

---

## Sound Practice No. 5

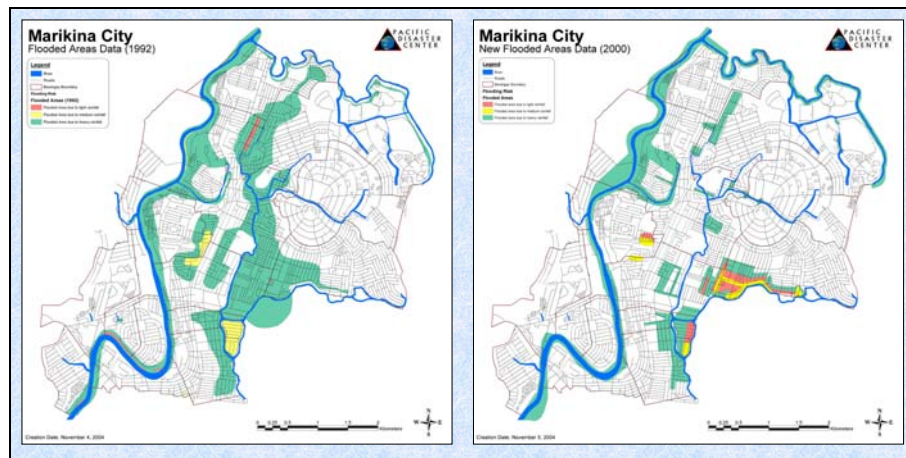
### Marikina City Flood Mitigation Countermeasure Program<sup>1</sup>

#### Overview

Marikina City's flood mitigation program has dramatically decreased the flood exposure to residences, businesses, and critical facilities and thus, the overall future flood impact on Marikina City, as described below. Physical flood mitigation countermeasures completed by Marikina City have succeeded in reducing flooded area in the City from 27.52% 12 years ago (1992) to 19.04% in 2004 (Figure 35).

These flood area comparisons were calculated from using GIS as follows:

1. Marikina City = 23.1 square kilometers
2. 1992 Flood Area = 6.36 square kilometers (27.52%)
3. 2004 Flood Area = 4.40 square kilometers (19.04%)



**Figure 1. Comparison of flooding in 1992 and 2004.** In 1992, a total of 27.52% of the City's area (6.4 square kilometers) was in the flood area. In 2004, a total of 19% of the City's area (4.40 square kilometers) is in the flood area. Due to flood mitigation activities, flooding in Marikina City has been reduced by 31% in 12 years. The benefit from flood mitigation will reduce social, economic, and environmental impacts for years to come.

---

<sup>1</sup> This practice has been prepared and written by the Pacific Disaster Center and the assistance of Julie Borje and her team in Marikina

---

## **Significant Background Information**

One of 17 cities in Metro Manila, Marikina City is comprised of **15** barangays covering 2,150 hectares or 21.50 square kilometers, with a population estimated at **447,000** in 2004. Although established in 1630, it was not incorporated as a city until December 8, 1996. Marikina City, like the rest of Metro Manila, is characterized by rapid growth due to high fertility and in-migration.

The active West Valley Fault creates the western boundary of the City. There is evidence of four dated, strike-slip earthquake occurrences that have taken place in the last 1400 years, including a scenario earthquake of magnitude 7.2 (Source: personal communications, Dr. Renato Solidum, Director, Philippines Institute of Volcanology and Seismology (PHIVOLCS), 2004). The fault system has created a graben valley in which the Marikina-Pasig River meanders through the City. Cyclone-driven rains can cause overflow of the riverbanks, which poses a repeated flooding risk.

Marikina City has a primarily residential land use pattern (38% of the total), followed by industrial, areas for priority development, mixed use, and commercial areas. In terms of land use trends, Marikina City shows decreases in residential areas and agricultural lands at the expense of increased industrial areas, space for commercial use, and recreational space. Consequently, the municipality has seen greater "densities" in terms of residential and commercial development. Overall, this has led to a very limited supply of undeveloped land.

Floods have proved a persistent hazard, and occur with high frequency. A comprehensive catalog of historical flood information for Marikina City has not been established. However, the flood risk is well acknowledged, and has been the focus of mitigation efforts over the past 20 years. Rain gauge recordings for the Marikina-Pasig River and watershed are presently being collected and summarized by PAGASA in an effort to summarize historical rainfall totals to establish repeat flood intervals (Source: personal communications, Dr. Prisco Nilo, Director, PAGASA).

## **Details**

The reduction in flood area between 1992 and 2004 equates to a 31% reduction in the original total flood area. Some flood mitigation successes and mitigation activities include:

1. The City's priority projects to concrete roads resulted in reduced amounts of sand, pebbles, and mud entering the drainage system.
2. Construction and rehabilitation of major outfalls allowing flooded areas to recede faster than before, resulting in reduced flood damage and impacts.
3. Massive dredging operations contributing to faster discharge from floodwaters in subdivisions into the creeks.

4. Demolition of obstructions produced by squatters (illegal settlers) resulted in the removal of major obstructions along waterways; and
5. Continued improvement to existing diversion channels and interceptors. (Please note that Marikina City officials stated that this activity is not enough to solve the present day flooding problems).

Figures 2 and 3 show a dramatic reduction in exposed residences, businesses, and critical facilities due to Marikina City flood mitigation strategies, policies, and mitigation actions. Residences exposed have been reduced by 54%, businesses exposed have been reduced by 36%, and critical facilities exposed have been reduced by 18%.

<b>Based on the 1992 Flood Area</b>		
	Number Exposed	Percent of Total
Residences	10,446	30%
Businesses	450	18%
Critical Facility	11	19%

<b>Based on the 2004 Flood Area</b>		
	Number Exposed	Percent of Total
Residences	4,789	14%
Businesses	289	13%
Critical Facility	9	15%

**Figure 2. Flood risk to residences, businesses, and critical facilities** based on 1992 and 2004 flood areas. Percent of Total represents a percentage of all residences, businesses, and critical facilities.

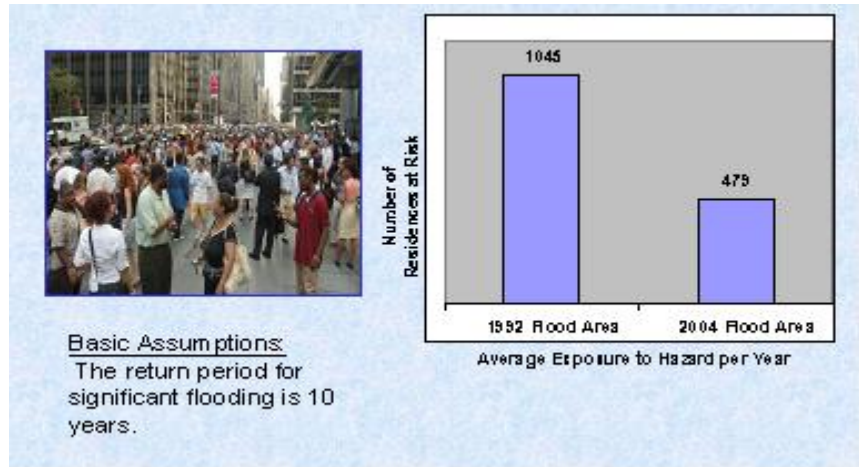
• Flood control projects between 1992 and 2004 have significantly reduced the impacts of flooding

	Number Exposed 1992	Number Exposed 2000	Percent Reduction in Impact
Residences	10,446	4,789	54%
Businesses	450	289	36%
Critical Facility	11	9	18%

**Figure 3. Flood Mitigation Impact Analysis.** Flood control projects between 1992 and 2004 have significantly reduced the impacts of flooding, as shown in the percent reduction in impact to the number of residences, businesses, and critical facilities.

**Figure 4** shows the dramatic reduction in the number of residences now exposed to floods on an annualized basis versus 1992 data.

The benefits of mitigation are illustrated by the fact that in 1992, a total of 1,045 residences on average were exposed to flooding on a yearly basis, compared to a total of 479 in 2004.



### Some Other Details



The Flood Mitigation activity of Marikina is foremost a technical project, although its very success can boost the popularity of the incumbent mayor, and give his administration additional political score. Flooding is a perennial problem in many parts of Metro Manila and Marikina is one among those communities regularly devastated. It is definitely a major concern of Marikina constituents, especially those

in the affected areas. It is one big problem that engulfed the poor physical situation of the town. In the 80s, town folks were too desperate to think that the problem will never be resolved.



The city's flood control project, which began implementation in 1992 was (and continues to be) funded by the local government. When it started, the then Mayor Fernando reorganized the city's Engineering Department, provided the initial needed materials and equipment, and improve on their competency to make the department truly perform its function. It also became the policy of the LGU at that time that all infrastructure projects shall be done by local administration, from planning to design and execution, consequently giving the institution a saving of 30% for every project completed.



Up to today, the project has been primarily planned and continuously implemented by the Engineering Department. It maintains its management and execution functions over the project. During the period, 1992-2001, former Mayor Fernando truly had a direct hand in the planning and design particularly, being an engineer himself. Till the present, the incumbent Mayor Marides Fernando oversees the continuation of this flood mitigation project.



Although the immediate recipients of this project would be those in the flood-prone areas, it is believed that the entire populace benefited (or shall benefit from the other continuing activities) from the project. To live in a flood-free community gave the residents more sense of security and comfort.

The project at the start covered 12 barangays. These included the barangays close to the river that get flooded when the river swells during rainy season. Today, it only covers about seven (7) barangays. With the problem on the swelling of the river, the city government has started implementing a project on the construction of a road dike covering three (3) of the barangays closest to the river.

Since 1992, the Engineering Department's budget averages P43 million a year for this flood control project.. With the planned completion of the road dike of six kilometers under the present administration, the required budget is P200 million. So far, only a kilometer has been constructed.

With the remaining 4.4 square kilometers of flood-prone areas, the city government is targeting its completion by year 2007. Though the road dike project may take beyond 2007 owing to some budgetary constraints.



This flood mitigation activity is certainly needed and, as it was proven by the good performance of the Engineering Department, it can be sustained even by the local government itself. After 12 years of planning and execution of pertinent activities, the Engineering Department has developed the capacity to understand better the situation and even established the city's requirements in protecting itself from flooding. Thus, it is continuously implementing programmed activities, guided by certain engineering standards set as a result of experiences, to resolve the remaining flood-prone areas.



At the onset of this project's planning, the Engineering Department, after a thorough survey of areas affected by flooding, has already measured then the areas to be constructed or reconstructed for improvement. The department has paid particular attention to the drainage system and the riverbanks. It should be noted

that upon the assumption of office of then Mayor Fernando, Marikina's city roads totaling close to 500 kms., of which more than half has not been concreted neither was there a good drainage system installed. By year 2000, Engineering has concreted 350.48 kms. of road and improved sidewalks and drainage of 224.98 kms. Comparing these results with other LGUs' engineering performance, Marikina has achieved 300-400% more than the typical 15 kms. of road concreting and drainage construction or improvement done by other LGUs per year.

The project is necessarily significant in the city's development, especially in the economic area and in public safety. The city hall officials believed that Marikina would not be completely progressive without being able to solve this perennial problem.

**Knowledge Base Coding Reference:**

Name of the Practice: Marikina City Flood Mitigation Countermeasure Program  
Contact Person(s): Julie Borje and her team at Marikina City  
Contact Address: [julie.borje@marikina.gov.ph](mailto:julie.borje@marikina.gov.ph); [centex\\_marikina@yahoo.com](mailto:centex_marikina@yahoo.com)  
Written by: Pacific Disaster Center with the assistance of Julie Borje and the Marikina Team