



# Emblematic Projects for watershed restoration and flood disaster mitigation in Mexico



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- 2. The Tropical Pacific Coastal Region
- 3. Project components
- 4. Conclusions

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Tropical and sub-tropical regions of southern Mexico (States of Chiapas, Tabasco and Veracruz) are frequently threatened by hydro-meteorological storm events and floods.

The national and state authorities recognize the necessity to take action and establish mitigation measures.

■ Objective six of the National Waters Program 2007 – 2012 is focused on the <u>"Prevention of risks derived from meteorological and hydro-meteorological phenomenon"</u>, and stipulates the implementation of restoration and preservation actions in the upper parts of watersheds to reduce runoff and sediment delivery rates downstream.





**National Waters Law\*** 

Article 14 BIS 5

II: "The integrated management of hydrologic resources at watershed level is the basis for national water politics"

VII: "Federal Executive will instrument mechanisms to maintain and reestablish the hydrologic equilibrium in the country watersheds.

\* Ley de Aguas Nacionales y su Reglamento (LAN 2004)





River Basin Councils: Entities of mixed membership providing support, consultation and advice between National Water Commission and Federal dependencies, State or Municipal instances.













# $\Rightarrow$ Huixtla, Huehuetán and Coatán watersheds have been selected for the establishment of three emblematic projects

Reduce runoff and sediment production upstream



**Tropical Pacific Coastal Region of the State of Chiapas** 





### Soil and Water Conservation Plan for the Chiapas Coast in 1999/2000





CENTRO PARA MIGRACIÓN Y

DESARROLLO INTERNACIONAL

SUBDIRECCIÓN GENERAL DE INFRAESTRUCTURA HIDROAGRICOLA GERENCIA DE DISTRITOS DE TEMPORAL TECNIFICADO

Cooperación Técnica México - Alemania Programa de Expertos Integrados del CIM



PLAN DE CONSERVACION DE SUELOS Y AGUA PARA LA COSTA DE CHIAPAS

Jürgen Baumann

Colaboración:

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- ⇒ Erosion diagnosis The analysis stressed that Coatán, Huixtla and Novillero watersheds are the most effected.
- ⇒ Soil and water conservation techniques for tropical regions.
- ⇒ Concepts for the development of conservation programs.





The Tropical Pacific Coastal Region of the State of Chiapas is one of the most affected zones by meteorological storm events and soil erosion in Mexico.

■ The zone was seriously affected by Hurricane "Francis" in 1998 and in 2005 by Hurricane "Stan".







3-day rain accumulations							
Station	1988	1998	2005				
	(31. Ago2. Sept.)	(8. – 10. Sept.)	(4. – 6. Oct.)				
		"Mitch"	"Stan"				
	Rainfall (mm)						
Margaritas	440	715					
Escuintla	557	329					
Despoblado	401	489					
Huixtla	391	323					
Tapachula	316	401					
Finca Argovia			827				
Huehuetán			641				
Finca Chanjul			1100				

3-day rain accumulations with recurrent periods of 100 – 200 years - occurred three times over the last 20 years.





Rainfall classes and range of erosivity*							
Rain class mm	Range of El <sub>30</sub> (N/h)*			N/h)*			
	n	min	max	mean			
0.1 – 10.0	1085	0.0	7.9	0.7	Slight rains with low erosive potential, mostly beneficial for agriculture (49.2%)		
10.1 – 20.0	458	0.5	28.9	6.7			
20.1 – 30.0	274	2.6	74.6	19.1			
30.1 – 40.0	164	5.7	80.3	36.5			
40.1 – 50.0	125	11.8	131.5	61.9	Rains with a wide range of		
50.1 – 60.0	89	26.7	174.8	91.3	erosivity, require the introduc-		
60.1 – 70.0	48	48.0	181.5	119.1	tion of erosion control measures		
70.1 – 80.0	33	11.6	328.3	120.1	tems (33.4%)		
80.1 – 90.0	25	78.3	365.0	198.8	Rains with high to very high		
90.1 – 100	13	103.2	271.6	191.6	erosivity. Single rains can cause		
100.1 – 150	23	62.8	553.6	267.0	severe damages at local leve		
150.1 – 200	6	122.5	870.0	418.0	tions regional hazards (17 4%)		
> 200	4	420.7	879.1	645.4			

\*Database 2047 rain events in the period 2000 - 2005





# Rain event June 12<sup>th</sup> 2005 registered at Argovia farm: 236.9 mm $I_{max}$ : 197.5 mm/h; Energy: 6.51 kJ/m<sup>2</sup>; El<sub>30</sub>: 719.2 N/h







### Middle and upper parts of the watersheds: Land use alteration



Forests: Tree felling for fire wood



Conversion to annual crops and pasture







### Road effects in vulnerable tropical ecosystems

### Landslides

Source of sediment production







#### Points of landslides in the upper Huixtla watershed

Main damages in the upper part of the watersehd in the subcatchments of El Retiro, Agua Fría y Ecumú, with mean slope angles of 54.9%, 52.3% y 46.7%





### Points of landslides in the upper Coatán watershed







### 3. Project components



#### **River Basin Council No. 23 Chiapas Coast**



Organization

## Local and community based organizational structure



#### River Basin Committee No. 23d Coatán River



### **Technical Sub-catchments Committees CoTeMs**







Control runoff in lineal landscape elements

Conservation and restoration works



#### **Vegetative check-dams**



Gabions



**Combined check-dams** 







#### **Vegetative strips**

# Conservation and restoration works

#### Agronomic measures



# Improved plant density in annual crops







#### Legume cover crops

#### Individual terraces





















Fish farm

**Constructed wetlands** 













### Hydrologic Monitoring

# Deficiency of information in humid tropical regions

- hydro-meteorological data
- Runoff
- Phyiscal soil conditions











- For the first time it was included in the National Waters Program as a central objective, the implementation of restoration and preservation actions in the upper parts of watersheds.
- The establishment of emblematic projects for the Huixtla, Huehuetán and Coatán watersheds is an important step towards an integrated watershed management in the Tropical Pacific Coastal Region of the State of Chiapas.
- The authorities recognized that a watershed monitoring network is an important component within emblematic projects, and that a real long term database is necessary for a better understanding of hydrological processes.



Thank you very much