The Vargas Disaster and Measures

VENEZUELA DECEMBER 15, 1999
INTRODUCTION

North face: La Guaira

Area: 1.497 Km²  Coastline: 128 Km  Average width: 8 Km  Population: - Vargas State 260,000 h - Caracas 3,000,000 h - Miranda State 3,000,000

Milestone: Dec 12 1958 (ruled by Democracy) creation by law of Avila National Park (85.192 Ha) in Cordillera de La Costa.
INTRODUCTION – VARGAS STATE

Yearly average rainfall: 475 mm

Monthly average rainfall, measured in stations located at: Maiquetia Airport and Mamo Naval Academy (Data Source: Venezuelan Aire Force) (Andressen and Pulwarty)
Historical Facts


- From 1960 – 1998: Illegal settlement by low-income population along Vargas State
  - Unregulated construction of buildings for high-income population.
  - Bribery is a common practice to obtain any municipality permission.

- Feb 2 1999: Hugo Chavez was sworn in as President of Venezuela

- Nov 20 1999: Constituent Assembly of Venezuela finished the project of a “Bolivarian” Constitution

- Dec 15 1999: a constitutional referendum was planned. Voters would be asked whether they approved the new constitution.
Chronology of a Disaster (1/4)

- Dec 5: **Civil Defense** issues warning to the population and city authorities due to 120 mm of rainfall in Vargas

- Dec 6: **Venezuelan Air Force** warns the National Government regarding rainfall: 3 times the historic average of the Vargas State

- Dec 10: beginning of significant landslides along the coastline, displacing 2,000 people.

- Dec 10: **Ministry of Environment** warns President Chavez of imminent threat, due to 250 mm rainfall.

Dec 15: constitutional referendum. Political forecasts expected above 50% of abstention (Voters 10,940,596).
Monthly average rainfall, measured in stations located at: Maiquetia Airport and Mamo Naval Academy (Data Source: Venezuelan Aire Force and Naval Army)

Daily rainfall, measured in meteorological stations located at: Maiquetia Airport and Mamo Naval Academy (Data Source: Venezuelan Aire Force and Naval Army)

Pluviometry-Topographical view of Avila National Park (between the stations Maiquetia and Cajigal). Pluviometric chart estimated for the whole rainfall from 01 until 16 December 1999
Dec 12: the massive evacuation of Vargas State (over 200,000 persons) is discarded as an option by the Central Government, regardless the advice from all three agencies.

Dec 15 (7:00 am – 4:00 pm): the constitutional referendum was held in the whole country.

In order to justify ignoring all preventive measures prior to the referendum, President Hugo Chavez invokes the words from the national Hero Simón Bolívar (1783-1830):

..IF NATURES OPPOSES, WE WILL FIGHT NATURE ITSELF AND FORCE IT TO OBEY US

(Note: those words were given by Bolívar to a square full of people screaming, few minutes after a strong earthquake destroyed Caracas on 12th March 1812, as related by royalist chronicler José Domingo Díaz)
Chronology of a Disaster (3/4)

- Dec 15 (08:00 pm): Heavy rains triggered thousands of landslides.
- Initially more than 20,000 are presumed dead...

Specialists estimate that 20 million cubic meters were deposited as a consequence of the event (Genatios, 2012)

Deposit thickness ranges from 4-5 m near the center of the alluvial cone (alluvial fan).

Towns like “Carmen de Uria” and “Cerro Grande” disappeared completely.

According to researchers, this type of extraordinary rainfall has a repeat interval (recurrence interval or return period) estimated at 500 years.
Chronology of a Disaster (4/4)

- Dec 14: the Miranda State (ruled by opposition leader E. Mendoza) is declared in ALERT. Evacuation of civilians starts with support of Miranda Governorship. Central Government accuses of sabotage Mr. Mendoza.

- Dec 15: remarkable abstention in places with displaced people in Miranda.

- Dec 16: El Guapo Dam breaks under the pressure of water. 25,000 persons affected.

El Guapo - River Dam / Miranda State
The reservoir created has a 60m high dam with a surface area of 600 Ha
During heavy rainfall in 1999, the existing dam in the area on the Guapo river suffered serious damages. In 2005 rebuilding works began.
The dam was reconstructed with a cost of USD 67.2M, providing potable water to 130,000 residents.
The flood ravaged the Vargas state on Dec. 16 1999, after torrential rains in few days.

Several towns and villages along 60 Km coastline, were buried under 4 m of mud. The mudslides altered the coastline of Vargas.

More than 100,000 were evacuated after the disaster struck. More than 8,000 houses were destroyed.

Dead persons: minimum 1,000 (estimated 2,500)

Estimated losses: 4.000 million USD
Looting and sacking sprouted up everywhere, forcing the military to implement martial law for more than one year.
Results of Constitutional Referendum

Yes : 3,301,475 (71.78%)
No : 1,298,105 (28.22%)
Nuled : 219,476 (4.55%)
Valid voters : 4,599,580
Voters population : 10,940,596 (100%)
Total voters : 4,819,056 (44.38%)
Abstention : 6,041,743 (55.62%)

“Felizmente, por encima de las tragedias, aquí está la nueva Constitución”

Lieutenant colonel Hugo Chavez
TV Broadcast message 16.12.1999
Measures: Inmediate Reaction

- 05.01.2000: a new Office was created to centralize the process for reconstruction (AUTORIDAD UNICA). The former Science Minister was designated for this service.

- 08.06.2000: a state-controlled corporation was created in order to proceed with the financial issues (CORPO-VARGAS).

- In less than a year, several projects were developed by a team of 200 high-level specialists (“Autoridad Única”) focusing on:
  - urban planning,
  - watersheds management
  - Hydraulic protection
  - disaster prevention
  - rebuild of damage infrastructure

- Government rejected the most of their proposed works, and re-shape them again.

- Dr.-Ing. C. Genatios resigned from any duty at the Bolivarian Government in 2002.

AUAEV (Unique Autorty for Vargas) proposals:

- Urban planning for every single basin in the coastline (33 cuencas)
- Do not issue any construction permission even for partial reconstruction, without the inspection of municipal engineering office.
- Improvement of water channels and other hydraulic civil works
- Development of new roads and well-designed bridges
Measures:

International Cooperation

- Several countries sent their experts to collaborate with the relief work and planning lead by “Autoridad Única”:
  - Japan
  - China
  - Austria
  - Italy
  - Spain
  - Norway
  - USA

- German Government offers a new system for potable water. German President Johannes Rau help with the delivery of material for a new water supply and sewage disposal system (6 years project).

- Self-organised venezuelan baseball players (US Major Leage Baseball) raised over $500,000 in relief funds.
Measures: CORPOVARGAS

- 2003: ordered structural measures for retention and storage of sediments, and control channels

- Construction of 35 sediment control dams, most of them were open-style.

- Intervention works in 25 basins (of 33 along the coastline)

- Most of sediment control dams were constructed by stone-gabions, instead of concrete or even with stand piping.

Open Dams (slotted):
- a) Reinforced concrete in Qda. Guanape
- b) Simple concrete in Qda. Curucuti
- c) Gavions dam in El Cojo
Measures: CORPOVARGAS

- Flash-Flood Early-Warning System: installation of 33 pluviometric stations and 9 hydrometric stations

- Corpovargas was finally closed in 2010.

- After 2011 the stations belonging to the Early Warning System do not offer real-time data, due to lack of maintenance.

d) Gavions open dam (window type) in Camuri Chico.

e) Slotted open dam (steel tubular) in Tacagua

f) Gavions closed dam in Macuto
Measures: Analysis and Weaknesses (I)

- Few years after the tragedy, the “Autoridad Única” (2002) office and “Corpo-Vargas” (2009) were closed, and their competences assumed by local government.
- However, the high budgets for the projects, after 17 years of the event, relevant works are still in execution.
- The poor quality of civil works was demonstrated during the Heavy Rainfall “Vaguada” of Feb 2005.
- The early warning system was abandoned.
- Only Community-based early warning systems still survive in some villages, due to the support of universities and other major actors.

Bridge at Camuri Grande after the intense rainfall (vaguada) 2005

Pictures from: http://alertanaiguata.wixsite.com

February 10, 2005
Measures:
Analysis and Weaknesses (II)

- The poor quality of civil works was demonstrated after the intense rainfall (Vaguada) of Feb 2005

- Experts suggest the demolition of some works, such as the stone gabions in the rivers, to be replaced with concrete

Broken bridge, due siltation (colmatación) after the intense rainfall (Feb 2005)

Stone Gabions at Quebrada El Cojo

Measures:
Analysis and Weaknesses (III)

- Town planning and strategic green areas, was replaced by the populism criteria, for the deployment of new settlement for displaced population.

- Massive state-owned block-buildings (Mision Vivienda) were constructed in the same areas where the destruction happened,

- Those works were criticised by specialists because of the exposición of human lives to the same threat (Rio San Juan) in the forthcoming decades.
Measures:
New Coastline Use

- Above the sediments that created more than 100 Ha, government decides to construct light weight structures, as sport arena, squares and boulevards, along the coastline.
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Non-Scientific references

- Author’s perspective
In Memoriam of victims of a man-made disaster
If you have a question, don’t hesitate to ask, or write me at: hugo.pernia@gmx.de