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General Guidelines For Setting-Up a Community-Based Flood Forecasting and Warning System (CBFFWS)

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Typhoon Committee
General Guidelines For Setting-Up A Community-Based Flood Forecasting And Warning System (CBFFWS)
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GUIDELINES FOR SETTING-UP A COMMUNITY-BASED FLOOD FORECASTING AND WARNING SYSTEM (CBFFWS)

The main beneficiaries of a CBFFWS program are the flood-prone communities within relatively small watershed or sub-basin areas that are not generally covered by an automated Flood Forecasting and Warning System (FFWS).

1. Description of a CBFFWS

The CBFFWS is a locally based operational flood forecasting and warning activities of a community that aids them in mitigating the effects of flooding in their area. It is a non-structural flood disaster mitigating activity that is simple in design and operation, relatively cheap, easy to sustain and most of all the social and moral responsibilities of the community and its leaders, the Local Government Unit (LGU), are enhanced through their direct and active participation. The ultimate goal of the system is to protect life and property by achieving and maintaining a high-level of community preparedness through timely flood information and warnings. The system is more important to areas prone to deviant or flash floods.

The true essence of CBFFWS is community empowerment. It empowers the people of the community to protect, prepare themselves and make them resilient against the disastrous effects of floods. The community and its LGU are in the best position to undertake preparedness measures against floods.

The system is basically composed of a set of monitoring instruments, staff gages along the target river channel and rain gages installed at strategic locations within the watershed area encompassing the target community. Flood markers are also installed in the target area for flood extent mapping and for other related studies. Community personnel or volunteers equipped with dedicated radio communication sets or cellular phones for data and info exchange and for transmitting warnings to the disaster groups will serve as hydrological observers. The weather forecast from the national meteorological office will be the initial information for system's operation. Localized weather systems affecting the community will also be observed, whenever possible, through the monitoring network of the community. A local flood warning or signal will then be issued by the community's operations center to its field personnel and disaster information groups based on pre-determined river stage assessment levels and or when the set of rainfall threshold values have been attained at the any of the stations within the area.

A CBFFWS is needed in order to provide the community's disaster response personnel of advance flood information that can be readily translated to community response actions. It is important that the flood information should be directly linked to disaster response actions of the community such as preparedness and evacuation activities. The major task of the community leaders is to organize and lead residents of the community in taking appropriate actions during flood events.

Another important function of a CBFFWS on a long-term basis is to provide information for water resources management as a support to daily decisions to water allocation issues through its continuous hydrological observation and analysis of its database.

A CBFFWS may come in several names such as Community-based Flood Early Warning System (CBFEWS), Community-based Flood Warning System (CBFWS), Local Flood Warning System (LFWS), Barangay Flood Warning System (BFWS) and so forth.

2. Setting-up a CBFFWS program

There are several approaches in undertaking a CBFFWS program based on the community's system of organization. The following activities are the basic ones that are mostly required and expected to be carried-out:

2.1 Initial activity

Coordination and a sit-down discussion with the community leaders or the LGU and residents of the target area is the first step to be undertaken. This is to determine the acceptability of the system in the area particularly as to what type of system does the community need, will be able to handle, support

and sustain. This initial activity is practically the most important step of the whole program as it looks into the real need and acceptability for such a system by the community.

The following people are the ones whom to talk to and work with in the community with regards to the initial activity:

- Elected Local Officials
- Respected Community Leaders And Personalities
- Local Priest / Religious Leaders
- School Officials

A CBFFWS is highly dependent on the community's leaders and key members. The local leadership is often the key element in engaging communities to a CBFFWS program, hence it is important to work closely with its leaders and respectable members of the society to build up understanding and support at the community level. A close tie-up with the community's Disaster Preparedness and Prevention (DPP) team is another important facet that should be identified and established immediately at the start of the program. It is best if harmonization of the different sectors of the community is worked-out for involvement in the program.

It may be possible that the affected watershed transcends political boundaries such that several communities are covered within the said watershed. For such a case, a holistic approach is needed in which a coordinated approach of all sectors of the communities within the watershed are enjoined and stating that there are no political issues involved when it comes to disaster mitigation. Identifying all possible opportunities in setting-up a CBFFWS will be a good start in organizing all the efforts and resources of all the stakeholders.

For a CBFFWS program to be operationally sound, the following two questions to the target community should first be answered:

1. Is the community interested, enthusiastic and willing to put-up a system?
2. Do they have the adequate community resources and are they willing to put-up the necessary funds to purchase, operate, maintain, and sustain a CBFFWS service?

The background idea about these questions is basically to promote a sense of ownership of the system on the part of the LGU and the community.

A negative answer to any of foregoing questions, particularly the first one, can be a good reason not to pursue such a program in the community. However, should the community agree on having such a system, then it is best to pursue and adopt a community resolution or an ordinance, within the structure of its local government system, that will pertain to the setting-up and institutionalization of such a program. This will likely prepare the community in setting aside a certain budget for the set-up, operation, maintenance and sustainability of the system.

Another opportunity in establishing a CBFFWS is the incorporation of partner agencies such as other national government agencies (NGA), non-governmental organizations (NGO), private corporations and the like. This can be a big support for the community in establishing the system by specifically identifying the roles wherein these different groups can come in and help in the set-up of the CBFFWS and

A startup activity that may prove to be effective is to undertake pre-program seminars with the community, a presentation why there is a need for a CBFFWS in the community integrated with the disaster contingency planning workshop for the target area. In the Philippines, this approach was carried out in the province of Bulacan at the start of the establishment of the CBFFWS in the said province.

specifically define what they can get in return for their involvement.

At this initial activity stage, there is a real need to identify the program coordinator or a focal point person, probably a respected person or the head in the community, who will be responsible in organizing the activities and other related matters that are involved in setting-up the CBFFWS.

3. Establishment of the system

3.1 Area survey

This is basically known as the information-gathering phase. This initially involves a tabletop survey of the watershed area through available maps, flood reports, area's socio-economic profile and other related materials.

During this activity, identification of initial station locations from the base maps is made. Selection should be based on watershed configuration and profile. An ocular and physical survey of the area is then carried-out to validate and finalize the locations previously identified in the maps taking into consideration hydrological area characteristics, number of observation points, data propagation test, and the like.

It is best to conduct the ocular activity with the help of the hydrologist or a hydrometeorologist and a community member/s knowledgeable with the area and has had quite an experience in the flood disaster events in the community. It is important to note that sometimes the best sources of information are the old folks in the community and the disaster response groups in the area.

3.2. Making a Flood Hazard Map (FHM) of the target community

In line with the area survey activity is the creation of a FHM for the target area. A good FHM is one that is simple and community-friendly, based on the community's level of understanding rather than a high-ended digitized Global Information System (GIS) output that is rather vague on the community's level of comprehension. A good practice is to have the community people draw their own maps, zooming in on specific areas within the community and then corroborated through actual ground survey and then subjected to few refinements. Eventually, these maps will serve as the community's own maps that will be presented or distributed in their area. The maps will serve as a means for identifying evacuation sites and routes and for community development planning purposes. The map should be updated whenever necessary, say after an actual flood event, construction of flood structural measures in the area and so forth.

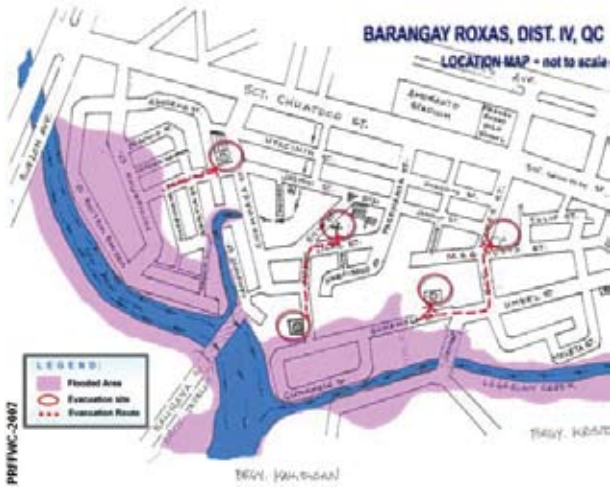


Figure 1.0. Sample of a flood hazard map prepared by the LGU of a community showing the flood extent, evacuation sites and possible evacuation routes to said identified evacuation sites. Maps such as this type are more likely to be appreciated on a community level rather than high-ended computer generated digitized maps.

Source: Output of the flood hazard mapping of Barangay Roxas for Barangay Flood Warning System (BFWS), Barangay Roxas, Quezon City, Philippines (May 2007).

3.3 Installation of monitoring instruments

This activity involves the actual installation of river gages, rain gages and flood markers and the communication system, including back-up communications. Again, when undertaking such activity, it best that the community be engaged in helping in the installation. This will prepare them for possible care and maintenance of instruments.

The type of monitoring system, whether automatic, manual or combination of both, and the number of station sites are basically determined on the watershed's physical configuration. However, the type and the number of sites are primarily subjected, based on the budgetary limitation, on the community's capability to operate and ability to sustain the system. The type of system and its quantity is also dependent on the need for accuracy, dependability and timeliness of data and information. The more sophisticated and high-ended the system configuration is, the more resources, time and money, are required.

It should be noted that for a CBFFWS program, automatic and digital monitoring gages are much preferred and would be more sensible for real-time information needed in the timely issuance of flood warnings, particularly on areas that are prone to flash floods. On the other hand, manual gages are generally used for researches, calibration of digital gages, and long-term study purposes.

3.3.1 Rainfall Monitoring Gages

Manual type: WMO standard, non-recording rain gages. While this gage is quite cheap, observation is more tasking and not appropriate for short-period real-time observation.

Digital type: Tipping-bucket, self-emptying type rain gage equipped with a digital display. This type can be used with an SMS-enabled observation for remote installation and also data can be saved with a data logger or on a rain chart. This type of

Manual rain gages (top) are a lot cheaper than digital ones but are not appropriate for real-time observations.

Digital Short-Messaging-System (SMS) enabled rain gages such as the one shown below are preferred for real-time observation in a CBFFWS.

An SMS-enabled, pressure-type river gage, such as the one shown on the left, have been installed in the Binahaan River local flood warning system in Leyte, Philippines.

Manually read staff gages (top) are relatively cheaper but requires continuous monitoring during inclement weather condition.

rain gage is preferable to be used for real-time observation particularly for a CBFFWS set-up.

Other monitoring instruments and devices such as an Automatic Weather Station (AWS), tide gages, alarm systems, etc., are practically determined on the community's need and their budgetary allocations. An AWS may come in quite handy in the forecasting side particularly during the passage of tropical cyclones.

For manual staff gages and flood markers, it is more practical to design a cutout template made out of a cardboard for ease in installation on bridge's pier, walls and posts. A white base paint, quick-dry enamel, is first overlaid on the identified post. The cutout template is used as a guide for the centimeter graduation of the gage sprayed with red paint. Sometimes it is better to use "reflector-type" paint for ease in night observations.
After every flood event, the gages should be cleaned of mud and dirt and if necessary repainted over using the same cutout template. The cutout template can be used many times over as long as it is properly kept.

3.3.2 Communications system

The main backbone of the CBFFWS is a reliable communications system set-up. Hydrologic data at real-time or near real-time is the key factor for issuing timely flood warnings. Hence, it is important that the communication system should be operationally reliable at all times. Dedicated radio-based or SMS-based systems may be effective at relatively small watershed areas. However, for relatively large catchments, dedicated telemetry systems may be better but relatively expensive. A back-up system of communication, such as a highly reliable Single Side Band (SSB) communication, should also be present in case the main communication system breaks down.

3.4 Determination of warning levels

After gages have been installed, hydrographic survey of the river channel (cross-section, slope profile, roughness coefficient, etc.) particularly at river gage locations are taken to determine the river assessment values for warning levels. Rainfall threshold values for warning purposes can also be determined using various empirical hydrologic formulae. There are several methods that can be used to get these values and the simplest is to base the warning levels on the community's past observations and experiences.

There are several ways of presenting the warning levels for floods in a CBFFWS. For example, river warning levels such as alert, alarm and critical levels that are related to staff gage readings based on streamflow or river cross-sectional area or plainly on the community's past flood experiences. Another is rate of rise, based on time, and from one predetermined staff gage level to a next level and or flood time from one station to another downstream station. Qualitative basis can also be used as another case such as changes in color of river from relatively light blue, clear or greenish to a brownish-muddy color, presence of debris, changes in river flow from a relatively calmness to torrent, and the like.

In the Philippines, such as in the Binahaan River local flood warning system in the Leyte Island, warning levels are connected to certain conditions, for example, storm warning signal associated with an approaching tropical cyclone, river stage at a certain forecasting point or an observed rainfall value at an upstream station accumulated for a certain period of time.

Another example, as in the Hermosa-Dinalupihan local flood warning system in the province of Bataan

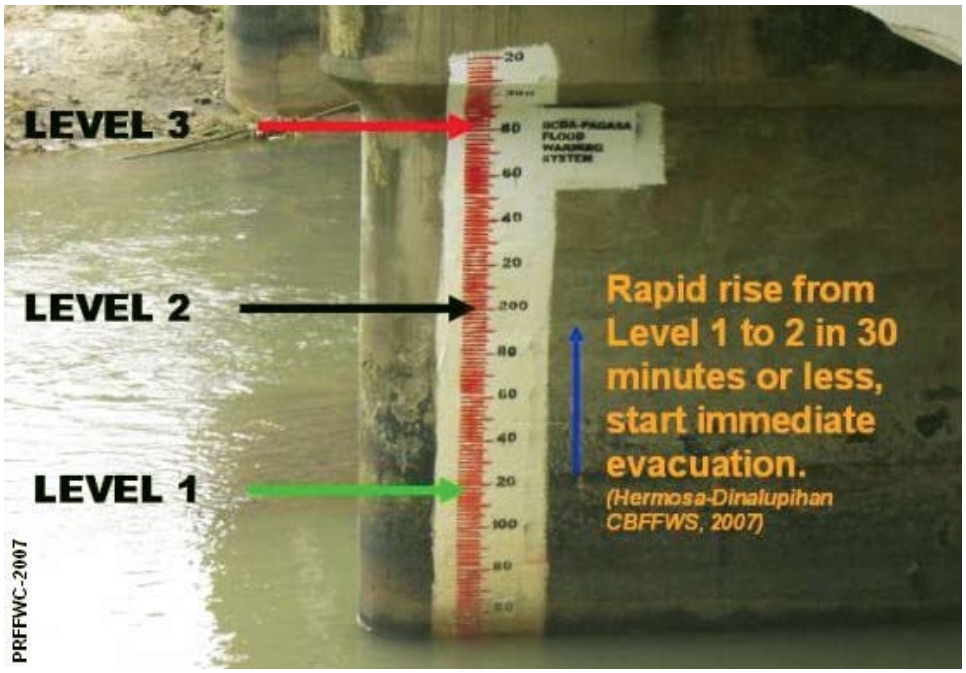
Hydrographic measurements (shown above) are necessary in establishing initial river assessment values as basis for warning levels.

in Philippines, the rate of rise from a predetermined river level to the succeeding predetermined level in a certain period of time is one criteria for activating the pre-disaster actions in a community (photo below).

River assessment levels and rainfall threshold values should be treated as subjective and temporary at start of operations. Values should be adjusted accordingly based on actual event observations and as more data and information comes in.

4. Setting-up of an Operations Center (OC)

A CBFFWS Operations Center within the watershed will serve as data and info exchange center, as a coordinating center for the whole system. While this office and the activity involve may not be needed in some cases, the establishment of an OC will greatly improve monitoring and collection of hydrological elements, and the coordination and dissemination of flood warnings to the community's disaster personnel. In many cases, the existing disaster



coordinating office in the community is made as the CBFFWS Operations Center.

It is important that the OC be in constant monitor of the present as well as the expected weather conditions over the target area. Hence, it is necessary that the OC should have continuous information from the state or national meteorological office either by phone or through the Internet. An inclement weather expected over the area will be the signal for initiating pre-flood warning activities. Subsequent defined activities will follow until such time that warnings levels have been called-off based on existing and expected conditions over the target area.

It is a must that an OC should have a stand-by power generator set in case of power failures, particularly during passage of a tropical cyclone over the area.

The OC can also be the hub of information for the watershed with its database of hydrological data taken from the CBFFWS stations for a period of time. It can serve as a research center for studies within the community. Finally, the forecasting portion for floods in the CBFFWS will soon be realized and be a major task of the OC once enough event data have been gathered from the CBFFWS stations and applied to flood models.

5. Training of observers

A very important aspect of the whole CBFFWS program is the training of rainfall and water level observers. The timely issuance of flood warnings is linked to the regularity and timeliness of observation and transmission of observed hydrological data and this will highly depend on the community observers, whether the LGU personnel or community volunteers. The sustainability of CBFFWS will depend largely on the dedication and diligence of its observers.

Provision of allowances or honoraria to observers may be necessary in many instances. However, volunteerism should first be implored before applying the former. Exhorting volunteerism for such an undertaking is quite a big challenge. It may be essential to provide some form of monetary recognition, which is not expected by the volunteer observers, from time to time for exceptional observation efforts made, especially during disastrous flood events.

It is important that there is enough number of observers to be trained. This is to ensure that there will be continuous 24-hour observations during flood events. It is also important that for each observation site, at least 2 observers should be working together in a shifting format. However, it is far better to have more observers per station than limiting to just two persons. A continuing program of refreshers and training programs for old and new observers should be undertaken on a regular basis to further ensure the sustainability of the CBFFWS.

6. Community activities on operations and maintenance

6.1 Monitoring and observation

This is the actual observation, monitoring and transmission of rainfall and water level information from various stations within the system to the operations center or the relevant office doing the flood information and warning activities.

Monitoring of hydrological data on a regular basis, daily basis, even without inclement weather condition should be observed. The importance of having continuous data will be realized when doing researches, studies and related activities or more importantly for future water allocation issues.

There should be a special form to be written on for the data observed. The form should be simple and readily understood by the observers. These forms

should be submitted on a regular period to the OC for data encoding to build its database.

6.2 Flood warning activities

These are the actual flood warning related activities undertaken during inclement weather conditions. It starts off by providing information to the community of an impending flood over the area and hence, disaster preparedness and preparations activities are carried-out. Flood warning activities can either be issuing a flood warning message to the target area, raising alert levels through warning signals such as a siren, hitting a gong, steel pipes, church bells, etc. This activity is precisely the main purpose of a CBFFWS, which is to provide timely flood warnings!

A community leader shows residence of Odelco riverside area in Quezon City how to give warning signals using a hollow steel pipe (encircled in red), which performs much like a bell. Warning activities in the Barangay San Bartolome Flood Warning System in Quezon City, Philippines, August 2006.

Table 1.0. Example of the warning levels, conditions and community activities

	Example of conditions (any one of the following)	Possible community activities
Warning Level 1 Flood is possible in the next 24 hours; suggest community awareness	• Public Storm Warning Signal (PSWS) no. 1 is raised; • When river stage reached the alert level at a water level monitoring station; • When rainfall observed at an upstream station reached about 100 mm in 18 to 24 hours or less.	Strengthening of house posts; charging of reserve batteries; stocking of food supplies to last for at least 3 days, and so forth. (These are activities that are not wasted even if floods do not occur)
Warning Level 2 Flood is threatening; suggest community preparedness	• PSWS no. 2 is raised; • When river stage reached alarm level at a water level monitoring station and • When rainfall observed at upstream station reached about 100 mm in 12 hours or less and continuous rains observed in all stations.	Raising flood-sensitive things above possible flood levels inside the house; gather farm animals to a safe place, and so forth. (These are activities that may take some time to accomplish)
Warning Level 3 Flood is expected to occur; suggest evacuation of areas to be affected	• PSWS no. 3 is raised, • When river stage reached critical level at a water level monitoring station; • When the rate of rise at a water level monitoring station from level 1 to level 2 is attained in 30 minutes or less; • When rainfall observed at upstream station reached about 100 mm in 9 hours or less and continuous rains observed in all stations.	Evacuate immediately to safer grounds.

6.3 Community response activities

These are the activities that the community will have to undertake in connection with the flood warning levels issued by the responsible person in the CBFFWS. The activities may either be simple stock piling of daily needs, raising important things above possible flood levels inside the house, waterproofing such as sandbagging, strengthening of house posts, pre- and evacuation procedures.
The dry run should focus only on what the observers have learned from their training and their response or action to such a situation. Identifying the points of weakness and the need for development and strengthening of these areas. A dry run should be carried-out at least once before the start of a rainy season. However, regular dry run of at least once in 3 months or less is far much better in order to refresh observers of their tasks but this is hardly attained in most cases.

Conducting a drill of pre-disaster activities with the community is sometimes a problem, particularly in the Philippines, that is being experienced in many of the target areas that have this system. A basic approach is clearly to do first a dry run of activities in the system, in terms of hydrological observations and transfer-exchange of information between observers and the operations center. This is done by working out a possible scenario within the target area.

It is best if a drill involving the target community is carried-out in order to determine their response time and possible weaknesses in the flow of activities, most particularly in the evacuation activities. If unable to organize such a drill, it may also be possible just to organize a meeting with the locals explaining the various activity responses for a respective warning level. A community information board that shows the level of warning/s and the respective community activities will help remind the locals on how to respond for each level of warning.

6.4 Instrument maintenance

This is the actual regular physical check-up, repair and maintenance, possible calibration, of the CBFFWS monitoring instruments.

Some perfunctory maintenance tasks such as rain gages should be cleared of leaves, twigs and other objects or cleaned of silt from accumulated dust by pouring water in its collector funnel. If a digital rain gage is set-up, then replacement of its digital display batteries should be made on a regular basis. Painted staff gages should be cleaned after every flood event or if necessary, repainted back to its original state. Likewise, flood markers should also cleaned and repainted whenever needed. All other monitoring instruments should be given the appropriate maintenance as provided for in their manual booklets.

A very important part of this activity is the check and maintenance of the communication system including back-up communication system and the warning facilities. A test of the system should be

Table 2.0. The Philippine Public Storm Warning Signals (PSWS)

PSWS no. 1	Winds of 35 to 60 kilometers per hour may be expected in at least 36 hours
PSWS no. 2	Winds of more than 60 to100 kilometers per hour may be expected in at least 24 hours
PSWS no. 3	Winds of more than 100 to185 kilometers per hour may be expected in at least18 hours
PSWS no. 4	Winds of more than 185 kilometers per hour may be expected in at least12 hours

done regularly as well.

6.5 Post-event evaluation

Post-flood surveys should be carried-out after every event for the analysis and improvement of the CBFFWS. Checking out the extent of flooding and the timing of the arrival of floodwaters is one reason of undertaking a post-flood investigation and analysis.

A brainstorming session with all of the key players in the CBFFWS set-up is done after every flood event. This is to identify the problems encountered, the weak and strong points of the system, ways to improve the system, further studies, proposals and other related matters.

7. CBFFWS related activities

1. Community drills or dry-run activities should be organized on a regular basis, at least once before onset of flooding season, to determine community actions and response times; again, to determine possible problem areas. In line with this is the specific identification of evacuation shelters and possible evacuation routes using signs and pictograms through the integration of 'Ubiquitous" flood hazard mapping, which is now being standardized in Japan.
2. Information and Education campaign (IEC) for the community on disaster preparedness and prevention activities. Setting-up of Information boards that will show the river and weather status, FHM showing evacuation areas and routes, warning levels to observe, and so forth. The information board should be erected at the community center areas or places that are frequented regularly by residents of the community.
3. Installation of flood markers at every flood-affected street for flood extent mapping and improvement of flood hazard maps. Again, there should be a special form to be used for this purpose. It should indicate time of start of flooding, time of peak and gage reading, the time floodwaters have subsided at the flood marker site, and a sketch of the extent of floodwaters in the affected area.
4. The dissemination of flood warnings through local community radio or other radio stations that are clearly received within the community. Oftentimes "brownout" or power failures occur during times of inclement weather particularly during passage of a tropical cyclone over the community and portable transistor radios may proved to be the best form of information in receiving flood warnings and other info updates particularly at the outskirt sides and remote areas of the community.
5. The program of School Hydrological Information Network (SHINe). It is said that disaster awareness, mitigation and prevention starts at school. This program is actually a separate

The above pictogram depicts an evacuation area during flood disaster.

The above pictogram depicts probable flooded area. Probable maximum flood depth can also be included in the sign.

Source: Ubiquitous FHM presentation by Kazuhisa ITO of IDI-Japan

undertaking but can be attached to a CBFFWS program. This is in a way similar to a CBFFWS except that it focuses on a particular school as a community. The idea is to engage students and teachers to do monitoring activities, rainfall and or river stage, and be part of the observation network of the CBFFWS in the target community. Not only does it contribute to the CBFFWS thru exchange of data and info but also rather it enhances the student's scientific inclination through observation and monitoring involvement.

6. The development of a simple flood forecasting and warning model for the CBFFWS. Sufficient observed data and info from the CBFFWS stations are needed for this purpose.

7. The possibility of incorporating the forecasts of rainfall-induced landslide and debris flow warnings through the CBFFWS for critical areas within the community, those that are close or adjacent to mountainous areas. By defining the rainfall threshold values for possible landslides and attaching this to the system can be another enhancement that should be looked into in the future.

8. Improvement of the CBFFWS using remote Closed-Circuit Television (CCTV) at strategic locations within the community to enhance real-time observation and support the warning activities of the OC.

9. Creation of a website of the CBFFWS in the community, showing present status of the river and other pertinent information. This will come in as a handy information, and a possible boost to the community's socio-economic status, for non-residents of the community particularly visitors and tourists.

There are other possible ramifications arising from the said program, which can be tied-up to other school-related activities, such as for studies and researches. The school should have a clear program on possible activities to sustain the need for such a network other than being just an added monitoring site for the CBFFWS in the community.

8. Sustaining the CBFFWS

Sustaining a CBFFWS is a rather complicated task to undertake especially if the community does not experience a regularity of floods or have long flood event intervals. In order for the system to be continuous, there should be other community needs and activities that should be tied-up to the system other than for its primary objective of issuing timely flood warnings. It is best to point out and make the community understand that the system can be utilized in other fields of endeavor. The continuous observation of hydrological data can be used in many related undertakings such as for the following:

- Agricultural purposes as in cropping patterns and irrigation needs;
- Water allocations as in future requirements and needs for domestic and industrial usage;
- Infrastructure aspects as in the design and specifications of buildings, roads, bridges, river works, drainage and the like;
- Researches and other studies particularly in macro and micro aspects

On the other hand, the warning system of the CBFFWS that was set-up, whether using a siren, gong, steel pipe, bell or any other means, can also be tied-up to other non-flood disaster warnings such as awareness to a fire in the community, earthquake occurrences, and tsunami if the community is in the coastal area, or plainly getting the community's attention for an important community gathering such as meetings and other community affairs. Again, the Operations Center can be the hub of information for all necessary undertakings related to its database.

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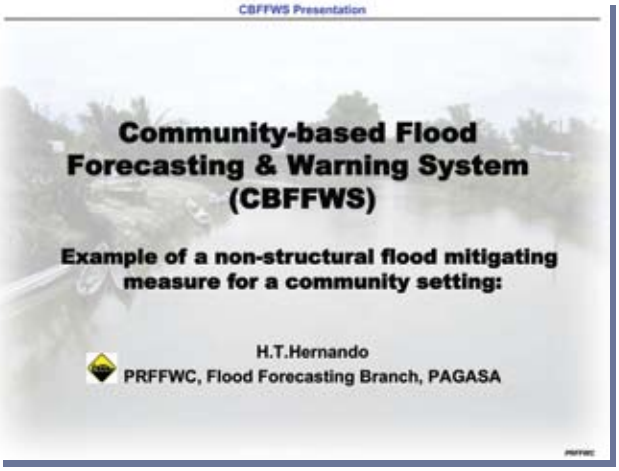
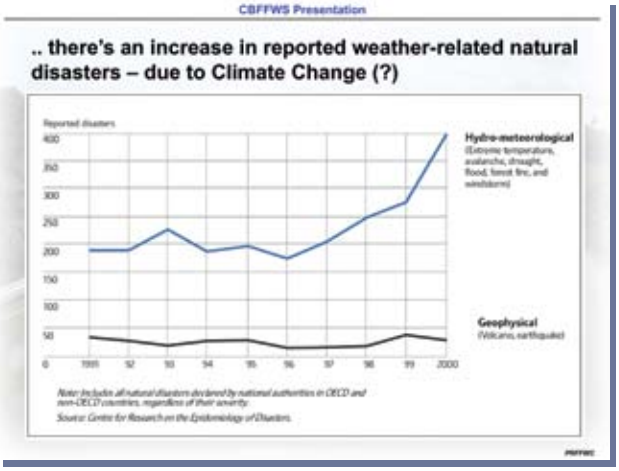
EXAMPLE OF A NON-STRUCTURAL FLOOD MITIGATING MEASURE FOR A COMMUNITY SETTING - CBFFWS






CBFFWS Presentation
Then again, the disaster scene in the Bicol Region after Typhoon Reming (Durian), Nov. 30, 2006.
• 546 dead
• 658 missing
• 1451 injured
Disaster scenes in the country


CBFFWS Presentation
If an effective warning system was put in placed before these disastrous events then maybe many lives may not have been wasted.!!!
Disaster scenes in the country
Typhoon Reming (Durian) November 30, 2006

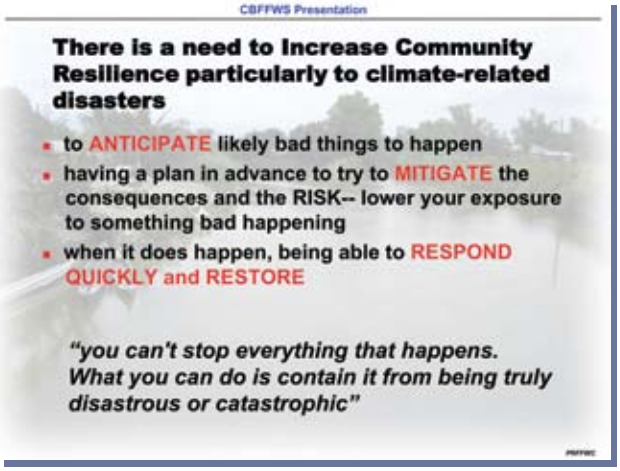

CBFFWS Presentation
Unfortunately, Early Warning (System) & Disaster awareness sell themselves only AFTER a disaster strikes a community!!
Ormoc Flood – Nov 1991


CBFFWS Presentation
Monitored / reported floods in the Philippines (1994-2006)
Ilocos Reg including Agno RB – 84
Cagayan RB – 49
Bicol Region including Bicol RB – 63
Pampanga RB – 43
Eastern Visayas Area – 118
Southern Tagalog Reg. – 26
Mindanao Area – 47
430 Flood events


CBFFWS Presentation
"There is a mutual relationship between community & environment which makes the separation of natural hazards from society impossible"…


CBFFWS Presentation
"Sadly, when disaster strikes a community, people that are affected think immediately of the first responders – the police, fire, emergency, and the like"…

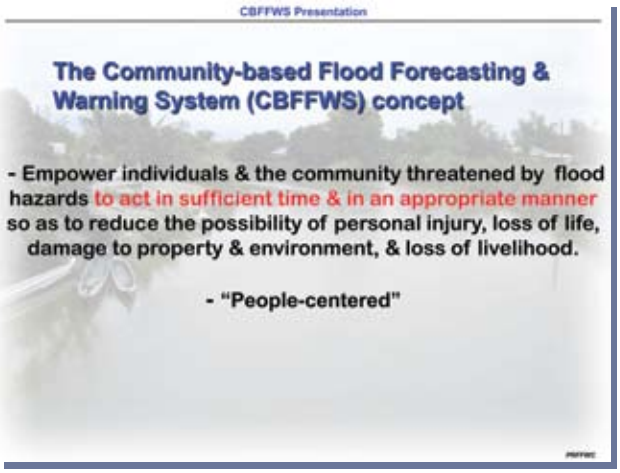

"Hence, living in such an environment, it is crucial that society or the community should be strong and resilient to any adverse eventualities (particularly to climate-induced disasters)"...


CBFFWS Presentation
There is a need to Increase Community Resilience particularly to climate-related disasters
to ANTICIPATE likely bad things to happen
having a plan in advance to try to MITIGATE the consequences and the RISK-- lower your exposure to something bad happening
when it does happen, being able to RESPOND QUICKLY and RESTORE
"you can't stop everything that happens. What you can do is contain it from being truly disastrous or catastrophic"


CBFFWS Presentation
Activities to Increase Community Resilience to climate-related disasters particularly FLOODS: Need for RISK Response – CBFFWS is one answer !!
Disaster scenes in the country


CBFFWS Presentation
Cagayan River Basin
Agno River Basin
Pampanga River Basin
Bicol River Basin
The present situation in Philippines: Only 4 Flood Forecasting & Warning Systems in the country to date (telemetered system)
Community Resilience Program - For other areas: Community-based Flood Warning System program is the best answer for now!!


CBFFWS Presentation
Communities that are prone and vulnerable to flood disasters are particularly the main target areas.
The Community-based Flood Forecasting & Warning System (CBFFWS) concept


CBFFWS Presentation
The Community-based Flood Forecasting & Warning System (CBFFWS) concept
- Empower individuals & the community threatened by flood hazards to act in sufficient time & in an appropriate manner so as to reduce the possibility of personal injury, loss of life, damage to property & environment, & loss of livelihood.
- "People-centered"

CBFFWS Presentation

The CBFFWS:

- Provides the community & disaster groups with advance info, particularly on the possibility of floods (landslides, debris flow, etc), that can be readily translated to response actions (for DPP).
- It also provides info for water resources mgt. that can support (daily) decisions concerning allocation & use of water.(ex. drought) – long-term situation

CBFFWS Presentation

The CBFFWS for non-telemetered basin and flood-prone areas:

- non-structural flood mitigating means
- can be quite simple & relatively cheap…
- possible on a real-time basis
- envisage monitoring, info exchange, WARNING and disaster preparedness / response
- enhances the social & moral responsibilities of the locals / community through their direct participation

CBFFWS Presentation

The Memorandum Of Agreement (MOA) issue … (?)
- a temporary undertaking; normally good only during the term of signatories in the MOA

CBFFWS Presentation

Implementation of the CBFFWS

Who are the people whom to talk & work with in a CBFFWS undertaking:

-In the community…
- local leaders / elected officials (LGU)
- local personalities
- local priest / religious leader
- local school officials (principal / teachers
- disaster organizations (within the community)

- Other stakeholders…
- NGOs, NGAs
- business sectors with interest in the area
- etc..

CBFFWS Presentation

Implementation of the CBFFWS

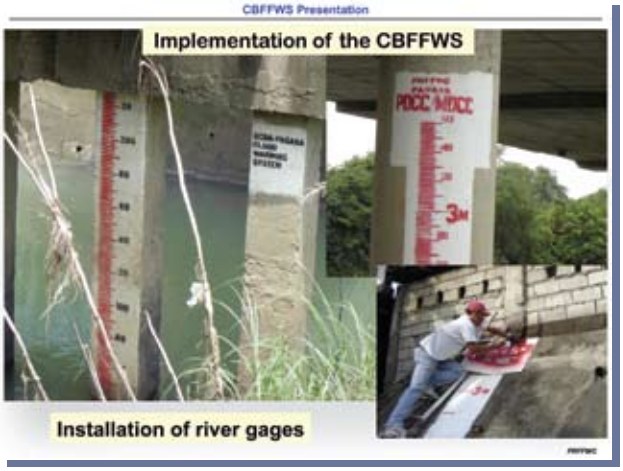
When is the appropriate time to approach a community for a CBFFWS program:
- after a flood event
- after a disastrous flood event within the country
- during seminars, workshops, conferences on Disaster Preparedness and the likes..
- Some articles, news & reports about flooding, vulnerability of an area, etc..
- before election or after election (Bulacan experience vs. the Metro-Bacolod experience)

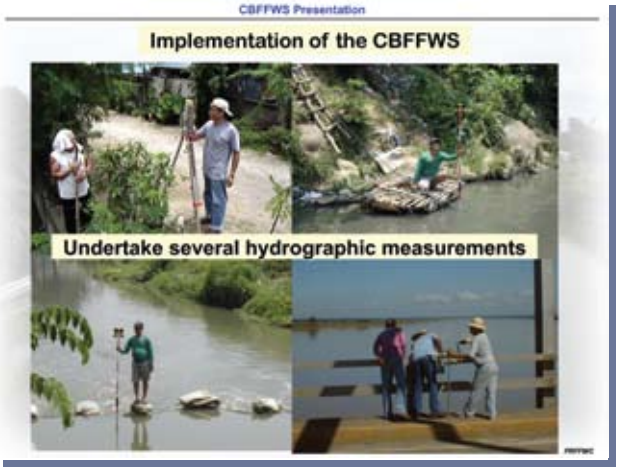
CBFFWS Presentation

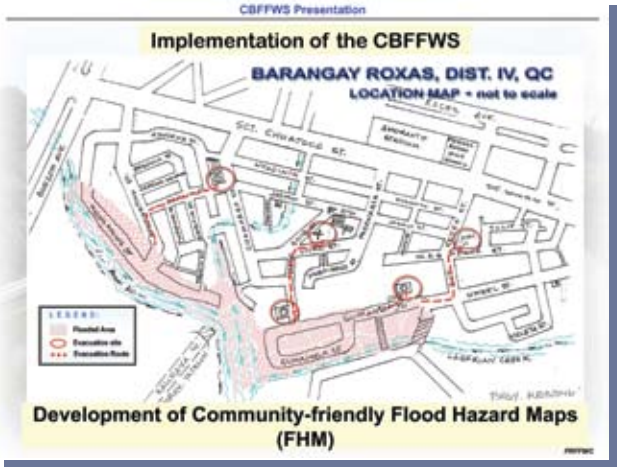
Implementation of the CBFFWS

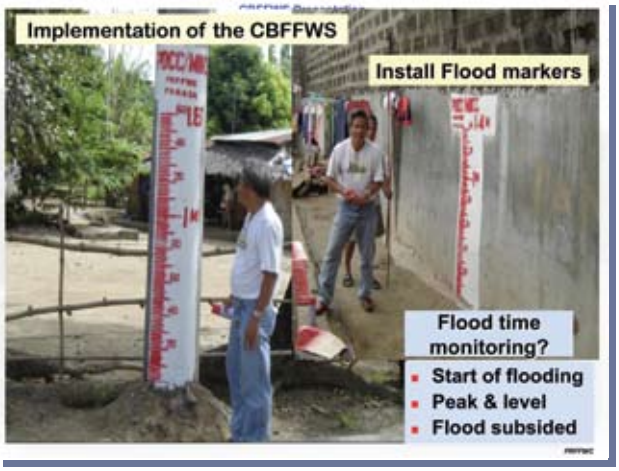
Initial undertaking: Site Survey of the target area (watershed & the community). Identification of monitoring stations.


CBFFWS Presentation
Implementation of the CBFFWS
Installation of rain gages


CBFFWS Presentation
Implementation of the CBFFWS
Installation of river gages


CBFFWS Presentation
Implementation of the CBFFWS
Undertake several hydrographic measurements


CBFFWS Presentation
Implementation of the CBFFWS
BARANGAY ROXAS, DIST. IV, QC
LOCATION MAP - not to scale
Development of Community-friendly Flood Hazard Maps (FHM)


Implementation of the CBFFWS
Install Flood markers
Flood time monitoring?
Start of flooding
Peak & level
Flood subsided


Implementation of the CBFFWS
Disaster Preparedness & Prevention, Contingency Planning seminars, Observer's Training, etc..

CBFFWS Presentation

CBFFWS Output: A set of Rainfall threshold values & River assessment levels for disaster preparedness & action

- Observed rainfall amount & intensity (flashfloods)
- Water level stage (alert, alarm & critical stages) from river cross-sections
- Flashflood alert based on rate of WL rise; river conditions – flow, color, presence of debris, etc
- Data exchange & information
- Activation of warning bells, sirens, automated signals, etc.
- Info boards & Warning signs (from FHM)

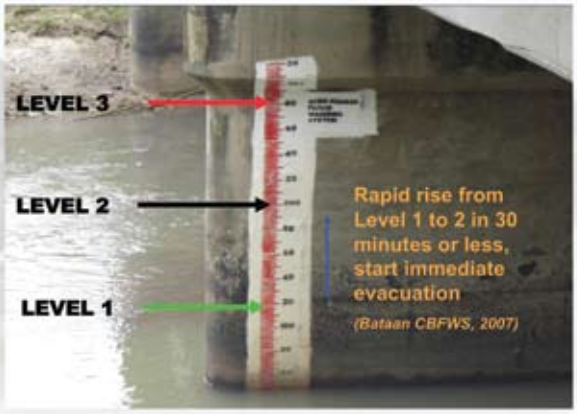
CBFFWS Presentation

Flood warning signs (Ubiquitous FHM)

CBFFWS Presentation

Flood warning signs (Ubiquitous FHM)

CBFFWS Presentation



CBFFWS Presentation

Some Operational CBFFWS Programs in the Philippines

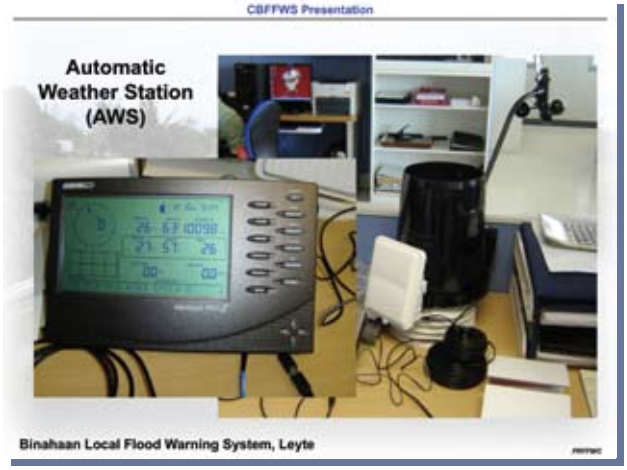
H.T.Hernando
PRFFWC, Flood Forecasting Branch, PAGASA

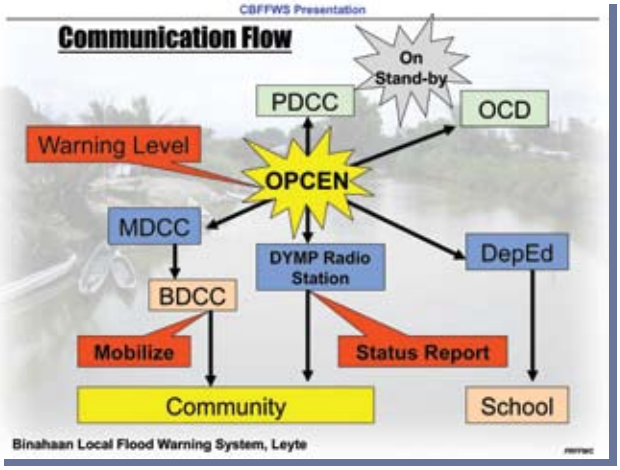
CBFFWS Presentation

Barangay Flood Warning System: Simple alarm system in the Barangay Flood Warning System in Barangay San Bartolome, Quezon City, Philippines


Binahaan Watershed
Binahaan Local Flood Warning System, Leyte
Flooded areas seen from helicopter on February 17th 2008


CBFFWS Presentation
Binahaan Local Flood Warning System, Leyte
Flood Operation Center, Leyte Academic Center, Palo, Leyte

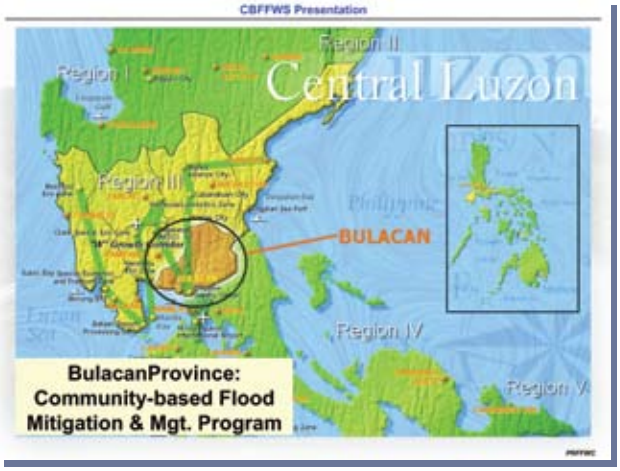

CBFFWS Presentation
Automatic Weather Station (AWS)
Binahaan Local Flood Warning System, Leyte


CBFFWS Presentation
Communication Flow
On Stand-by
PDCC
OCD
Warning Level
OPCEN
MDCC
DYMP Radio Station
DepEd
BDCC
Mobilize
Status Report
Community
School
Binahaan Local Flood Warning System, Leyte


Binahaan Local Flood Warning System, Leyte
Upstream station in TINGIB
SAN BENITO BRIDGE STATION
DAGAMI, LEYTE
5 HOURS
7 HOURS
Flood Travel Time
SANTA ELENA & SAN JOAQUIN BRIDGE STATION
TANAUAN & PALO, LEYTE

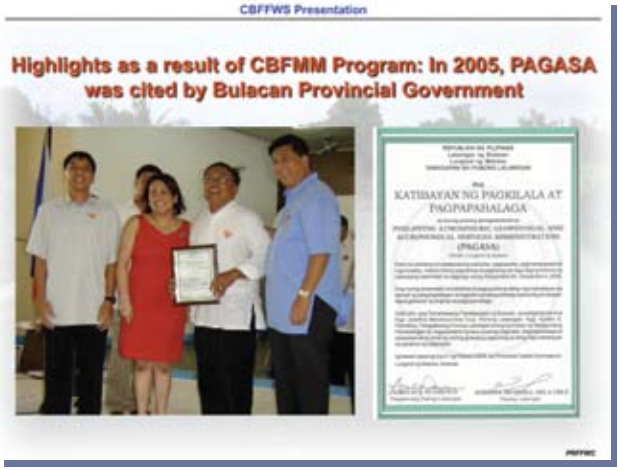

CBFFWS Presentation
Webpage developed for Binahaan river LFWS
http://www.leyte.org.ph/binahaan/
Binahaan River Local Flood
Early Warning System
LEYTE
COMMUNITY-BASED FLOOD MANAGEMENT PROGRAM


CBFFWS Presentation
BulacanProvince:
Community-based Flood
Mitigation & Mgt. Program


CBFFWS Presentation
Region II
Central Luzon
Region I
Region III
BULACAN
Region IV
Region V
BulacanProvince:
Community-based Flood
Mitigation & Mgt. Program


CBFFWS Presentation
Bulacan: Community-based Flood Mitigation & Mgt. Program


CBFFWS Presentation
CBFEWS presentation / documentation in CD
showing the experience of Bulacan Province
JICA
Community-based
Flood Early Warning
System
Landslide
Disaster
Preparedness
JICA
Community-based Flood Early Warning System


CBFFWS Presentation
Highlights as a result of CBFMM Program: In 2005, PAGASA
was cited by Bulacan Provincial Government
KATIBAYAN NG PAGKILALA AT
PAGPAPAHALAGA
(PAGASA)


Republic of the Philippines
National Disaster Coordinating Council
Camp General Emilio Aguinaldo, Quezon City
SPECIAL CITATION
BULACAN PROVINCIAL DISASTER COORDINATING COUNCIL
The province, in coordination with PAGASA-DOST, developed and continuously implements a Community-Based Flood Mitigation Management Program (CBFMMP) – the first community-based program in the country solely funded by a provincial government.
GILBERTO C. TEODORO, JR.
Secretary, National Defense and
Chairman, NDCC
RONALDO V. PUNO
Secretary, DILG and Chairman,
National Selection Committee, NDCM 2008

CBFFWS Presentation

http://www.bulacan.gov.ph/pdcc/

CBFFWS Presentation

Brief History of CBFFWS programs in the Philippines by PRFFWC-PAGASA

- Mid 1990's – a simple set-up in Guagua Municipality
- 1999 – CBFFWS programs tie-up with CNDR in Metro-Bacolod (NEDF), Davao, Pampanga (Mondragon)
- early 2000 – Proposed CBFFWS project by FFB-PAGASA to the WGH -TCS
- 2004 – established CBFMMP in Bulacan with PDMO-LGU
- 2005-2006 – tie-up with Quezon City-DPOS on Local Flood Warning Systems for Barangays; some CD outputs
- 2006 – established Binahaan Local Flood Warning System in Leyte with GTZ and Leyte Province; Bataan FWS with BCDA & LGU
- 2007 – prepared Guidelines in setting-up a CBFFWS
- 2008 – proposals for CBFWS for Iloilo City & Nueva Ecija

CBFFWS Presentation

...but not all CBFFWS programs succeeded !!

Example: The (Metro) Bacolod experience:

- NGO funds diverted to other programs; contact person/ s transferred
- Too many towns/cities for coordination – no central operations center, no lead LGU
- Most of the LGU officials were replaced (program was close to election period) – MOA issue...
- Poor communication link with LGU: issues on follow-up and info / data exchange
- Link was basically dependent on the NGO

CBFFWS Presentation

... CBFFWS program other problems and issues !!

- The "Not affected" attitude
- The "observer issue" – Police were asked to observe
- The "observer issue" – "Barangay tanod"
- The NGO issue – people were replaced
- A political agenda – not priority, wrong timing (?)
- The "Hit-and-run" approach – quantity not quality

CBFFWS Presentation

The Community-based Flood Forecasting & Warning System irony: there's a need for a system but hope that you don't use it !!

Sustaining a CBFFWS is a rather complicated task to undertake especially if the community does not experience a regularity of floods or have long flood event intervals

CBFFWS Presentation

For Sustainability..

- Strong relationship with the concerned & action agencies / organizations – Disaster Management Offices (PDCC / MDCC-CDCC / BDCC)
- Dedicated communication network
- Continuing programs on community level – DCC meetings, seminars, refreshers, drills, updates on thresholds and assessment values
- Incentives – trainings; possible allowances (?)
- MOA into Provincial or Municipal Resolution / ordinance
- There should be other community needs and activities that should be tied-up to the system other than for its primary objective of issuing timely flood warnings !

CBFFWS Presentation

(SOME) OUTPUTS / BENEFITS of having a CBFFWS or a HydroMeteorological Monitoring system

A warning system for community disaster awareness & preparedness

CBFFWS Presentation

(SOME) OUTPUTS / BENEFITS of having a CBFFWS or a HydroMeteorological Monitoring system

A set of monitoring equipment – a database system (commercialization of data for infra, researches, design, and the like..) The warning system can also be used for other purposes: warning in case of fire in the community, for community meetings, etc..

CBFFWS Presentation

(SOME) OUTPUTS / BENEFITS of having a CBFFWS or a HydroMeteorological Monitoring system

Long-term strategies (cropping patterns for agriculture; drought indicator, water allocation)

CBFFWS Presentation

(SOME) OUTPUTS / BENEFITS of having a CBFFWS or a HydroMeteorological Monitoring system

With such a monitoring system, the Operations Center can be the hub of hydrometeorological information and research center for the area.

CBFFWS Presentation

Another program that can be tied-up to CBFFWS:

School Hydrological Information NEtwork (SHiNE)

Disaster Reduction begins in School!!

CBFFWS Presentation

Other issues for Sustainability..

- counterpart sharing
- creation of a special unit / section to man the Operations Center with itemized position & budget allocation
- involvement in networks – ex. Network of Local Flood Warning Systems (NLFLoWS) in the Philippines
- involvement of other sectors in the community (ex. church, business establishments)
- continuous enhancement activities
  - capacity-building workshops
  - post-event surveys (weaknesses-strengths, etc)
  - webpage development & updates


CBFFWS Presentation
For now, the CBFFWS is one way of addressing the pressing need for an early warning system in small communities that are not covered by the conventional (telemetered) flood forecasting & warning system.


CBFFWS Presentation
For additional info…
Webpage http://kidlat.pagasa.dost.gov.ph
Floods (Flood Forecasting Branch): 929-4065 / 928-2754
Pampanga River Flood Forecasting & Warning System:
E-mail: prffwc_ffb@yahoo.com
http://groups.msn.com/PampangaRiverBasin/prffc.msnw (to be relocated)
Download Guidelines in setting-up CBFFWS (pdf format)
Download presentation on Flood hazard awareness & mitigation:
www.pagasa.dost.gov.ph/ffb/PRFFWC_news.htm
(at the bottom of the page)


CBFFWS Presentation
Thank you

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