:00 on the 14th November 2007, the SWC issued a warning that the cyclone SIDR would cross the coastal lines between Khuluna and Barisal by noon next day, which means that the SWC issued the warning (Signal 9/10) 18 hours ahead. However, the actual crossing time was 21:00 next day, thus it took 27 hours after the signal 9/10.

Khepupara Radar, which was established in 2008 particularly for the purpose of cyclone monitoring, was utilized.

One possible unexpected positive impact in the future is to incorporate the meteorological information into the school curriculum and textbooks. Based on the open-class activities for secondary schools by using the booklets which were produced under Output 5, BMD started to discuss with the Ministry of Education a possibility for incorporating the meteorological information into the science textbooks for secondary students.

No particular negative impact was identified by CPs, experts and the evaluation team.

2.4.5 Sustainability

In view of the political, organizational, technical and financial aspects, it is considered that the sustainability of the Project is generally high, but it could be higher if human resources are properly allocated and their capacity is developed particularly in the field observatories and if all the training components are conducted along with the revised PDM.

1) Political and organizational aspects

It is highly possible that the Government of Bangladesh will continue to consider the dissemination of the meteorological information as an important issue in response to the natural disaster management. Therefore, political sustainability is high.

Organizational sustainability is medium. According to the Standing Orders on Disaster, BMD remains a sole organization in the country for disseminating meteorological services. The strong leadership of the BMD Director and high motivation of staff are BMD's organizational strength. The number of the total staff of BMD is 1,064 persons. The current organizational structure of BMD is shown in **ANNEX 16**. The organizational structure of BMD remains same as the time of the project formulation except the addition of Moulvibazar Radar Station[12] under the Chittagong Office. The mission identified that some RICs and observatories do not have sufficient number of staff. BMD is currently waiting for the approval for the proposal for organizational restructuring and human resource allocation plan from the government. It is hoped that sufficient and proper human resources are in place as soon as the plan is implemented.

2) Technical aspects

Overall technical sustainability of this Project is high. It can be judged that the technical sustainability of the observation and forecasting (Output 1), using basic techniques of NWP (Output 4), information dissemination (Output 5) and O&M of the Radar Systems (Output 6) are very high in light of the current level of technical capacity and strong commitment of the CPs. On the other hand, technical sustainability related to Output 2 cannot be judged because the activities have not started yet. As the human resources required for the quality control of archived database has not been properly in place, technical sustainability of Output 3 cannot be judged either.

It was confirmed by the evaluation team that draft field observation guidelines is user-friendly with

[12] It was established in March 2009.

pictures and graphics, and reflect the Bangladesh meteorological context and the WMO latest policy. Both guidelines and observation data input sheet were developed through the full consultation between the CPs and experts. The questionnaire answers from CPs also revealed a high possibility that the guidelines and input sheet will be utilized by the observers. It should be ensured that training on meteorological guidelines and data entry format is conducted at field observatories by inviting observers from neighbouring observatories so that the trainees can transfer the training contents to other observers through OJT. In addition, it is highly recommended that the above guidelines and the format be incorporated into the existing training for observers, which is conducted by the Training Institute, in order to ensure that the guidelines are institutionalized in BMD.

Regarding the operation and maintenance of the Radar Systems, there is a high possibility in the near future that the number of maintenance personnel to handle regular maintenance and trouble shooting is sufficient (see the Achievement of Output 6). When necessary, senior mechanical engineer at the BMD Head Office has provided support to the stations and he can manage most of the troubles except serious damages which require repairs by the manufacturers. The mission's visit to Cox's Bazar Radar showed that the superintendent who had acquired rich experiences in other radar station is passing on his experiences to the young staff through OJT. This indicates the sustainable technical transfer within the organization is functioning across the radar systems and across the generation.

As per the AWSs, if the maintenance training for observers and instrument inspectors in regional centres is conducted as planned, it is highly possible that the BMD staff can manage regular maintenance and certain trouble shooting. The participation of the Electrical and Instrument Section staff in the training is highly recommended from the sustainability point of view.

Although BMD's technical capacity is promising, improving accuracy of forecast is continuous process by conducting data quality control in each stage and by combining various techniques. The Japanese experts' guidance and training are vital to this process.

3) Financial aspects

Financial sustainability is also high. As shown in the figure 1, BMD's annual budget is gradually increasing from 2,150 Lakh Taka in FY2007/08 (before the Project started) to 3,771 Lakh Taka in FY 2011/2012 (prospective). Accordingly, the budget of all the five Radar Stations, SWC and the BMD Head Office (including cost of spare-parts) is increasing trend.

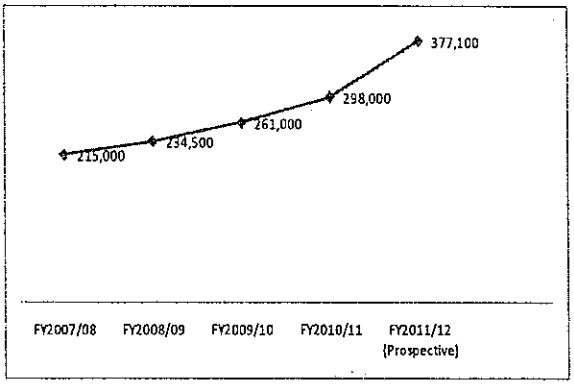


Figure 1: BMD's annual budget from FY2007/08 to FY2011/12 (unit: 1,000 Taka)
Source: BMD

3. MODIFICATION OF THE PDM

Based on the discussions among the Team and the concerned parties, PDM was revised taking into account of the progress of on-going activities and the prospect for the achievement of Outputs by the end of

December 2012[13]. This PDM3 will be used to monitor the project activities for the remaining period of the Project. (See **ANNEX 17**). There is no change with the direction of the Project. Major reasons for changes are the followings. 1) The activities which have already been conducted and are required for achieving Outputs, but those have not been stated in the current PDM; thus those were reflected in PDM 3. 2) The indicators for Outputs in PDM 2 were insufficient or/and inappropriate; thus those were rephrased, and some indicators were added. 3) The important assumptions identified by the team during the mission were added. Reasons of each modification are listed below. Activities in the PDM3 are listed chronologically or logically. Means of Verification were modified in accordance with the indicators. For details, see **ANNEX 17**.

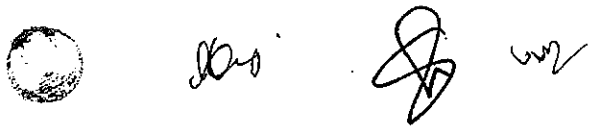
Table 7 Details of Modification of PDM

Items	Modifications	Reasons
Overall Goal: Following was rephrased.		
Natural disaster losses are reduced by the utilization of highly precise weather information.		In PDM2, two following overall goals existed: "Highly precise weather and climate information is utilized for Natural Disaster Management, which contributes to the reduction of the Natural Disaster Losses." In the PDM, there should be only one overall goal.
Project Purpose: Following was rephrased.		
More accurate weather information is timely issued to the "stakeholders (Note 1)" of the natural disaster management. Note1: The "stakeholders" includes the followings: DMB, FFWC, mass media, related disaster management organizations and residents in the disaster-prone areas (cyclones, tornados, thunderstorms, flood, drought, etc).		Sentences are rephrased, so that the state of achievement for BMD is properly expressed in the Project Purpose. The stakeholders are defined in Note 1.
Outputs: Following Outputs were rephrased.		
2	Analysis of quantitative rainfall estimation by using the Radars is implemented	"Analysis of" was added because the sentence in PDM2 was incomplete. "Doppler" was deleted because this Project includes all the five radars.
3	The trend analysis of climate change is conducted by using the accumulated meteorological data.	"by using the accumulated meteorological data" was added in order to express the relationship with the Output 1.
4	Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.	Changed from "1 to 5 days" to "1 to 3 days", and "on trial" was added in order to make the target for this Project more realistic. "3 days" forecasting by NWP is the limit even in Japan.
5	Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.	Rephrased in order to express the target group is "BMD", not "stakeholders" in this Project.
6	The Meteorological Radar Systems are operated and maintained properly and efficiently.	"Weather observation and monitoring equipment" was deleted so that this Output is exclusively for the Radar Systems. "efficiently" was added because the activity for reducing O&M cost was added.

[13] Although some activities related to Output 1 and Output 2 are behind the schedule, if the procured equipment is installed as scheduled by May/June before the rainy season, all the activities are to be completed by December 2012.

Activities:	Following activities were added or rephrased.	
Activities under Output 1	1-1 To install the six (6) AWSs and twelve (12) rain gauges at the eighteen existing meteorological observatories.	1-1 Sentences are rephrased because "To rehabilitate the existing meteorological observatories in the targeted areas" in PDM 2 was vague.
	1-2 To revise the field observation guidelines (including AWS) in accordance with the latest WMO policy.	1-2 "(including AWS) in accordance with the latest WMO policy" was added to ensure the quality of guidelines.
	1-3 To provide the observation training for field observers based on the field observation guidelines and the data entry format (developed by Activity 3-1).	1-3 and 1-4 Observation training for field observers and data quality control training for forecasters were separated. Data Inspectors were rephrased as forecasters.
	1-4 To conduct training on the data quality of observed data for forecasters	
	1-5 To prepare the operation and maintenance manuals for observation fields and instruments (including AWS).	1-5 and 1-6 "(including AWS)" was added.
	1-6 To provide the training for field observers and instruments inspectors on maintenance and control of observation fields and observation instruments (including AWS).	
	1-7 To compare the data obtained by the AWS and existing equipment and conduct quality control	1-7 Activity related to the data quality control was added in order to achieve the Output 1.
	1-8 To prepare the briefing flowchart and record, and conduct briefing along with the flow chart.	1-8 "conduct briefing along with the flow chart" was added in order to achieve the Output 1.
Activities under Output 2	2-2 To identify the radar ZR relation parameter for rainfall calculation in the observation range of 5 existing meteorological radar systems and optimize the parameter 2-3 To prepare correlation charts of rainfall data of radar and surface observations 2-4 To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC	2-2 in the PDM2 was divided into 2-2 and 2-3. 2-3 in the PDM2 became 2-4.
Activities under Output 3	3-2 To archive the observed data and conduct quality control	3-2 This activity has already been conducted, but has not been stated in the PDM.
	3-3 To conduct climate data statistical analysis by using the above data	3-3 "by using the above data" was added to clarify the links with the Activity 3-2.

Activities under Output 5	5-1 To prepare PR materials of weather, climate and natural disaster	5-1 "Booklets" was replaced by "PR materials" in order to seek for more efficient and cost-effective means.
	5-2 To conduct the seminars/open-class for the stakeholders	5-2 This activity has already been conducted, but has not been stated in the PDM.
	5-3 To update meteorological information including summarized result of climate data statistical analysis on the BMD website	5-3 This activity has already been conducted, but has not been stated in the PDM. "3-3 To publish the summarized result of climate data statistical analysis to BMD Web page" in the PDM2 was combined.
	5-4 To disseminate meteorological information through media (Note 2). Note2: TV, radio, mobile phone, on-demand services such as push-pull service, etc.	5-4 This activity has already been conducted, but has not been stated in the PDM. Mobile phone and on-demand services were also included because there is a possibility of such service in the future.
Activities under Output 6	6-3 To prepare the meteorological radar observation routine schedule in order to reduce the operation cost and implement it	In order to reduce operation cost for the Radar System, this activity was added.
Indicators: Following indicators were rephrased.		
Overall Goal	Cases which prove that the utilization of BMD's weather information by organizations related to natural disaster management contributed to the natural disaster losses.	"Utilization of weather and climate information by organizations related to natural disaster management" is insufficient indicator for the contribution to the disaster reduction.
Project Purpose	Data from the BMD Radar Systems optimized by radar ZR relation parameter for rainfall calculation is timely provided to FFWC	Wording was not appropriate. "timely" was added because the timeless of the dissemination is important.
	Accurate and easy-understanding forecasting and warning including tropical cyclone are timely issued to the organizations related to natural disaster management and mass media.	Because the definition of warning is vague, "including tropical cyclone" was added.
Outputs: Following indicators were added and/or rephrased.		



Outputs	Indicators for Output 1 1.1 More than 80% of the hourly data of surface temperature, humidity, wind direction, wind speed and precipitation are acquired at the six meteorological observatories with the AWSs.	1.1 In the PDM 2, "accurate" and "6 existing meteorological observations" were vague.
	1.2 Surface observations are conducted in each observatory by using the existing equipment in accordance with the observation guidelines which is developed by this Project.	1.2 The indicator related to the standardization of way of observations among the observers was added because the indicators in PDM 2 were insufficient to examine the Output 2.
	1.3 Among the observers who attend the data quality control training, more than 70% of the participants understand the contents of the training.	1.3 The indicator in PDM 2 was input-oriented indicator such as number of training. Instead, the quantitative target was set to examine the level of human resources development.
	1.4 Quality control is continuously conducted.	1.4 The indicator related to quality control was added because the indicators in PDM 2 were insufficient to examine the Output 2.
	1.5 Briefing for understanding and sharing the meteorological situations is conducted at SWC at least once a day.	1.5 The indicator in PDM 2 indicated only the frequency of briefing. "for understanding and sharing the meteorological situations" was added to examine the qualitative aspect of briefing.
	Indicators for Output 2 2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems optimized ZR relation parameter for radar rainfall calculation is composed	2.1 "Rainfall intensity composite picture" was replaced by "composite rainfall amount" to be more precise. Only when data transfer system between BMD and FFWC functions properly (important assumption), then the data is distributed to FFWC. The distribution to FFWC is achieved at the Project Purpose.
	Indicators for Output 3 3.1 More than two (2) BMD staff can detect abnormal values and human error of the accumulated meteorological data through the computer program.	3.1 An indicator for the data quality control which is the pre-requisite for the trend analysis of the climate change was added.
	3.2 Summary of climate statistical analysis is shared in the public.	3.2 The summary is shared not only with the SAARC countries, but also in the public.
	Indicators for Output 4 4.1 More than five (5) staff of BMD can develop products and guidance by the Numerical Weather Prediction (NWP) model.	4.1 The expression "Using basic techniques" in PDM 2 was vague.

	Indicators for Output 5 5.1 BMD staff's planning and presentation skills for disseminating meteorological information is improved. 5.2 70% of the participants in the seminars/open-class (more than 8 times) understand the contents. 5.3 Meteorological information on the BMD's website is user-friendly and updated.	5.1 The indicator in PDM 2 was showing the result of activity such as the number of booklets. Instead, the qualitative target was set to examine the level of human resources development. 5.2 Open-class has already been conducted, but has not been stated in the PDM. 5.3 This indicator was added in order to examine the BMD's continuous self efforts based on the Activity 5-3.
	Indicators for Output 6 6.1 More than fifteen (15) for the five Radar systems BMD staff can implement regular maintenance and trouble shooting for the meteorological radar systems (except serious troubles which require assistance from HQ or manufacturer). 6.2 More than 80% of the BMD's staff in each existing meteorological radar station can operate and maintain the radar system in accordance with the operation/maintenance manual which is developed by this Project. 6.3 Meteorological radar observation schedule is maintained based on the requirement of SWC. 6.4 Operation cost for the meteorological radar system in normal season is saved.	6.1 The target number was revised. The number includes the staff of all the five Radar Systems instead of the three Doppler Radar Systems. 6.2 The indicator related to the standardization of O&M among the staff was added because the indicators in PDM 2 were insufficient to examine the Output 6. 6.3 & 6.4 These indicators were added to examine the progress in efficient operation including the cost-effectiveness.
Important Assumptions: Following important assumptions were added.		
From Project Purpose to Overall Goal	BMD's meteorological data and weather forecast and warning prepared by BMD is utilized by the natural disaster management organizations and mass media.	This is crucial condition to be met in order to achieve the Overall Goal.
From Activities to Outputs	Electricity is provided stably. Fuel unit cost does not drastically increase. Data transfer system (internet, phone, SSB, etc) works properly.	Stable electricity/fuel cost and data transfer system are essential to produce Outputs, and these are external conditions to be monitored. Therefore, these were added to Important Assumptions.
From Outputs to Project Purpose	Trained BMD staff remains on the duty. Data transfer system between BMD and FFWC functions properly.	Sustaining human resources developed by this Project in BMD is crucial to achieve the Project Purpose. Data transfer between BMD and FFWC is important for information dissemination for natural disaster management. Thus, these were added.

4. Conclusions

Based on the strong cooperation relationship between the experts and BMD and their commitment, the Project is making a progress except some activities related to the delayed procurement of the equipment under Output 1 and 2. It was identified that Output 5 and 6 has already shown the possibility of achieving

those targets.

In light of the five evaluation criteria, *the relevance of the Project is high* in reference to the needs and policies of Bangladesh as well as Japan's ODA policy for Bangladesh. Based on the indicators and means of verification in the current PDM, *it is difficult to judge the effectiveness*. Therefore, it is recommended that the indicators and means of verification be revised and effectiveness be judged based on the revised ones. Regarding the means of verification, more cases are required.

The relationship between the invested inputs so far and the current achievement levels of the Outputs, namely *the efficiency, is judged medium*. However, there is a still possibility that the efficiency will improve by the end of the Project if the activities related to AWSs under Output 1 and 2 make progress as scheduled upon the installation of the equipment.

During the project implementation period, a large scale natural-disaster such as cyclones and flood has not hit Bangladesh. Therefore, there is no specific case which illustrate that the BMD's weather information contributed to the reduction of the natural disaster losses. However, there is a high possibility that the overall goal is achieved if a large scale natural disaster hit Bangladesh considering the recent cases such as Cyclone SIDR, AILA and GIRI. It is considered that *the sustainability of the Project is generally high*, but it could be higher if human resources are properly allocated and their capacities are further developed and if all the training components are conducted along with the revised PDM.

In the meteorological services, by its nature, improving accuracy and timeliness is never-ending process. In this sense, the two-track approach of this Project, i.e. controlling quality of manually and automatically observed and archived data every day as well as pursuing modern techniques such as the radar rain calibration and NWP should be fully shared among the stakeholders and be carried out for the remaining period of the Project.

5. Recommendations

5.1 Recommendations to Project

1. In order to review the overall progress and achievement of the Project and to discuss the planning for the coming year before the submission of an annual budget proposal to JICA Bangladesh Office, it is recommended that the Project convene the Joint Coordination Committee (JCC) at least twice a year.
2. In order to monitor the progress of activities, it is recommended that Plan of Operations, which specifies the actions to be taken, time schedule and responsible persons, be revised along with the revised PDM and both experts and C/Ps monitor the progress referring to the PO.
3. In order to complete the training components stated in the revised PDM efficiently by December 2012, it is suggested that training plan be carefully prepared. The following points should be considered in planning.
   - The training contents should be decided carefully in consultation with Training Institute, Synoptic Division, Climate Division and field observatories.
   - The field observers in the proximity of the stations, where AWSs will be installed, should also be invited for training.
   - Activity 1-3, 1-5 and 1-6 should not focus on AWSs equipment too much, but should also cover basics to improve the quality control of observation.
   - Quality control element should be further stressed at each Output as shown in **ANNEX 14**: Observation (Output 1), Database (Output3) and Forecasting (Output 1).
4. In order to ensure that FFWC understand the rainfall data produced under Output 2 and fully utilize it

for disaster management, it is recommended that FFWC staff be invited and attend the training on the analysis of quantitative rainfall estimation as observers.

5. In order to make the weather forecast more attractive to the TV audience, the following actions are recommended, for example:
   - To utilize more graphics such as cyclone tracking and radar-rain amount;
   - To improve colour combination;
   - To show zoomed satellite image with closer image of Bangladesh;
   - To utilize key words linking weather forecast with public events/daily life such as sports events in order to enhance the proximity between the weather forecast and the audience.

5.2 Recommendations to BMD

1. In order to ensure the decision-making process more transparent and the links among the working groups, it is recommended that a committee for project implementation consisting of the representatives from each working group be formed in BMD. It is suggested that each task group discuss issues to be decided or solved before committee meetings and raise crucial issues to the committee meeting agenda based on the group discussion. It is also suggested that decisions or discussion results at committee meetings be fed back to the task group members through representatives of each working group.
2. In order to allocate sufficient and proper human resources in proper place and to develop their capacities, particularly in the field observatories, it is recommended that the proposed organizational system and human resource allocation plan be implemented as soon as the proposal is approved by the Government.
3. In light of sustainability, it is recommended that the observation handbook revised by this Project be utilized as textbook for the existing training for induction, promotion and other purposes held by the Training Institute.

6. Lessons Learned/Good Practice

In this Project, the dispatch of short-term experts functioned well in terms of smooth communication and technical transfer based on the following conditions: 1) some C/Ps had already exposure to the technical transfer from Japanese experts through the series of the Grant Aid Projects since 1988 as well as the training in Japan before this Project; 2) these cooperation had already built strong mutual trust between the C/Ps and the Japanese experts even before the Project started; and 3) it was planned that this Project would commence just after all the fifth Radar Systems were established by the Grand Aid Project in order to ensure the full utilization of the radar data. In the similar future projects, these points can be noted at the time of planning. At the same time, the following points for the dispatch of short-term experts were also considered: 1) meteorological calendar in order to avoid heavy burden on the C/Ps; and 2) assigning Japanese experts in different timings to the extent possible in order to keep the experts' presence throughout the year. These points should be noted at the time of implementation in the future project.

Annex 1. Mission Schedule

No.	Date	Day	Time	Mr. Tomita (Team Leader)	Mr. Kojo (Technical Evaluation)	Ms.Miura (Monitoring & Evaluation)	Mr. Katayama (Evaluation Planning)
1	2-Feb	Wed			Arrive at Dhaka	Arrive at Dhaka	
			11:45				Courtesy call to MoD
2	3-Feb	Thu	9:00	Meeting at JICA	Meeting at JICA	Meeting at JICA	Meeting at JICA
			11:30	Meeting with Director BMD	Meeting with Director BMD	Meeting with Director BMD	Meeting with Director BMD
			13:30		Meeting with JICA Experts	Meeting with JICA Experts	Meeting with JICA Experts
3	4-Feb	Fri			Site Visit (Cox's Bazar)	Site Visit (Cox's Bazar)	Site Visit (Cox's Bazar)
4	5-Feb	Sat			Site Visit (Chittagong)	Site Visit (Chittagong)	Site Visit (Chittagong)
5	6-Feb	Sun	10:00		Seminar	Seminar	
			11:00		Meeting with SWC/BMD	Meeting with SWC/BMD	
			14:00		Meeting with Climate Div./BMD	Meeting with Climate Div./BMD	
			15:00		Meeting with SWC/BMD	Meeting with SWC/BMD	
			16:00		Seminar	Seminar	Seminar
6	7-Feb	Mon	11:00-17:30		Meeting with JICA Experts	Meeting with JICA Experts	
7	8-Feb	Tue	9:30		Meeting with Comm. Div./BMD	Meeting with Comm. Div./BMD	
			10:15		Meeting with Training Div./BMD	Meeting with Training Div./BMD	
			10:45		Meeting with Electric Div./BMD	Meeting with Electric Div./BMD	
			12:30		Meeting with DMB	Meeting with DMB	
			15:30		Meeting with FFWC/BWDB	Meeting with FFWC/BWDB	
			17:30		Internal Meeting	Internal Meeting	Internal Meeting
8	9-Feb	Wed	10:00		Meeting with Bangladesh TV	Meeting with Bangladesh TV	
			12:30		Meeting with Bangladesh Radio	Meeting with Bangladesh Radio	
			15:30		Meeting with CPP	Meeting with CPP	
9	10-Feb	Thu	10:00	Internal Meeting	Internal Meeting	Internal Meeting	Internal Meeting
			14:00		Meeting with JICA Expert	Meeting with JICA Expert	
			14:20		Meeting with Director BMD	Meeting with Director BMD	
10	11-Feb	Fri			Documentation	Documentation	
11	12-Feb	Sat			Site Visit (RIC Comilla)	Documentation	Site Visit (RIC Comilla)
12	13-Feb	Sun	9:00		Internal Meeting	Internal meeting	
			13:30		Discussion/Revision Draft JER	Discussion/Revision Draft JER	Discussion/Revision Draft JER
13	14-Feb	Mon	10:30		Documentation	Documentation	
			13:30	Discussion/Revision Draft JER	Discussion/Revision Draft JER	Discussion/Revision Draft JER	Discussion/Revision Draft JER
14	15-Feb	Tue	10:00	JCC Meeting (Joint Evaluation)	JCC Meeting (Joint Evaluation)	JCC Meeting (Joint Evaluation)	JCC Meeting (Joint Evaluation)
15	16-Feb	Wed	9:00	Report to JICA	Report to JICA	Report to JICA	Report to JICA
					Documentation	Documentation	
16	17-Feb	Thu			Documentation	Documentation	
17	18-Feb	Fri			Leave for Tokyo	Leave for Tokyo	
18	19-Feb	Sat			Reach to Tokyo	Reach to Tokyo	

Annex 2. List of Stakeholders Consulted/Interviewed by the Evaluation Mission

BMD Head Office

Ms. Arjumand Habib,	Director
Mr. Md. Ahmed Arif Rashid	Senior Mechanical Engineer, Workshop & Laboratory and E&I
Mr. Syed Abul Hasanat	Meteorologist, Storm Warning Centre (SWC)
Mr. Md. Shadekul Alam	Meteorologist, SWC
Mr. S.M. Quamrul Hassan	Meteorologist, SWC
Mr. Shamsuddin Ahmed	SWC
Mr. Md. Rashaduzzaman	Assistant Meteorologist, SWC
Mr. Md. Abdur Rahman Khan	Assistant Meteorologist, SWC
Mr. Md. Muzammel Haque Tarafder	Senior Communication Engineer, National Meteorological Communication Centre (NMCC)
Mr. Md. Abdul Matin	Assistant Communication Engineer, NMCC
Mr. Md. Shameem Hassan Bhuiyan	Meteorologist, Agromet Division
Mr. Nur Mohammad Miah	Deputy Director, Training Institute

RIC Comilla

Mr. A.K.M Mizanur Rahman Bhuyan	Senior Observer
Mr. Md. Mujibur Rahman	Senior Observer
Mr. Md. Iqbal Hossain	Senior Observer
Mr. S. M. Fazlul Hassan	Senior Observer
Mr. Md. Moniruzzaman	Observer
Mr. Md. Moin Uddin	Balloon Maker

Chittagong BMD

S. M. Elias Azam Khan	Senior Observer
Jalal Uddin Mohammad Firoz	Senior Observer
Md. Abul Bashar	Senior Observer
Bijoy Kumar Dhe	Senior Observer
Kazi Sirajul Islam	Senior Observer
A. N. M Selim Reza	Balloon Maker
Nure Alm Siddique	Balloon Maker
Md. Mizanur Rahman	Balloon Maker
Md. Mazharul Islam	Professional Assistant

Chittagong BMD (Radiosonde Division)

Mr. Swapon Bhattacharjee	Assistant communication Engineer
Mr. Alauddin Dewan Chittagong	Electric Assistant
Mr. Jahar Lal Baidya Chittagong	Wireless operator

Cox's Bazar Radar Station

Mr. Abul Hashem	Assistant Electronic Engineer
Mr. Md. Mominur Rahman	Assistant Electronic Engineer
Mr. Md. Al Imran	Electronic Assistant
Mr. Md. Aslam Hafiz	Electronic Assistant
Mr. Md. Abu Taher	Radio Mechanic
Mr. Md. Rafiqul Islam	Mechanic Grade–II

Mr. Md. Abdul Mabud	Mechanic Grade–II
Mr. Jahangir Alam	Mechanic Grade–II
Mr. Md. Nazmul Haider	Mechanic Grade–II
Mr. Md. Nur Alam	Mechanic Grade–II

Japanese Experts

Mr. Yoshihisa Uchida
Mr. Nobutaka Noguchi
Mr. Takayuki Motoya
Mr. Soshi Iwata
Mr. Takehiro Yoshida*
Mr. Takayuki Otsu *
Mr. Toshihide Endo *
Mr. Kenji Mori *

Note: The persons with * were communicated by e-mail/questionnaires.

Disaster Management Bureau (DMB)

Mr. Mohammad Abu Sadeque PEng, Director

FFWC

Mr. Md. Sazzad Hossain	Sub Divisional Engineer
Mr. A.K.M Saifuddin	Sub Divisional Engineer
Mr. Md. Abul Bashar	Sub Divisional Engineer
Mr. Mohiuddin Ahmed	System Analyst
Ms. Farzana Warda	Assistant Engineer
Mr. Md. Selim Bhuiyan	Superintend Engineer
Mr. Mohammad Shahabuddin	Executive Engineer

Bangladesh Television - BTV

Mr. Md. Abu Saleque	Deputy Director General – News
Mr. Hashim Reza	Chief News Editor
Mr. Iqbal Hossain	News Editor
Mr. Gopal Chandra Dev	News Editor
Mr. Harun-or-Rashid	News Editor

Bangladesh Betar - Radio Bangladesh

Mr. A. K. M Shamom Chowdhury	Director General
Mr. Mohammad Basir	Deputy Director

Cyclone Preparedness Program - CPP

Mr. Swapon Mitra	Deputy Director
Mr. Md. Imtiaz Shihab	Accounts officer
Mr. Md. Arafat-ul-Islam	Senior Radio Operator

Annex 3. PDM 0 (November 2008)

Project Title: Development of Human Capacity on operation of weather Analysis and Forecasting | Duration: July, 2009 - June, 2012 | Version 0

Target Area: Operation area of BMD | Target Group: BMD officials (SWC, Climate Division, Meteorological Training Institute, Met. & Geo. Center, Chittagong) | Date: 12th November, 2008

[redacted]	[redacted]	[redacted]	[redacted]
Overall Goal Highly precise weather and climate information is utilized for Natural Disaster Management and contributed to the reduction of the Natural Disaster Losses.			
Project Purpose Weather information for natural disaster management is more strengthened in terms of time and quality through human capacity development and dissemination of weather information among the stakeholders are more broadened.	1 Quantitative rainfall information using rainfall calibration is provided. 2 More timely and precise forecasting and warning-delivery to organizations related to Natural Disaster Management and Mass Media are performed.	1 Report of the Project 2 Record of forecasting and warning Report of the Project Interview to organization related to DM and Mass Media	State policy of weather services in the Government of Bangladesh remains unchanged.
Outputs 1 Capacity of BMD for daily weather observation and forecasting is improved.	1-1 The training for observers / inspectors are implemented more than 6 times during the Project and 70% of participants understand the contents of the training. 1-2 More than 70% of the observers follow the revised observation guideline by end of the Project. 1-3 More than 70% of the inspectors follow the revised guideline for inspections by end of the Project.	1-1 Report of training for observers / inspectors Result of Questionnaire 1-2 Questionnaire and survey 1-3 Evaluation by expert Questionnaire	
2 Quantitative rainfall estimation by using Doppler Radars is effectively utilized for weather forecasting and warning.	2-1 Correlation between calibrated rainfall data and actual rainfall data is confirmed by December, 2010. 2-2 BMD can calculate the estimated rainfall data under the coverage area of 5 Radars by using the calibration method by December, 2011.	2-1 calculated Correlation 2-2 estimated rainfall data	
3 Climate data is utilized for the trend analysis of climate change.	3-1 Result of the Climate statistical analysis is shared with the SAARC Countries by December, 2010.	3-1 Result of statistical analysis Report of regional workshop	
4 Capacity of BMD personnel for weather forecasting using basic techniques of Numerical Weather Prediction (NWP) is established.	4-1 More than 5 personnel of BMD are capable of using the NWP basic technique by the end of the Project.	4-1 Evaluation by expert Questionnaire	
5 Capacity of BMD to promote understandings about weather and climate information in central/local governments, related organizations/agencies and end-user is improved.	5-1 The seminar / workshop are implemented more than 6 times during the Project and 70% of participants understand the contents of the training. 5-2 More than 2 categories of Booklets for target group (elementary school and people of affected area, etc) for promoting understandings of weather, climate and disaster are published and distributed during the Project.	5-1 Report of seminar / workshop Result of Questionnaire 5-2 Booklets	
6 Weather observation and monitoring equipment such as meteorological Radar system etc. are operated and maintained properly.	6-1 The training on O&M of Meteorological Radar are implemented more than 3 times during the Project and 70% of participants understand the contents of the training. 6-2 10 personnel of BMD are capable of efficient O&M of Meteorological Radar system by the end of the Project. 6-3 More than 70% of the personnel related to O&M of Meteorological Radar follow the guideline for O&M.	6-1 Report of the training Result of Questionnaire 6-2 Evaluation by expert 6-3 Report of the Project Questionnaire and survey	

Activities	Inputs		Pre-conditions
	Bangladeshi Side	Japanese Side	
1-1 To conduct the training for observers on Meteorological Observation.	1. Personnel - project director - project manager - Weather observation group - Radar rainfall calibration group - Climate data management group - Numerical Weather Prediction group 2. Provision of the Project Office - Sufficient office space - Office logistics for implementation of the Project 3. Expenses - Maintenance costs related to the Project - Allocation of necessary budget for implementation of the Project - Remuneration and other allowances for the counterpart personnel - Bearing running expenses for the office space, including equipment, such as electricity and water.	1. Experts - Weather Observation - Weather Forecasting - Radar Calibration techniques - Climate data management - Statistical Analysis techniques - Numerical Weather Prediction - Weather Radar operation and maintenance 2. Training in Japan - Climate data management - NWP basic training 3. Equipments - Computers for Radar Calibration - Computers for climate data management - Computers for statistical analysis/regional climate model - Computers for NWP basic training 4. Expenses Expenses necessary for implementation of the Project	Trained observers continue working for BMD. Trained inspectors continue working for BMD. BMD personnel who acquired technique remain on duty. Meteorological Radar works without breaking. Budget required for maintenance allocates. **Pre-conditions** N/A
1-2 To revise the existing guideline on Meteorological Observation in accordance with latest WMO edition.			
1-3 To conduct the training for forecasters on data acquisition and quality control.			
1-4 To have the daily briefing on every weather forecast among the forecasters.			
1-5 To conduct the training for inspectors on inspection of the instruments.			
1-6 To revise the existing guideline on inspection of the instruments and equipments in accordance with latest WMO edition.			
2-1 To implement the Radar Calibration with existing Radar data and actual rainfall data in the observatories under coverage area of Cox's Bazar and Khepupara Radars.			
2-2 To establish the correlation between actual rainfall and estimated rainfall.			
2-3 To implement the Radar Calibration with existing Radar data and actual rainfall data in the observatories under coverage area of Moulavi bazar Radar.			
2-4 To implement the Radar Calibration with existing Radar data and actual rainfall data in the observatories under coverage area of Dhaka and Rangpur Radars.			
2-5 To evaluate the result of estimated rainfall data by the calibration method.			
3-1 To develop the Quality Control System (automatic and human quality control) for identification of abnormal values.			
3-2 To modify the Quality Control System.			
3-3 To archive the climate data in the database developed in the Project.			
3-4 To implement the statistical analysis of climate trend.			
3-5 To organize the regional workshop on climate change.			
4-1 To conduct the basic training on Numerical Weather Prediction (NWP).			
4-2 To study for the applicability of NWP result calculated by other countries.			
4-3 To examine the method of Guidance by using the result of study mentioned 4-2.			
4-4 To develop the Meso Spectral Model (MSM) for NWP by using PC on trial.			
5-1 To conduct the workshop for organizations and agencies related to disaster management.			
5-2 To make the booklet for promoting the understandings of end-users of weather and climate information.			
6-1 To conduct the training on operation and maintenance of Meteorological Radar System.			
6-2 To review the guideline for maintenance of the equipments.			
6-3 To review the guideline for operation of Meteorological Radar system.			
6-4 To make the appropriate maintenance plan.			

Annex 4.Master Plan as PDM 1 (May 2009)

MASTER PLAN

1. Overall Goal

Highly precise weather and climate information is utilized for Natural Disaster Management and contributed to the reduction of the Natural Disaster Losses.

2. Project Purpose

Weather information for natural disaster management is more strengthened in terms of time and quality through human capacity development and dissemination of weather information among the stakeholders are more broadened.

3. Outputs

1. Capacity of BMD for daily weather observation is improved.
2. Quantitative rainfall estimation by using Doppler Radars data is implemented.
3. Climate data is utilized for the trend analysis of climate change.
4. Capacity of BMD personnel for medium range weather forecasting using basic techniques of Numerical Weather Prediction (NWP) is established.
5. Capacity of BMD to promote understandings about weather and climate information in central/governments, related organizations/agencies and end-user is improved.
6. Weather observation and monitoring equipment such as meteorological Rader system etc. are operated and maintained properly.

4. Activities

1.1. To conduct the training for observers on Meteorological Observation.
1.2. To revise the existing guideline on Meteorological Observation in accordance with latest WMO edition.
1.3. To conduct the training for forecasters on data acquisition and quality control.
1.4. To have the daily briefing on every weather forecast among the forecasters.
1.5. To conduct the training for inspectors on inspection of the instruments.
1.6. To revise the existing guideline on inspection of the instruments and equipments in accordance with latest WMO edition.
2.1. To implement the Radar Calibration with existing Radar data and actual rainfall data in the observatories under coverage area of Cox's Bazar and Khepupara Radars.
2.2. To establish the correlation between actual rainfall and estimated rainfall.
2.3. To implement the Radar Calibration with existing Radar data and actual rainfall data in the observatories under coverage area of Moulavi bazar Radar.
2.4. To implement the Radar Calibration with existing Radar data and actual rainfall data in the observatories under coverage area of Dhaka and Rangpur Radars.
2.5. To evaluate the result of estimated rainfall data by the calibration method.
3.1. To develop the Quality Control System (automatic and human quality control) for

identification of abnormal values.

3.2. To modify the Quality Control System.

3.3. To archive the climate data in the database developed in the Project.

3.4. To implement the statistical analysis of climate trend.

3.5. To organize the regional workshop on climate change.

4.1. To conduct the basic training on Numerical Weather Prediction (NWP).

4.2. To study for the applicability of NWP result calculated by other countries.

4.3. To examine the method of Guidance by using the result of study mentioned 4-2.

4.4. To develop the Meso Spectral Model (MSM) for NWP by using PC on trial.

5.1. To conduct the workshop for organizations and agencies related to disaster management.

5.2. To make the booklet for promoting the understandings of end-users of weather and climate information.

6.1. To conduct the training on operation and maintenance of Meteorological Radar System.

6.2. To review the guideline for maintenance of the equipments.

6.3. To review the guideline for operation of Meteorological Radar system.

6.4. To make the appropriate maintenance plan.

Annex 5. PDM2 (October 2009)

PROJECT DESIGN MATRIX (PDM)

Project on Development of Human Capacity on Operation of Weather Analysis and Forecasting (October 07, 2009)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Highly precise weather and climate information is utilized for natural disaster management which contributes to the reduction of the natural disaster losses.	Utilization of weather and climate information by organizations related to natural disaster management	Interview to the person in charge in organizations related to natural disaster management	
Project Purpose Weather information for natural disaster management is strengthened in terms of time and quality through human capacity development and dissemination of weather information among various stakeholders.	1. Rainfall data of the optimized radar ZR relation parameter for rainfall calculation being provided to FFWC. 2. Accurate and easily understandable forecasting and warning to organizations related to natural disaster management and Mass Media are timely issued.	1. Data distribution record 2. Weather forecasting and warning prepared by BMD for organizations related to natural disaster management and Mass Media	~~Weather data, forecasting and warning of BMD are utilized by organizations related to natural disaster management and Mass Media.~~ (Deleted)
Outputs			
1. Capacity of BMD for observation and forecasting is improved.	1.1. Enable to acquire and archive accurate observed data: 6 existing meteorological observatories 1.2. Training for field observers and data inspectors on observed data acquisition and data quality control: 6 times 1.3. Briefing in SWC: at least 1 time/day	1.1. Database in BMD Head Office 1.2. Report of the Project 1.3. Briefing records	State policy of weather services in the Government of Bangladesh remains unchanged.
2. Quantitative rainfall estimation by using Doppler Radars is implemented.	2.1. Correlation of radar rainfall data observed by the optimized radar ZR relation parameter for rainfall calculation and surface observation being corroborated. 2.2. Binary data of rainfall intensity composite picture created by rainfall data of 5 existing radar systems	2.1. Correlation chart of rainfall data of radar and surface observations 2.2. Computers in SWC	

	optimized ZR relation parameter for radar rainfall calculation is distributed to FFWC.		
3. Climate data is utilized for the trend analysis of climate change.	3.1. Summary of Climate statistical analysis is shared with the SAARC Countries.	3.1. BMD web page Regional Workshop of SAARC Countries opened	
4. Capacity of BMD personnel for 1 to 5 days weather forecasting using basic techniques of Numerical Weather Prediction (NWP) is established.	4.1. Enable to use the basic techniques of Numerical Weather Prediction (NWP): 5 staff of BMD	4.1. Report of the Project	
5. Understanding about weather and climate information among stakeholders related to natural disaster are deepened.	5.1. Implementation of seminars for stakeholders related to natural disaster: 8 times, 70% of the participants understood the contents 5.2. Booklets of weather, climate and natural disaster to be distributed to stakeholders related to natural disaster including elementary schools and residents in disaster affected area: 3	5.1. List of participants of seminar Questionnaires to the participants of seminar 5.2. Booklets	
6. Weather observation and monitoring equipment such as meteorological radar system etc. are operated and maintained properly.	6.1. Enable to implement regular maintenance and trouble shooting for the meteorological Doppler radar systems: 9 staff of BMD 6.2. Operation/maintenance manuals being utilized in each existing Meteorological Radar Station	6.1. Report of the Project 6.2. Record sheet of regular check	

Activities	Inputs		Pre-conditions
1.1. To rehabilitate the existing meteorological observatories in the targeted areas 1.2. To prepare the field observation guideline 1.3. To provide the training for field observers and data inspectors on observed data acquisition and data quality control 1.4. To prepare the operation and maintenance manuals for observation fields and instruments 1.5. To provide the training for field observers and instrument inspectors on maintenance and control of observation fields and observation instruments 1.6. To prepare the briefing flowchart and record 2.1. To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation 2.2. To prepare correlation charts of rainfall data of radar and surface observations in the observation range of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation 2.3. To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC 3.1. To develop daily observation data input sheet for	(Bangladesh Side) 1. Provision of the project office for the project experts in BMD Head Office 2. Allocation of the required counterpart personnel 3. Provision of training spaces 4. Provision of installation spaces for the equipment to be procured under the Project 5. Security of the equipment for the Project 6. Operation and maintenance expenses of the equipment for the Project 7. Tax exemption, custom clearance and other procedures required for importing the equipment for the Project	(Japan Side) 1. Dispatch of experts - Weather Forecasting & Warning Service and Organization Management - Weather Observation - Weather Service Infrastructure - Meteorological Radar Calibration - Data Quality Control and Statistical Analysis - Web Site Design - Numerical Weather Prediction - Weather Information Dissemination - Meteorological Radar Operation and Maintenance 2. Equipment Supply 3. Provision of training in Japan	To be able to obtain cooperation of organizations related to natural disaster management

easy statistical processing and data quality control of observed data			
3.2. To conduct climate data statistical analysis			
3.3. To publish the summarized result of climate data statistical analysis to BMD Web page			
4.1. To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP)			
4.2. To conduct the basic training on Numerical Weather Prediction (NWP)			
4.3 To conduct the training on Numerical Weather Prediction (NWP) guidance			
4.4. To operate the Meso Scale Model (MSM) by using PC (Linux) on trial base			
5.1. To conduct the seminars for the stakeholders related to natural disaster			
5.2. To prepare the booklets of weather, climate and natural disaster			
6.1. To conduct the training on operation and maintenance of the meteorological radar systems			
6.2. To prepare the operation and maintenance manuals for the meteorological radar system			

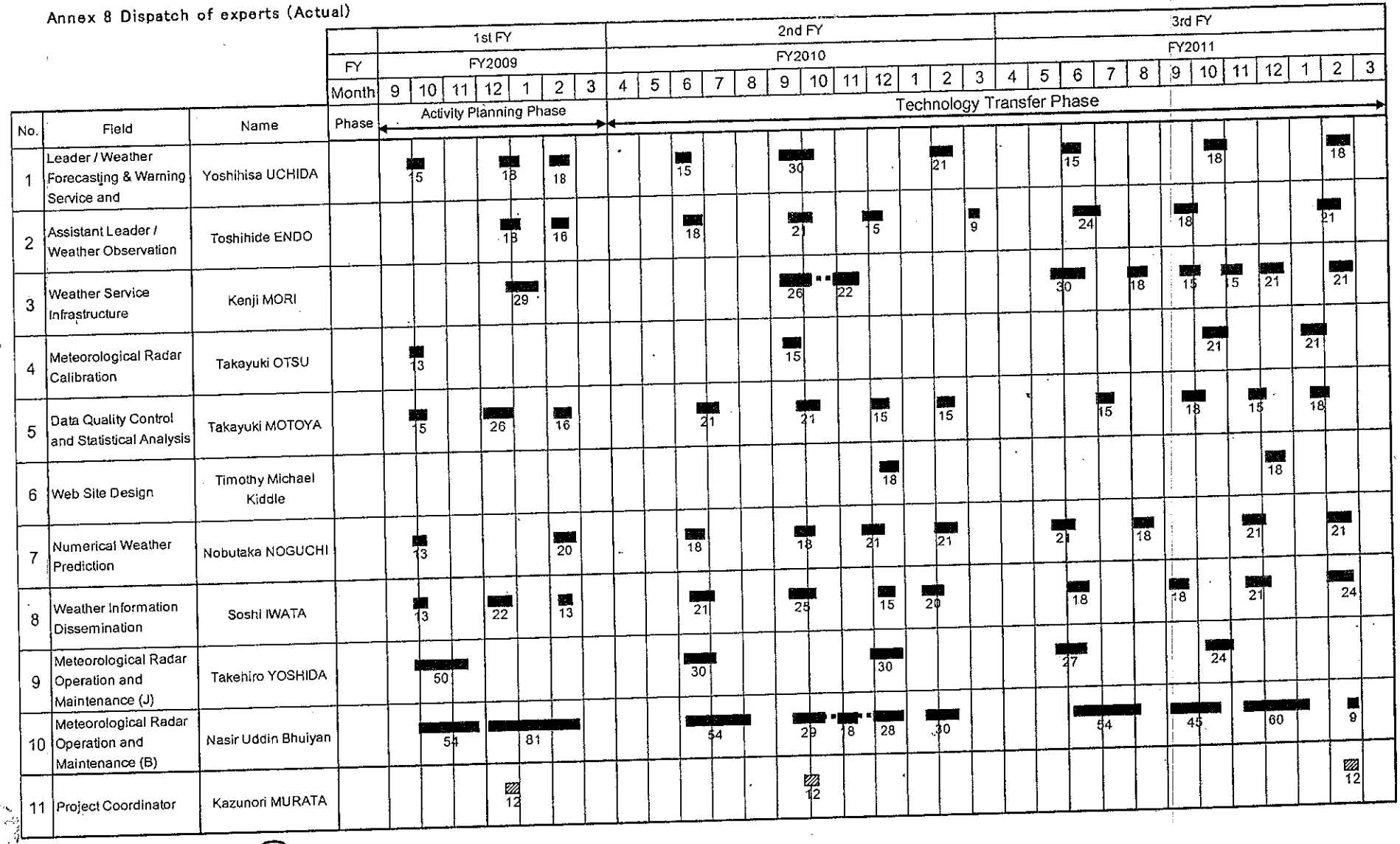
Annex 6. Grant Aid List

Project Title	FY	Cost	Remarks
Not found	1986-1988		
Rehabilitation of the coastal observatories of Bangladesh Meteorological department affected by the tropical cyclone of 29th April 1991	1992-1994	123.75 lac taka	Chittagong, Cox's Bazar
Establishment of Microwave link Between Storm Warning Center, Dhaka and Radar Station at Cox's Bazar and	1992-1994	2586.67 lac taka	Dhaka , Cox,s Bazar , Khepupara
Rehabilitation of Cox,s Bazar and Khepupara weather surveilleance radars	1993-1994	44.46 lac taka	Cox,s Bazar , Khepupara
Strengthening of weather warning services related to natural disaster	1997-2000	6084.59 lac taka	
Cox's Bazar and Khepupara Radar Systems I	2005-2007	10302 lac taka	Cox's Bazar and Khepupara
Cox's Bazar and Khepupara Radar Systems II	2006-2008		
Moulvibazar Meteorological Radar Systems	2007-2009	1792 lac taka	Moulvibazar

Annex 7. Training in Japan

FY	Types of training	Field of expertise	Persons
2002	Group Training course on Meterology – II	Meteorology	1
2003	Group Training course on sysmology and Earthquake engineering	Meteorology	1
2005	Group Training course on Meterology – I	Meteorology	1
2005	Group Training course in mitigation and strategy for mega urban earthquake disaster	Meteorology	1
2005	C/P Training for radar Meteorology	Radar meteorology	2
2006	Group Training course on Meterology	Meteorology	1
2006	JICA C/P Training for Cox's Bazar and Khepupara	Radar O&M	3
2007	JICA C/P Training for establishment of meteorological radar system at	Electrical	2
2007	Group Training course on Meterology	Meteorology	1
2007	Group Training course on earthquake engineering and Disaster mitigation	Meteorology	3
2008	Reinforcement of Meteorological services	Meteorology	1
2009	Traing seminar on the quality control and interpolation system used in APHRODITE grading analysis	Meteorology	1
2009	Reinforcement of Meteorological services	Meteorology	1
2009	Traing Seminar on climate analysis using re-analysis data	Meteorology	1
2010	JMA / WMO workshop on quality management in surface and upper air observation in RA – II (Asia)	Meteorology	1

Annex 8 Dispatch of experts (Actual)



Annex 9. Equipment procured under the Project

Equipment procured by the JICA Bangladesh Office in this Japanese fiscal year

Name of Equipment	Manufacturer	Model	Purpose	Q'ty	Installation Place	Inspection Date
None						

Due to the JICA project budget constraints, the AWS procurement scheduled to complete in FY2010 has been postponed to the beginning (April-May) of FY2011.

Equipment procured by the Consultant (Expert Team) in this Japanese fiscal year

Name of Equipment	Manufacturer	Model	Purpose	Q'ty	Installation Place	Inspection Date
For Numerical Weather Prediction						
PC Cluster for training on NWP	Delairco	-	For numerical analyses	1	BMD Head Office	

Other Items procured by the Consultant (Expert Team) in this Japanese Fiscal Year

Name of Equipment	Manufacturer	Model	Purpose	Q'ty	Installation Place	Acquisition Date
For Numerical Weather Prediction						
White Board	-	-	For training on NWP	1	BMD Head Office	June 12, 2010
For Web Site Design						
USB Modem for training on Web Site design	Huawei	E1550	For Internet access by a PC for training	1	BMD Head Office	December 10, 2010
Software for training on Web Site design	Adobe	Dreamweaver CS5	For web page edit	1	BMD Head Office	December 8, 2010
Others						
Vacuum Cleaner	Panasonic	MC-CL481	For cleaning the equipment procured under the Project	1	BMD Head Office	June 11, 2010

Reference Books procured in this Japanese Fiscal Year

Name of Book	Purpose	Q'ty	Storage Location	Date of Procurement
For Numerical Weather Prediction				
An Introduction to Numerical Weather Prediction Techniques	For training on NWP	2	BMD Head Office	July 16, 2010
Introduction to the Command Line		2	BMD Head Office	September 9, 2010
Introduction to Programming with Fortran		2	BMD Head Office	July 12, 2010
An Introduction to Dynamic Meteorology, Fourth Edition		2	BMD Head Office	July 1, 2010

Mesoscale Meteorological Modeling		2	BMD Head Office	July 12, 2010
Computational Methods for the Atmosphere and the Oceans, Volume 14: Special Volume		2	BMD Head Office	July 29, 2010
Data Assimilation: Making Sense of Observations		2	BMD Head Office	July 21, 2010
Atmospheric Modeling, Data Assimilation and Predictability		2	BMD Head Office	July 1, 2010
Parameterization Schemes: Keys to Understanding Numerical Weather Prediction Models		2	BMD Head Office	August 18, 2010
Cloud Dynamics, Volume 53		2	BMD Head Office	July 1, 2010
An Introduction to Atmospheric Radiation, Volume 84, Second Edition		2	BMD Head Office	July 1, 2010
An Introduction to Boundary Layer Meteorology		2	BMD Head Office	July 14, 2010

Equipment provided to Bangladesh Side in the Japanese FY 2009

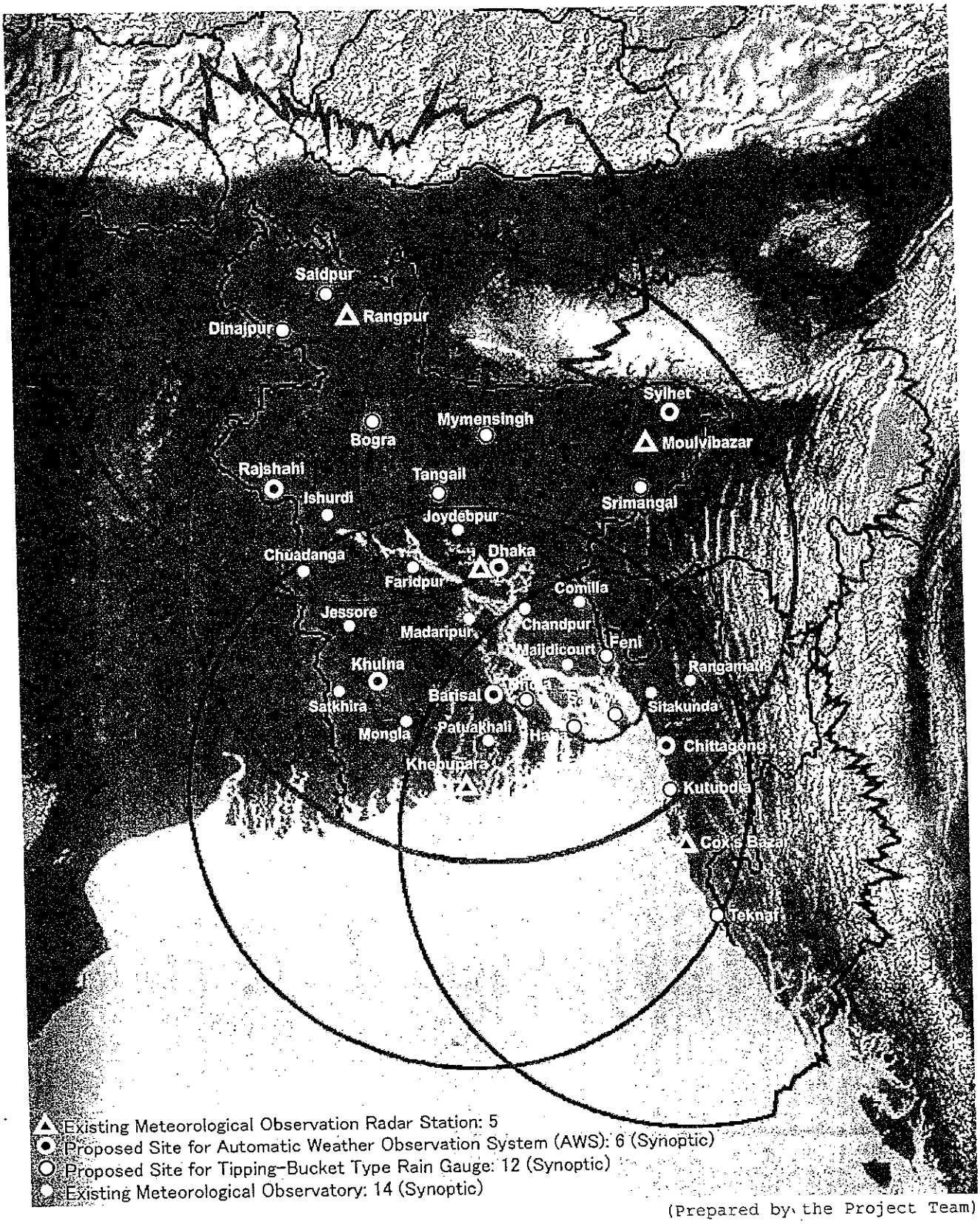
Name of Equipment	Manufacturer	Model	Purpose	Q'ty	Installation Site	Inspection Date
For Weather Forecasting & Warning Service and Organization Management						
Digital Visual Presenter	ELMO	P30S	For visual aid projector of document data, etc.	1	BMD Head Quarters	Feb. 5, 2010
Color LCD Type Monitor Display	PROLINK	PRO3201TW	For display of the weather information	3	BMD Head Quarters	Oct. 20, 2009
Desktop PC for Weather Briefing	HP Compaq	DC5800	For display, preparation and storage of the weather information	3	BMD Head Quarters	Oct. 20, 2009
For Weather Information Dissemination						
Laptop PC for Workshop	HP	6930P	For projection of the documents at the workshop	1	BMD Head Quarters	Oct. 20, 2009
For Data Quality Control and Statistical Analysis						
Desktop PC for Data Quality Control and Statistical Analysis	HP Compaq	DC5800	For statistical analysis	2	BMD Head Quarters	Oct. 20, 2009
	HP Compaq	DX2810	For data quality control	1	BMD Head Quarters	Feb. 17, 2010
For Meteorological Radar Calibration						
Desktop PC for Radar Calibration	HP Compaq	DC5800	For radar calibration	2	BMD Head Quarters	Oct. 20, 2009
Linux OS	Red Hat	Enterprise Linux 5	For radar calibration	2	BMD Head Quarters	Mar. 04, 2010
Rain Gauge and Data Logger	Delairco	-	For acquisition of rainfall data	12	Twelve (12) Existing Observatories 1) Saidpur 2) Dinajpur 3) Bogra 4) Mymensingh 5) Tangai 6) Srimangal 7) Chandpur 8) Mongla 9) Bhola 10) Sitakunda 11) Kutubdia 12) Teknaf	Mar. 15, 2010

Data Collection & Storage Unit	Delairco	-	For data collection & storage at the BMD Head Quarters	1	BMD Head Quarters	Mar. 15, 2010
Hard Disk for Data Storage	Buffalo	HD-PX500U2	For radar calibration data storage	2	BMD Head Quarters	Feb. 26, 2010
For Numerical Weather Prediction						
Laptop PC for Basic Training on NWP	Best Systems	BSC-LOWMM5N BV	For basic training on NWP	1	BMD Head Quarters	Mar. 12, 2010
Others						
UPS	APOLLO	1120F	For supplying back-up AC power to PC etc.	7	BMD Head Quarters	Oct. 20, 2009
				3		Feb. 17, 2010
Color Inkjet Printer	HP	K7100	For printing the documents and materials	3	BMD Head Quarters	Oct. 20, 2009
	Cannon	PIXUS iP100		1		Nov. 27, 2009

Other Items and Equipment purchased in the Japanese FY 2009

Name of Equipment	Manufacturer	Model	Purpose	Q'ty	Site of Installation	Date Purchased
GPS System (GPS measuring device, Altimeter)	(GPS measuring device) Garmin	GPSMAP60 CSx	For site survey of latitude, longitude and altitude	1	BMD Head Quarters	Feb. 5, 2010
	(Altimeter) Brunton	ADC Summit				
Laser Pointer	KOKUYO	SASHI - 82	For pointing table, figure, video, etc.	2	BMD Head Quarters	Sep. 24, 2009
Projector	Hitachi	RX80	For projecting table, figure, video, etc. to the screen	2	BMD Head Quarters	Oct. 13, 2009
Spare of a Valve for the projector	Hitachi	For RX80	For spare of a valve for the projector	8	BMD Head Quarters	Oct. 13, 2009
Color Inkjet Printer	Cannon	PIXUS iP100	For printing documents & materials	1	BMD Head Quarters	Nov. 27, 2009
Copy Machine (including Scan)	Canon	IR-3225	For printing documents & materials	1	BMD Head Quarters.	Oct. 13, 2009
Hard Disk for Data Storage	Buffalo	HD-PX500U2	For data storage of the report, etc.	1	BMD Head Quarters	Nov. 18, 2009

Annex 10.Location Map of the Project Sites



(Prepared by the Project Team)

Annex 11. Budgetary Allocations for the Project by the Japanese side

Japanese Yen in Thousand (000)

Item	FY 2009	FY 2010 (in progress)	Total
Expert (inc. Travel expenses)	47,996	73,079	121,075
Local cost	3,518	9,823	13,341
Equipment	16,516	15,702	32,218
Tax	3,402	4,930	8,332
Sub-Total	71,432	103,534	174,966
			0
Mission		3,036	3,036
			0
Total	71,432	106,570	178,002

※JICA Rate (Feb.2011) USD1=JPY82.16

Annex 12. List of Counterpart Participants on Different Fields under Technical Cooperation Project of JICA

Name	Present Working Place	Position	Output1	Output1	Output2	Output 3	Output4	Output5	Output5	Output6
			Weather Observation	Briefing	Radar Calibration	Data Quality Control	NWP	Web	Weather Information Dissemination	Radar O&M
Ms. Mahnaz Khan	International Meteorology, BMD HQ, Dhaka.	Assistant Director							○	
Ms. Ayesha Khatoon	Storm Warning Centre, Dhaka.	Assistant Director		○					○	
Mr. Shamsuddin Ahamed	Storm Warning Centre, Dhaka.	Assistant Director				○	○			
Mr. S.M. Mahmudul Huq	Storm Warning Centre, Dhaka.	Meteorologist		○					○	
Mr. Syed Abul Hasanat	Storm Warning Centre, Dhaka.	Meteorologist		○						
Mr. Md. Sanaul Haque Mondal	Storm Warning Centre, Dhaka.	Meteorologist		○						
Mr. Md. Shadekul Alam	Storm Warning Centre, Dhaka.	Meteorologist		○	○	○	○			
Ms. Taslima Imam	Training Institute, BMD HQ, Dhaka	Meteorologist		○					○	
Ms. Farah Deeba	Storm Warning Centre, Dhaka.	Meteorologist		○		○				
Mr. Sheikh Shajahan Alam	Chittagong Air Port, Chittagong.	Meteorologist		○						
Mr. Md. Shameem Hassan Bhuiyan	Agromet Division, BMD HQ, Dhaka	Meteorologist					○		○	
Mr. Md. Abdul Mannan	Storm Warning Centre, Dhaka.	Meteorologist		○		○	○		○	
Mr. S.M. Quamrul Hassan	Storm Warning Centre, Dhaka.	Meteorologist		○	○	○	○	○		
Mr. Md. Rashaduzzaman	Storm Warning Centre, Dhaka.	Assistant Meteorologist		○			○	○	○	
Mr. Md. Abdur Rahman Khan	Storm Warning Centre, Dhaka.	Assistant Meteorologist		○			○			
Mr. Md. Bazlur Rashid	Storm Warning Centre, Dhaka.	Assistant Meteorologist		○			○			
Mr. Kh. Hafizur Rahman	Chittagong Air Port, Chittagong.	Assistant Meteorologist		○						
Mr. Md. Muzammel Haque Tarafder	National Meteorological Communication Centre.Dhaka	Senior Communication Engineer			○		○			
Mr. Md. Ahmed Arif Rashid	Workshop & Laboratory And E&I BMD HQ, Dhaka	Senior Mechanical Engineer			○		○	○	○	
Mr. Md. Abdul Matin	National Meteorological Communication Centre.Dhaka	Assistant Communication Engineer	○		○		○	○	○	
Mr. Md. Sazzad Hossain	National Meteorological Communication Centre.Dhaka	Assistant Communication Engineer	○				○		○	
Mr. Murad Ahmed	Communication Division, BMD HQ, Dhaka	Assistant Communication Engineer	○				○			
Mr. Abu Shazzad Chowdhury	Seismic Observatory, Dhaka	Assistant Mechanical Engineer	○							
Ms. Halima Khanam	Electronic & Instrument Division, BMD HQ, Dhaka	Assistant Electronic Engineer	○						○	
Mr. Md. Saiful Hossain	Flood Forecasting and Warning Centre, Dhaka	Executive Engineer		○						
Mr. Md. Abul Bashar	Flood Forecasting and Warning Centre, Dhaka	Assistant Engineer			○		○			
Mr. Md. Ariful Islam Bhuiyan	Flood Forecasting and Warning Centre, Dhaka	Assistant Engineer			○		○			
Dhaka Radar										○
Mr. Munsi Mahmudul Hasan	Dhaka	Electronic Assistant								○
Mr. S.M.A Mamun	Dhaka	Electronic Assistant								○
Ms. Anisa Siddiqua	Dhaka	Electronic Assistant								○
Ms. Nurunnahar Lovely	Dhaka	Electronic Assistant								○
Mr. Md. Hanif Sheikh	Dhaka	Electronic Assistant								○
Mr. Abdul Khaleque	Dhaka	Electronic Assistant								○
Mr. Jasim Uddin	Dhaka	Electronic Assistant								○
Mr. Md. Hafizur Rahman	Dhaka	Mechanic Grade–II								○
Mr. Md. Kamrul Hasan	Dhaka									

Name	Present Working Place	Position	Output1 Weather Observation	Output1 Briefing	Output2 Radar Calibration	Output 3 Data Quality Control	Output4 NWP	Output5 Web	Output5 Weather Information Dissemination	Output6 Radar O&M
Cox,s Bazar Radar										
Mr. Abul Hashem	Cox's Bazar	Assistant Electronic Engineer								O
Mr. Md. Mominur Rahman	Cox's Bazar	Assistant Electronic Engineer								O
Mr. Md. Al Imran	Cox's Bazar	Electronic Assistant								O
Mr. Md. Aslam Hafiz	Cox's Bazar	Electronic Assistant								O
Mr. Md. Abu Taher	Cox's Bazar	Radio Mechanic								O
Mr. Md. Rafiqul Islam	Cox's Bazar	Mechanic Grade–II								O
Mr. Md. Abdul Mabud	Cox's Bazar	Mechanic Grade–II								O
Mr. Jahangir Alam	Cox's Bazar	Mechanic Grade–II								O
Mr. Md. Nazmul Haider	Cox's Bazar	Mechanic Grade–II								O
Mr. Md. Nur Alam	Cox's Bazar	Mechanic Grade–II								O
Rangpur Radar										
Mr. Mohammed Ali	Rangpur	Electronic Assistant								O
Mr. Md. Abdus Sobhan	Rangpur	Electronic Assistant								O
Mr. A.K.M Fazlur Rahman	Rangpur	Electronic Assistant								O
Mr. Nur Mohammed	Rangpur	Electronic Assistant								O
Mr. Md. Younus Ali	Rangpur	Mechanic Grade–I								O
Mr. Md. Mosaharul Islam	Rangpur	Mechanic Grade–II								O
Mr. Md. Mahafuzul Islam	Rangpur	Mechanic Grade–II								O
Khepupara Radar										
Mr. Pradip Kumar Chakraborty	Khepupara, Patuakhali	Assistant Electronic Engineer								O
Mr. Md. Nazrul Islam	Khepupara, Patuakhali	Electronic Assistant								O
Mr. Md. Nurun Nabi Paiker	Khepupara, Patuakhali	Electronic Assistant								O
Mr. Md. Sayed Hassan	Khepupara, Patuakhali	Electronic Assistant								O
Mr. Md. Habibur Rahman Bhuiyan	Khepupara, Patuakhali	Mechanic Grade–I								O
Mr. Md.Rafiqul Islam	Khepupara, Patuakhali	Mechanic Grade–II								O
Mr. Md. Zahangir Alam	Khepupara, Patuakhali	Mechanic Grade–II								O
Moulavibazar Radar Station										
Mr. Mohammad Mustafa	Moulavibazar	Assistant Communication Engineer								O
Mr. Md. Abdul Hannan	Moulavibazar	Electronic Assistant								O
Mr. Pradyut Mazumder	Moulavibazar	Wireless Supervisor								O
Mr. Md.Mamun Serajul Mazid	Moulavibazar	Wireless Supervisor								O
Mr. Md. Abdullah Al Mamun	Moulavibazar	Wireless Operator								O
Mr. Md. Yusuf	Moulavibazar	Mechanic Grade–II								O
Mr. Md. Mohsin	Moulavibazar	Mechanic Grade–II								O

Annex 13. Standing Orders on Disaster 2010

16.1 Meteorological Department

In addition to normal duties, the Meteorological Department will perform the following duties:

Normal Times

(a) Keep ever careful watch over weather conditions, and ensure improvement of cyclone forecast procedures and supply of information on regular basis.

(b) Ensure full time effectiveness of the quickest channel of communication for disseminating weather warnings to all concerned. Fax arrangement must be established between SWC of Meteorological Department and Radio, Television and the Ministry of Disaster Management and Relief.

Alert Stage

(a) Issue as soon as possible the alert warning signals of cyclone, at least 36 hours ahead of formation of depression in the Bay of Bengal.

(b) Supply information through Fax/telephone/teleprinter to Cyclone Preparedness Programme (CPP) about the formation of depression in Bay of Bengal so as to allow CPP to take appropriate actions including dissemination of information to all concerned.

(c) Issue warning signals code 'Whirlwind' as per Annexure-A to all concerned officials through telephone, teleprinter, telegram etc., fax, (email)

(d) Prepare and submit Special Weather Bulletin and broadcast/publicise the same through national news media such as the all stations of Radio and Television and in national newspapers for the benefit of the general people. In case of Local Cautionary Signal no. 3, arrange for adequate and full time coordination between SWC of the Meteorological Department, Bangladesh Betar, Bangladesh Television for publicity beyond normal broadcasting hours.

(e) Send Special Weather Bulletins to EOC at the Ministry of Disaster Management and Relief, the Directorate of Relief and Rehabilitation, the Cyclone Preparedness Programme and Bangladesh Red Crescent Society for undertaking adequate arrangements.

Warning Stage

Publicise warning signals at each of the following specified stages.

(a)	Warning	24 hours before
(b)	Danger	At least 18 hours before
(c)	Great Danger	At least 10 hours before

The same warning signals are to be repeated to the EOC at the Ministry of Disaster Management and Relief, Control Room of the Disaster Management Bureau, the Directorate of Relief and Rehabilitation, the Cyclone Preparedness Programme and the Bangladesh Red Crescent Society.

The following information should be mentioned in the signals to be disseminated.

1. (a)Position of the storm centre

(b) Velocity and direction of the storm

(c) Mention of the thanas of the districts likely to be affected, if possible.

(d) Appropriate time of commencement of gale wind at different places (Velocity above 32 miles/hour or 51.84 km/hour).

In case of danger signals messages are to be sent to the addresses under code name "Hurricane" as per Annexure-A through Fax/telephone/teleprinter or telegraph. In case of great danger signals messages should be sent to the addresses under code name "Typhoon" as per Annexure-A through Fax/telephone/teleprinter or telegraph. For the purpose of Inland Water Transportation, appropriate separate messages should be sent to addresses mentioned therein through Fax/telephone/teleprinter or telegraph under code name "Water ways and Authority" mentioned in Annexure-A.

Alert/Warning signals should be sent to the concerned authorities for publicity through all centres of Bangladesh Betar and Bangladesh Television.

Rehabilitation Stage

Work in collaboration with the Disaster Management Bureau to perform the following tasks.

(a) Compare the severity of cyclone with that of warning signal.

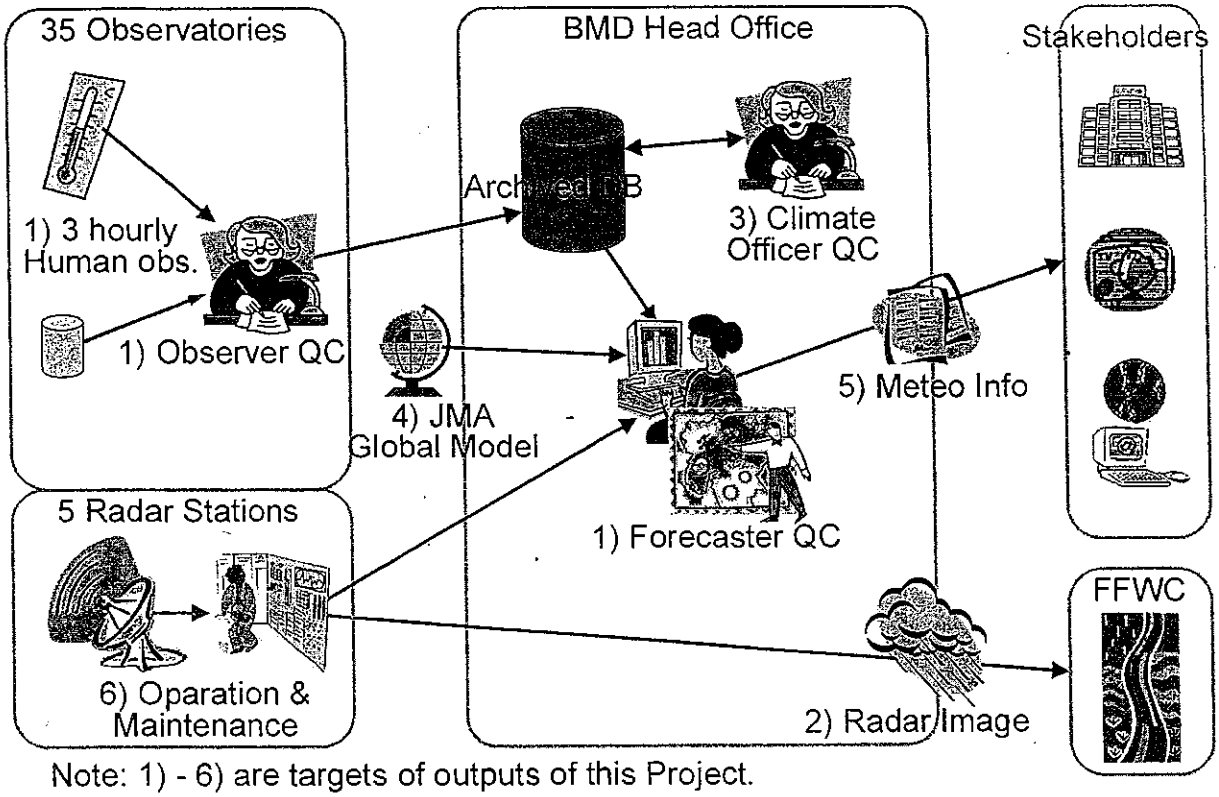
(b) Collect data from affected areas for research purpose

(c) Obtain opinion of the people about the signals issued.

Relationship between each output and contribution to Project Purpose (1)

Annex 14

The following diagram shows the status BEFORE the Project started.

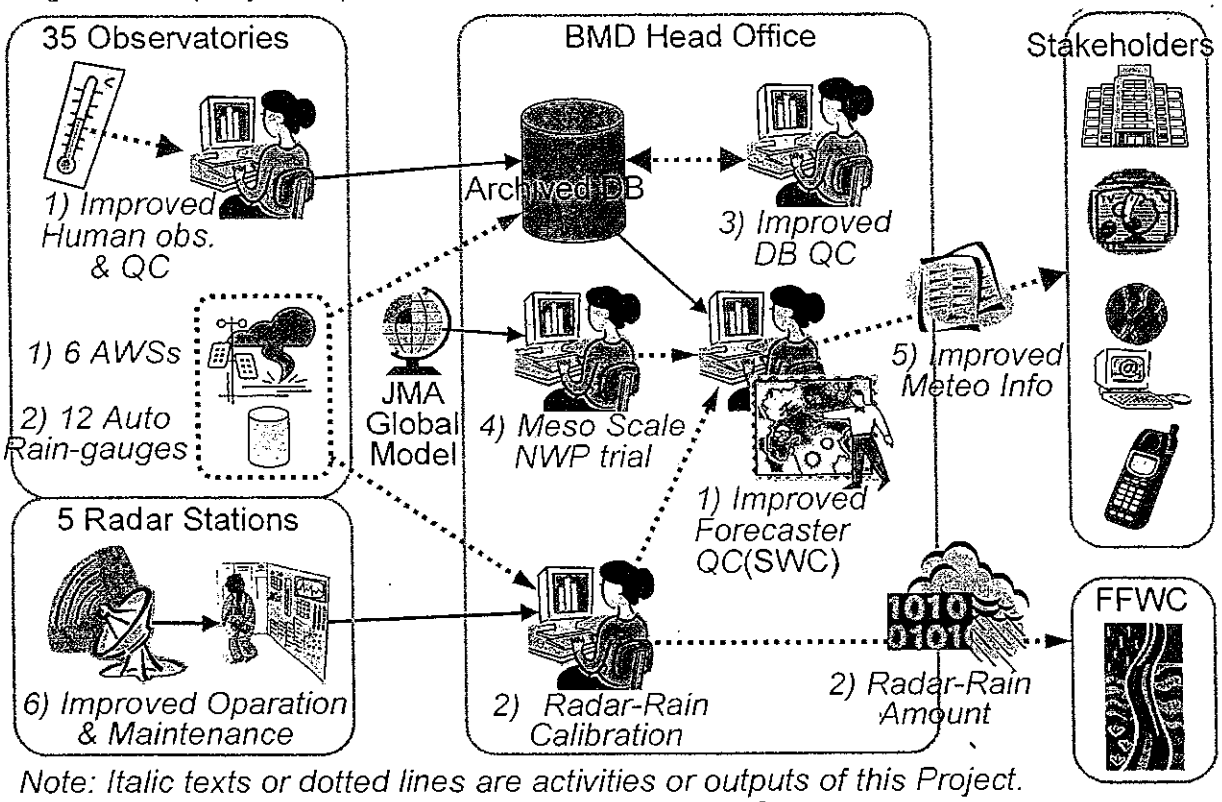


Note: 1) - 6) are targets of outputs of this Project.

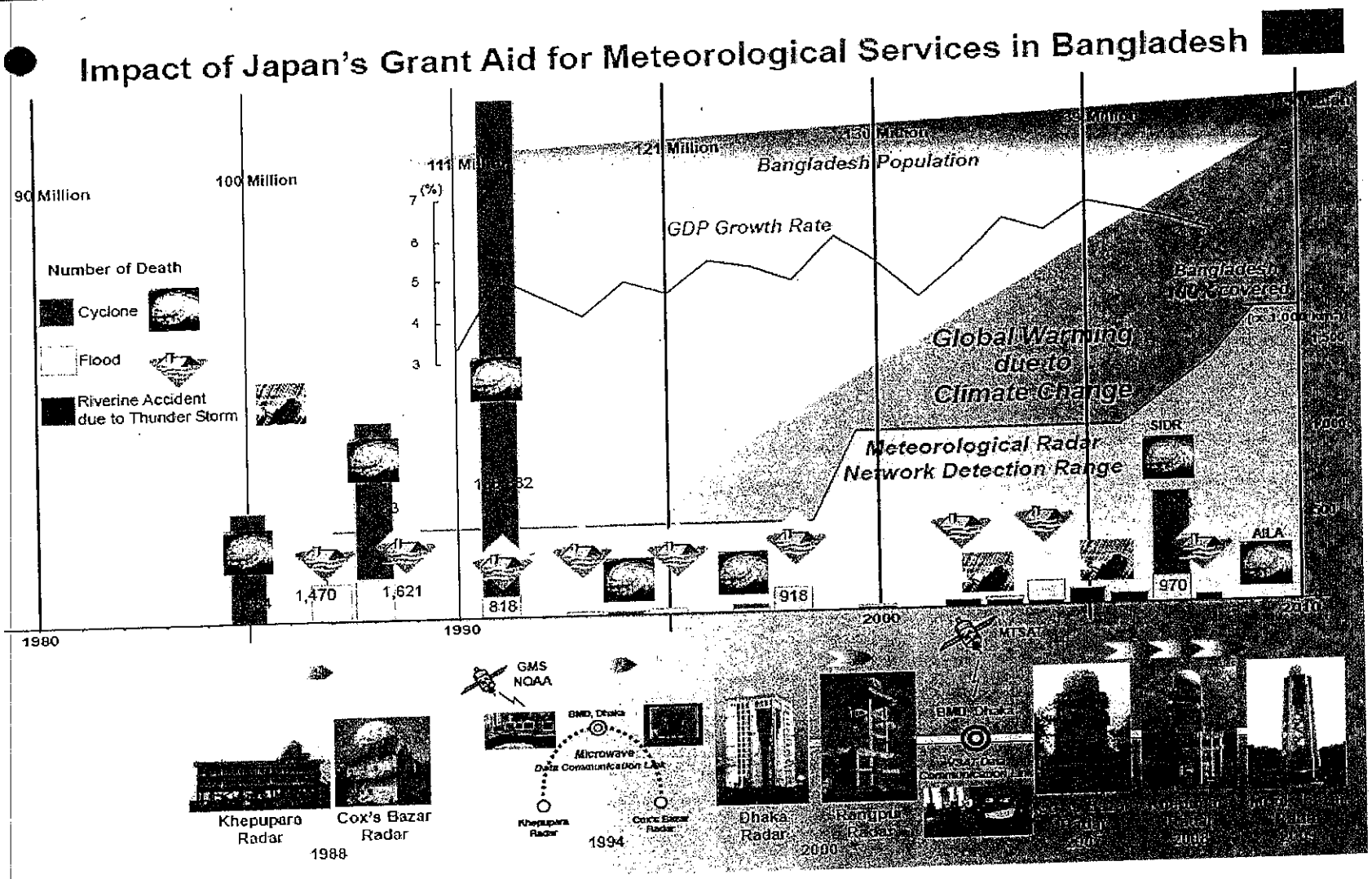
Relationship between each output and contribution to Project Purpose (2)

Annex 14

Project Purpose: Weather Info for natural disaster management is strengthened in terms of time and quality through human capacity development and dissemination of weather info among stakeholders (PDM2)

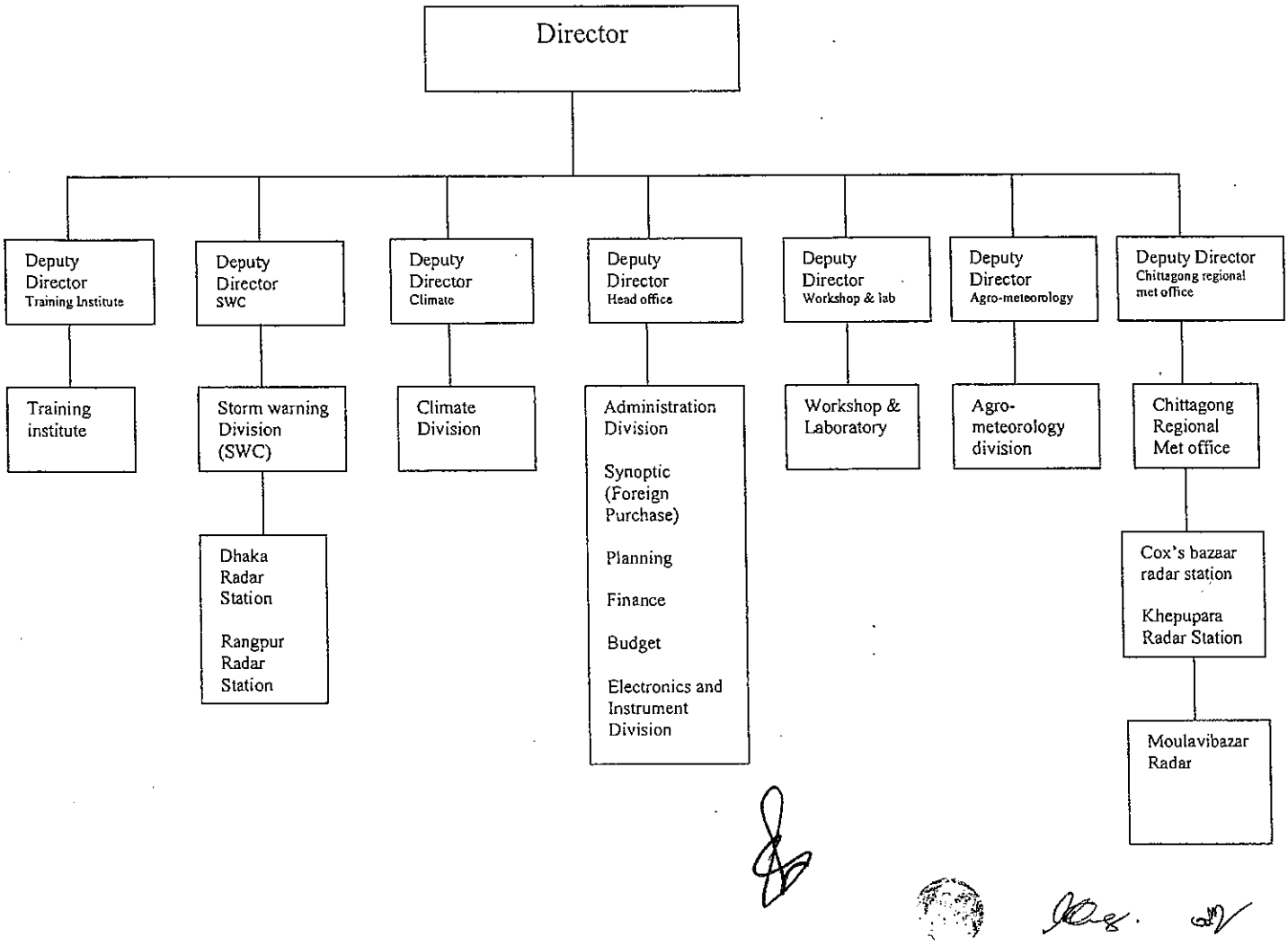


Note: Italic texts or dotted lines are activities or outputs of this Project.



Prepared by the Project Team

Annex 16. Organization Chart of BMD



Title: Development of Human Capacity on operation of weather Analysis and Forecasting

Annex 17. PDM 3 adopted Feb 2011

Version 3 Date: February 15, 2011

Area: Operation area of BMD

Target Group: BMD officials, Duration: October, 2009 - December, 2012

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
l/Goal l disaster losses are reduced by the utilization of highly precise weather ation.	Cases which prove that the utilization of BMD's weather information by organizations related to natural disaster management contributed to the natural disaster losses.	1. Interviews with SWC and the persons in charge in organizations related to natural disaster management 2. Case analysis by experts including the third party experts	
t/Purpose ccurate weather information is timely issued to the "stakeholders (Note 1)" natural disaster management.	1 Data from BMD Radar Systems optimized by radar ZR relation parameter for timely forecasting and warning is provided to FFWC 2 Accurate and easily-understanding forecast and warning including tropical cyclone are timely issued to the organizations related to natural disaster management and mass media.	1-1 Data distrtbution record at BMD 1-2 Data receiving record at FFWC 2-1 Weather forecast and warning prepared by BMD to natural disaster management organizations and mass media such as special weather bulletin 2-2 Interviews with the natural disaster management organizations and mass media	BMD's meteorological data and weather forecast and warning prepared by BMD is utilized by the natural disaster management organizations and mass media.
uts Capacity of BMD for observation and forecasting is improved.	1.1 More than 80% of the hourly data such as surface temperature, humidity, wind direction, wind speed and precipitation are acquired at the six meteorological observatories with the AWSs. 1.2 Surface observations are conducted in each observatory by using the existing equipment in accordance with the observation guidelines which is developed by this Project. 1.3 Among the observers who attend the data quality control training, more than 70% of the participants understand the contents of the training. 1.4 Quality control is continuously conducted. 1.5 Briefing for understanding and sharing the meteorological situations is conducted at SWC at least once a day.	1.1 Database in BMD head office 1.2 Direct observation by experts including the third party experts 1.3 Achievement test 1.4 Observation records 1.5 Briefing records	State policy of weather services in the Government of Bangladesh remains unchanged. Trained BMD staff remain on the duty. Data transfer system between BMD and FFWC functions properly.
Analysis of quantitative rainfall estimation by using the Radar data is implemented	2.1 Correlation of radar rainfall data observed by the optimized radar ZR relation parameter for rainfall calculation and surface observation is corroborated 2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems optimized ZR relation parameter for radar rainfall calculation is composed	2.1 Correlation chart of rainfall data of radar and surface observations 2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems	
The trend analysis of climate change is conducted by using the accumulated meteorological data.	3.1 More than two (2) BMD staff can detect abnormal values and human error of the accumulated meteorological data through the computer program. 3.2 Summary of climate statistical analysis is shared in the public.	3.1 Analysis result of the data quality control program 3.2 BMD's website	
Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.	4.1 More than five (5) staff of BMD can develop products and guidance by the Numerical Weather Prediction (NWP) model.	4.1 Report of the project Outputs of the NWP	
Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.	5.1 BMD staff's planning and presentation skills for disseminating meteorological information is improved. 5.2 70% of the participants in the seminars/open-class (more than 6 times) understand the contents. 5.3 Meteorological information on the BMD's website is user-friendly and updated.	5.1 PR materials Weather forecast (such as TV)/ daily and speacial weather bulletin 5.2 Questionnaires to the participants of seminar/open-class 5.3 BMD's website	
The meteorological Radar systems are operated and maintained properly and efficiently.	6.1 More than fifteen (15) BMD staff for the five Radar systems can implement regular maintenance and trouble shooting (except serious troubles which require assistance from HQ or manufacturer) for the meteorological radar systems. 6.2 More than 80% of the BMD's staff in each existing meteorological radar station can operate and maintain the radar system in accordance with the operation/maintenance manual which is developed by this Project. 6.3 Meteorological radar observation schedule is maintained based on the requirement of SWC. 6.4 Operation cost for the meteorological radar system in normal season (Note 2) is saved.	6.1 Record sheet of regular check and trouble shooting Interview with the superintendents of each radar system 6.2 Direct observation by experts including the third party experts 6.3 Project report 6.4 Operation cost for meteorological radar system in normal season (before and after the implementation of the radar observation routine schedule)	

Activities	Inputs: Japanese Side	Inputs: Bangladeshi Side	Pre-conditions
To install the six (6) AWSs and twelve (12) rain gauges at the eighteen existing meteorological observatories. To revise the field observation guidelines (including AWS) in accordance with the latest WMO policy. To provide the observation training for field observers based on the field observation guidelines and the data entry format (developed by Activity 3-1). To conduct training on the data quality of observed data for forecasters To prepare the operation and maintenance manuals for observation fields and instruments (including AWS). To provide the training for field observers and instruments inspectors on maintenance and control of observation fields and observation instruments (including AWS). To compare the data obtained by the AWS and existing equipment and conduct quality control To prepare the briefing flowchart and record, and conduct briefing along with the flow chart. To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation To identify the radar ZR relation parameter for rainfall calculation in the observation range of 5 existing meteorological radar systems and optimize the parameter To prepare correlation charts of rainfall data of radar and surface observations To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC To develop daily observation data input sheet for easy statistical processing and data quality control of observation data To archive the observation data and conduct quality control To conduct climate data statistical analysis by using the above data To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP) To conduct the basic training on Numerical Weather Prediction (NWP) To conduct the training on Numerical Weather Prediction (NWP) guidance To operate the Meso Scale Model (MSM) by using PC (Linux) on trial base To prepare PR materials of weather, climate and natural disaster To conduct the seminars/open-class for the stakeholders To upload and update meteorological information including summarized result of climate data statistical analysis on the BMD website To disseminate meteorological information through media (Note 3). To prepare the operation and maintenance manuals for meteorological radar system To conduct the training on operation and maintenance of the meteorological radar systems To prepare the meteorological radar observation routine schedule in order to reduce the operation cost and implement it	1 Dispatch of experts - Weather Forecasting & Warning Service and Organization Management - Weather Observation - Weather Service Infrastructure - Meteorological radar calibration - Data quality control and Statistical analysis - Web site Design - Numerical Weather Prediction - Weather Information Dissemination - Meteorological radar operation and Maintenance 2 Equipment supply 3 Provision of training in Japan	1 Provision of project office for the project experts in BMD head office 2 Allocation of the required counterpart personnel 3 Provision of training spaces 4 Provision of installation spaces for the equipment to be procured under the project 5 Security of the equipment for the project 6 Operation and maintenance expenses of the equipment for the project 7 Tax exemption , custom clearance and other procedures required for importing the equipment for the project	To be able to obtain cooperation of organizations related to natural disaster management. Electricity is provided stably. Fuel unit cost does not drastically increase. Data transfer system (internet, phone, SSB, etc) works properly.

: The "stakeholders" includes the followings: DMB, FFWC, mass media, related disaster management organizations and residents in the disaster-prone areas (cyclones, tornados, thunderstorms, flood, drought, etc).

: "Normal Season" is defined as the time which does not require 24 hour operation of the Radar Systems.

TV, radio, mobile phone, on-demand services such as push-pull service, etc.

MINUTES OF MEETING BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY AND
AUTHORITIES CONCERNED OF THE PEOPLE'S REPUBLIC OF BANGLADESH
AND BANGLADEDH METEOROLOGICAL DEPARTMENT
ON
THE PROJECT FOR DEVELOPMENT OF HUMAN CAPACITY
ON OPERATION OF WEATHER ANALYSIS AND FORECASTING

The Japanese Terminal Evaluation Team, organized by the Japan International Cooperation Agency and headed by Mr. Hiroyuki Tomita, stayed in the People's Republic of Bangladesh (hereinafter referred to as "Bangladesh") from August 1 to 13 and September 15 to 24, 2012 for the purpose of conducting the Joint Terminal Evaluation on the Project for Development of Human Capacity on Operation of Weather Analysis and Forecasting.

The Bangladesh Evaluation Team, which consists of members from the Economic Relations Division, Ministry of Defense and Bangladesh Meteorological Department, was also assigned for the purpose of conducting the evaluation.

After intensive study and discussion on the achievement of the project and its activities by both teams, all parties agreed upon the Joint Terminal Evaluation Report attached hereto.

Dhaka, September 24 , 2012

Mr. Hiroyuki Tomita
Leader
Japanese Terminal Evaluation Team
Japan International Cooperation Agency
Japan

Mr. Mahbubur Rahman
Deputy Secretary
Economic Relations Division
Ministry of Finance
The People's Republic of Bangladesh

Ms. Arjumand Habib
Director
Bangladesh Meteorological Department
The People's Republic of Bangladesh

Mr. Shamimuzzaman
Senior Assistant Chief
Ministry of Defense
The People's Republic of Bangladesh

Attachment: Joint Terminal Evaluation Report

JOINT TERMINAL EVALUATION REPORT
ON
THE PROJECT
FOR
DEVELOPMENT OF HUMAN CAPACITY ON OPERATION OF WEATHER ANALYSIS AND FORECASTING
IN
THE PEOPLE'S REPUBLIC OF BANGLADESH

September 2012

Bangladesh – Japan
Joint Terminal Evaluation Team

Table of Contents

1. Introduction 1
   1-1 Background 1
   1-2 Objectives of the Evaluation 1
   1-3 Methodology of the Evaluation 1
   1-4 Members of the Joint Evaluation Team 2
   1-5 Schedules of the Evaluation 3
2. Outline of this Project 4
   2-1 Objectives of the Project 4
   2-2 Outputs of the Project 4
   2-3 Duration of the Project 4
3. Achievements of the Project 5
   3.I Inputs 5
   3.2 Activities 5
   3-3 Outputs 6
   3-4 Project Purpose 10
   3-5 Overall Goal 10
   3-6 Implementation Process 11
4. Evaluation Based on Five Criteria 11
   4-1 Relevance 11
   4-2 Effectiveness 12
   4-3 Efficiency 13
   4-4 Impact 14
   4-5 Sustainability 14
5. Conclusions 15
6. Recommendations 15
7. Lessons learnt 16

Annex 1	Evaluation Schedule
Annex 2	Project Design Matrix (PDM) ver.03
Annex 3	List of JICA Experts
Annex 4	List of Participants in Counterpart Training in Japan
Annex 5	List of Equipment Provided
Annex 6	List of Counterpart Personnel
Annex 7	Progresses of Activities (as of August 2012)
Annex 8	Revised PDM

16.

ABBREVIATIONS

AWS	Automatic Weather Observation System
BMD	Bangladesh Meteorological Department
CDVAT	Custom Duty and Value Added Tax
C/P	Counterpart Personnel
JCC	Joint Coordination Committee
DAC	Development Assistance Committee
DMB	Disaster Management Bureau
FFWC	Flood Forecasting and Warning Centre
ERD	Economic Relations Division, Ministry of Finance
JICA	Japan International Cooperation Agency
M/M	Minutes of Meetings
MoD	Ministry of Defense
NWP	Numerical Weather Prediction
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PDM	Project Design Matrix
PO	Plan of Operation
R/D	Record of Discussions
SWC	Storm Warning Centre
TPP	Technical Assistance Project Proposal

1. INTRODUCTION

1-1 Background

The People's Republic of Bangladesh (hereinafter to as "Bangladesh") is located on the delta of major rivers like the Ganges, the Brahmaputra and the Meghna with 20% of its landmass being flooded annually. During March to November, it is constantly affected by tropical cyclones, storm surges, local severe storms etc. and these common scenarios of Bangladesh requires the efficient role of Meteorological Services to save the lives and livelihood for the vulnerable people.

Since 1988, Japan has the long history of cooperation for improving the meteorological services in Bangladesh. Japan's grant aid projects have contributed to establish infrastructure for data communication and weather observation including 5 radar stations covering the whole territory of Bangladesh. These infrastructures however have not contributed enough to weather forecasting and analysis since data calibration of the radar data and actual rainfall amount is yet to be conducted. In addition, new technology of weather analysis such as Numerical Weather Prediction is being required for accurate preparation of weather information products and warnings by Bangladesh Meteorological Department (herein after referred to as "BMD").

Based on the requirement of Technical Cooperation for BMD, Japan International Cooperation Agency (hereinafter referred to as "JICA") has collaborated with BMD in implementing the Project for Development of Human Capacity on Operation of Weather Analysis and Forecasting ("hereinafter referred to as "the Project") for Bangladesh. The Project was launched in September 2009, and will be completed in December 2012.

From 1st to 13th August 2012 and 15th to 24th September 2012, Joint Terminal Evaluation was conducted to 1) review the progress of the Project and evaluate the achievement from the viewpoints of the five evaluation criteria, 2) analyse the factors to promote/impede the effects, 3) suggest necessary actions to be taken and make recommendation for the Project. The entire process was a joint undertaking by the both sides, with full cooperation from BMD and other relevant organizations. After intensive study and discussion, both Bangladesh and Japanese sides agreed on the Minutes of Meeting (M/M), which includes "Recommendation" with the revision of PDM.

1-2 Objectives of the Evaluation

1) To verify the level of achievements and performance of the Project based on the Record of Discussions (R/D), Plan of Operations (P/O), and Project Design Matrix (PDM),
2) To evaluate the Project in terms of the five evaluation criteria,
3) To draw useful recommendations to the Project and lessons learned from the Project, and
4) To judge propriety of the Project termination and necessity of follow-ups including extended period of cooperation.

1-3 Methodology of the Evaluation

The evaluation was conducted by the Joint Evaluation Team consisting of Bangladesh and

Japanese members. The members of Bangladesh were nominated by the Economic Relations Division, Ministry of Finance (hereinafter referred to as "ERD"), Ministry of Defence (hereinafter referred to as "MoD") and BMD, and the members of Japan were nominated by JICA. The evaluation was conducted based on the "New JICA Guidelines for Project Evaluation: First Edition of June 2010". The evaluation activities included documents analysis, field survey and interviews to the persons concerned.

The Team reviewed and evaluated activities and achievement of the Project, based on the five evaluation criteria recommended by the DAC (Development Assistance Committee) of OECD (Organization for Economic Cooperation Development). The five criteria are as follows;

(1) Relevance
Relevance is a criterion to evaluate the validity of the Project Purpose and Overall Goal in line with development policies of countries concerned and the needs of beneficiaries.
(2) Effectiveness
Effectiveness is a criterion to evaluate how far the Project Purpose is achieved, and examine if the achievement is brought about by the project, not by the external factors.
(3) Efficiency
Efficiency is a criterion to evaluate the productivity of the project, or to examine if the Inputs of the project have been efficiently converted into the Outputs.
(4) Impact
Impact refers to direct and indirect, positive and negative impact caused by implementing the Project, including the extent to which the Overall Goal has been attained.
(5) Sustainability
Sustainability refers to the extent to which the Bangladesh side can further develop the Project, and the benefits generated by the Project can be sustained under Bangladesh policies, technologies, systems and financial state of the Bangladesh side.

1-4 Members of the Joint Evaluation Team

(1) Bangladesh Evaluation Team

	Name	Position/ Organization
1	Mr. Mahbur Rahman	Deputy Secretary, ERD
2	Mr. Shamimuzzaman	Senior Assistant Chief, MoD
3	Mr. Arif Rashid	Senior Mechanical Engineer, BMD

(2) Japanese Evaluation Team

	Name	Field	Position/ Organization
1	Mr. Hiroyuki TOMITA	Leader	Senior Representative, JICA Bangladesh Office
2	Mr. Yoshitomo KOJO	Technical	Senior Coordinator for International

		Evaluation	Telecommunication, Forecast Department, Japan Meteorological Agency
3	Mr. Naoki MATSUMURA	Cooperation Planning 1	Project Formulation Adviser, JICA Bangladesh Office
4	Mr. Md. Anisuzzaman	Cooperation Planning 2	Senior Program Officer, JICA Bangladesh Office
5	Mr. Izumi SAKAYA	Evaluation Analysis	Senior Consultant, Prastha, Ltd.

1-5 Schedules of the Evaluation

The Terminal Evaluation was conducted from the 1st to the 13th August 2012, and the 15th to 24th September 2012. The schedule is attached as Annex 1.

2. Outline of the Project

2-1 Objectives of the Project

(1) Overall Goal

Natural disaster losses are reduced by the utilization of highly precise weather information.

(2) Project Purpose

More accurate weather information is timely issued to the "stakeholders (Note 1)" of the natural disaster management.

*(Note1) The "stakeholders" includes the followings: DMB, FFWC, mass media, related disaster management organizations and residents in the disaster-prone areas (cyclones, tornados, thunderstorms, flood, drought, etc).

2-2 Outputs of the Project

(1) Capacity of BMD for observation and forecasting is improved.

(2) Analysis of quantitative rainfall estimation by using the Radar data is implemented.

(3) The trend analysis of climate change is conducted by using the accumulated meteorological data.

(4) Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.

(5) Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.

(6) The meteorological Radar systems are operated and maintained properly and efficiently.

(For the detail, refer to PDM ver.3 in Annex 2.)

2-3 Duration of the Project

September, 2009 - December, 2012

3. Achievements of the Project

3-1. Inputs

Inputs from both the Japanese and Bangladesh sides, since its inception in September 2009 till September 2012, have been executed mostly as planned, except for equipment of the Japanese side.

3-1-1 Japanese Side

(1) Experts

A total of 12 JICA experts have been assigned since the inception of the Project with a total man months of 75 (including assignments planned from September to December 2012), as listed in Annex 3.

(2) Counterpart Training

A total of 6 Bangladesh C/P were sent to Japan in 2012 as listed in Annex 4

(3) Equipment

Machinery and equipment were provided for the Project activities, as listed in Annex 5. All of them are properly utilized. Installation of some equipment was delayed as mentioned in 3-3.

3-1-2 Bangladesh Side

(1) Counterpart Personnel (C/P) and Steering Committee members

A total of 27 staff members of BMD, including three (3) FFWC officials have been assigned as the counterpart personnel of the Project by the Bangladesh side as listed in Annex 6. In addition, around 40 BMD officials of 5 (five) radar stations participated in the Project.

(2) Offices and facilities

The office space and other facilities for the Project staff have been provided.

(3) Operational expenses

BMD provided logistical support and supplementary budget for the seminars and open-classes. The amount of the Technical Assistance Project Proposal (TPP) approved by the Government of Bangladesh and actual expenditure were shown in the table below.

Table Expenses by BMD (Unit: Taka in 100 thousand)

Financial Year	Budget	Actual.Expenditure
Yr-1 (2009-2010)	-	-
Yr-2 (2010-2011)	88.50	27.62
Yr-3 (2011-2012)	116.50	102.51
Yr-4 (2012-2013)	26.00	-
Total	231.00	130.13

Source: BMD

3-2. Activities

Many of the activities of the Project, as stated in Plan of Operation (PO) and PDM[1] have been conducted without major delays compared with the planned schedule. However, the delay of

[1] PO and PDM were modified at the Mid-term Review of the Project.

procurement of the AWSs and rain gauges mentioned above caused the delay in some activities for the Output 1 and the Output 2. See Annex 7 for summary of the progress of activities.

3-3. Outputs

The Team confirmed that the Project has so far fulfilled the following outputs along with the plan stated in PDM. The degrees of fulfilment are shown under each output.

Output 1: Capacity of BMD for observation and forecasting is improved.

Indicators
1-1 More than 80% of the hourly data such as surface temperature, humidity, wind direction, wind speed and precipitation are acquired at the six meteorological observatories with the AWSs.
1-2 Surface observations are conducted in each observatory by using the existing equipment in accordance with the observation guidelines which is developed by this Project.
1-3 Among the observers who attend the data quality control training, more than 70% of the participants understand the contents of the training.
1-4 Quality control is continuously conducted.
1-5 Briefing for understanding and sharing the meteorological situations is conducted at SWC at least once a day.

Indicator 1-1

The automatic weather observation systems (AWSs) have been installed at five (5) meteorological observatories; Dhaka, Sylhet, Barisal, Khulna and Chittagong, and started operation in July 2012 with more than one year's delay from the initial schedule[2]. The installation of an AWS in Rajshahi, another observatory, will be finished soon[3]. Hourly data have been acquired and accumulated since the operation of AWSs started at the 5 observatories, but still needs verification as data accumulation is not sufficient because of delay in inception of the operation.

Indicator 1-2

The Project has developed a field observation guideline and a maintenance manual of observation instruments and distributed them to main observatories at the end of 2011. They will be distributed to all 35 observatories after receiving the official approval from BMD.

Indicator 1-3

Although the training for the data quality control has been conducted on the OJT basis, the training has not been practical enough because data accumulation of AWSs is not sufficient. According to the JICA experts, most of trainees well understood the training so far. Further training, including training for comparison of data observed with the existing instruments and newly observed data of AWSs, is scheduled by the JICA experts in the remaining Project period.

Indicator 1-4

Because accumulation of data observed with AWSs is not sufficient, the comparison between the data observed by the existing instruments and the data from AWSs is yet to be practiced

[2] Due to delay of both procurement of AWSs and payment of CDVAT.
[3] The installation at Rajshahi is not in time due to boundary wall construction work.

properly. Further training is scheduled in the remaining Project period.

Indicators 1-5

Currently, briefing of meteorological situations is being conducted every day at 2PM at the briefing room of BMD.

Out of total Output 1 has been partially fulfilled as activities for data quality control delayed due to delay in installation of AWSs. It appears that full achievement of the Output 1 will be difficult by the end of the Project in December 2012.

Output 2: Analysis of quantitative rainfall estimation by using the Radar data is implemented.

Indicators
2-1 Correlation of radar rainfall data observed by the optimized radar ZR relation parameter for rainfall calculation and surface observation is corroborated.
2-2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems optimized ZR relation parameter for radar rainfall calculation is composed,

Indicator 2-1

The rain gauges have been installed at 12 observatories in 2011; Bogra, Mymensingh, Tangail, Sreemongal, Joydebpur, Chandpur, Maijdi Court, Mongla, Patuakhali, Sitakunda, Teknaf and Dinajpur, and started operation in July 2012[4], with more than one year's delay from the initial schedule. At the time of the terminal evaluation, the rain gauges at Bogra and Teknaf are not working; in Bogra damaged by inundation and in Teknaf due to GSM communication network problem. The training on correlation of optimized radar rainfall data and surface observation was conducted three times in 2010 and 2011 for 17 BMD personnel. However, as the accumulation of rain gauge data is not sufficient because of the delay of rain gauges installation of, proper justification of correlation of the two data is yet to be conducted.

Indicator 2-2

The training on optimization of radar rainfall data was conducted as above. However, because for optimization of rainfall data observed by radar, the sufficient accumulation of data by rain gauges and AWSs is indispensable, composition of binary data is yet to be completed. Another factor to deter this Output 2 is that one of the five radar stations, Rangpur Radar Station which covers the northern part of the country, is at present out of function due to non-availability of spare parts and not expected to start operation soon.

Because of delay in accumulating data by AWSs and rain gauges, the degree of fulfilment of Output 2 is low. It appears that full achievement of the Output 2 will be difficult by the end of the Project in December 2012.

Output 3: The trend analysis of climate change is conducted by using the accumulated meteorological data.

Indicators
3-1 More than two (2) BMD staff can detect abnormal values and human error of the

[4] Due to delay in releasing the equipment from the customs.

accumulated meteorological data through the computer program. 3-2 Summary of climate statistical analysis is shared in the public.

Indicator 3-1

Daily observation data input sheet for easy statistical processing and data quality control of observation data have been prepared by the Project. A number of BDM staff are capable of the detection of abnormal values and human errors.

Indicator 3-2

Meteorological data for the past 30 years was collected and preliminary statistical analysis of climate change was practiced. However, the summary result of the analysis is still to be made public, because further practice is necessary during the remaining period of the Project.

The achievement level is high for the Output 3, and full achievement would be likely at the end of the Project in December 2012.

Output 4: Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.

Indicator
4-1 More than five (5) staff of BMD can develop products and guidance by the Numerical Weather Prediction (NWP) model.

Indicator 4-1

The PC cluster with relevant software necessary for the NWP has been installed in BMD in 2011. Training programs on the NWP were conducted for BMD staff 73 times in 2009, 2010 and 2011. At least 6 officials attended for each training session and they showed good understanding of the contents of the training, according to the JICA expert. Even though further training on development of the guidance is necessary, Output 4 shows proper progress overall.

Output 5: Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.

Indicators
5-1 BMD staff's planning and presentation skills for disseminating meteorological information are improved. 5-2 70% of the participants in the seminars/open-class (more than 8 times) understand the contents. 5-3 Meteorological information on the BMD's website is user-friendly and updated.

Indicator 5-1

Several presentation materials on weather and natural disasters have been developed, including brochures, booklets and an animated cartoon DVD, which are utilized in seminars, open classes and other opportunities to disseminate meteorological information. Various forms of digital /graphical presentation of BMD special bulletin of text basis were prepared, but some of them still need approvals from authorities for actual use. Further activities to disseminate meteorological information are in progress; i) negotiation between BMD and Disaster Management Bureau is under process for the provision of meteorological information through mobile network, and ii) set up of a weather studio in BMD for broadcasting weather information and related weather programs is ongoing but behind the schedule due to delay of procurement procedure.

Indicator 5-2

Seminars for relevant authorities/institutions (central and local government officials, NGOs, schools, media, BMD staff, etc.) were held 5 times and open classes for high school students (class 7-8) were held 21 times with over 3,000 participants in five cities; Tangail, Rangpur, Dhaka, Sylhet and Chittagong as of September 2012. Most of participants well understood the contents in the seminars, and the results of the post examination in the open classes were 80% to 97%.

Indicator 5-3

Contents of BMD's web site have been prepared under the Project. It is expected that the information on the site will be improved and become user-friendly compared to before the Project.

In total indicators for the Output 5 show good progress and achievement even though there are remaining activities to be completed during the Project period.

Output 6: The meteorological Radar systems are operated and maintained properly and efficiently.

Indicators
6-1 More than fifteen (15) BMD staff for the five Radar systems can implement regular maintenance and troubleshooting (except serious troubles which require assistance from HQ or manufacturer) for the meteorological radar systems.
6-2 More than 80% of the BMD's staff in each existing meteorological radar station can operate and maintain the radar system in accordance with the operation/maintenance manual which is developed by this Project.
6-3 Meteorological radar observation schedule is maintained based on the requirement of SWC.
6-4 Operation cost for the meteorological radar system in normal season is saved.

Indicator 6-1

Lectures and OJT were conducted on maintenance of radar system for 54 staff members; 3 in Dhaka, 18 in Cox's Bazar, 6 in Rangpur, 15 in Khepupara, 12 Moulvibazar). JICA experts assessed that most of participant were now capable of regular maintenance and minor trouble shooting.

Indicator 6-2

A reference/summary of the operation and maintenance manual of the radar system provided by the manufacturer, and an operation and management record form have been developed by the Project. Thirty eight (38) BMD officials of 5 radar stations participated in the training mentioned in 6-1.

Indicator 6-3

Operation schedule of radar system in each radar stations is based on the instructions by SWC.

Indicator 6-4

Radar operation schedule in the normal period is decided through discussions in BMD and an operation schedule table has been prepared with monthly target operation time to save operation cost.

It seems that the degree of fulfilment of Output 6 has been relatively high. However, the Evaluation Team found that Cox's Bazaar Radar Station had experienced serious trouble in the radar operation several times and in the most serious case the operation stopped for 15 days

before it was recovered with support from the consultant of the Japan's grant aid project and the manufacturer.

3-4. Project Purpose

Project Purpose: More accurate weather information is timely issued to the "stakeholders" of the natural disaster management.

Indicators
1. Data from BMD Radar Systems optimized by radar ZR relation parameter for timely forecasting and warning is provided to FFWC.
2. Accurate and easily-understanding forecast and warning including tropical cyclone are timely issued to the organizations related to natural disaster management and mass media.

Indicator 1

Data from radar system have not been optimized as surface data from rain gauges and AWSs are not sufficiently accumulated.

Indicator 2

Since the Project started in September 2009, Bangladesh has not experienced a tropical cyclone. Therefore, it is difficult to measure the current status of this indicator. However, the Evaluation Team learned that there was one case where the forecast issued by BMD in April 2012 has helped agricultural sector to reduce the related risk and also at that time BMD issued heavy rainfall warning for the north-eastern part of the country using NWP model[5] and transmitted this information to FFWC for issuance of flash flood warnings. As a result, local farmers in the north-eastern were able to take preventive measures to save their crops. Further, with improved presentation materials and issuance of accurate and timely warnings, as seen in Indicator 5-1, BMD certainly would be improved more.

Indicator 1 is still to see the result and the status of Indicator 2 is not yet known though one favourable case was found. It is judged that the degree of achievement of the Project Purpose is still low and its full achievement by the termination of the Project seems to be difficult mainly due to insufficient data accumulation by AWSs and rain gauges.

3-5. Overall Goal

Overall Goal: Natural disaster losses are reduced by the utilization of highly precise weather information.

Indicator
1. Cases which prove that the utilization of BMD's weather information by organizations related to natural disaster management contributed to the natural disaster losses.

Indicator 1

As seen above in Project Purpose, the Evaluation Team has found one case where BMD's weather information was utilized to mitigate damages on agricultural products by flash flood. Although it is still quite difficult to judge whether losses caused by natural disasters will be reduced in coming years, still it is expected that a lot of scope created through the Project would

[5] BMD provides NWP products on a trial basis.

help BMD for issuance of "highly precise" weather information at regular basis to overcome the present situation of low achievement of the Project Purpose.

3-6. Implementation Process

The Evaluation Team confirmed that implementation of the Project has been conducted smoothly in general, except for the delay of activities under Outputs 1 and 2. However, the Team noted that there are some points which could be improved.

(1) Relation between C/P and JICA Experts

Communications and relations between Bangladesh counterpart personnel (C/P) and JICA experts have been good and frequent, based on the questionnaire survey and interviews with Bangladesh C/P and JICA experts. During the period when experts were away from Bangladesh, both sides contacted each other through e-mail. A few C/P expressed, however, they sometimes experienced difficulty in understanding some experts' English language, though it did not cause serious problems in the activities.

(2) Relation between JICA Expert Team and JICA Bangladesh Office

It seems that JICA Bangladesh Office did not receive sufficient information on the progress of the Project as its contact with the JICA Expert Team was not often enough. One of the reasons may be the fact that under the Project schedule many JICA experts did not stay in Bangladesh for long time, not having enough time to discuss with JICA Office[6].

(3) JCC

The Joint Coordination Committee (JCC) meetings have been convened only three times to date; October 2009, February 2011 and March 2012 due to non-participation of the members, although the Joint mid-Term Review Report recommended that JCC be convened at least twice a year. For the purpose of monitoring overall progress and achievement of the Project, JCC should have been held more frequently.

(4) Delay of procurement of AWSs and rain gauges

As mentioned earlier, delay of the procurement of AWSs and rain gauges caused the Project activities to remain behind the Project schedule in fulfilment of relevant Outputs and Project Purpose. The procurement was conducted after the Bangladesh Government's approval of the TPP. The Japanese side was also responsible in a sense that they decided to start the Project before the approval of the TPP.

4. Evaluation Based on Five Criteria

The evaluation based on five evaluation criteria is presented below.

4-1. Relevance

The relevance of the Project is very high because of the following reasons.

(1) Consistency with the Bangladesh Government Policy

In light of the National Development Plan for Disaster Management (2010-2015), the technical and technological capacity building of BMD and other related organizations have been given

[6] It is scheduled that from September 2012, one Japanese Expert (Coordinator) will stay in Bangladesh for more than three months.

the highest priority to improve the system for information generation and dissemination for public use. Thus, the Project is in consistent with the national policy.

(2) Consistency with Needs of the Country and Beneficiaries
Bangladesh is situated in a heavy rainfall and tropical cyclone prone region in the flood plains of the major rivers like the Ganges, the Brahmaputra and the Meghna with 20% of the landmass being flooded annually. Flood is a perennial problem for Bangladesh causing severe economic setbacks with miseries to livelihood and damage to agriculture. Besides the floods, tropical cyclones, severe thunderstorms, tornadoes, flash floods, droughts & river erosion are all responsible for its perpetual economic retardation. Now as a result of global warming and climate change, this country with its high population density is likely to become more vulnerable to natural disasters and will encounter more intense floods, droughts and more severe and frequent tropical cyclones. During summer and the southwest monsoon season, intense rainfall in and around Bangladesh with its large spatial and temporal variation, with excessive rainfall at times and scanty sometimes are responsible for the flash floods, floods and droughts thereby causing extensive damage to infrastructure and agriculture of Bangladesh. Under the situation indicated above, meteorology is always considered as top priority in Bangladesh. The direct beneficiaries of the Project are Bangladesh C/P, staff of BMD. They are in needs of capacity development in line with above-mentioned policy and to fulfil national needs of providing meteorological services

(3) Consistency with ODA Policy of Japanese Government
The Project is consistent with Japan's ODA policy towards Bangladesh announced in June 2012. In the ODA policy, two focal areas for assistance are specified; 1) acceleration of economic growth beneficial for all the people towards middle-income country status, and 2) overcoming social fragility. Both include forecast and warning of natural disasters which is relevant to the Project.

(4) Advantage of Japan's Cooperation in the Project
Japan has experiences in technical cooperation in meteorology in a number of countries, which indicates the Japan's technical advantages. For Bangladesh, Japan has had cooperation to improve meteorological services since 1988, including grant aid projects of five radar stations. Therefore, the Project fully utilizes Japan's technical advantage, with long history of cooperation with Bangladesh.

4-2. Effectiveness

The Team considers that effectiveness of the Project is fair, based on the current state of the achievement of the Project Purpose.

As mentioned in 3-4, the degree of achievement of the Project Purpose is still low and its full achievement by the termination of the Project in December 2012 seems to be difficult mainly due to insufficient data accumulation by AWSs and rain gauges.

Among six Outputs of the Project, Output 3, Output 4 and Output 5 have made good contributions towards the achievement of the Project Purpose through collection and analyses of the past meteorological data, introduction of NWP techniques and BMD's promotion to

disseminate meteorological information among the stakeholders. Output 6 has also contributed to the achievement of the Project Purpose to some extent, but there is still some concern about maintenance of radar operation. Fulfilment of Output 1 and Output 2 has been slow, hindering the achievement of the Project Purpose, because these Outputs depend on accumulation of data by AWSs and rain gauges, which is not sufficient yet.

Among three Important Assumptions to achieve Project Purpose described in the PDM, "State policy of weather services in the government of Bangladesh remains unchanged" and "Trained BMD staff remains on the duty" are maintained while "Data transfer system between BMD and FFWC functions properly" is not maintained as a PC for this purpose at FFWC is out of order at the moment.

4-3. Efficiency

The degree of efficiency of the Project is assumed to be fair, judging from the performances of inputs and outputs described below.

(1) Appropriateness of Inputs
As mentioned earlier, the delay of the procurement and commencement of operation of AWSs and rain gauges adversely affected the overall efficiency of the Project. Even though most of the equipment are properly utilized for the Project, the delay in accumulating data by AWSs and rain gauges is the single most serious reason for weakening efficiency.

The Project has so far had 13 JICA experts. In general, they have efficiently managed to conduct various activities with strong commitment and responsibility, and appropriately implemented technical transfer to Bangladesh C/P.

Most of C/P are satisfied with performances of JICA experts, though a few C/P complained about some experts' command on English language. Meanwhile, through the Project period, each expert visited Bangladesh on a relatively short term basis, which might have caused rather insufficient communication with JICA Bangladesh Office.

Allocation of the Bangladesh C/P of BMD was mostly appropriate for the activities. Nearly 70 BMD staff, including radar operators of five radar stations have been engaged in the Project activities even though BMD has a limited number of staff. They were capable enough to conduct Project activities. On the other hand, since a relatively large number of staff was involved in the Project, it was seen that not all the C/P considered the Project as their own and only took part in the activities when they were requested to.

All the three (3) subjects of the counterpart training in Japan, which was conducted in February to March 2012, were relevant to the Project and all the six (6) participants in the training utilized the experiences to their duty after coming back to Bangladesh.

(2) Achievement of Outputs
As seen in indicators of Outputs in 3-3, the degree of fulfilment of Project Outputs shows mixed results, depending mainly on how each Output has been affected by the delay of the equipment.

4-4. Impact

As mentioned in 3-5, it is difficult to judge whether the Overall Goal of the Project will be achieved in 3 to 5 years after the completion of the Project. The Team also found that implementation of the Project has some positive impacts as seen below. No negative impacts have been observed.

(1) Improvement of BMD's Credibility

The Team found in interviews with organizations related to disaster management, such as DMB, the Ministry of Defence, BMD and FFWC that during the last few years BMD's information has been improving in terms of its accuracy and timing, even though no quantitative evidences available. Thus, now they have more confidence in BMD as an organization to provide meteorological services.

(2) Expectations to Public Awareness of Natural Disasters

As mentioned in 3-3 Output 5, the Project has held a number of seminars and open classes, which have been proved very successful. With comprehensive and visual presentation, participants of the seminars and open classes improved their understanding of meteorology and natural disasters. By continuing and expanding the activities, school children and the general public will surely acquire more awareness of natural disasters.

4-5. Sustainability

The Team considers that sustainability of the Project will be generally high, although there are some uncertain factors in technical aspects.

(1) Policy Aspect

As stated in 4-1 Relevance, the Government of Bangladesh has considered policy on meteorology with top priority. Therefore, it is highly possible that the Government will continue to consider the dissemination of the meteorological information as an important issue in response to the natural disaster management. Policy sustainability is high.

(2) Institutional and Organizational Aspect

BMD is a sole national organization in the country for disseminating meteorological services, according to the Standing Orders on Disaster. The Ministry of Defence, which has the jurisdiction over BMD, stresses the importance of BMD's function in national security, and denies the possibility that the organization of BMD will be reduced in the future. With highly motivated staff, BMD has sound basis as a government organization to perform its responsibility. However, it is also fact that some observatories are in a shortage of number of staff. BMD submitted to the government more than two years ago the proposal for organizational restructuring and human resource allocation plan. Sustainability in institutional and organizational aspects is judged fairly high.

(3) Financial Aspect

Financial sustainability is high. BMD's annual budget is steadily increasing from 215 million Taka in FY2007/08 (before the Project started) to 477 million Taka in FY 2012/13. Taking account of the GDP deflators of Bangladesh in recent years, 6.3 to 8.8% increase per annum, the growing trend of BMD budget secures financial sustainability of the Project. Ministry of

Defence also assured budget of BMD would be secured even though sharp increases in FY2011/12 and FY2012/13 might not continue every year.

Table Annual Budget of BMD

Financial Year	Budget (Million Taka)	Increase in per cent
2007/08	215.0	
2008/09	234.5	9.1
2009/10	261.0	11.3
2010/11	298.0	14.1
2011/12	377.1	26.5
2012/13	477.3	26.6

Source: BMD

(4) Technical Aspect

There are some uncertain factors in technical sustainability. Through interviews with BMD staff, almost all of them expressed that they had upgraded their skills and knowledge during the Project and had become more confident of their services at BMD. As such, it is recognized that C/P of BMD has improved their capacity. On the other hand, as mentioned earlier, a number of the Project activities have not been finished as data accumulation by AWSs and rain gauges are not yet sufficient. It is questionable that in the remaining Project period all the activities would be completed and C/P acquires enough skills and knowledge so as to continue the activities by themselves. Apart from activities related to data accumulation, it appears that BMD staff needs some more time to utilize the NWP which has been newly introduced to Bangladesh under the Project. As for the equipment, the Team found no serious problems for equipment provided under the Project.

5. Conclusion

The Team has found that the degree of achievement of the Project Purpose is still low because some critical activities are delayed as accumulation of data by the AWSs and rain gauges is not sufficient. It is not likely that the Project Purpose will be achieved at the end of the Project period, December 2012.

From the viewpoint of five evaluation criteria, "relevance" of the Project is very high while both "effectiveness" and "efficiency" are fair. As for "impact", some positive impacts have been observed and no negative impacts have been found. It seems that "sustainability" of the Project will be generally high, but with uncertain factors in technical sustainability still remaining.

Based on the above findings the Team concludes that the Project will be extended in order to raise the degree of the achievement of the Project Purpose.

6. Recommendations

1) Extension of the cooperation period of the Project

The cooperation period of the Project should be extended for one year to December 2013 in order to fully attain the Project Purpose, which would not be possible by the end of the present cooperation period, December 2012. The following Activities should be continuously

conducted during the extended period for the following reasons:

Output 1: 1-1, 1-6 and 1-7
Installation of one AWS at Rajshahi cannot be completed by December 2012 due to the delay of the equipment procurement and the boundary wall construction.
Output 2: 2-1, 2-2, 2-3 and 2-4
The sufficient accumulation of surface data observed by rain gauges and AWSs are indispensable, but composition of binary data is difficult to be completed by December 2012.
Output 5: 5-4
The setup of a TV studio in BMD for weather information will not be completed by December 2012.

The above recommendation will not prevent the BMD staff from carrying out other activities in its routine operations by its own efforts.

2) Revision of PDM
PDM should be revised on the following point in order to secure technical sustainability of the Project. There is no significant change with the overall framework of the PDM even if the following modification is being made. Revised PDM is shown in Annex 8. The following Activity should be added to Output 1 (Capacity of BMD for observation and forecasting is improved) in the PDM:

Activity 1-9: To conduct training on preventive maintenance and calibration of AWS in order to achieve quality improvement in observation.

3) Human resource allocation in BMD
It is recommended that the BMD's proposed plan of human resource allocation and reorganization be implemented as soon as the proposal is approved by the Government, so that human resource allocation and performance of BMD would be done efficiently.

4) Closer contact between BMD and FFWC
Although fast and smooth transmission of meteorological data from BMD to FFWC is indispensable for the achievement of the Project Purpose, at the moment, equipment for the data transmission is not working properly at FFWC side and staff training of FFWC on operation of the system and data analysis seems not sufficient. Both organizations should make efforts to solve procedural and technical problems for better utilization of the data and information produced by BMD.

7. Lessons Learnt

For those projects in which the provision of equipment plays a vital role of the project activities, the timing and schedule of the procurement should be considered with much caution. At the project design stage, planner should closely look into these issues and design the project accordingly and/or internalize countermeasures to tackle these issues into the project framework.

Annex. 1

Schedule for Terminal Evaluation (Phase I) mission for BMD proejct

No.	Dute	Day	Time	Mr. Tomita (Team Leader)	Mr.Sakaya (Evaluation Analysis)	Mr. Matsumura (Evaluation Planninig1)	Mr. Anisuzzaman (Evaluation Planninig 2)
1	1-Aug	Wed			Arrive in Dhaka		
2	2-Aug	Thu	08.30 am		Meeting with JICA		Meeting with JICA
			10.30 am		Meeting at MoD		Meeting at MoD
			12.00 pm		Meeting with Director BMD		Meeting with Director BMD
			14.30 pm		Meeting at ERD		Meeting at ERD
3	3-Aug	Fri			Documentation		Documentation
4	4-Aug	Sat	15.00 pm		Site Visit Cox Bazar Radar	Site Visit Cox Bazar Radar	Site Visit Cox Bazar Radar
5	5-Aug	Sun	10.00 am		Site Visit Cox Bazar Radar	Site Visit Cox Bazar Radar	Site Visit Cox Bazar Radar
			12.00 pm				
			14.00 pm				
6	6-Aug	Mon	9:30		Meeting with Counterpart	Meeting with Counterpart	Meeting with Counterpart
			10:30		Meeting with - SWC	Meeting with - SWC	Meeting with - SWC
			11:30		Meeting with Climate Div	Meeting with Climate Div	Meeting with Climate Div
			14:30		Meeting withTraining div	Meeting withTraining div	Meeting withTraining div
7	7-Aug	Tue	9:30		Meeting with communication Div.	Meeting with communication Div.	Meeting with communication Div.
			10:45		Meeting with Electric div.	Meeting with Electric div.	Meeting with Electric div.
			12:30		Meeting with DMB	Meeting with DMB	Meeting with DMB
			15.00 pm		Meeting with FFWC	Meeting with FFWC	Meeting with FFWC
8	8-Aug	Wed	10:00		Meeting with MoFDM	Meeting with MoFDM	Meeting with MoFDM
			12:00		Meeting with BMD	Meeting with BMD	Meeting with BMD
9	9-Aug	Thu			Meeting with FFWC	Meeting with FFWC	Meeting with FFWC
10	10-Aug	Fri			Documentation		
11	11-Aug	Sat			Prepare Draft Evaluation Report	Prepare Draft Evaluation Report	
12	12-Aug	Sun			Meeting with MoD		Meeting with MoD
					Meeting with BMD		Meeting with BMD
13	13-Aug	Mon		Meeting with JICA	Meeting with JICA	Meeting with JICA	
					Leave for Tokyo		

Schedule for Terminal Evaluation (Phase II) mission for BMD proejct

No.	Date	Day	Time	Mr. Tomita (Team Leader)	Mr. Kojo (Technical Evaluation)	Mr. Sakaya (Monitoring & Evaluation)	Mr. Matsumura (Evaluation Planning)	Mr. Anis (Evaluation member)
1	15-Sep	Sat			Arrive at Dhaka	Arrive at Dhaka		
2	16-Sep	Sun	9:00	Meeting at JICA	Meeting at JICA	Meeting at JICA	Meeting at JICA	Meeting at JICA
			11:30	Meeting with MoD	Meeting with MoD	Meeting with MoD	Meeting with MoD	Meeting with MoD
			PM	Meeting with Director BMD	Meeting with Director BMD	Meeting with Director BMD	Meeting with Director BMD	Meeting with Director BMD
					Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)
3	17-Sep	Mon	7:00		Field Visit Moulavibazar Radar Station	Field Visit Moulavibazar Radar Station	Field Visit Moulavibazar Radar Station	Field Visit Moulavibazar Radar Station
			19:00					
4	18-Sep	Tue	9:00		Meeting with Counterpart(FFWC)	Meeting with Counterpart	Meeting with Counterpart	Meeting with Counterpart
			Whole day		Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)
			17:30		Making Evaluation Report(1)	Making Evaluation Report(1)	Making Evaluation Report(1)	Making Evaluation Report(1)
5	19-Sep	Wed	AM		Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)
			PM		Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)	Meeting with Counterpart(BMD)
			17:30		Making Evaluation Report(2)	Making Evaluation Report(2)	Making Evaluation Report(2)	Making Evaluation Report(2)
5	20-Sep	Thu	8:30	Meeting at JICA	Meeting at JICA	Meeting at JICA	Meeting at JICA	Meeting at JICA
			12:30	Report Finalize	Report Finalize	Report Finalize	Report Finalize	Report Finalize
			15:00	Joint Coordination Committee Meeting	Joint Coordination Committee Meeting	Joint Coordination Committee Meeting	Joint Coordination Committee Meeting	Joint Coordination Committee Meeting
9	21-Sep	Fri	Whole day		Field Visit Rangpur Rader Station	Field Visit Rangpur Rader Station	Field Visit Rangpur Rader Station	Field Visit Rangpur Rader Station
10	22-Sep	Sat	Whole day		Field Visit Rangpur Rader Station	Field Visit Rangpur Rader Station	Field Visit Rangpur Rader Station	Field Visit Rangpur Rader Station
11	23-Sep	Sun	10:00		Meeting with BMD	Meeting with BMD	Meeting with BMD	Meeting with BMD
			13:30		Meeting at JICA	Meeting at JICA	Meeting at JICA	Meeting at JICA
			15:30	Report to EOJ	Report to EOJ	Report to EOJ	Report to EOJ	Report to EOJ
12	24-Sep	Mon	Whole day	Meeting at JICA	Meeting at JICA	Meeting at JICA	Meeting at JICA	Meeting at JICA
			22:00		Leave for Tokyo	Leave for Tokyo		

Project Title: Development of Human Capacity on operation of weather Analysis and Forecasting

Target Area: Operation area of BMD

Target Group: BMD officials, Duration: September, 2009 - December, 2012

Annex 2. PDM 3 adopted Feb 2011
Version 3 Date: February 15, 2011

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Natural disaster losses are reduced by the utilization of highly precise weather information.	Cases which prove that the utilization of BMD's weather information by organizations related to natural disaster management contributed to the natural disaster losses.	1. Interviews with SWC and the persons in charge in organizations related to natural disaster management 2. Case analysis by experts including the third party experts	
Project Purpose			
More accurate weather information is timely issued to the "stakeholders (Note 1)" of the natural disaster management.	1 Data from BMD Radar Systems optimized by radar ZR relation paremeter for timely forecasting and warning is provided to FFWC 2 Accurate and easily-understanding forecast and warning including tropical cyclone are timely issued to the organizations related to natural disaster management and mass media.	1-1 Data distribution record at BMD 1-2 Data receiving record at FFWC 2-1 Weather forecast and warning prepared by BMD to natural disaster management organizations and mass media such as special weather bulletin 2-2 Interviews with the natural disaster management organizations and mass media	BMD's meteorological data and weather forecast and warning prepared by BMD is utilized by the natural disaster management organizations and mass media.
Outputs			
1 Capacity of BMD for observation and forecasting is improved.	1.1 More than 80% of the hourly data such as surface temperature, humidity, wind direction, wind speed and precipitation are acquired at the six meteorological observatories with the AWSs.	1.1 Database in BMD head office	State policy of weather services in the Government of Bangladesh remains unchanged.
	1.2 Surface observations are conducted in each observatory by using the existing equipment in accordance with the observation guidelines which is developed by this Project.	1.2 Direct observation by experts including the third party experts	
	1.3 Among the observers who attend the data quality control training, more than 70% of the participants understand the contents of the training.	1.3 Achievement test	Trained BMD staff remain on the duty.
	1.4 Quality control is continuously conducted.	1.4 Observation records	
	1.5 Briefing for understanding and sharing the meteorological situations is conducted at SWC at least once a day.	1.5 Briefing records	Data transfer system between BMD and FFWC functions property.
2 Analysis of quantitative rainfall estimation by using the Radar data is implemented	2.1 Correlation of radar rainfall data observed by the optimized radar ZR relation parameter for rainfall calculation and surface observation is corroborated	2.1 Correletion chart of rainfall data of radar and surface observations	
	2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems optimized ZR relation paramater for radar reinfall calculation is composed	2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems	
3 The trend analysis of climate change is conducted by using the accumulated meteorological data.	3.1 More than two (2) BMD staff can detect abnormal values and human error of the accumulated meteorological data through the computer program.	3.1 Analysis result of the data quality control program	
	3.2 Summary of climate statistical analysis is shared in the public.	3.2 BMD's website	
4 Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.	4.1 More than five (5) staff of BMD can develop products and guidance by the Numerical Weather Prediction (NWP) model.	4.1 Report of the project Outputs of the NWP	
5 Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.	5.1 BMD staff's planning and presentation skills for disseminating meteorological information is improved.	5.1 PR materials Weather forecast (such as TV)/ daily and speacial weather bulletin	
	5.2 70% of the participants in the seminars/open-class (more than 8 times) understand the contents.	5.2 Questionnaires to the participants of seminar/open-class	
	5.3 Meteorological information on the BMD's website is user-friendly and updated.	5.3 BMD's website	
6 The meteorological Radar systems are operated and maintained properly and efficiently.	6.1 More than fifteen (15) BMD staff for the five Radar systems can implement regular maintenance and trouble shooting (except serious troubles which require assistance from HQ or manufacturer) for the meteorological reder systems.	6.1 Record sheet of regular check and trouble shooting Interview with the superintendents of each radar system	
	6.2 More than 80% of the BMD's staff in each existing meteorological radar station can operate and maintain the radar system in accordance with the operation/maintenance manual which is developed by this Project.	6.2 Direct observation by experts including the third party experts	
	6.3 Meteorological rader observation schedule is meintained based on the requirement of SWC.	6.3 Project report	
	6.4 Operation cost for the meteorological radar system in normal season (Note 2) is saved.	6.4 Operation cost for meteorological radar system in normal season (before and after the implementation of the radar observation routine schedule)	

Activities	Inputs		Pre-conditions
	Japanese Side	Bangladeshi Side	
1-1 To install the six (6) AWSs and twelve (12) rain gauges at the eighteen existing meteorological observatories. 1-2 To revise the field observation guidelines (including AWS) in accordance with the latest WMO policy. 1-3 To provide the observation training for field observers based on the field observation guidelines and the data entry format (developed by Activity 3-1). 1-4 To conduct training on the data quality of observed date for forecasters 1-5 To prepare the operation and maintenance manuals for observation fields and instruments (including AWS). 1-6 To provide the training for field observers and instruments inspectors on maintenance and control of observation fields and observation instruments (including AWS). 1-7 To compare the data obtained by the AWS and existing equipment and conduct quality control 1-8 To prepare the briefing flowchart and record, and conduct briefing along with the flow chart. 2-1 To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation 2-2 To identify the rader ZR relation parameter for rainfall calculation in the observation range of 5 existing meteorological radar systems and optimize the parameter 2-3 To prepare correlation charts of rainfall data of radar and surface observations 2-4 To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC 3-1 To develop daily observation data input sheet for easy statistical processing and data quality control of observation data 3-2 To archive the observation data and conduct quality control 3-3 To conduct climate data statistical analysis by using the above data 4-1 To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP) 4-2 To conduct the basic training on Numerical Waather Prediction (NWP) 4-3 To conduct the training on Numerical Weather Prediction (NWP) guidance 4-4 To operate the Meso Scale Model (MSM) by using PC (Linux) on trial base 5-1 To prepare PR materials of weather, climate and natural disastar 5-2 To conduct the seminers/open-class for the stakeholders 5-3 To upload and update meteorological information including summarized result of climate date statistical analysis on the BMD website 5-4 To disseminate meteorological information through media (Note 3). 6-1 To prepare the operation and maintenance manuals for meteorological radar system 6-2 To conduct the training on operation and maintenance of the meteorological radar systems 6-3 To prepare the meteorological radar observation routine schedule in order to reduce the operation cost and implement it	1 Dispatch of experts - Weather Forecasting & Warning Service and Organization Management - Weather Observation - Weather Service Infrastructure - Meteorological radar calibration - Data quality control and Statistical anelysis - Web site Design - Numerical Weather Prediction - Weather Information Dissemination - Meteorological radar operation and Maintenance 2 Equipment supply 3 Provision of training in Japan	1 Provision of project office for the project experts in BMD head office 2 Allocation of the required counterpart personnel 3 Provision of training spaces 4 Provision of installation spaces for the equipment to be procured under the project 5 Security of the equipment for the project 6 Operation and maintenance expenses of the equipment for the project 7 Tax exemption , custom clearance and other procedures required for importing the equipment for the project	Electricity is provided stably. Fuel unit cost does not drastically increase. Data transfer system (internet, phone, SSB, etc) works properly. To be able to obtain cooperation of organizations related to natural disaster management.

Note1: The "stakeholders" includes the followings: DMB, FFWC, mass media, related disaster management organizations and residents in the disaster-prone areas (cyclones, tornados, thunderstorms, flood, drought, etc).

Note2: "Normal Season" is defined as the time which does not raquire 24 hour operation of the Radar Systems.

Note3 TV, radio, mobile phone, on-demand services such as push-pull service, etc.

Annex 3 List of JICA Experts

No.	Field	Name	Phase	1nd FY FY2009 Month 9	10	11	12	1	2	3	2nd FY FY2010 4	5	6	7	8	9	10	11	12	1	2	3	3rd FY FY2011 4	5	6	7	8	9	10	11	12	1	2	3	4th FY FY2012 4	5	6	7	8	9	10	11	12
				Activity Planning Phase							Technology Transfer Phase																																		
1	Leader / Weather Forecasting & Warning Service and Organization Management	Yoshihisa UCHIDA		15			18		18		15					30				21			17					12			18	10	15						18		15	24			
2	Assistant Leader / Weather Observation	Toshihide ENDO					18		16		18					21			15				35					11			74							21				21			
3	Weather Service Infrastructure	Kenji MORI					29									26		22													25		14											
4	Meteorological Radar Calibration	Takayuki OTSU		13												15															15											18		
5	Data Quality Control and Statistical Analysis	Takayuki MOTOYA		15			26		16				21			21			15		15		18					15			30		17						18			18		
6	Web Site Design	Timothy Michael Kiddle																	18												18													
7	Numerical Weather Prediction	Nobutaka NOGUCHI		13					20		18					18			21		21		18					21			26	13	17						18		15			
8	Weather Information Dissemination	Soshi IWATA		13			22		13		21					25			15		20		17					25			19	23	19						21		21			
9	Meteorological Radar Operation and Maintenance (J)	Takehiro YOSHIDA		50							30								30				27						28												45			
10	Meteorological Radar Operation and Maintenance (B)	Nasir Uddin Bhuiyan		54			81				54					29	18		28		30		35					60			46		30						18			36		
11	Meteorological Information Application and Promotion for Mass	Motoko KANOME																															19								15		18	
12	Meteorological Radar Observation Data Collection & Calibration	Takanari FUJII																																							15		15	
13	Project Coordinator/ Open Class Conductor	Yoshiyuki YAGIRI																																							21		99	

Annex.4 List of Participants in Counterpart Training in Japan

Name	Position	Subject and Period
Mr. S.M. Quamrul Hassan	Forecaster, NWP	Basics for NMP February 06 - March 03, 2012
Mr. Md. Abdul Matin	Communication Engineer, NWP	ditto
Mr. Md. Shameem Hassan Bhuiyan	Agro-meteorology Division	Meteorological Information Service February 06 - March 01, 2012
Ms. Taslima Imam	Training Division	ditto
Mr. Md. Shadekul Alam	Weather Forecaster in SWC	Data Management of Meteorological Observation February 06 - February 22, 2012
Mr. Md. Ahmed Arif Rashid	Senior Mechanical Engineer	ditto

Annex 5 List of Equipment Provided

Name of Equipment	Manufacturer	Model	Purpose	Qty	Installation Site	Inspection Date
FY01						
For Weather Forecasting & Warning Service						
Digital Visual Presenter	ELMO	P30S	For visual aid projector of document data, etc.	1	BMD Head Quarters	Feb. 5, 2010
Color LCD Type Monitor Display	PROLINK	PRO3201TW	For display of the weather information	3		Oct. 20, 2009
Desktop PC for Weather Briefing	HP Compaq	DC5800	For preparation and storage of products	3		Oct. 20, 2009
For Weather Observation						
GPS measuring device	Garmin	GPSMAP60CSx	For site survey of latitude, longitude and altitude	1	BMD Head Quarters	Feb. 5, 2010
Altimeter	Brunton	ADC Summit		1		Feb. 5, 2010
For Meteorological Radar Calibration						
Desktop PC	HP Compaq	DC5800	For radar calibration	2	BMD Head Quarters	Oct. 20, 2009
Linux OS	Red Hat	EL5	For radar calibration	2		Mar. 04, 2010
Rain Gauge and Data Logger	Delairco	-	For acquisition of rainfall data	12	12 Meteorological Observatories 1) Saidpur 2) Dinajpur 3) Bogra 4) Mymensingh 5) Tangai 6) Srimangal 7) Chandpur 8) Mongla 9) Bhola 10) Sitakunda 11) Kutubdia 12) Teknaf	Mar. 15, 2010
Data Collection & Storage Unit	Delairco	-	For data collection & storage	1	BMD Head Quarters	Mar. 15, 2010
External Hard Disk	Buffalo	HD-PX500U2	For radar data storage	2		Feb. 26, 2010
For Data Quality Control and Statistical Analysis						
Desktop PC	HP Compaq	DC5800	For statistical analysis	2	BMD Head Quarters	Oct. 20, 2009
	HP Compaq	DX2810	For data quality control	1		Feb. 17, 2010
For Numerical Weather Prediction						
Laptop PC	Best Systems	bsc-lowmmSnbv	For NWP basic training	1	BMD Head Quarters	Mar. 12, 2010
For Weather Information Dissemination						
Laptop PC for Workshop	HP	6930P	For projection of the documents at the workshop	1	BMD Head Quarters	Oct. 20, 2009
Others						
UPS	APOLLO	1120F	For supplying back-up AC power to PC etc.	7	BMD Head Quarters	Oct. 20, 2009
				3		Feb. 17, 2010
Color Inkjet Printer	HP	K7100	For printing the documents and materials	3		Oct. 20, 2009
	Cannon	PIXUS iP100		1		Nov. 27, 2009
Laser Pointer	KOKUYO	SASHI - 82	For pointing table, figure, video, etc.	2		Sep. 24, 2009
Projector	Hitachi	RX80		2		Oct. 13, 2009
Spare of a Valve for the projector	Hitachi	For RX80	For spare of a valve for the projector	8		Oct. 13, 2009
Color Inkjet Printer	Cannon	PIXUS iP100	For printing documents & training materials	1	BMD Head Quarters	Nov. 27, 2009
Copy Machine (including Scan)	Canon	IR-3225	For printing documents & training materials	1		Oct. 13, 2009
External Hard Disk	Buffalo	HD-PX500U2	For data storage	1		Nov. 18, 2009
FY02						
For NWP						
PC Cluster for NWP	Delairco	-	For numerical analyses	1	BMD Head Quarters	Mar. 7, 2011
White Board	-	-	For training on NWP	1		Jun. 12, 2010
For Web Site Design						
USB Modem	Huawei	E1550	For internet access	1	BMD Head Quarters	Dec. 10, 2010
Software for Web design	Adobe	DreamweaverCS5	For web page edit	1		Dec. 8, 2010
Others						
Vacuum Cleaner	Panasonic	MC-CL481	For cleaning the equipment procured under the Project	1	BMD Head Quarters	Jun. 11, 2010
FY03						
For Weather Observation						
Automatic Weather System (AWS)	Delairco	-	Weather Observation	6	Synoptic Observation Station 1) Dhaka 2) Rajshahi 3) Sylhet 4) Barisal 5) Khulna 6) Chittagong	Nov. 01, 2011
Spare parts for AWS	Delairco	-	Maintenance of AWS	1	BMD Head Quarters	Mar. 08, 2012
Spare parts for AWS and Rain gauge	Delairco	-	Maintenance of AWS and Rain gauge	1		Mar. 19, 2012
Vibration Battery Drill	Hitachi	dv18dbl(2lsck)	Installation of Observation Equipment	1		Jun. 24, 2011
Safety Belt	Fujii Electric	Tsuyo-light td-27		2		Oct. 4, 2011
Laminate Machine	LAMINATOR	YL-320	Courting of Meteorological Product	1		Jun. 30, 2011
For NWP						
PC for Guidance training	DELL	Inspiron N5110	Training for Guidance	3	BMD Head Quarters	Jul. 2, 2011
Anti-Virus Software	Kaspersky	Internet Security	Virus Protection for PC	3		Jun. 29, 2011
HDD Drive for Data	BUFFALO	shd-pe128g wh	Storage for NWP Product	1		Jun. 24, 2011
Storage	BUFFALO	hd-lbv3 0tu3		1		Jun. 24, 2011
For Weather Information Dissemination						
PC for Cyclone Tracking Bulletin Display	DELL	Vostro 460n	Cyclone Tracking Bulletin Display	1	BMD Head Quarters	Jan. 23, 2012
Generator	Walton	Zoom-1200	Implementation of Open Class and Seminar	1		Jan. 31, 2012
Electric Cable Drum	-	-		1		Jun. 29, 2011
Monitor Cable	-	-		1		Jun. 29, 2011
Portable Screen	-	-		1		Jun. 30, 2011
Accessories for Video	King	Fotopro C-4i	Implementation of Open	1		Jun. 23, 2011
	Transcend	TS160SDHC10	Class and Seminar	4		Jun. 23, 2011
Graphic Software	CorelDRAW	GraphicsSuiteX5	Production of Weather information Dissemination	1		Dec. 22, 2011
Video Camera	Panasonic	Panasonic		1		Mar. 15, 2012
For Meteorological Radar Operation and Maintenance						
AVR	-	-	For training on Meteorological Radar Operation and Maintenance	1	Rangpur Meteorological Radar Station	Jun. 29, 2011
Antenna Controller Circuit Board Maintenance Parts	-	-		1		Jun. 24, 2011
Circuit breaker	Nikko Electric	nsl 02 s-ac300v-75 s-hc-lw		1		Feb. 7, 2012
FY04						

For Weather Information Dissemination						
Equipment for Broadcasting Studio			For producing weather information programmes in order to distribute it to TV center and BMD Website via the Internet	1	BMD Head Quarters	
Graphic Design Tool Kit (Software)			For implementation of Open Class/ Seminar	2		
Megephone			For implementation of Open Class/ Seminar	2		
External Hard Disk Drive			For archiving Outputs	1		
For Weather Observation						
Battory Charger			For maintenance of AWS and Rain Gauge	1	BMD Head Quarters	
Hexagon Shaft Drill Set				2		
Maintenance Terminal				2		
For Meteorological Radar Calibration						
External Hard Disk Drive			For archiving Radar Rainfall Data	1	BMD Head Quarters	

Source: JICA Expert Team

Annex 6 List of Counterpart Personnel

Name	Position
Ms. Arjumand Habib	Director, BMD, Project Director
Ms. Mahnaz Khan	Assistant Director
Ms. Ayesha Khatoon	Assistant Director
Mr. S.M. Mahmudul Huq	Meteorologist
Mr. Syed Abul Hasanat	Meteorologist
Mr. Md. Sanaul Haque Mondal	Meteorologist
Mr. Md. Shadekul Alam	Meteorologist
Ms. Taslima Imam	Meteorologist
Ms. Farah Deeba	Meteorologist
Mr. Sheikh Shajahan Alam	Meteorologist
Mr. Md. Shameem Hassan Bhuiyan	Meteorologist
Mr. Md. Abdul Mannan	Meteorologist
Mr. S.M. Quamrul Hassan	Meteorologist
Mr. Md. Rashaduzzaman	Assistant Meteorologist
Mr. Md. Abdur Rahman Khan	Assistant Meteorologist
Mr. Md. Bazlur Rashid	Assistant Meteorologist
Mr. Kh. Hafizur Rahman	Assistant Meteorologist
Mr. Md. Muzammel Haque Tarafder	Senior Communication Engineer
Mr. Md. Ahmed Arif Rashid	Senior Mechanical Engineer, Project Coordinator
Mr. Md. Abdul Matin	Assistant Communication Engineer
Mr. Md. Sazzad Hossain	Assistant Communication Engineer
Mr. Murad Ahmed	Assistant Communication Engineer
Mr. Abu Shazzad Chowdhury	Assistant Mechanical Engineer
Ms. Halima Khanam	Assistant Electronic Engineer
Mr. Md. Ali Hayder	Assistant Electronic Engineer
Mr. Md. Saiful Hossain	FFWC, Executive Engineer
Mr. Md. Abul Bashar	FFWC, Assistant Engineer
Mr. Md. Ariful Islam Bhuiyan	FFWC, Assistant Engineer

Source: BMD

Annex 7 Progress of Acticities (as of August 2012)

ACTIVITIES		PROGRESS/ACHIEVEMENT
Output 1 Capacity of BMD for observation and forecasting is improved.		
1-1	To install the six (6) AWSs and twelve (12) rain gauges at the eighteen existing meteorological observatories.	Five (5) AWSs have been installed except at Rajshani observetory, where construction of the border walls is on going. Twelve rain gauges have been installed but two are temporarily not working properly.
1-2	To revise the field observation guidelines (including AWS) in accordance with the latest WMO policy.	Completed.
1-3	To provide the observation training for field observers based on the field observation guidelines and the data entry format (developed by Activity 3-1).	Training has been done. Field observation guideloines are yet to be distributed.
1-4	To conduct training on the data quality of observed data for forecasters	Done, to some extent. More practical training is necessary utilizing accumulated data by AWSs.
1-5	To prepare the operation and maintenance manuals for observation fields and instruments (including AWS).	Completed.
1-6	To provide the training for field observers and instruments inspectors on maintenance and control of observation fields and observation instruments (including AWS).	Training has been done partly. Further training is required.
1-7	To compare the data obtained by the AWS and existing equipment and conduct quality control	Data accumulation by AWSs just started in July 2012.
1-8	To prepare the briefing flowchart and record, and conduct briefing along with the flow chart.	Being done. Briefing is conducted at BMD on 2PM every day.
Output 2 Analysis of quantitative rainfall estimation by using the Radar data is implemented.		
2-1	To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation	Equipment has been partly set up (see 1-1) and training was conducted. Further training utilizing accumulated data by rain gauges is necessary.
2-2	To identify the radar ZR relation parameter for rainfall calculation in the observation range of 5 existing meteorological radar systems and optimize the parameter	Training on optimization of radar ZA relation paremeter was conducted. Actual identification of the parameter is yet to be done with accumulated data by rain gauges.
2-3	To prepare correlation charts of rainfall data of radar and surface observations	Not yet done. Accumulation of data by rain gauges is required.
2-4	To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC	Yet to be done.
Output 3 The trend analysis of climate change is conducted by using the accumulated meteorological data.		
3-1	To develop daily observation data input sheet for easy statistical processing and data quality control of observation data	Completed. Examination is necessary on whether input sheet is properly used.
3-2	To archive the observation data and conduct quality control	Completed. Data for the last 30 years have been collected.
3-3	To conduct climate data statistical analysis by using the above data	Completed. Rough analysis of climate change was conducted but further examination is necessary.
Output 4 Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.		
4-1	To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP)	Completed.
4-2	To conduct the basic training on Numerical Weather Prediction (NWP)	Completed
4-3	To conduct the training on Numerical Weather Prediction (NWP) guidance	Completed.
4-4	To operate the Meso Scale Model (MSM) by using PC (Linux) on trial base	Completed. Further practices are needed.
Output 5 Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.		
5-1	To prepare PR materials of weather, climate and natural disaster	Done. Various materials including brochures and animation DVD were prepared.
5-2	To conduct the seminars/open-class for the stakeholders	Seminars/open-classes have been conducted more than 20 times.
5-3	To upload and update meteorological information including summarized result of climate data statistical analysis on the BMD website	MDB wbsite has been updated with forecast using NWP. Results of statistical analysis are yet to be uploaded.
5-4	To disseminate meteorological information through media.	Various materials for dissemination of information have been prepared. Contract with a mobile phone company, Bengal Link, on disseminatio system of weather information is under negotiation. Seting up of TV studio within BMD is scheduled.
Output 6 The meteorological Radar systems are operated and maintained properly and efficiently.		
6-1	To prepare the operation and maintenance manuals for meteorological radar system	Completed.
6-2	To conduct the training on operation and maintenance of the meteorological radar systems	Completed. Further training is scheduled.
6-3	To prepare the meteorological radar observation routine schedule in order to reduce the operation cost and implement it	Completed. Radar operation shcedule for the dry season was prepared.

Source: JICA Evaluaiton Team based on reports by the Project

Project Title: Development of Human Capacity on operation of weather Analysis and Forecasting

Target Area: Operation area of BMD Target Group: BMD officials, Duration: September, 2009 - December, 2012

Annex 8. PDM 4 adopted Sep 2012
Version 4 Date: September 20, 2012

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal Natural disaster losses are reduced by the utilization of highly precise weather information.	Cases which prove that the utilization of BMD's weather information by organizations related to natural disaster management contributed to the natural disaster losses.	1. Interviews with SWC and the persons in charge in organizations related to natural disaster management 2. Case analysis by experts including the third party experts	
Project Purpose More accurate weather information is timely issued to the "stakeholders (Note 1)" of the natural disaster management.	1 Data from BMD Radar Systems optimized by radar ZR relation parameter for timely forecasting and warning is provided to FFWC 2 Accurate and easily-understanding forecast and warning including tropical cyclone are timely issued to the organizations related to natural disaster management and mass media.	1-1 Data distribution record at BMD 1-2 Data receiving record at FFWC 2-1 Weather forecast and warning prepared by BMD to natural disaster management organizations and mass media such as speciel weather bulletin 2-2 Interviews with the natural disaster menagement organizations and mass media	BMD's meteorological data and weather forecast and warning prepared by BMD is utilized by the natural disaster management organizations and mass media.
Outputs			
1 Capacity of BMD for observation and forecasting is improved.	1.1 More than 80% of the hourly data such as surface temperatura, humidity, wind diraction, wind speed and precipitation are acquired at the six meteorological observatorias with the AWSs.	1.1 Database in BMD head office	State policy of weather services in the Government of Bangladesh remains unchanged.
	1.2 Surface observations are conducted in each observatory by using the existing equipment in accordance with the observation guidelines which is developed by this Project.	1.2 Direct observation by experts including the third party experts	
	1.3 Among the observers who attend the data quality control training, more than 70% of the participants understand the contents of the training.	1.3 Achievement test	Trained BMD steff remain on the duty.
	1.4 Quality control is continuously conducted.	1.4 Observation records	
	1.5 Briefing for understanding and sharing the meteorological situations is conducted at SWC et least once a day.	1.5 Briefing records	Data transfer system between BMD and FFWC functions properly.
2 Analysis of quantitative rainfall estimation by using the Radar data is implemented	2.1 Correlation of radar rainfall data observed by the optimized radar ZR relation paramater for rainfall calculation and surface observation is corroborated	2.1 Correlation chart of rainfall data of radar and surface observations	
	2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) axisting radar systems optimized ZR relation parameter for radar rainfall calculation is composed	2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems	
3 The trend analysis of climate change is conducted by using the accumulated meteorological data.	3.1 More than two (2) BMD staff can detect abnormal values and human error of the accumulated meteorological data through the computer program.	3.1 Analysis result of the data quality control program	
	3.2 Summary of climate statistical analysis is shared in the public.	3.2 BMD's website	
4 Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.	4.1 More than five (5) staff of BMD can develop products and guidance by the Numerical Weather Prediction (NWP) model.	4.1 Report of the project Outputs of the NWP	
5 Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.	5.1 BMD staff's planning and presentation skills for disseminating meteorological information is improved.	5.1 PR materials Weather forecast (such as TV)/ daily and speacial weather bulletin	
	5.2 70% of the participants in the seminars/open-class (more than 8 times) understend the contents.	5.2 Questionnaires to the participants of seminar/open-class	
	5.3 Meteorological information on the BMD's website is user-friendly and updated.	5.3 BMD's website	
6 The meteorological Radar systems are operated and maintained properly and efficiently.	6.1 More then fifteen (15) BMD staff for the five Radar systems can implement regular maintenance and trouble shooting (except serious troubles which require assistance from HO or manufacturer) for the meteorological radar systems.	6.1 Record sheet of regular check and trouble shooting Interview with the superintendents of each radar system	
	6.2 More than 80% of the BMD's staff in each existing meteorological radar station can operate and maintain the radar system in accordance with the operation/maintenance manual which is developed by this Project.	6.2 Direct observation by experts including the third party experts	
	6.3 Meteorological rader observation schedule is maintained based on the requirement of SWC.	6.3 Project report	
	6.4 Operation cost for the meteorological radar system in normal season (Note 2) is saved.	6.4 Operation cost for meteorological radar system in normal season (before and after the implementation of the radar observation routine schedule)	

Activities	Inputs	
	Japanese Side	Bangladeshi Side
1-1 To install the six (6) AWSs and twelve (12) rain gauges at the eighteen existing meteorological observatories.	1 Dispatch of experts - Weather Forecasting & Warning Service and Organization Management - Weather Observation - Weather Service Infrastructure - Meteorological radar calibration - Data quality control and Statistical analysis - Web site Design - Numerical Weather Prediction - Weather Information Dissemination - Meteorological radar operation and Maintenance 2 Equipment supply 3 Provision of training in Japan	1 Provision of project office for the project experts in BMD head office 2 Allocation of the required counterpart personnel 3 Provision of training spaces 4 Provision of installation spaces for the equipment to be procured under the project 5 Security of the equipment for the project 6 Operation and maintenance expenses of the equipment for the project 7 Tax exemption , custom clearance and other procedures required for importing the equipment for the project
1-2 To revise the field observation guidelines (including AWS) in accordance with the latest WMO policy.		
1-3 To provide the observation training for field observers based on the field observation guidelines and the data entry format (developed by Activity 3-1).		
1-4 To conduct training on the data quality of observed data for forecasters		
1-5 To prepare the operation and maintenance manuels for observation fields and instruments (including AWS).		
1-6 To provide the training for field observers and instruments inspectors on maintenance and control of observation fields and observation instruments (including AWS).		
1-7 To compare the data obtained by the AWS and existing equipment and conduct quality control		
1-8 To prepare the briefing flowchart and record, and conduct briefing along with the flow chart.		
1-9 To conduct training on preventive maintenance and calibration of AWS in order for quality improvement of observation data		
2-1 To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation		
2-2 To identify the radar ZR relation parameter for rainfall calculation in the observation range of 5 existing meteorological radar systems and optimize the parameter		
2-3 To prepare correlation charts of rainfall data of radar and surface observations		
2-4 To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC		
3-1 To develop daily observation data input sheet for easy statistical processing and data quality control of observation data		
3-2 To archive the observation data and conduct quality control		
3-3 To conduct climate data statistical analysis by using the above data		
4-1 To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP)		
4-2 To conduct the basic training on Numerical Weather Prediction (NWP)		
4-3 To conduct the training on Numerical Weather Prediction (NWP) guidance		
4-4 To operate the Meso Scale Model (MSM) by using PC (Linux) on trial base		
5-1 To prepare PR materials of weather, climate and natural disaster		
5-2 To conduct the seminars/open-class for the stakeholders		
5-3 To upload and update meteorological information including summarized result of climate data statistical analysis on the BMD website		
5-4 To disseminate meteorological information through media (Note 3).		
6-1 To prepare the operation and maintenance manuals for meteorological radar system		
6-2 To conduct the training on operation and maintenance of the meteorological radar systems		
6-3 To prepare the meteorological radar observation routine schedule in order to reduce the operation cost and implement it		

Electricity is provided stably.
Fuel unit cost does not drastically increase.
Data transfer system (internet, phone, SSB, etc) works properly.

Pre-conditions

To be able to obtain cooperation of organizations related to natural disaster management.

Note1: The "stakeholders" includes the followings: DMB, FFWC, mass media, related disaster management organizations and residents in the disaster-prone areas (cyclones, tornados, thunderstorms, flood, drought, etc).

Note2: "Normal Season" is defined as the time which does not require 24 hour operation of the Radar Systems.

Note3 TV, radio, mobile phone, on-demand services such as push-pull service, etc.

RECORD OF DISCUSSIONS
BETWEEN JAPAN INTERNATIONAL COOPERATION AGENCY
AND THE AUTHORITIES CONCERNED OF THE GOVERNMENT
OF THE PEOPLE'S REPUBLIC OF BANGLADESH
ON JAPANESE TECHNICAL COOPERATION
FOR "DEVELOPMENT OF HUMAN CAPACITY ON OPERATION OF WEATHER ANALYSIS AND FORECASTING"

Japan International Cooperation Agency (hereinafter referred to as "JICA") held a series of discussion with the Bangladesh authorities concerned of the Government regarding the extension of the Project "Development of Human Capacity on Operation of Weather Analysis and Forecasting" (hereinafter referred to as "the Project"), which was recommended to JICA Bangladesh office and the concerned departments in Japan in the Minutes of Meeting on Terminal Evaluation of the Project dated September 24, 2012.

As a result of the discussions, and in accordance with the provisions of the Agreement on Technical Cooperation between the Government of Japan and the Government of Bangladesh, signed in Dhaka on December 8th 2002 (hereinafter referred to as "the Agreement"), both sides agreed on the matters referred to in the document attached hereto.

Dhaka, 6th February 2013

Mr. Hiroyuki Tomita
Senior Representative
Japan International Cooperation Agency
Bangladesh Office

Mr. Mahbubur Rahman
Deputy Secretary
Economic Relations Division
Ministry of Finance

Ms. Arjumand Habib
Director
Bangladesh Meteorological Department

Mr. Shamimuzzaman
Senior Assistant Chief
Ministry of Defense

THE ATTACHED DOCUMENT

I. EXTENSION OF COOPERATION BETWEEN JICA AND GOVERNMENT OF BANGLADESH

1. The duration of the extension of the Project is from January 2013 to December 2013.

2. The Project during the extended period will be implemented in accordance with the Project Design Matrix (PDM) ver.4 (Adopted in 24th September, 2012) which is given in Annex I.

II. SCOPE OF EXTENSION

During the original period of the project, the achievements of some outcomes are not fulfilled because some critical activities are delayed such as the procurement of Automatic Weather Observation System (hereinafter referred to as "AWS"), sufficient data accumulation by AWS and rain gauges, and setup of a weather studio in Bangladesh Meteorological Department (hereinafter referred to as "BMD") for broadcasting weather information. Therefore the period of actual works and trainings are shortened and could not been the expected outcome. These unmet outputs along with management skills shall be achieved based on Project Design Matrix (hereinafter referred to as "PDM"). Within the project extension period, the following activities should be continuously conducted: 1) Installation of one AWS at Rajshahi, 2) Sufficient data accumulation by AWSs and rain gauges and enabling BMD officials to utilize the data with proper manner by self-help, 3) Involvement of engineers and meteorologist in the training activities on preventive maintenance and calibration of AWS, 4) More constructive and elaborated trainings on Radar operation and maintenance, 5) Setup of a weather studio in BMD for improved weather information dissemination, 6) Establishment of disaster early warning systems using mobile network in association with Department of Disaster Management. In addition to these, the extended project period will establish an individual monitoring method to check the improvement among the staffs considering the baseline skill. These inclusions are essential for sustainability of project.

III. MEASURES TO BE TAKEN BY JICA

In accordance with the laws and regulations in force in Japan and the provisions of

Article of the Agreement, JICA, as the executing agency for technical cooperation by the Government of Japan, will take, at its own expense, the following measures according to the normal procedures of its technical cooperation scheme.

1. DISPATCH OF JAPANESE EXPERTS

JICA will provide the services of the Japanese experts as listed in Annex II. The provision of Article V of the Agreement will be applied to the above-mentioned experts.

2. PROVISION OF MACHINERY AND EQUIPMENT

JICA will provide such machinery, equipment and other materials (hereinafter referred to as "the Equipment") necessary for the implementation of the Project as listed in Annex III. The provision of Article IV of the Agreement will be applied to the Equipment.

3. TRAINING OF BANGLADESH PERSONNEL IN JAPAN

JICA will receive the Bangladesh personnel connected with the Project for technical training in Japan, if necessary.

IV. MEASURES TO BE TAKEN BY THE GOVERNMENT OF BANGLADESH

1. The Government of Bangladesh will take necessary measures to ensure that the self-reliant operation of the Project will be sustained during and after the period of Japanese technical cooperation, through full and active involvement in the Project by all related authorities, beneficiary groups and institutions. In particular, in order to achieve the Project purpose within the scheduled period, the Government of Bangladesh agreed to secure the followings;
   1) To secure budget of the Project during the whole project period enough to fully implement the Project;
   2) Not to transfer any personnel who have been trained in the Project to other departments / divisions during the whole project period;
   3) To make every effort to improve and streamline the operation of the Project through the mutual understanding among project members, such as flexible allocation of equipment, division of operation line, improvement of each staff's productivity, coordination with the stakeholders etc.
   4) To disseminate the improved weather data to be produced by the Project to the concerned agencies.

2. The Government of Bangladesh will ensure that the technologies and knowledge acquired by the Bangladesh nationals as a result of the Japanese technical

cooperation will contribute to the economic and social development of Bangladesh.

3. In accordance with the provisions of Article IX of the Agreement, the Government of Bangladesh will take the measures necessary to receive and use the Equipment provided by JICA mentioned in Annex III.

4. The Government of Bangladesh will take necessary measures to ensure the knowledge and experience acquired by the Bangladesh personnel from technical training in Japan will be utilized effectively in the implementation of the Project.

5. In accordance with the provision of Article V of the Agreement, the Government of Bangladesh will provide the services of Bangladesh counterpart personnel and administrative personnel as listed in Annex IV.

6. In accordance with the provision of Article V of the Agreement, the Government of Bangladesh will provide the buildings and facilities as listed in Annex V.

7. In accordance with the laws and regulations in force in Bangladesh, the Government of Bangladesh will take necessary measures to supply or replace at its own expense machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than the Equipment provided by JICA under Annex III.

8. In accordance with the laws and regulations in force in Bangladesh, the Government of Bangladesh will take necessary measures to meet the running expenses necessary for the implementation of the Project.

V. ADMINISTRATION OF THE PROJECT

1. Director, Bangladesh Meteorological Department as the Project Director, will bear overall responsibility for the administration and implementation of the Project.

2. Senior Mechanical Engineer, Bangladesh Meteorological Department as the Project Coordinator, will be responsible for the managerial and technical matters of the Project.

3. The Japanese Chief Advisor and Team Leader will provide necessary recommendations and advice to the Project Director and the Project Coordinator on any matters pertaining to the implementation of the Project.

4. The Japanese experts will give necessary technical guidance and advice to Bangladesh counterpart personnel on technical matters pertaining to the implementation of the Project.

5. For the effective and successful implementation of technical cooperation for the Project, a Joint Coordination Committee will be established whose functions and composition are described in Annex VI.

VI. JOINT EVALUATION

Evaluation of the Project will be conducted jointly by JICA and the Bangladesh authorities concerned, during the last six months of the cooperation extension term in order to examine the level of achievement.

VII. CLAIMS AGAINST JAPANESE EXPERTS

In accordance with the provision of Article VII of the Agreement, the Government of Bangladesh undertakes to bear claims, if any arises, against the Japanese experts engaged in technical cooperation for the Project resulting from, occurring in the course of, or otherwise connected with the discharge of their official functions in Bangladesh except for those arising from the willful misconduct or gross negligence of the Japanese experts.

VIII. MUTUAL CONSULTATION

There will be mutual consultation between JICA and the Government of Bangladesh on any major issues arising from, or in connection with this attached documents.

IX. MESURES TO PROMOTE UNDERSTANDING OF AND SUPPORT FOR THE PROJECT

For the purpose of promoting support for the Project among the people of Bangladesh, the Government of Bangladesh will take appropriate measures to make the Project widely known to the people of Bangladesh.

ANNEX I	PDM ver. 4
ANNEX II	LIST OF JAPANESE EXPERTS
ANNEX III	LIST OF MACHINERY AND EQUIPMENT
ANNEX IV	LIST OF BANGLADESH COUNTERPART AND ADMINISTRATIVE PERSONNEL
ANNEX V	LIST OF BUILDINGS AND FACILITIES
ANNEX VI	JOINT COORDINATION COMMITTEE

Project Title: Development of Human Capacity on operation of weather Analysis and Forecasting

Target Area: Operation area of BMD | Target Group: BMD officials, Duration: October, 2009 - December, 2013 | Version 4 Date: September 20, 2012

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumptions
Overall Goal	Cases which prove that the utilization of BMD's weather information by organizations related to natural disaster management contributed to the natural disaster losses.	1. Interviews with SWC and the persons in charge in organizations related to natural disaster management 2. Case analysis by experts including the third party experts	
Natural disaster losses are reduced by the utilization of highly precise weather information.			
Project Purpose			BMD's meteorological data and weather forecast and warning prepared by BMD is utilized by the natural disaster management organizations and mass media.
More accurate weather information is timely issued to the "stakeholders (Note 1)" of the natural disaster management.	1 Data from BMD Radar Systems optimized by radar ZR relation parameter for timely forecasting and warning is provided to FFWC	1-1 Data distribution record at BMD 1-2 Data receiving record at FFWC	
	2 Accurate and easily-understanding forecast and warning including tropical cyclone are timely issued to the organizations related to natural disaster management and mass media.	2-1 Weather forecast end warning prepared by BMD to natural disaster management organizations and mass media such as spacial weather bulletin 2-2 Interviews with the natural disaster management organizations and mass media	
Outputs			
1 Capacity of BMD for observation and forecasting is improved.	1.1 More than 80% of the hourly data such as surface temperature, humidity, wind direction, wind speed and precipitation are acquired at the six meteorological observatories with the AWSs.	1.1 Database in BMD head office	State policy of weather services in the Government of Bangladesh remains unchanged.
	1.2 Surface observations are conducted in each observatory by using the existing equipment in accordance with the observation guidelines which is developed by this Project.	1.2 Direct observation by experts including the third party experts	
	1.3 Among the observers who attend the data quality control training, more than 70% of the participants understand the contents of the training.	1.3 Achievement test	Trained BMD staff remain on the duty.
	1.4 Quality control is continuously conducted.	1.4 Observation records	
	1.5 Briefing for understanding and sharing the meteorological situations is conducted at SWC at least once a day.	1.5 Briefing records	Data transfer system between BMD and FFWC functions properly.
2 Analysis of quantitative rainfall estimation by using the Radar data is implemented	2.1 Correlation of radar rainfall data observed by the optimized radar ZR relation parameter for rainfall calculation and surface observation is corroborated	2.1 Correlation chart of rainfall data of radar and surface observations	
	2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems optimized ZR relation parameter for radar rainfall calculation is composed	2.2 Binary data of composite rainfall amount created by rainfall data of the five (5) existing radar systems	
3 The trend analysis of climate change is conducted by using the accumulated meteorological data.	3.1 More than two (2) BMD staff can detect abnormal values and human error of the accumulated meteorological data through the computer program.	3.1 Analysis result of the data quality control program	
	3.2 Summary of climate statistical analysis is shared in the public.	3.2 BMD's website	
4 Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.	4.1 More than five (5) staff of BMD can develop products and guidance by the Numerical Weather Prediction (NWP) model.	4.1 Report of the project Outputs of the NWP	
5 Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.	5.1 BMD staff's planning and presentation skills for disseminating meteorological information is improved.	5.1 PR materials Weather forecast (such as TV)/ daily and speacial weather bulletin	
	5.2 70% of the participents in the seminars/open-class (more than 8 times) understand the contents.	5.2 Questionnaires to the participants of seminar/open-class	
	5.3 Meteorological information on the BMD's website is user-friendly and updated.	5.3 BMD's website	
6 The meteorological Rader systems are operated end maintained properly and efficiently.	6.1 More than fifteen (15) BMD staff for the five Radar systems can implement reguler maintenance and trouble shooting (except serious troubles which require assistance from HQ or manufacturer) for the meteorological radar systems.	6.1 Record sheet of regular check and trouble shooting Interview with the superintendents of each radar system	
	6.2 More than 80% of the BMD's staff in each existing meteorological redar station can operate and maintain the radar system in accordance with the operation/maintenance manual which is developed by this Project.	6.2 Direct observation by experts including the third party experts	
	6.3 Meteorological radar observation schedule is maintained based on the requirement of SWC.	6.3 Project report	
	6.4 Operation cost for the meteorological radar system in normal season (Note 2) is saved.	6.4 Operation cost for meteorological radar system in normal season (before and after the implementation of the radar observation routine schedule)	

Activities	Inputs		
	Japanese Side	Bangladeshi Side	
1-1 To install the six (6) AWSs and twelve (12) rain gauges at the eighteen existing meteorological observatories.			Electricity is provided stably.
1-2 To revise the field observation guidelines (including AWS) in accordance with the latest WMO policy.	1 Dispatch of experts - Weather Forecasting & Warning Service and Organization Management - Weather Observation - Weather Service Infrastructure - Meteorological radar calibration - Data quality control and Statistical analysis - Web site Design - Numerical Weather Prediction - Weather Information Dissemination - Meteorological radar operation and Maintenance	1 Provision of project office for the project experts in BMD head office 2 Allocation of the required counterpart personnel 3 Provision of training spaces 4 Provision of installation spaces for the equipment to be procured under the project 5 Security of the equipment for the project 6 Operation and maintenance expenses of the equipment for the project 7 Tax exemption , custom clearance and other procedures required for importing the equipment for the project	Fuel unit cost does not drastically increase. Data transfer system (internet, phone, SSB, etc) works property.
1-3 To provide the observation training for field observers based on the field observation guidelines and the data entry format (developed by Activity 3-1).			
1-4 To conduct training on the data quality of observed data for forecasters			
1-5 To prepare the operation and maintenance manuals for observation fields and instruments (including AWS).			
1-6 To provide the training for field observers and instruments inspectors on maintenance and control of observation fields and observation instruments (including AWS).			
1-7 To compare the data obtained by the AWS and existing equipment and conduct quality control			
1-8 To prepare the briefing flowchart and record, and conduct briefing along with the flow chart.			
1-9 To conduct training on preventive maintenance of AWS in order for quality improvement of observation data	2 Equipment supply		
2-1 To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation			
2-2 To identify the radar ZR relation parameter for rainfall calculation in the observation range of 5 existing meteorological radar systems and optimize the parameter	3 Provision of training in Japan		
2-3 To prepare correlation charts of rainfall data of radar and surface observations			
2-4 To compose the rainfall composite picture of 5 existing meteorological radar systems optimized rader ZR relation parameter for rainfall calculation in SWC			
3-1 To develop daily observation data input sheet for easy statistical processing and data quality control of observation data			
3-2 To archive the observation data and conduct quality control			
3-3 To conduct climate data statistical analysis by using the above data			
4-1 To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP)			
4-2 To conduct the basic training on Numerical Weather Prediction (NWP)			
4-3 To conduct the training on Numerical Weather Prediction (NWP)			
4-4 To operate the Meso Scale Model (MSM) by using PC (Linux) on trial			
5-1 To prepare PR materials of weather, climate and natural disaster			
5-2 To conduct the seminars/open-class for the stakeholders			
5-3 To upload and update meteorological information including summarized result of climate data statistical analysis on the BMD website			
5-4 To disseminate meteorological information through media (Note 3).			
6-1 To prepare the operation and maintenance manuals for meteorological radar system			
6-2 To conduct the training on operation and maintenance of the meteorological radar systems			
6-3 To prepare the meteorological radar observation routine schedule in order to reduce the operation cost and implement it			

Pre-conditions

To be able to obtain cooperation of organizations related to natural disaster management.

Note1: The "stakeholders" includes the followings: DMB, FFWC, mass media, related disaster management organizations and residents in the disaster-prone areas (cyclones, tornados, thunderstorms, flood, drought, etc).

Note2: "Normal Season" is defined as the time which does not require 24 hour operation of the Radar Systems.

Note3: TV, radio, mobile phone, on-demand services such as push-pull service, etc.

ANNEX II

LIST OF JAPANESE EXPERTS

For the following fields;

1) Leader / Weather Forecasting & Warning Service and Organization Management
2) Assistant Leader / Weather Observation
3) Meteorological Radar Calibration
4) Data Quality Control and Statistical Analysis
5) Weather Information Dissemination
6) Meteorological Information Application and Promotion for Mass Media
7) Meteorological Radar Observation Data Collection & Calibration Technique
8) Project Coordinator/ Open Class Conductor
9) Preventive maintenance and calibration of AWS
10) Other(s), when need arises.

ANNEX III

LIST OF MACHINERY AND EQUIPMENT

1) Electric Barometer
2) Electric Thermometer
3) Thermo-hygrometer
4) Equipment when need arises.

ANNEX IV

LIST OF BANGLADESH COUNTERPART AND ADMINISTRATIVE PERSONNEL

1. Counterpart Personnel

1) Project Director: Director of BMD
2) Project Coordinator: Senior Mechanical Engineer
3) Other(s) technical personnel as need basis.

2. Administrative Personnel

1) Administrative Assistant
2) Technical Assistant for Maintenance of equipment and facilities
3) Other(s) administrative personnel as need basis

ANNEX V

LIST OF BUILDINGS AND FACILITIES

1) Office room for Japanese experts with furniture
2) Telephone line and Internet facility
3) Other(s) when need arises.

ANNEX VI

JOINT COORDINATION COMMITEE

1. Function

The Joint Coordination Committee (JCC) will be established for the effective and efficient implementation of the project. JCC will meet every six (6) months or whenever necessity arises, in order to fulfill the following functions:

1) To discuss and approve of the annual work plan of the project based on the approved annual budget in line with the tentative schedule of the Implementation formed under the framework of the Record of Discussion ;
2) To review the overall progress and annual expenditure of the project as well as the achievement of the annual work plan mentioned above ; and
3) To review and exchange views on major issues arising from or in connection with the project.

2. Composition

1) Chairperson
Director, Bangladesh Meteorological Department

2) Co-Chairperson
Senior Representative, JICA Bangladesh office

3) Members

(a) Bangladeshi side
Deputy Secretary, Japan Branch, Economic Relations Division
Senior Assistant Chief / Assistant Chief, Ministry of Defense
Executive Engineer, Flood Forecasting and Warning Center (FFWC), BWDB
Director (Planning), Department of Disaster Management (DDM)
Project Coordinator of the project
Others appointed by the Chairperson and Co-Chairperson as need basis

(b) Japanese Side
Official(s) in charge, JICA Bangladesh Office
Experts of the Project
Others appointed by the Chairperson and Co-Chairperson as need basis

Observer: Representative from Embassy of Japan when necessary.

MINUTES OF MEETING
ON

TECHNICAL COOPERATION PROJECT FOR
DEVELOPMENT OF HUMAN CAPACITY ON OPERATION OF WEATHER ANALYSIS AND FORECASTING
IN THE PEOPLE'S REPUBLIC OF BANGLADESH

The series of discussions on the above-captioned project among the officials concerned of the Government of the People's Republic of Bangladesh and the Japan International Cooperation Agency (JICA) Bangladesh Office have been conducted under the chairmanship of Mr. Md. Shah Alam, Director of the Bangladesh Meteorological Department (BMD). As a result of the said discussions, both sides have confirmed the main items described in the attached sheets.

Dhaka, December 17, 2013

for 戸田隆行

TODA Takao
Chief Representative,
Japan International Cooperation Agency
Bangladesh Office

17-12-13

Md. Shah Alam
Director,
Bangladesh Meteorological Department

ATTACHMENT

1. Project Name

Technical Cooperation Project for Development of Human Capacity on Operation of Weather Analysis and Forecasting in the People's Republic of Bangladesh

2. Implementing Agency

Japan Side: Japan International Cooperation Agency (JICA)
Bangladesh Side: Bangladesh Meteorological Department (BMD)

3. Relevant Items discussed

1) Confirmation of the role of JCC and its composition

Through a proper quorum of all the attendants of the Bangladeshi and the Japanese sides named in Annex-1 (hereinafter referred to as the "JCC"), the functions of the JCC were confirmed. The "Functions and Composition of the Joint Coordination Committee" is attached as Annex-2.

2) Handing Over of all the Equipment procured under the Project to the BMD

All the Equipment for technology transfer procured under the Project was handed over from the JICA Bangladesh Office to the BMD, and the complete list of the said Equipment is contained in the attached Annex-3. The JICA experts strongly requested the BMD to properly operate and maintain all the Equipment procured under the Project, to which the BMD fully agreed to do so.

3) Introduction of the Major Project Outputs

The BMD and the JICA experts reported the number of the participants for the Open School (Major Dissemination Activity of Animated Cartoon for Natural Disaster Awareness named "Save Yourself and Reduce Risk" and Result of Open Class Activity: Annex-4) conducted during the Project Period, as well as the changing trend of yearly mean temperature and the yearly precipitation for more than 30 years to the JCC. In addition, the BMD and the JICA experts introduced the Major Project Outputs in the attached Annex-5.

4) Actual Dispatch Schedule of JICA Expert Team in the Project

The JICA experts explained the Actual Dispatch Schedule of the JICA Expert Team in the Project. The BMD and the JICA experts exchanged mutual appreciation and gratitude for the successful completion of the Project. The schedules are attached as Annex-6.

5) Completion of the Project Achievements according to the revised Project Design Matrix

26.

(PDM) recommended by the JICA Terminal Evaluation Team in October 2012.

In accordance with the revised Project Design Matrix (PDM), all the Project Achievements planned at prior to commencement of the Project were completely accomplished by the BMD and the JICA experts, and confirmed by the JCC. The Project Achievements are detailed in the attached Annex-7.

6) Further Cooperation of the Government of Japan for the Improvement of the BMD

In order to continuously attain greater improvement of the BMD capability and services, the BMD very strongly expressed demand and necessity to have further cooperation with the Government of Japan, and indicated that the Government of Bangladesh has already promptly requested 2 grant aid projects (the meteorological Doppler radar systems for Dhaka (Joydevpur) and Rangpure and the request for 35 automatic weather observation systems). The JICA informed the BMD that the preparatory study for the requested grant aid project which is the provision of meteorological Doppler radar systems for Dhaka (Joydevpur) and Rangpure has been scheduled to commence from February/March 2014. Moreover, the JICA indicated to the BMD that the requested grant aid project of 35 automatic weather observation systems would be given high priority.

Furthermore, the JICA experts mentioned that in Myanmar, the Government of Japan is providing 3 meteorological Doppler radar systems and 30 automatic weather observation systems (AWS) within few years, in this regards, the JICA experts advised the BMD to make collaboration with Myanmar especially in terms of radar and AWS data sharing. In accordance with the opinion of the JICA experts, the BMD expressed interest of further strengthening the collaboration among meteorological organizations, especially between Bangladesh (BMD) and Myanmar (Department of Meteorology and Hydrology: DMH) for radar & observation data exchange, standardization of the tropical cyclone category and tropical cyclone special bulletin, etc. in the area of the Bay of Bengal for a more effective tropical cyclone disaster prevention and management strategy. Both the JCC and JICA are highly cognizant of the significance of such consideration.

Annex-1 List of Attendants of the JCC

Annex-2 Joint Coordination Committee

Annex-3 List of Handed Over Equipment procured under the Project to the BMD

Annex-4 Results of the Open Class Activity

Annex-5 List of the Project Major Outputs

Annex-6 Actual Dispatch Schedule of the JICA Expert Team

Annex-7 List of Accomplished Project Achievements

Annex-1

LIST OF ATTENDANTS

JOINT COORDINATION COMMITTEE (JCC)
FOR
TECHNICAL COOPERATION PROJECT FOR
DEVELOPMENT OF HUMAN CAPACITY ON OPERATION OF WEATHER ANALYSIS AND FORECASTING
IN THE PEOPLE'S REPUBLIC OF BANGLADESH

Location: Bangladesh Meteorology Department (BMD), Head Office
Time: 15:00, December 17, 2013

No.	Name	Position	Signature
1	MD. SHAH ALAM Director.	BMD	
2	Mir Ahmed	Director, DDM	17.12
3	Mahbubur Rahman	Deputy Secretary ERD.	17.12.13
4	Naoki Matsumura	Adviser, JICA	17/12/2013
5	Anisuzzaman Chowdhury	SPO, JICA	
6	Yoshihisa UCHIDA	JICA Expert (Team Leader)	
7	Nasiruddin Bhuiyan.	JICA Expart.	17/12/2013
8	Soshi IWATA	JICA Expert	
9	Yoshiyuki Yagiri	JICA Expert	
10	Ahmed Arif Rashid	Project-Co-ordinator	

Annex-2

Function and Composition of Joint Coordinating Committee

1. Function

- To discuss and approve of the annual work plan of the project based on the approved annual budget in line with the tentative schedule of the implementation formed under the framework of the Record of Discussion;
- To review the overall progress and annual expenditure of the Project as well as the achievement of the annual work plan mentioned above;
- To review and exchange views on major issues arising from or in connection with the Project.

2. Composition

(1) Chairperson
Director of Bangladesh Meteorological Department (BMD)

(2) Co-Chairperson
Chief Representative, JICA Bangladesh Office

(3) Members

a. Deputy Secretary, Japan Branch, Economic Relation Division
b. Senior Assistant Chief/Assistant Chief, Ministry of Defence
c. Executive Engineer, Flood Forecasting and Warning Centre (FFWC), BWDB
d. Director (Training & Planning), Disaster Management Bureau (DMB)
e. Official(s) in charge, JICA Bangladesh Office
f. Project Coordinator, Bangladesh Meteorological Department (BMD)
g. Japanese Experts of the Project
h. Other appointed by the Chairperson and the Co- Chairperson as need basis

Annex-3

List of Handed Over Equipment procured under the Project to the BMD

Name of Equipment	Manufacturer	Model	Purpose	Q'ty	Installation Site	Inspection Date
FY2009 (1st FY)						
For Weather Forecasting & Warning Service and Organization Management						
Digital Visual Presenter	ELMO	P30S	For visual aid projector of document data, etc.	1	BMD Head Office	Feb. 5, 2010
Color LCD Type Monitor Display	PROLINK	PRO3201TW	For display of the weather information	3	BMD Head Office	Oct. 20, 2009
Desktop PC for Weather Briefing	HP Compaq	DC5800	For display, preparation and storage of the weather information	3	BMD Head Office	Oct. 20, 2009
For Meteorological Observation						
GPS measuring device	Garmin	GPSMAP60 CSx	For site survey of latitude, longitude and altitude	1	BMD Head Office	Feb. 5, 2010
Altimeter	Brunton	ADC Summit		1	BMD Head Office	Feb. 5, 2010
For Meteorological Radar Calibration						
Desktop PC for Radar Calibration	HP Compaq	DC5800	For radar calibration	2	BMD Head Office	Oct. 20, 2009
Linux OS	Red Hat	Enterprise Linux 5	For radar calibration	2	BMD Head Office	Mar. 04, 2010
Rain Gauge and Data Logger	Delairco	-	For acquisition of rainfall data	12	Twelve (12) Existing Observatories 1) Saidpur 2) Dinajpur 3) Bogra 4) Mymensingh 5) Tangai 6) Srimangal 7) Chandpur 8) Mongla 9) Bhola 10) Sitakunda 11) Kutubdia 12) Teknaf	Mar. 15, 2010
Data Collection & Storage Unit	Delairco	-	For data collection & storage at the BMD Head Quarters	1	BMD Head Office	Mar. 15, 2010
Hard Disk for Data Storage	Buffalo	HD-PX500U2	For radar calibration data storage	2	BMD Head Office	Feb. 26, 2010
For Data Quality Control and Statistical Analysis						
Desktop PC for Data Quality Control and Statistical Analysis	HP Compaq	DC5800	For statistical analysis	2	BMD Head Office	Oct. 20, 2009
	HP Compaq	DX2810	For data quality control	1	BMD Head Office	Feb. 17, 2010
For Numerical Weather Prediction						
Laptop PC for Basic Training on NWP	Best Systems	BSC-LOWM M5NBV	For basic training on NWP	1	BMD Head Office	Mar. 12, 2010
For Weather Information Dissemination						
Laptop PC for Workshop	HP	6930P	For projection of the documents at the workshop	1	BMD Head Office	Oct. 20, 2009
Others						
UPS	APOLLO	1120F	For supplying back-up AC power to PC etc.	7	BMD Head Office	Oct. 20, 2009
				3		Feb. 17, 2010
Color Inkjet Printer	HP	K7100	For printing the documents and materials	3	BMD Head Office	Oct. 20, 2009
	Cannon	PIXUS iP100		2		Nov. 27, 2009
Laser Pointer	KOKUYO	SASHI-82	For pointing table, figure, video, etc.	2	BMD Head Office	Sep. 24, 2009
Projector	Hitachi	RX80	For projecting table, figure, video, etc. to the screen	2	BMD Head Office	Oct. 13, 2009
Spare of a Valve for the projector	Hitachi	For RX80	For spare of a valve for the projector	8	BMD Head Office	Oct. 13, 2009
Copy Machine (including Scan)	Canon	IR-3225	For printing documents & materials	1	BMD Head Office	Oct. 13, 2009
Hard Disk for Data Storage	Buffalo	HD-PX500U2	For data storage of	1	BMD Head Office	Nov. 18, 2009

			the report, etc.			
FY2010 (2nd FY)						
For Numerical Weather Prediction						
PC Cluster for training on NWP	Delairco	-	For numerical analyses	1	BMD Head Office	Mar. 7, 2011
White Board	-	-	For training on NWP	1	BMD Head Office	Jun. 7, 2010
For Web Site Design						
USB Modem for training on Web Site design	Grameenphone	Internet modem	For Internet access by a PC for training	1	BMD Head Office	Dec. 10, 2010
Software for training on Web Site design	Adobe	Dreamweaver CS5	For web page edit	1	BMD Head Office	Dec. 8, 2010
Others						
Vacuum Cleaner	Panasonic	MC-CL481	For cleaning the equipment procured under the Project	1	BMD Head Office	Jun. 11, 2010
FY2011 (3rd FY)						
For Meteorological Observation						
Automatic Weather System (AWS)	Delairco	-	Weather Observation	6	Six (6) Synoptic Observation Station 1) Dhaka 2) Rajshahi 3) Sylhet 4) Barisal 5) Khulna 6) Chittagong	Nov. 01, 2011
Spare parts for AWS ▪ 5103 Wind Speed and Direction Sensor: 2 ▪ Temperature and Humidity Sensor: 1 ▪ PTB330A Barometer:1 ▪ RIM8050 Rain Gauge: 1 ▪ CSD3 Solar Duration Sensor: 1 ▪ SP LIte2 Solar Radiation Sensor: 1 ▪ DLM Data Collection Unit: 1 ▪ µDCP: 1 ▪ Interface Board: 1 ▪ Set 1008M/F Line Driver: 1 ▪ SAM2W GPRS Modem: 1 ▪ PS15M Solar Power Regulator: 1	Delairco	-	Maintenance o fAWS	1	BMD Head Office	Mar. 19, 2012
Spare parts for Rain gauge ▪ Data Logger Board: 1 (Used for Bogla Station) ▪ Sunguard 4.5A Solar Power Regulator: 1 ▪ CELFXT009S GPRS Modem (Fastrak Extend): 1 (Used for MaijdiCourt Station) ▪ CNPV-10M Solar Panel: 1 (Used for Joydebpur Station)	Delairco	-	Maintenance of AWS and Rain gauge	1	BMD Head Office	Mar. 19, 2012
Vibration Battery Drill	Hitachi	DV18DBL(2 LSCK)	Installation of Observation Equipment	1	BMD Head Office	Jun. 24, 2011
Safety Belt	Fujii Electric	Tsuyo Light TD-27		2	BMD Head Office	Oct. 4, 2011
Laminate Machine	LAMINATOR	YL-320	Courting of Meteorological Product	1	BMD Head Office	Jun. 30, 2011
For NWP						
Laptop PC for Guidance training	DELL	Inspiron N5110	Training for Guidance	3	BMD Head Office	Jul. 28, 2011
Anti-Virus Software	Kaspersky	Internet Security	Virus Protection for PC	3	BMD Head Office	Jun. 29, 2011
HDD Drive for Data Storage	BUFFALO	SHD-PE128 G-WH	Storage for NWP Product	1	BMD Head Office	Jun. 24, 2011
HDD Drive for Data Storage	BUFFALO	HD-LBV3.0T U3		1	BMD Head Office	Jun. 24, 2011
For Weather Information Dissemination						
PC for Cyclone Trucking Bulletin Display	DELL	Vostro 460n	Cyclone Trucking Bulletin Display	1	BMD Head Office	Jan. 23, 2012
Generator	Walton	Zoom-1200	Implementation of	1	BMD Head Office	Jan. 31, 2012
Electric Cable Drum	-	-	Open Class and	1	BMD Head Office	Jun. 29, 2011

Monitor Cable	-	-	Seminar	1	BMD Head Office	
Portable Screen	-	-		1	BMD Head Office	Jun. 30, 2011
Accessories for Video	King	Fotopro C-4i		1	BMD Head Office	Jun. 23, 2011
	Transcend	TS16GSDHC 10		4	BMD Head Office	Jun. 23, 2011
Graphic Software	CorelDRAW	GraphicsSuite X5	Production of Weather information Dissemination	1	BMD Head Office	Dec. 22, 2011
Video Camera	Panasonic	Panasonic		1	BMD Head Office	Mar. 15, 2012
For Meteorological Radar Operation and Maintenance						
AVR	Delixi	SVE3000	Operation and Maintenance of Meteorological	1	Rangpur Meteorological Radar Station	Jun. 29, 2011
Maintenance Parts for Antenna Controller Circuit Board	-	-		1		Jun. 24, 2011
Circuit breaker	Nikko Electric	NS102A-AC 500V-75A-HC-LW		1		Feb. 7, 2012
FY2012(4th FY)						
Meteorological Information Programmes Recording Equipment (Audio-video and Studio Equipment)						
Live Editing Unit	NEWTEK	Tricaster 455	For producing weather information programmes in order to distribute it to TV centers and BMD Website via the Internet	1	BMD Head Office	Jan. 1, 2013
Live Recording Control Unit	NEWTEK	CS-450		1	BMD Head Office	Jan. 1, 2013
Data Storage External HDD	WESTERN DIGITAL	WDBY8L0020BBKNESN		1	BMD Head Office	Jan. 1, 2013
Live Text Editing programme	NEWTEK	LTX-10		1	BMD Head Office	Jan. 1, 2013
HD Camera Recorder	CANON	XF-300		1	BMD Head Office	Jan. 1, 2013
Ultra-Directional Microphone	Betterway	EM2800A		1	BMD Head Office	Jan. 1, 2013
Tripod for Camera	Libec	RH25		1	BMD Head Office	Jan. 1, 2013
Tiepin Microphone	SONY	ECMC115		2	BMD Head Office	Jan. 1, 2013
Monaural Mixer	YAMAHA	MG102		1	BMD Head Office	Jan. 1, 2013
Monitor for Caster (Dual Monitor Type)	FUJITSU	PD-LED185B		1	BMD Head Office	Jan. 1, 2013
Video Distribution Unit	KRAMER	VM-216H		1	BMD Head Office	Jan. 1, 2013
Monitor for Editing Work	DELL	U2711		2	BMD Head Office	Jan. 1, 2013
Uninterrupted Power Supply	APC	2kVA		1	BMD Head Office	Jan. 1, 2013
Automatic Voltage Regulator	MICRO	2kVA		1	BMD Head Office	Jan. 1, 2013
LED Lighting Set	NANGGUANG	CN600HS	For producing weather information programs in order to distribute it to TV center and BMD Website via the Internet	1	BMD Head Office	Jan. 1, 2013
Automatic Voltage Regulator	MICRO	2kVA		1	BMD Head Office	Jan. 1, 2013
Air Conditioning System	Fujitsu General	ASG-30	For keep the appropriate room temperature for broadcast studio	2	BMD Head Office	Jan. 1, 2013
For Weather Observation						
Battery Charger	ALPS Electric Instruments	SP1210TR	For maintenance of AWS and Rain Gauge	1	BMD Head Office	Jul. 9, 2012
Hexagon Shaft Drill Set	NACHI	COSET10		1	BMD Head Office	Jul. 9, 2012
Maintenance Terminal for AWS and Rain Gauge	FUJITSU	LH531		1	BMD Head Office	Jan. 2, 2013
For Radar Calibration						
External Hard Disk Drive	LaCie	LCH-MN2TU3/E	For archiving Radar Rainfall Data	1	BMD Head Office	Jul. 5, 2012
For Weather Information Dissemination						
Graphic Design Tool Kit (Software)	Adobe	Creative Suite 6	For implementation of Open Class/Seminar	1	BMD Head Office	Jan. 2, 2013
Megaphone	TOA	3W ER-1103		2	BMD Head Office	Jul. 4, 2012
External Hard Disk Drive	LaCie	LCH-MN2TU3/E	For archiving Outputs of Weather Dissemination Activities	1	BMD Head Office	Jul. 5, 2012
FY2013(5th FY)						
None						

Annex-4

Results of the Open Class Activity

Date	City Name	School Name	Number of Classes		Number of Students	Average Score	
						Pre-Test	Post-Test
September 19, 2010	Tangail	Bindu Bashini Gov't Boy's High School	Bengali Class	4	310	33	91
September 20, 2010	Tangail	Bindu Bashini Gov't Girl's High School	Bengali Class	2	206	33	86
September 22, 2010	Rangpur	Rangpur Zila School	Bengali Class	1	255	48	92
September 23, 2010	Rangpur	Rangpur Govt Girl's High School	Bengali Class	2	164	33	90
September 26, 2010	Dhaka	Dhaka Residential Model School & College	Bengali Class	2	354	36	90
			English Class			37	89
September 27, 2010	Dhaka	Rajuk Uttara Model School & College	Bengali Class	1	261	44	97
			English Class			31	94
September 28, 2010	Dhaka	Viqarunnessa Noon Girl's School & College	Bengali Class	1	295	44	95
September 29, 2010	Dhaka	Dhanmondi Gov't Boy's High School	Bengali Class	2	220	38	92
September 30, 2010	Dhaka	Sher-e-Bangla Nagar Gov't Girl's High School	Bengali Class	1	220	25	92
March 7, 2012	Sylhet	Scholarshome Boy's High School	Bengali Class	1	219	49	80
March 7, 2012	Sylhet	Blue Bird School & College	Bengali Class	1	165	49	87
September 16, 2012	Chittagong	Radiant School & College	Bengali Class	1	54	48	82
September 16, 2012	Chittagong	Chittagong Development Authority Public School & College	Bengali Class	1	192	48	97
September 17, 2012	Chittagong	Bangladesh Elementary School	Bengali Class	1	157	38	91
October 11, 2012	Dhaka	Mohammad Preparatory Girl's School	Bengali Class	3	508	51	97
			English Class	2	248	57	98
October 13, 2012	Dhaka	Sher-e-Bangla Nagar Gov't Girl's High School	Bengali Class	2	213	52	73
					202	58	80
October 14, 2012	Dhaka	Sher-e-Bangla Nagar Gov't Boy's High School	Bengali Class	2	180	50	88
					190	50	97
October 15, 2012	Dhaka	Gonobaban High School	Bengali Class	2	68	43	93
					67	40	96
October 17, 2012	Dhaka	Mohammad Preparatory Secondary High School	Bengali Class	1	152	52	81
			English Class	1	57	42	74
October 18, 2012	Dhaka	Rajuk Uttara Model College	Bengali Class (1st)	2	227	53	96
			English Class (1st)		161	49	91
			Bengali Class (2nd)	2	211	60	97
			English Class (2nd)		156	48	98
November 5, 2012	Dhaka	St. Joseph Higher Secondary School	Bengali Class	2	158	48	83
					154	62	92
November 18, 2012	Sitakunda	Barab Kund High School	Bengali Class	3	154	54	93
November 19, 2012	Sitakunda	Latifpur Alhaj Abdul Jalil High School	Bengali Class	2	273	46	85
March 29, 2013	Dhaka	Kishaloy Girls' School & College	Bengali Class	2	115	49	98
April 4, 2013	Dhaka	Lalmatia Housing Society School & College	Bengali Class	5	101	50	92
April 13, 2013	Dhaka	Kingshuk Participatory High School	Bengali Class	2	53	35	94
April 18, 2013	Dhaka	Mohammadpur Govt. Boys School	Bengali Class	2	173	48	83
					167	43	89
April 20, 2013	Dhaka	Lalmatia Girls' High School	Bengali Class	2	128	58	92
April 22, 2013	Rajshahi	Belghoria Abdus Sattar High School	Bengali Class	3	271	43	76
April 23, 2013	Rajshahi	Shyampur High School	Bengali Class	3	158	45	77
					122	42	80
April 25, 2013	Rajshahi	Collegiate School	Bengali Class	3	119	57	92
					205	58	95
April 26, 2013	Rajshahi	Mirjapur High School & College	Bengali Class	5	105	44	89
April 27, 2013	Rajshahi	Agrani High School & College	Bengali Class	3	143	46	88
					169	48	92
					178	53	94
April 28, 2013	Rajshahi	Maskatadighi High School	Bengali Class	3	107	54	88
April 29, 2013	Rajshahi	Dasmari High School	Bengali Class	1	129	49	91
April 29, 2013	Rajshahi	Pa Govt. High School	Bengali Class	3	265	61	95
May 4, 2013	Mymensing	Premier Idial High School	Bengali Class	3	248	53	87
May 5, 2013	Mymensing	Udyoun Mahila Samiti High School	Bengali Class	5	140	56	86
May 6, 2013	Mymensingh	Parangonj High School	Bengali Class	4	139	43	83
					120	53	87
May 6, 2013	Mymensing	Kazi Nazrul Islam Model High School	Bengali Class	3	134	45	83
May 7, 2013	Mymensing	Abdul Khaleque High School	Bengali Class	3	167	40	82
May 7, 2013	Mymensing	Ram Kishore High School	Bengali Class	3	335	50	77
May 9, 2013	Mymensing	Bororchar High School	Bengali Class	3	365	51	82
May 9, 2013	Mymensing	Mir Kandapara High School	Bengali Class	3	87	49	95
May 11, 2013	Mymensing	Mritunjoy High School	Bengali Class	3	95	44	86
May 12, 2013	Mymensing	Renaissance Girls' School	Bengali Class	3	226	51	96
May 12, 2013	Mymensingh	Char Kharicha High School	Bengali Class	3	182	52	96
					138	57	96
May 13, 2013	Mymensing	Nogendra Narayan Pilot Girls' High School	Bengali Class	3	258	50	94
May 14, 2013	Mymensingh	Zihiruddin High School	Bengali Class	3	170	41	96
					118	54	93
May 15, 2013	Mymensingh	Kalir Bazar High School	Bengali Class	4	245	41	89
					241	53	98
May 15, 2013	Mymensing	Fatemanagar High School	Bengali Class	3	315	47	95
May 16, 2013	Mymensing	Mokul Niketon High School	Bengali Class	1	253	46	92
June 20, 2013	Dhaka	Kurmitola High School & College	Bengali Class	3	219	55	86
					273	49	81
					237	59	90
June 26, 2013	Dhaka	Hazi Nuruddin Hmed High School	Bengali Class	4	162	49	90
					153	57	93
June 27, 2013	Dhaka	Rupshi New Model School	Bengali Class	4	158	50	87
June 29, 2013	Dhaka	Gandabpur High School	Bengali Class	5	163	45	90
					110	56	96
June 30, 2013	Dhaka	Parab High School	Bengali Class	3	441	53	85
July 2, 2013	Khulna	Khulna Model School	Bengali Class	2	236	51	92
July 4, 2013	Khulna	Khulna Zila School	Bengali Class	4	217	52	98
					178	56	97
July 6, 2013	Khulna	Govt. Coronation Girl's High School	Bengali Class	2	312	62	94
July 7, 2013	Barisal	Sofiulla High School	Bengali Class	4	375	46	81
July 8, 2013	Barisal	BM School Barisal	Bengali Class	5	231	50	94
July 9, 2013	Barisal	Soyoda Mazidunnesa High School	Bengali Class	5	186	59	99
July 11, 2013	Khepupara	Khepupara Model School & College	Bengali Class	3	361	51	91
July 13, 2013	Barisal	Nooria Secondary School	Bengali Class	5	228	52	97
		Total		196	17375	48	90

Annex-5

List of the Project Major Outputs

Annex	Outputs
1	Weather Observation Guideline
2	Analysis Result based on Stored Radar and Raingauge Data
3	Instruction on radar calibration for BMD radar system
4	Calculation of Atmospheric Pressure for Fixed-Cistern Type (Kew Type) Barometer
5	Calculation of Atmospheric Pressure for Fortin Type Barometer
6	Calculation of Relative Humidity and Dew Point Temperature
7	Weather Observation Data Input Manual
8	Changing Trend of Yearly Mean Temperature and Yearly Precipitation
9	Installation of CentOS 5.5 (Linux OS)
10	(JMA-NHM) Operation Manual for PC-Cluster
11	PC-Cluster Operation Manual
12	Brochure "Save Yourself"
13	Book "Weather Information"
14	BMD Character
15	Mascot of BMD Character
16	Visualized BMD Special Weather Bulletin on May 16, 2013
17	Major Dissemination Activity of Animated Cartoon for Natural Disaster Awareness named "Save Yourself and Reduce Risk"
18	Result of Open Class Activity
19	Routine Check Sheet for Radar System

Annex-6

Actual Dispatch Schedule of the JICA Expert Team

Assigned Field	Name of Experts	Dispatch Schedule in This Fiscal Year	
Leader / Weather Forecasting & Warning Service and Organization Management	Yoshihisa UCHIDA	September 27, 2009 – October 11, 2009 December 20, 2009 – December 20, 2009 February 6, 2010 – February 23, 2010	1.70 M/M
		June 4, 2010 – June 18, 2010 September 13, 2010 – October 12, 2010 January 29, 2011 – February 18, 2011	2.20 M/M
		June 27. 2011 – July 13, 2011 September 9, 2011 – September 20, 2011 December 14, 2011 – December 31, 2011 January 23, 2012 – February 1, 2012 March 3, 2012 – March 17, 2012	2.40 M/M
		September5, 2012 – September20, 2012 November5, 2012 – November15, 2012 December 1, 2012 – December20, 2012	1.57 M/M
		March 29, 2013 – April 19, 2013 July 7, 2013 – July 18, 2013 October 19, 2013 – November1, 2013 December 10, 2013 – December 19, 2013	1.93 M/M
Assistant Leader / Weather Observation	Toshihide ENDO	December 20, 2009 – January 6, 2010 February 8, 2010 – February 23, 2010	1.13 M/M
		June 10, 2010 – June 27, 2010 September 18, 2010 – October 8, 2010 November 27, 2010 – December 11, 2010	1.80 M/M
		June 27, 2011 – July 31, 2011 September 08, 2011 – September 18, 2011 November 14, 2011 – January 26, 2012	4.00 M/M
		June 30, 2012 – July20, 2012	0.70 M/M
		March 29, 2013 – April 19, 2013 July 7, 2013 – July 19, 2013 September 23, 2013 – October 14, 2013 December 10, 2013 – December 18,2013	2.20 M/M
Weather Service Infrastructure	Kenji MORI	September 13, 2010 – October 8, 2010 October 24, 2010 – November 14, 2010	1.60 M/M
		December 19, 2011 – January 12, 2012 February 28, 2012 – March 14, 2012	1.37 M/M
Meteorological Radar Calibration	Takayuki OTSU	September 27, 2009 – October 9, 2009	0.43 M/M
		September 14, 2010 – September 28, 2010	0.50 M/M
		December 02, 2011 – December 16, 2011	0.50 M/M
		December 05, 2012 – December 22, 2012	0.60 M/M
		October 18, 2013 – November 1, 2013	0.50 M/M
Data Quality Control and Statistical Analysis	Takayuki MOTOYA	September 27, 2009 – October 11, 2009 December 1, 2009 – December 26, 2009 February 8, 2010 – February 23, 2010	1.90 M/M
		June 4, 2010 – June 24, 2010 September 18, 2010 – October 14, 2010 December 2, 2010 – December 16, 2010 February 4, 2011 – February 18, 2011	2.40 M/M
		June 27, 2011 – July 14, 2011 September 09, 2011 – September 23, 2011 December 2, 2011 – December 31, 2011 March 01, 2012 – March 17, 2012	2.67 M/M
		August31, 2012 – September22, 2012 December4, 2012 – December 10, 2013 December26, 2012 – January 04, 2013	1.33 M/M
		March 29, 2013 April 19, 2013 May 14, 2013 – May 19, 2013 October 20, 2013 – November 2, 2013 November 14, 2013 – December 6, 2013	2.17 M/M
Web Site Design	Timothy Michael Kiddle	December 6, 2010 – December 23, 2010	0.60 M/M
		December 2, 2011 – December 19, 2011	0.60 M/M

Numerical Weather Prediction	Nobutaka NOGUCHI	September 27, 2009 – October 9, 2010 February 6, 2010 – February 8, 2010	1.10 M/M
		June 11, 2010 – June 26, 2010 September 21, 2010 – October 8, 2010 November 26, 2010 – December 16, 2010 January 29, 2011 – February 18, 2011	2.60 M/M
		June 27, 2011 – July 14, 2011 September 09, 2011 – September 29, 2011 December 2, 2011 – December 27, 2011 January 23, 2012 – February 4, 2012 March 1, 2012 – March 17, 2012	3.17 M/M
		September 5, 2012 – September 16, 2012 December 6, 2012 – January01, 2013	1.30 M/M
Weather Information Dissemination	Soshi IWATA	September 27, 2009 – October 9, 2009 December 1, 2009 – December 22, 2009 February 15, 2010 – February 27, 2010	1.60 M/M
		June 13, 2010 – July 3, 2010 September 14, 2010 – October 8, 2010 December 7, 2010 – December 21, 2010 January 22, 2011 – February 10, 2011	2.70 M/M
		June 27, 2011 – July 13, 2011 September 11, 2011 – October 5, 2011 December 06, 2011 – December 24, 2011 January 13, 2012 – February 04, 2012 February 28, 2012 – March 17, 2012	3.43 M/M
		September 13, 2012 – October 4, 2012 December 05, 2012 – December 20, 2012	1.27 M/M
		April 5, 2013 – April 19, 2013 October 1, 2013 – October 16, 2013 December 12, 2013 – December 20, 2013	1.33 M/M
Meteorological Radar Operation and Maintenance (J)	Takehiro YOSHIDA	September 27, 2009 – November 15, 2009	1.67 M/M
		June 4, 2010 – July 3, 2010 November 26, 2010 – December 25, 2010	2.00 M/M
		June 26, 2011 – July 22, 2011 October 13, 2011 – November 09, 2011	1.83 M/M
		October 30, 2012 – December 7, 2012	1.30 M/M
Meteorological Radar Operation and Maintenance (B)	Nasir Uddin Bhuiyan	September 29, 2009 – November 21, 2009 December 2, 2009 – February 20, 2010	4.50 M/M
		June 5, 2010 – July 28, 2010 September 14, 2010 – October 12, 2010 October 26, 2010 – November 12, 2010 November 27, 2010 – December 24, 2010 January 19, 2011 – February 17, 2011	5.30 M/M
		June 27, 2011 – July 31, 2011 September 10, 2012 – November 08, 2011 November 15, 2011 – December 30, 2011 February 16, 2012 – March 16, 2012	5.70 M/M
		July 1, 2012 – July18, 2012 November 1, 2012 – December 6, 2012	1.80 M/M
Operation & Maintenance for Studio Equipment	Nasir Uddin Bhuiyan	March 28, 2013 May 2, 2013	1.80 M/M
Meteorological Information Application and Promotion for Mass Media	Motoko KANOME		
Radar Observation Data Collection and Calibration	Takanari FUJII	September 22, 2012 – October6, 2012 December 08, 2012 – December 22, 2012	1.00 M/M
		July 5, 2013 – July 19, 2013 October 18, 2013 – November 1, 2013	1.00 M/M
Disaster Awareness Building (Project Coordinator)	Yosyiyuki YAGIRI	June 30, 2012 – July30, 2012 September 05, 2012 – January 05, 2013	5.13 M/M
		March 19, 2013 August 4, 2013 August 17, 2013 – August 26, 2013 December 3, 2013 – December19, 2013	5.53 M/M
Project Coordinator	Kazunori MURATA	December 20, 2009 – December 31, 2009	0.40 M/M
		September 27, 2010 – October 8, 2010	0.40 M/M
	Takanari FUJII	January 24, 2012 – February 4, 2012	0.40 M/M

Annex-7

List of Accomplished Project Achievements

Progress of the Project Achievements

Project Purpose	Indicators	Achievements
Weather information for natural disaster management is strengthened in terms of time and quality through human capacity development and dissemination of weather information among various stakeholders.	1. Rainfall data of the optimized radar ZR relation parameter for rainfall calculation being provided to FFWC.	Optimized radar data was provided to the FFWC by the BMD.
	2. Accurate and easily-understanding forecast and warning including tropical cyclone are timely issued to the organizations related to natural disaster management and mass media.	The program for the preparation of Visualized BMD Special Weather Bulletins (for Cyclone Tracking, Storm Surge & Strong Wind Warning) was developed. The "Visualized BMD Weather Bulletin" was issued timely through TVs and the BMD web site, when cyclone "Mahasen" attacked Bangladesh in May 2013.

Output	Activities	Achievements
1. Capacity of BMD for observation and forecasting is improved.	1-1 More than 80% of the hourly data such as surface temperature, humidity, wind direction, wind speed and precipitation are acquired at the six meteorological observatories with the AWSs.	Hourly data such as surface temperature, humidity, wind direction, wind speed and precipitation have been acquired at the five meteorological observatories with the AWSs from July 2012.
	1-2 Surface observations are conducted in each observatory by using the existing equipment in accordance with the observation guidelines which is developed by this Project.	Training in accordance with the prepared field observation and observation instruments maintenance/management manuals was implemented.
	1-3 Among the observers who attend the data quality control training, more than 70% of the participants understand the contents of the training.	Training on quality control was implemented and all of the participants understood the contents of the training.
	1-4 Quality control is continuously conducted.	Observed data which deviated from the normal value range was detected by the "Observation Data Input Format." In addition, human errors such as the misreading of the conversion table were reduced.
	1-5 Briefing for understanding and sharing the meteorological situations is conducted at SWC at least once a day.	Weather Briefing is conducted at the briefing room which was newly constructed under the Project.

Activities of PDM	Achievement Ratio	Achievements
1-1 To install the six (6) AWSs and twelve (12) rain gauges at the eighteen existing meteorological observatories.	100%	6 AWSs were installed at the 6 existing synoptic meteorological observatories: 1) Dhaka 2) Rajshahi 3) Sylhet 4) Barisal 5) Khulna 6) Chittagong 12 Rain gauges were installed at the 12 existing synoptic meteorological observatories: 1) Saidpur 2) Dinajpur 3) Bogra 4) Mymensingh 5) Tangai 6) Srimangal 7) Chandpur 8) Mongla 9) Bhola

			10) Sitakunda 11) Kutubdia 12) Teknaf The following drawings were prepared. ・Layout plan for the AWS pole ・Concrete foundation for the AWS pole ・10m height AWS pole (Manufacturing Drawings) ・Concrete foundation for the AWS pole (Shop Drawings) ・Standardized observation equipment layout plan for the synoptic meteorological observatory ・Standardized observation equipment layout plan for the agro-meteorological observatory. AWS specifications were also prepared.
	1-2 To revise the field observation guidelines (including AWS) in accordance with the latest WMO policy.	100%	Field observation procedures were prepared. Field observation guidelines were prepared. The training on observation data acquisition & quality control was implemented.
	1-3 To provide the observation training for field observers based on the field observation guidelines and the data entry format	100%	Training on observation data was implemented at a total of (x) synoptic meteorological observatories in Bangladesh.
	1-4 To provide the training for field observers on observed data acquisition and data quality control	100%	Data collected from the installed AWSs and rain gauges were compared with manually observed data. Based on the results of the comparison, a significant difference was not found.
	1-5 To prepare the operation and maintenance manuals for observation fields and instruments (including AWS).	100%	The following products were prepared. ・Drawings for the manufacturing of furniture for the briefing room equipment ・Forecast briefing flowchart ・Briefing flowchart for the mass media ・BMD meteorological service regulation ・Forecast products according to the emergency management phase and location specificity
	1-6 To provide the training for field observers and instruments inspectors on maintenance and control of observation fields and observation instruments (including AWS).	100%	Preparation of the field observation & instruments maintenance/management rules was conducted. Preparation of the observatory maintenance and management record book was conducted. Preparation of the field observation & instruments maintenance/management manual was conducted. Trainings for field observation & instruments maintenance/management were implemented.
	1-7 To compare the data obtained by the AWS and existing equipment and conduct quality control.	100%	Comparison between the data obtained using the AWSs and Rain Gauges installed under the Project and those obtained using manual observation was conducted.
	1-8 To prepare the briefing flowchart and record, and conduct briefing along with the flow chart.	100%	Training for forecast briefing has been implemented. The following products were prepared. ・Drawings for the manufacturing of furniture for briefing room equipment ・Forecast briefing flowchart ・Briefing flowchart for the mass media ・BMD meteorological service regulation ・Forecast products according to the emergency management phase and location specificity
Project Purpose	**Indicators**		**Achievements**
2. Quantitative rainfall estimation by using Doppler Radars is implemented.	2-1 Correlation of radar rainfall data observed by the optimized radar ZR relation parameter for rainfall calculation and surface observation being corroborated.		The training on the detailed procedures for analysis was implemented and the conduct of correlation analysis using observed data for this year was carried out as a test case.
	2-2 Binary data of rainfall intensity composite picture created by rainfall data of 5 existing radar systems optimized ZR relation parameter for radar rainfall calculation is distributed to FFWC.		The binary data of composite rainfall amount was created using rainfall data from the five (5) existing radar systems whose ZR relation parameters were optimized for radar rainfall calculation.

	Activities	Achievement Ratio	Achievements
	2-1 To procure and set up the required equipment for the training on optimization of radar ZR relation parameter for rainfall calculation.	100%	The rain gauges were installed at the 12 meteorological observatories: 1) Saidpur 2) Dinajpur 3) Bogra 4) Mymensingh 5) Tangai 6) Srimangal 7) Chandpur 8) Mongla 9) Bhola 10) Sitakunda 11) Kutubdia 12) Teknaf
	2-2 To prepare correlation charts of rainfall data of radar and surface observations in the observation range of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation.	100%	After the correlation analysis between the rainfall data from surface observation and the radar rainfall data obtained after increasing radar operation hours was done, the optimization of the radar ZR relation parameter of the 5 existing meteorological radar systems for rainfall calculation was implemented.
	2-3 To prepare correlation charts of rainfall data of radar and surface observations.	100%	The training on the detailed procedure for analysis was implemented. Correlation analysis using observed data from the installed rain gauges in the Project and the existing meteorological radar was conducted. C-shell script of the automatic data collection and the analysis programs for radar data (Analysis PC in the BMD) Training material about "Radar Calibration"
	2-4 To compose the rainfall composite picture of 5 existing meteorological radar systems optimized radar ZR relation parameter for rainfall calculation in SWC	100%	The plan to release additional products made from the new B and β values for testing purposes was adjusted.

Project Purpose	Indicators	Achievements
3. The trend analysis of climate change is conducted by using the accumulated meteorological data.	More than two (2) BMD staff can detect abnormal values and human error of the accumulated meteorological data through the computer program.	2 Counterparts can detect the value which deviated from the normal value range.
	3-2 Summary of climate statistical analysis is shared in the public.	Graphics showing the correlations and trends of annual precipitation and temperature for more than 30 years at the 6 existing synoptic observations (Dhaka, Rajshahi, Sylhet, Barisal, Khulna and Chittagong) were prepared.

	Activities	Achievement Ratio	Achievements
	3-1 To develop daily observation data input sheet for easy statistical processing and data quality control of observed data	100%	Observation data input sheet was developed. Formula for the automatic calculation by the Input Format was determined. • Formula for Relative Humidity • Formula for Dew Point Temperature • Formula for the temperature correction value for the calculation of Station Level Pressure • Formula for the gravity correction value for the calculation of Station Level Pressure • Formula for the height correction value for the calculation of Mean Sea Level (MSL) Pressure Operation manual for the observation data input sheet was also prepared.
	3-2 To archive the observation data and conduct quality control	100%	Observation data of the AWS is archived automatically. Through a comparison of the data obtained by the AWS and those obtained using manual observation as well as the determination of the normal value range, data quality control was conducted.
	3-3 To conduct climate data statistical analysis by using the above data	100%	Statistical analysis (histogram preparation and calculation of correlation) of the climate data (rainfall and temperature) for more than 30 years at the 6 existing synoptic observations (Dhaka, Rajshahi, Sylhet, Barisal, Khulna and Chittagong) was executed.

Project Purpose	Indicators		Achievements
4. Capacity of BMD personnel for 1 to 3 days weather forecasting on trial using basic techniques of Numerical Weather Prediction (NWP) is developed.	4-1 Enable to use the basic techniques of Numerical Weather Prediction (NWP): 5 staff of BMD		More than 6 C/Ps of the BMD could develop products and guidance using the NWP model. The capacity of BMD personnel to conduct 1 to 3 days trial weather forecasting using basic techniques of the NWP was developed.
	Activities	**Achievement Ratio**	**Achievements**
	4-1 To procure and set up the required equipment for the training on Numerical Weather Prediction (NWP)	100%	Installation of the cluster computer procured for the training on the NWP at the SWC was completed. Installation of the required software/model into the cluster computer was also completed.
	4-2 To conduct the basic training on Numerical Weather Prediction (NWP)	100%	The basic training on the NWP was conducted. Training on computer operation for the NHM was conducted. Comparison between the NHM calculation result using the observation data of the tropical cyclone which landed in Bangladesh and the MTSAT imageries as well as the evaluation of the accuracy of the NHM calculation result were conducted.
	4-3 To conduct the training on Numerical Weather Prediction (NWP) guidance	100%	Lectures on the concept and theory of NWP Guidance were conducted. A 35 Grid Point Value (GPV) near the synoptic meteorological observation point in Bangladesh was selected. NWP forecast guidance for 1-3 days at the 35 points was prepared using a multiple regression analysis.
	4-4 To operate the Meso Scale Model (MSM) by using PC (Linux) on trial base	100%	The trial operation of the NHM using the cluster computer and laptop PCs for training was conducted.
Project Purpose	**Indicators**		**Achievements**
5. Capacity of BMD staff to promote understandings about meteorological information among the "stakeholders" is further developed.	5-1 BMD staff's planning and presentation skills for disseminating meteorological information is improved.		The BMD staff's planning and presentation skills for disseminating meteorological information have been improved.
	5-2 Implementation of seminars for stakeholders related to natural disaster: 8 times, 70% of the participants understood the contents		Seminars for stakeholders related to natural disaster management were implemented more than 8 times, and more than 70% of the participants understood the contents.
	5-3 Meteorological information on the BMD's website is user-friendly and updated.		Meteorological information on the BMD's website is user-friendly and updated.
	Activities	**Achievement Ratio**	**Achievements**
	5-1 To prepare PR materials of weather, climate and natural disaster	100%	Animated cartoon DVDs entitled "Save Yourself and Reduce Risk," brochures and posters on the natural disasters which dealt damages and negative impacts to Bangladesh were prepared.
	5-2 To conduct the seminars/ open-class for the stakeholders	100%	Seminars/open classes for the stakeholders were implemented,
	5-3 To upload and update meteorological information including summarized result of climate data statistical analysis on the BMD website	100%	A hyperlink button to access the website of the animated cartoon entitled "Save Yourself and Reduce Risk" to allow users to download or display the cartoon was created on the BMD's website. BMD Special Weather Bulletins prepared under the Project for the Cyclone which attacked Bangladesh were uploaded on the BMD website and were regularly updated on time on the BMD website.
	5-4 To disseminate meteorological information through media.	100%	The Department of Disaster Management (DDM) under the Ministry of Disaster Management and Relief had expressed a dissenting view on the early warning dissemination done by the BMD. However, during a meeting among the DDM, BMD and JICA (including the project expert) on November 15, 2012, the DDM agreed on a "Positive Duplication" of the early warning dissemination system by the DDM and the BMD.
Project Purpose	**Indicators**		**Achievements**

6. Weather observation and monitoring equipment such as meteorological radar system etc. are operated and maintained properly.	6-1 More than fifteen (15) BMD staff for the five Radar systems can implement regular maintenance and trouble shooting (except serious troubles which require assistance from HQ or manufacturer) for the meteorological radar systems.		1. In order to improve the technical skills of all radar staff at each radar station, 30 engineers in total joined an OJT on maintenance and measurement work of the radar system in FY2012 (Cox's Bazar: 9, Rangpur: 7, Khepupara: 7 and Moulvibazar: 7). 2. Maintenance work for the workstation of the Doppler Radar systems were carried out by two (2) engineers belonging to the National Meteorological Communication Centre and the BMD Head Office. 3. OJTs for new or transferred personnel were carried out by the skilled personnel of each radar station. All personnel except the mechanical staff was able to operate and shutdown the radar with accuracy. 4. Troubleshooting of the MOD UNIT was done by the personnel of the Moulvibazar radar station. The unit was tested by the Experts and was confirmed to be in good operation.
	6-2 More than 80% of the BMD's staff in each existing meteorological radar station can operate and maintain the radar system in accordance with the operation/maintenance manual which is developed by this Project.		All of the BMD staff at each radar station operate and maintain the system in accordance with the operation/maintenance manual which was developed under the Project.
	6-3 Meteorological radar observation schedule is maintained based on the requirement of SWC.		Advice to the BMD on radar operation hours during the rainy season and the dry season.
	6-4 Operation cost for the meteorological radar system in normal season is saved.		Observation schedule for the meteorological radar was observed and maintained properly.
	Indicators	**Achievement Ratio**	**Achievements**
	6-1 To prepare the operation and maintenance manuals for the meteorological radar system	100%	Technical training for the staff of five (5) radar stations on the fundamental skills and circuit diagram necessary for troubleshooting works of the meteorological radar system was conducted. (Radar stations: Dhaka, Rangpur, Cox's Bazar, Khepupara and Moulvibazar) Training on radar operation procedures at three (3) Doppler meteorological radar stations (Cox's Bazar, Khepupara, and Moulvibazar) was conducted. Training on maintenance works for the radar transmitter, receiver and Antenna System at 3 Doppler radar stations (Cox's Bazar, Khepupara and Moulvibazar) was conducted. Main training was focused on: 1. Replacement and adjustment works of "Klystron." 2. Measurement of the following items: (1) Average transmitting power. (2) Pulse width (3) Pulse repetition frequency (4) Radar receiver sensitivity check (5) Receiver Linearity check (6) Receiver Dynamic Range (Z CAL) check (7) Sleep ring Cleaning (8) Motor belt tension checking (9) Meter reading of voltage and current 3. Practical Troubleshooting After the preparation of the manual summary, a portion of the manual summary (exchange and adjustment procedure of the transmitter) was revised and adapted to the C/P's technical level.
	6-2 To conduct the training on operation and maintenance of Meteorological Radar System.	100%	The operation & maintenance record book was used in the conduct of routine work. Instructions for the preparation of the radar spare parts consumables (ink cartridge and battery for the UPS) list were made.
	6-3 Operation cost for meteorological radar system in normal season (before and after the implementation of the radar observation routine schedule)	100%	Radar Observation Frequency was set as follows. 1. Radar observation: 6 times per day according to the WMO guidelines. 2. During cyclone/severe weather: 24 hours continuously. The review and establishment of the radar observation system of the BMD during the dry season were conducted.