



# Mainstreaming Climate Change Mitigation and Adaptation: THE SANTA ROSA EXPERIENCE

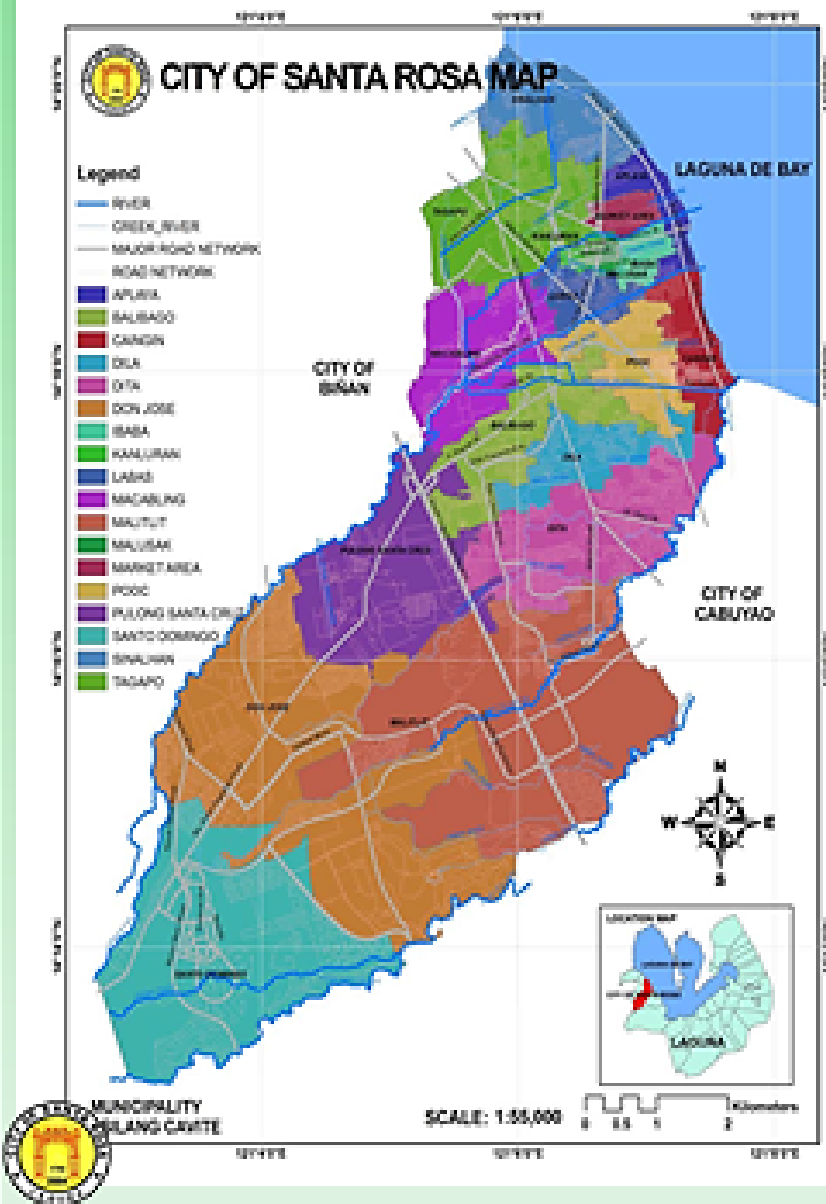
***Erlinda Carrasco-Creencia, EnP.***

*City-ENRO*

*Discovery Suites, Ortigas Center, Pasig City*

*2 February 2017*





## GEOGRAPHICAL PROFILE

- Land Area: 5,549 Hectares
- It covers 3.2% of the total land area of the Province of Laguna.
- It controls 37% of the Santa Rosa Watershed
- Population 2015 : 297,800 (NSO)
- Accessed via South Luzon Expressway (SLEX):  
Mamplasan Exit  
Santa Rosa Exit  
Eton-Greenfield Exit
- Accessibility:  
South Luzon Expressway  
Manila South Road  
Philippine National Railway
- Political Subdivision:  
18 Barangays  
1<sup>st</sup> District of Laguna



**Legend**

- Binan
- Cabuyao
- Sta. Rosa
- Sta. Rosa River Watershed
- Laguna De Bay

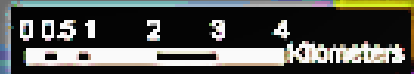
Silang

Binan

4 LGUs

Sta. Rosa

Cabuyao

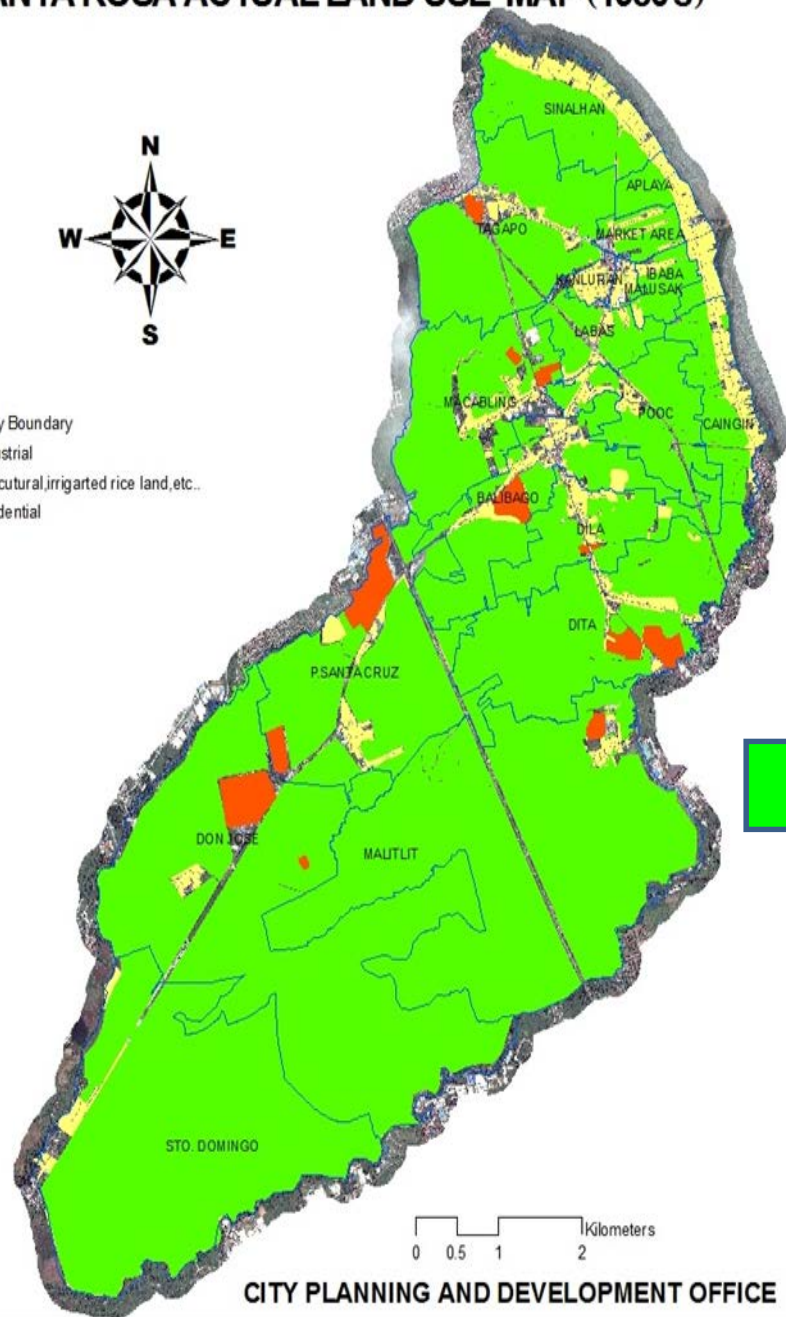


# SANTA ROSA ACTUAL LAND USE MAP (1980's)



## Legend

- Brgy Boundary
- industrial
- agricultural, irrigated rice land, etc..
- residential



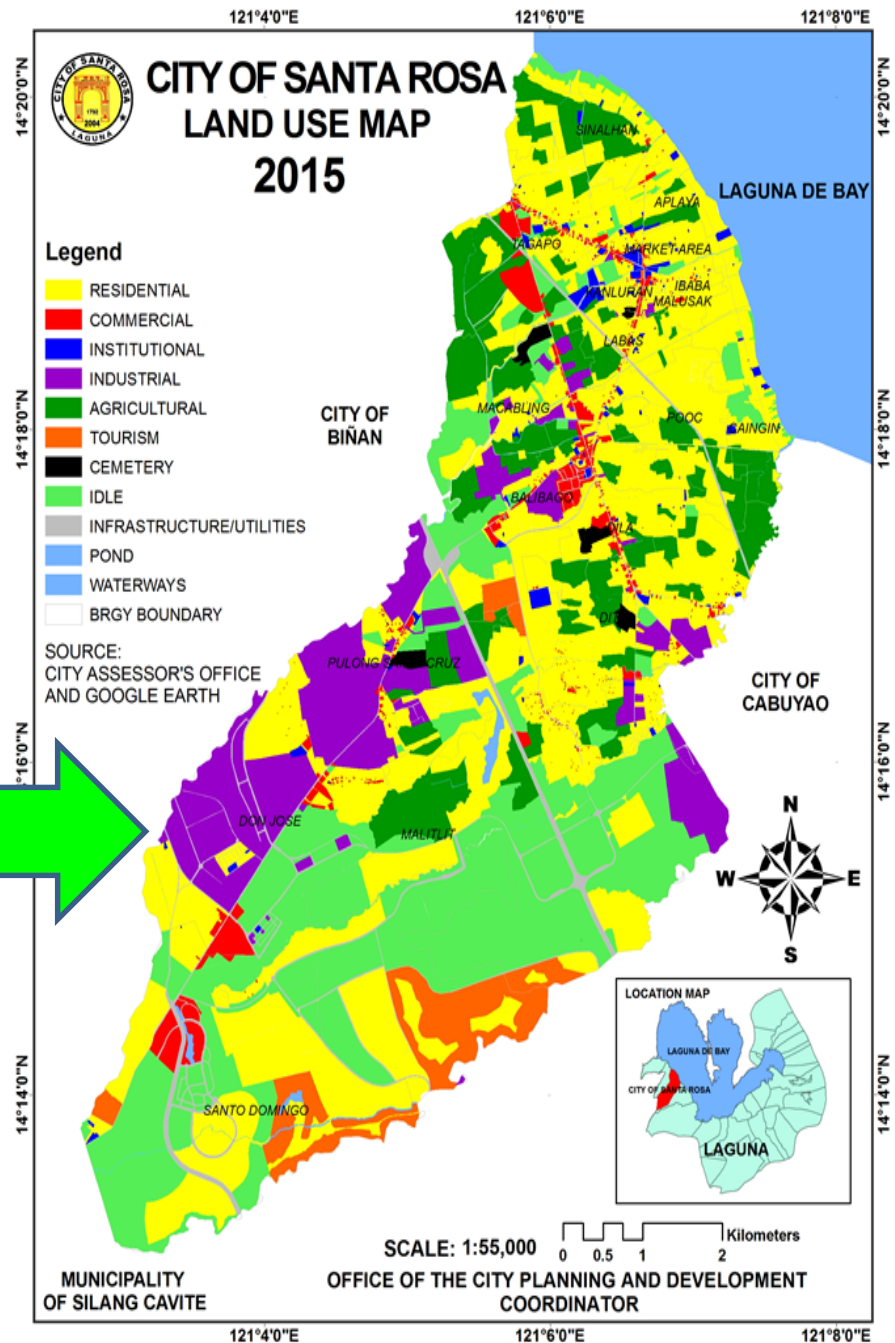
CITY PLANNING AND DEVELOPMENT OFFICE

# CITY OF SANTA ROSA LAND USE MAP 2015

## Legend

- RESIDENTIAL
- COMMERCIAL
- INSTITUTIONAL
- INDUSTRIAL
- AGRICULTURAL
- TOURISM
- CEMETERY
- INFRASTRUCTURE/UTILITIES
- POND
- WATERWAYS
- BRGY BOUNDARY

SOURCE:  
CITY ASSESSOR'S OFFICE  
AND GOOGLE EARTH

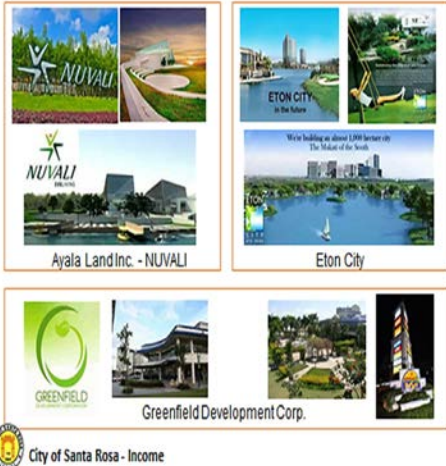


MUNICIPALITY  
OF SILANG CAVITE

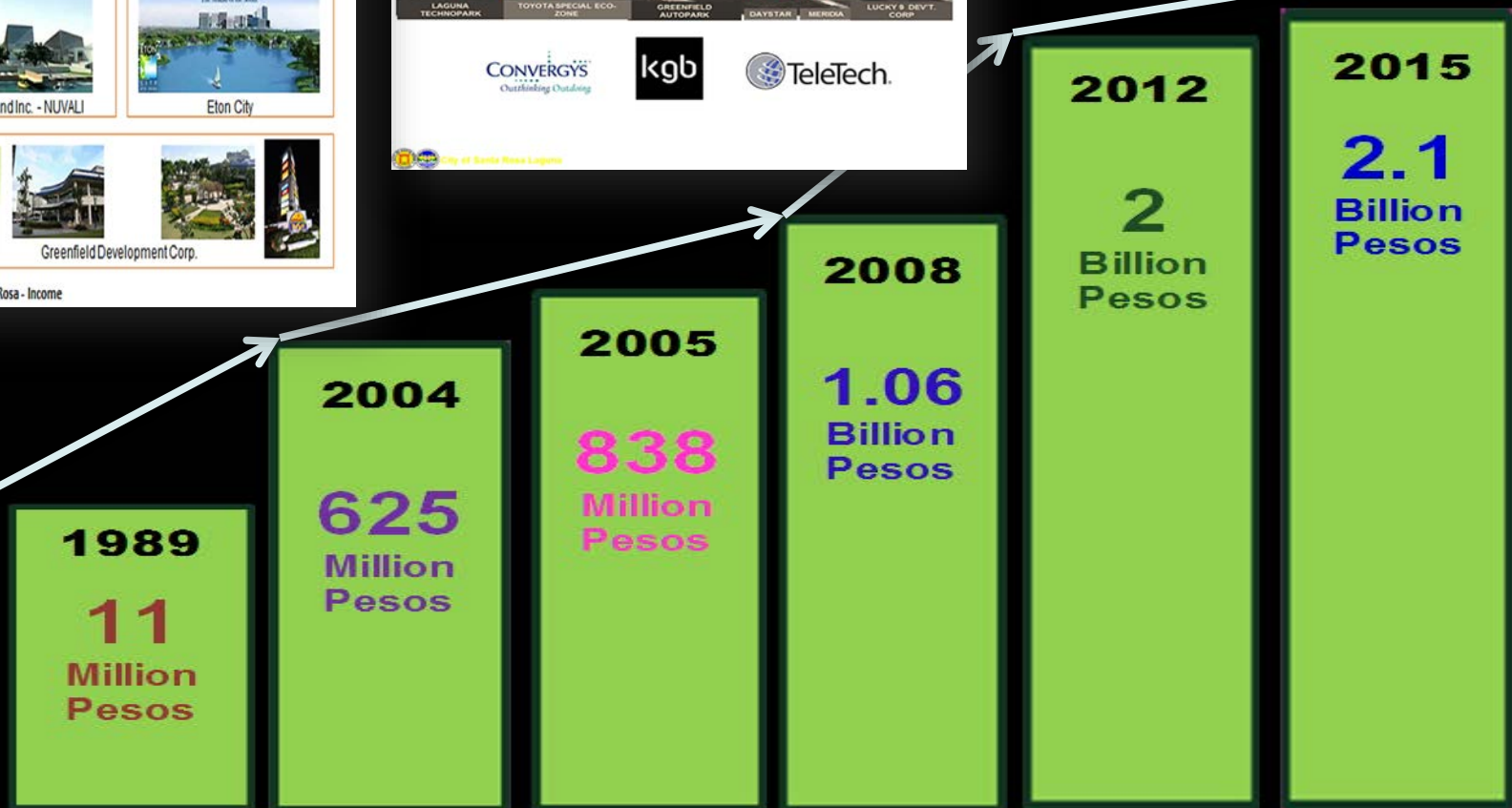
SCALE: 1:55,000  
OFFICE OF THE CITY PLANNING AND DEVELOPMENT  
COORDINATOR

# HISTORY OF GROWTH

## MASTER-PLANNED RESIDENTIAL COMMUNITIES



## IDEAL BUSINESS ENVIRONMENT





FLOODING



GROUNDWATER  
SCARCITY

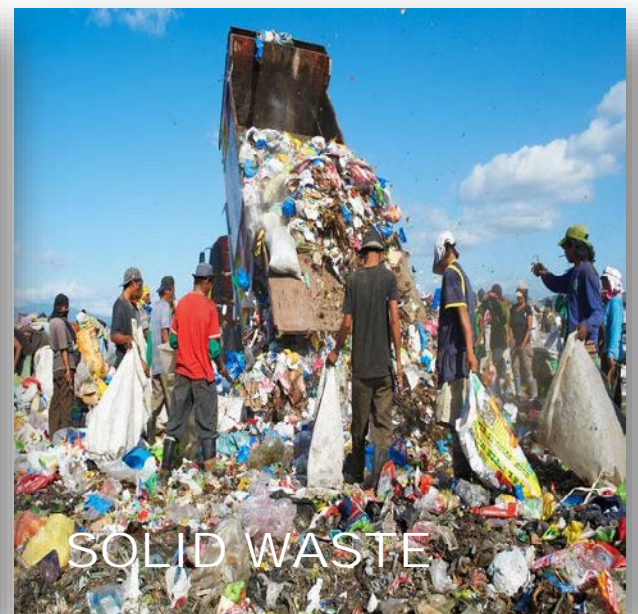


WATER  
POLLUTION  
AND SANITATION  
ISSUES

# ***DEVELOPMENTAL CHALLENGES***



AIR POLLUTION AND GHG EMISSIONS



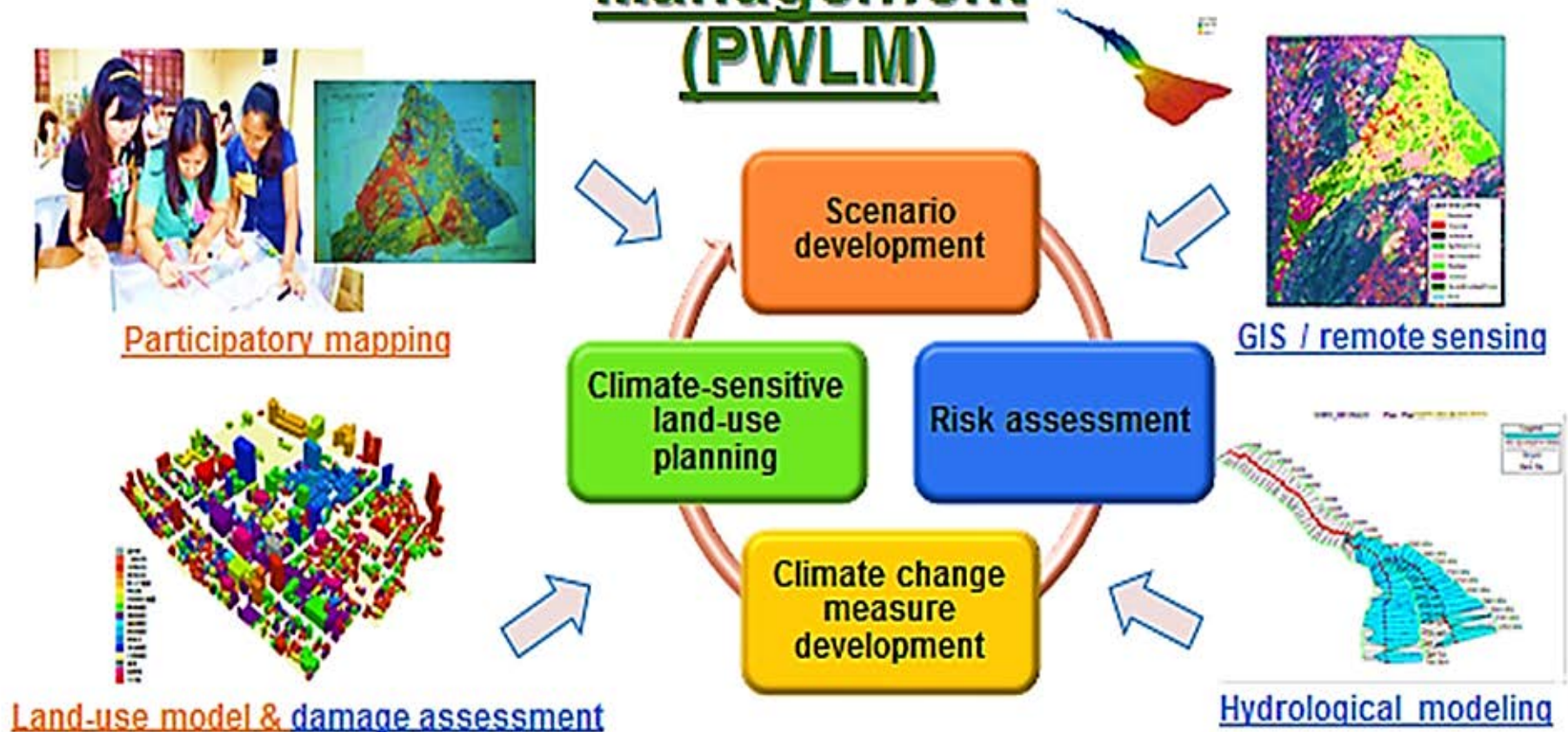
SOLID WASTE

# Collaboration among Local Governments at the Watershed level.



# The Methodology

## Participatory Watershed Land-use Management (PWLM)

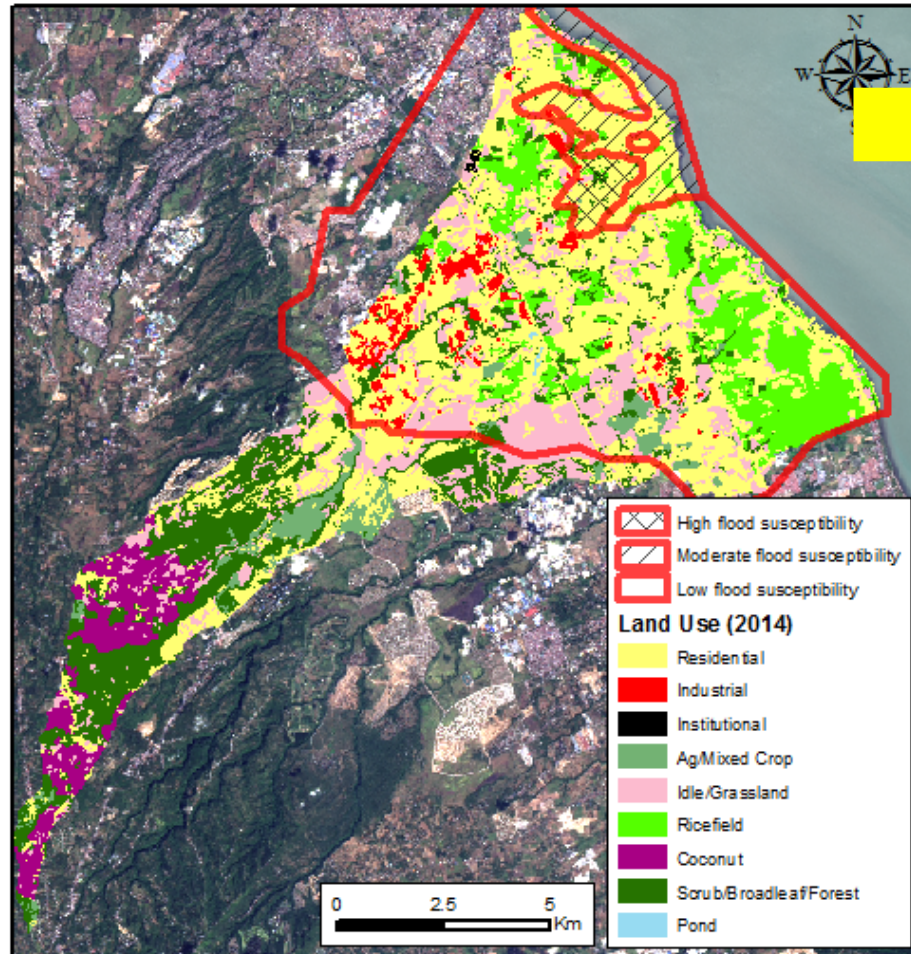


*Participatory management approach to improve land-use at watershed level to mitigate development and climate risks (e.g. floods, landslides)*

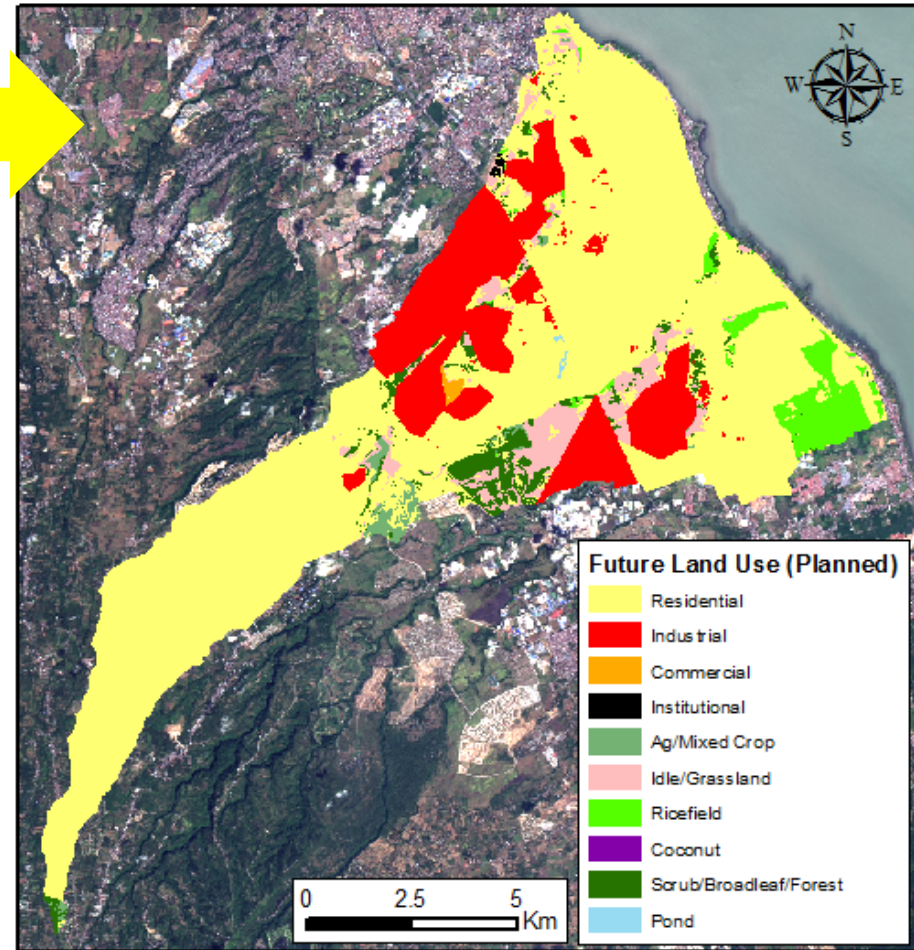
# Risk assessment

## More development

Current Land Use (2014)



Future Land Use Plan (BAU)\*

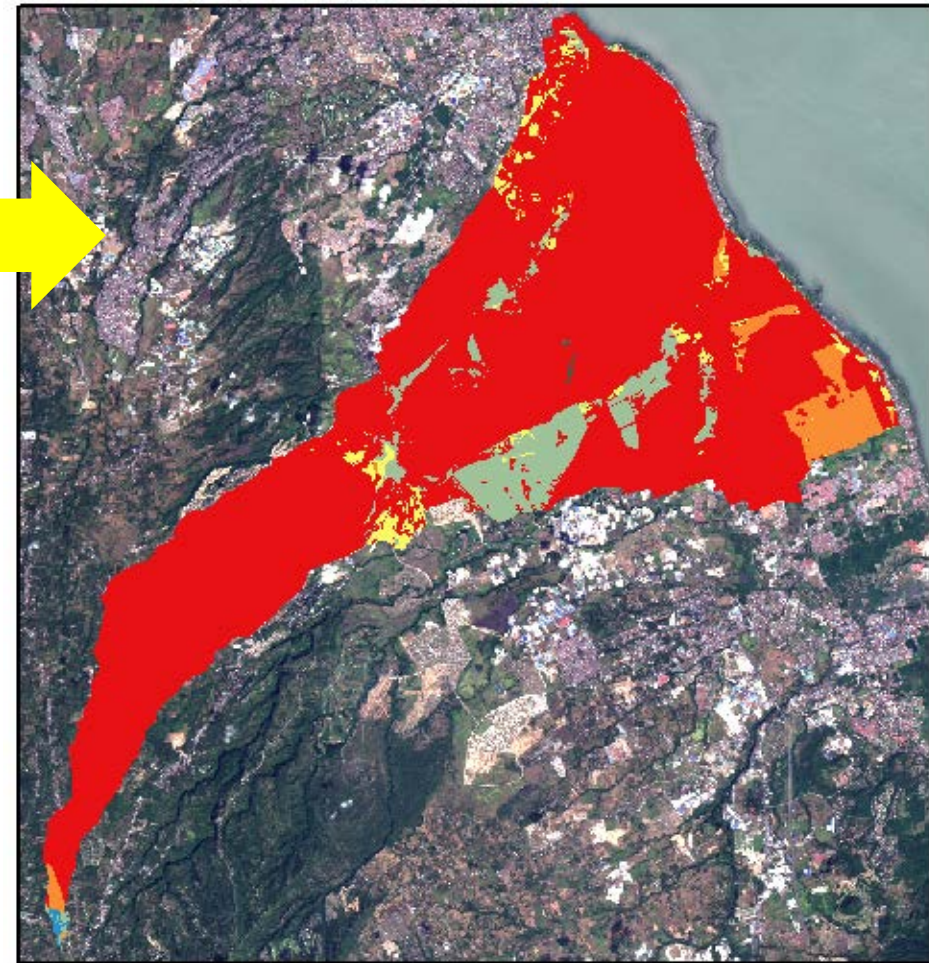
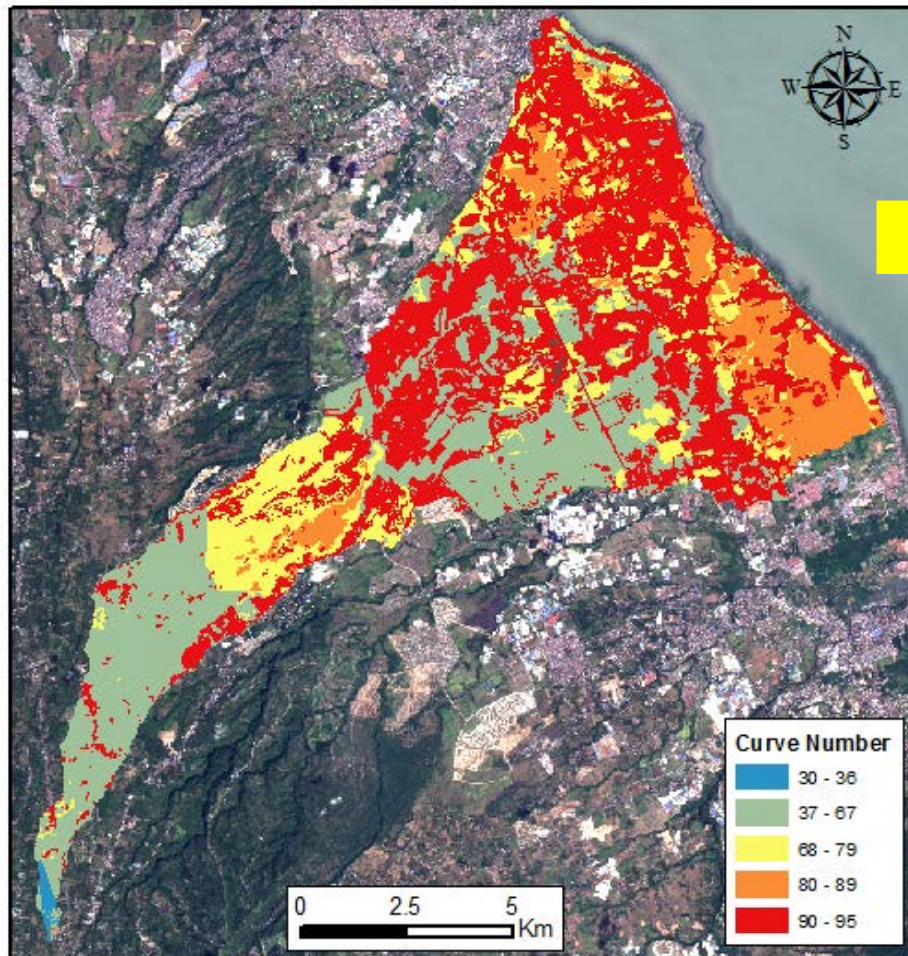


\*Future land use plan map based on the results of a participatory land use mapping session with representatives from four local government units (LGUs)

# **More flooding**

Current curve number (2014)

Future curve number (2025)



**Higher Curve Number values indicate higher stormwater runoff.** Values are based on land use and soil type. Curve Numbers are used for flood hazard modeling.

**Table 1 Estimated Monthly Rainfall of the Sta. Rosa River Basin**

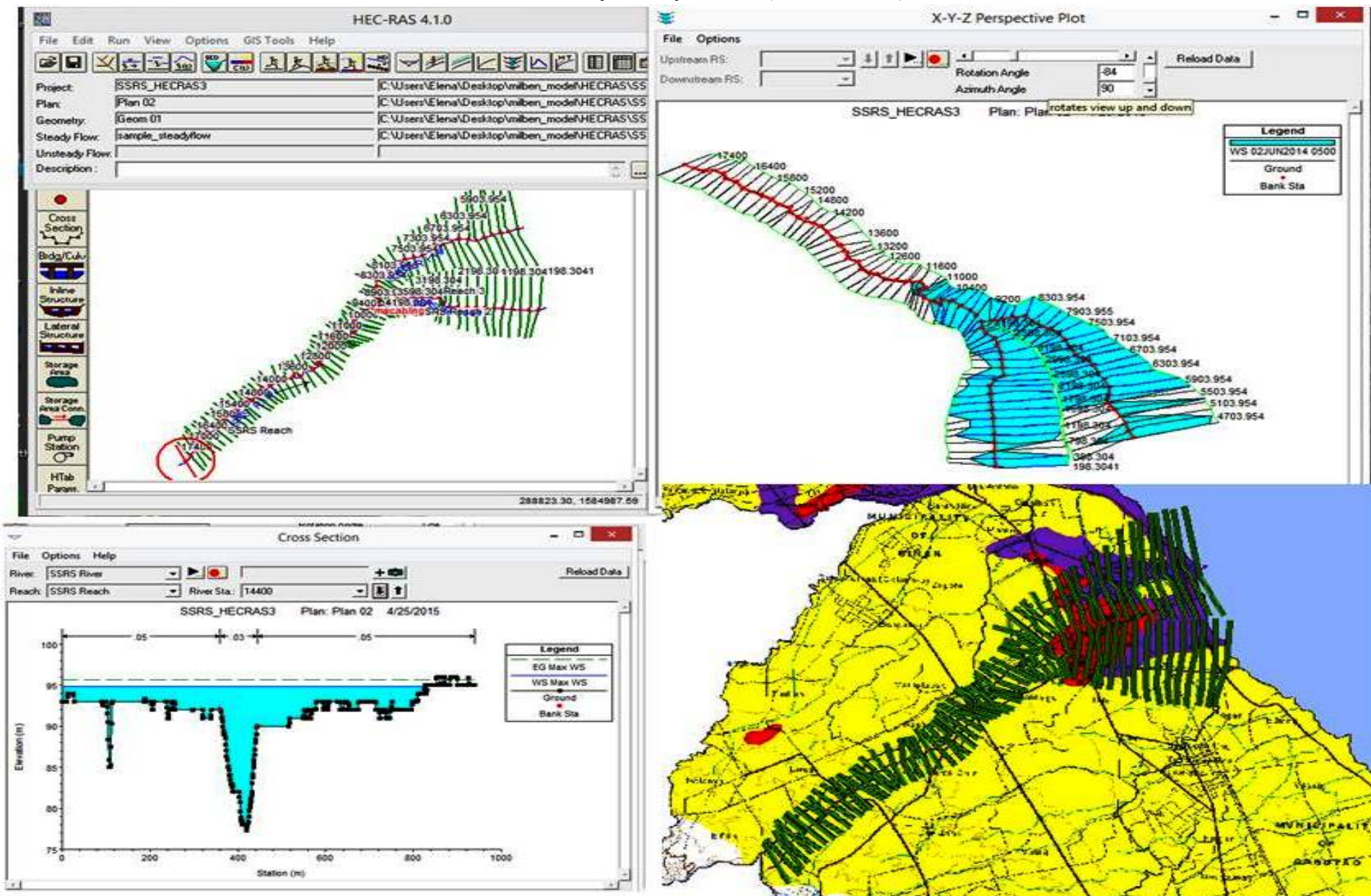
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
1985	2.0	1.5	46.0	185.1	200.3	1362.9	499.0	468.3	376.1	647.8	139.6	112.4	4040.9
1986	6.8	21.8	1.3	10.2	108.7	179.5	402.5	1036.0	557.8	765.3	458.5	48.1	3596.4
1987	15.0	0.5	1.0	6.7	25.8	102.1	91.2	197.1	347.6	119.7	212.3	106.9	1225.8
1988	97.6	9.6	2.5	47.2	103.4	339.1	272.2	106.4	134.1	616.0	246.8	9.1	1984.1
1989	26.1	30.8	70.3	37.5	104.8	133.3	415.6	976.5	568.0	425.0	15.9	10.0	2814.0
1990	5.6	1.3	14.5	2.6	248.1	525.3	382.5	1051.3	223.4	251.1	299.5	85.9	3091.2
1991	7.2	6.7	76.1	9.8	70.1	129.1	398.0	972.2	303.4	63.6	160.7	50.2	2247.2
1992	2.1	4.3	5.1	44.6	180.4	101.7	494.7	648.6	221.7	292.9	187.9	62.3	2246.5
1993	32.0	0.4	2.0	6.8	5.9	282.7	455.9	362.0	158.6	233.0	184.1	321.8	2045.2
1994	15.8	0.6	2.6	36.3	93.9	270.5	878.5	182.7	283.0	249.6	50.3	56.8	2120.5
1995	6.5	32.7	0.0	1.9	290.5	606.6	283.4	194.3	530.9	387.4	291.0	198.5	2823.7
1996	9.4	2.8	15.3	94.7	63.8	195.0	949.4	133.9	289.8	208.0	480.2	52.9	2495.0
1997	3.0	24.2	2.7	21.4	584.7	280.4	608.2	506.1	188.7	49.0	48.7	15.4	2332.5
1998	37.9	0.2	2.7	31.1	229.9	232.4	184.9	228.7	647.6	910.9	402.4	1043.0	3951.8
1999	69.7	67.4	223.3	198.0	257.4	544.9	513.4	534.0	282.5	534.3	264.7	454.3	3943.9
2000	170.6	166.0	97.3	58.7	456.2	275.0	1041.4	291.3	287.6	358.7	226.6	122.8	3552.1
2001	25.9	85.3	14.5	17.3	179.5	264.4	304.6	285.1	56.5	208.8	179.2	82.5	1703.7
2002	2.0	6.6	6.0	3.6	53.4	175.3	761.9	173.6	188.9	131.6	82.3	39.3	1624.4
2003	11.8	0.5	2.9	9.4	385.5	128.8	255.5	225.0	218.3	53.4	114.2	38.3	1443.6
2004	13.0	21.0	11.2	12.9	98.9	310.6	242.9	397.6	70.4	65.9	236.7	49.9	1531.2
2005	15.5	8.8	10.4	33.8	80.0	125.6	147.2	327.4	297.2	276.6	106.1	270.3	1698.9
2006	97.4	15.7	34.8	4.1	181.7	211.0	301.8	204.7	431.5	55.8	128.0	201.9	1868.4
2007	23.3	8.4	21.7	3.9	105.2	72.6	144.8	417.0	226.8	157.8	334.7	141.0	1657.2
Mean	30.3	22.5	28.9	38.2	178.6	297.8	436.1	431.3	299.6	307.1	210.9	155.4	2436.4
Max.	170.6	166.0	223.3	198.0	584.7	1362.9	1041.4	1051.3	647.6	910.9	480.2	1043.0	4040.9
Min.	2.0	0.2	0.0	1.9	5.9	72.6	91.2	106.4	56.5	49.0	15.9	9.1	1225.8
StDv	41.3	38.1	50.3	53.4	143.0	273.0	260.0	303.8	157.7	242.4	125.9	222.6	877.5



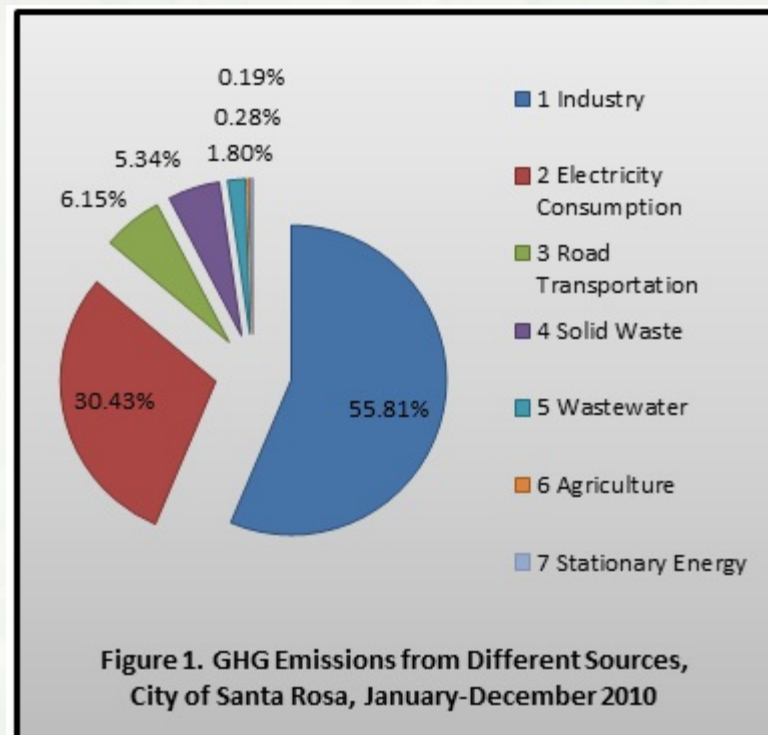
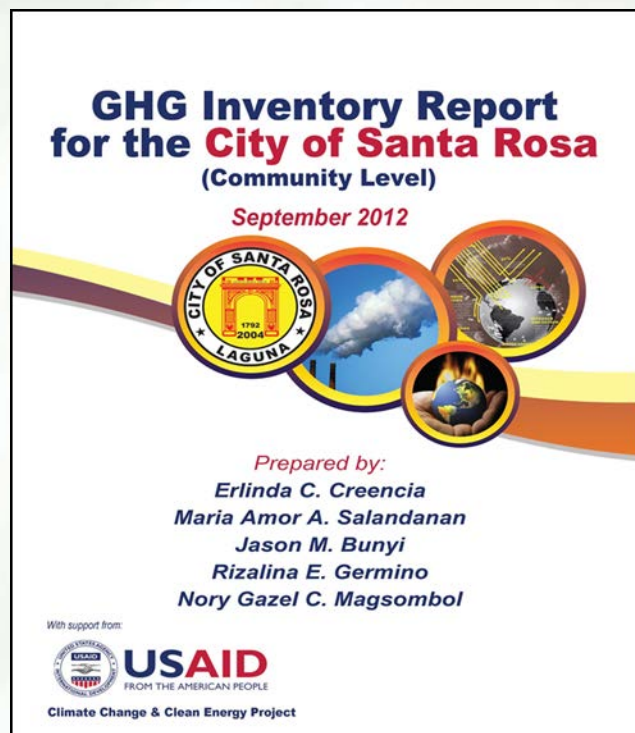
Source: Sta. Rosa Watershed Hydrology and Hydrogeology Report by WWF

# Flood modelling

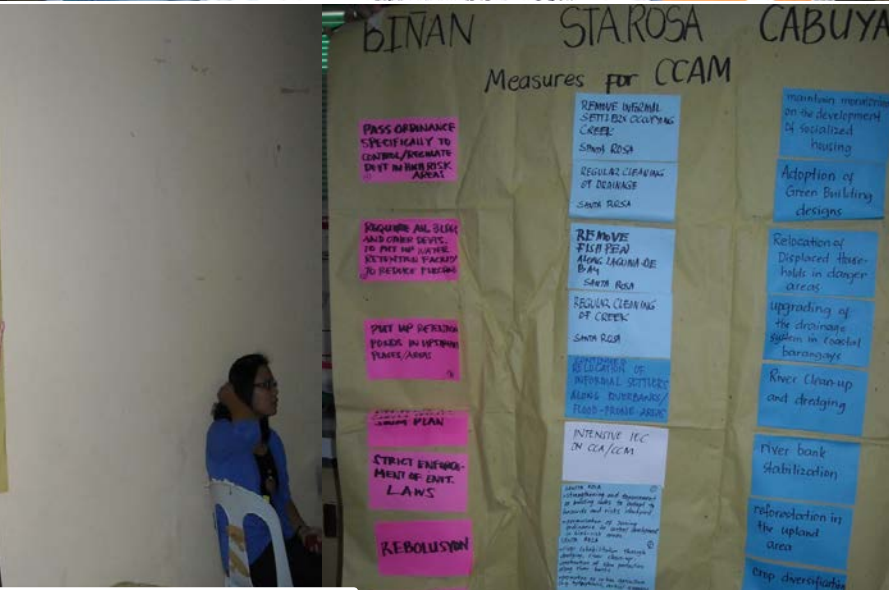
using Hydrologic Engineering Center's Hydrologic Modeling System (HEC-HMS) and River Analysis System (HEC-RAS)



# GREENHOUSE GAS EMISSION INVENTORY



# Step 3: Countermeasure development



Through participatory rapid appraisal activities e.g., key informant and focus group discussions

# STEP 4: Climate-Sensitive land-Use

- Mainstreaming of Climate Change Mitigation and Adaptation in the LGUs Comprehensive Land-Use Plan
- Harmonization of land-use within the subwatershed for an effective integration of climate change responses
- Formulation of the Local Climate Change Action Plan

# UPDATED THE COMPREHENSIVE LAND USE PLAN

- Policies and Strategies with climate change measure
- Regulation of future development in high risk areas for certain types of land use and physical structure
- Develop and strengthen building design standards
- Adoption and application of green technology in government and private sector building
- Formulate and implement a sustainable watershed development plan that will address flooding and protection of the water recharge areas through an integrated approach in coordination with the neighboring LGUs

# LOCAL CLIMATE CHANGE ACTION PLAN



CITY OF SANTA ROSA  
Province Of Laguna

LOCAL CLIMATE CHANGE ACTION PLAN  
2016-2025

To ensure its implementation, the LGUs are mandated to :

- Integrated in the 10-year City Development Programs (CDP)
- Programs and Projects should be included in the LGUs Annual Investment Program
- Climate Change Expenditure Tagging
- Submitted for funding in the annual budget

# 2017 ANNUAL INVESTMENT PROGRAM

## CY 2017 Annual Investment Program (AIP)

### Details of Program/Project/Activity by Sector

As of January 25, 2017

City: Santa Rosa

Province: Laguna

☐ No Climate Change Expenditure (Please tick the box if your LGU does not have any climate change expenditure)

AIP Reference Code	PROGRAM / PROJECT / ACTIVITY DESCRIPTION	IMPLEMENTING OFFICE / AGENCY	SCHEDULE OF IMPLEMENTATION		EXPECTED OUTPUTS	SOURCE OF FUND	AMOUNT				AMOUNT of Climate Change expenditure (In Thousand Pesos)		
			START DATE	COMPLETION DATE			PS	MOOE	CO	TOTAL	Climate Change Adaptation	Climate Change Mitigation	CC Typology Code
8000-01	POLLUTION CONTROL PROGRAM	City ENRO	1/1/2017	12/31/2017	Decrease in the amount/volume of waste disposed in the landfill by 50%, improved air and water quality	General Fund	2,371,774.571	756,414.286	11,000,000.000	14,128,188.86			
8000-01-01	Solid Waste Management	City ENRO	1/1/2017	12/31/2017	Decrease in the amount/volume of waste disposed in the landfill by 50%	General Fund	790,591.52	252,138.10	10,000,000.00	11,042,729.62			
8000-01-01-01	Operation of Centralized Composting Facility	City ENRO	1/1/2017	12/31/2017	500 kgs of compost produced per month	General Fund	65,882.63	21,011.51	0.00	86,894.13		86,894.13	M324-04
8000-01-01-02	Operation of Charcoal Briquetting Facility	City ENRO	1/1/2017	12/31/2017	150 kgs of charcoal briquettes produced per month	General Fund	65,882.63	21,011.51	0.00	86,894.13	86,894.13		M314-08
8000-01-01-03	Installation of Materials Recovery Facility (MRF) in barangays and turned-over subdivisions	City ENRO / City Engineering	1/1/2017	12/31/2017	construction of at least ten (10) MRFs in strategic areas and turned-over subdivisions	General Fund	65,882.63	21,011.51	0.00	86,894.13		86,894.13	M324-04

# OTHER INITIATIVES MADE BY THE CITY OF SANTA ROSA ON CLIMATE CHANGE MITIGATION AND ADAPTATION



## TREE PLANTING ACTIVITIES AND REGULATION OF TREE CUTTING ACTIVITIES



## Centralized Composting Facility



- Aims to reduce GHG emissions from organic wastes and has contributed 12.17% (WACS 2014) to the total organic waste diversion of the City.
- The compost serve as soil conditioner and available for free to local farmers in the City.



- Established in 2009
- The facility has 4 Bioreactor units
- 3 units of 3 MT capacity
- 1 unit of 1.5 MT capacity donated by Sen. Cynthia Villar

## CHARCOAL BRIQUETTING PROGRAM

Water Hyacinth (Water Lilies)



+ Coconut Husks



= Charcoal Briquettes



- Established in 2011 to further enhance the City's organic waste diversion
- All equipment provided by Toyota Autoparts, Inc.
- Used as alternative source of fuel for cooking
- Sold at PhP 20.00/pack



## Integration of SWM into the school curriculum for Grades 3, 4, 5 & 6



Under Resolution No. 74-2015, a MOA between DENR, NSWC, DEPED, Toyota Autoparts, Inc. and the City of Santa Rosa on the implementation of School-based Ecological Solid Waste Management Program (SESWMP).

## MONTHLY MULTI-SECTORAL CLEAN UP ACTIVITIES

In conjunction with the "Bayan Ko, Linis Ko" Campaign of DENR



## MATERIALS RECOVERY FACILITIES

BARANGAYS WITH EXISTING MRF's:

1. Balibago
2. Caingin
3. Don Jose
4. Labas
5. Pooc
6. Pulong Santa Cruz (operational)
7. Sinalhan (operational)



MRFs will be given to the remaining 11 barangays with an allocation of PhP 300k for each barangay by 2017.

## 3-Bin Waste System



# The GIZ-Nexus Project



- proposed low-cost, medium-rise sustainable housing for the informal settlers of Sitio Masiit, Brgy. Labas incorporating waste-to-energy, urban agriculture and vacuum sewer technologies. This project was conceptualized in 2013 and still ongoing at its second phase for the period of 2016 to 2019.



Compliance Monitoring of Business establishments to:

- Environmental Compliance Certificate
- Certificate of Non-Coverage
- LLDA Clearance

- To regulate pollution sources



## INFORMATION AND EDUCATION CAMPAIGNS

Catering to HOAs, schools, barangays, companies, and other organizations



## ADVOCACY CAMPAIGNS

### SILAKBO (Sikad-Lakad-takBO)

- An annual fun run event in commemorating the EARTH WEEK CELEBRATION. Now on its 5<sup>th</sup> year.
- For the benefit of the SAVE SILANG-SANTA ROSA RIVER (SSRR2) Foundation, a Non-government organization that is multi-sectoral in composition, formed in September 1997 to address the Silang-Santa Rosa River issues through its various programs.



## URBAN AGRICULTURE DEMO FARM



The City of Santa Rosa realizes that the effects of Climate Change will threaten food security.

The program on Urban Agriculture will further counterbalance this imminent threat by introducing this novel technology to its stakeholders.

Participation in the



Recognized as the NATIONAL EARTH HOUR CAPITAL of the Philippines for the year 2016





# Other Pipeline/Proposed Projects for CCA/CCM

- Formulation of the City Green Building Code
- Approval and adoption of the Local Climate Change Action Plan with the incorporation of Climate Risk Reduction Assessment (CDRA)
- Formulation of an Integrated Water Resources Management Action Plan for the Santa Rosa Sub-watershed.
- Formulation of a Policy For Regulating Groundwater Extraction
- Small Water Impounding System (SWIS) for flood control (includes construction of detention ponds in strategic locations, in Brgy. Sto. Domingo (upstream), Macabling Midstream and Tagapo (downstream) to improve waterways)





# Thank You!

