Instituto Nicaragüense de Energía

Environmental Quality in Nicaragua

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Austin, Texas – July 2008

PRESENTATION OBJECTIVES

- Showing current power plant environmental quality. Case examples.

Environmental Requirements in Power Generation Project Implementation

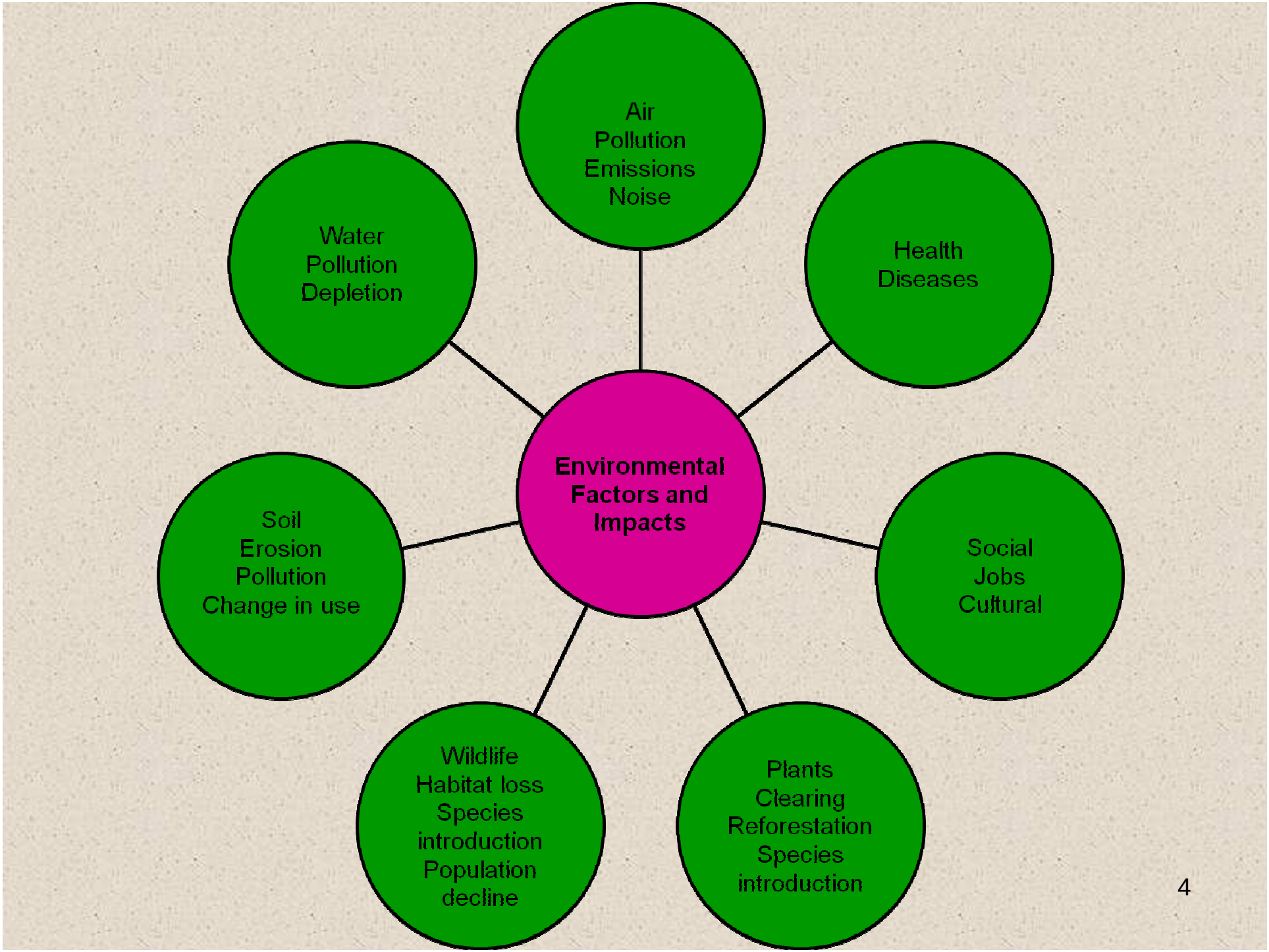
Environmental Permit

Ranking by generation type

- Wind, biomass, and hydroelectric power plants under 10W are required to carry out an Environmental Assessment. The Permit is granted by MARENA Departmental Delegations.

- Thermal, geothermal, biomass, wind, and hydroelectric power plants over 10 MW are required to submit an Environmental Impact Assessment (EIA). The Permit is granted by MARENA headquarters

Source: Decree 76-2006


Air
Pollution
Emissions
Noise
Water
Pollution
Depletion
Health
Diseases
Environmental
Factors and
Impacts
Soil
Erosion
Pollution
Change in use
Social
Jobs
Cultural
Wildlife
Habitat loss
Species
introduction
Population
decline
Plants
Clearing
Reforestation
Species
introduction

PERCENTAGE GENERATION BY FUEL TYPE

- Fossil Fuels 71.01%
- Water 9.55%
- Geothermal Steam 7.58%
- Biomass 11.86%

Source: INE Statistics, 2007

Power Plants

Interconnected System

- **Tipitapa Power**
- Censa Amfels
- Margarita Plant
- *Nicaragua Plant
- *Managua Plant
- *Las Brisas Plant
- Hugo Chávez Plants
- Huyndai Managua Plants
- Huyndai Tipitapa Plants
- Huyndai Masaya Plants
- *Centroamérica Hydropower Plant
- *Santa Bárbara Hydropower Plant
- *San Jacinto Geothermal Plant
- *Momotombo Geothermal Plant (ORMAT)
- GESARSA
- San Antonio Cogeneration
- Monte Rosa Cogeneration

Stranded Systems

- ***Puerto Cabezas Power**
- *EGOMSA
- Aprodebo Hydropower Plant
- Wabule Hydropower Plant
- ATDER Hydropower Plant
- *ENEL Thermal Miniplants

- Energy Structure prior to current environmental regulation

Fuel Used by Generation Type

Generation Type	Fuel	Units	Amount
Hydrocarbons	Bunker	Thousand gallons	131, 849.5
Hydrocarbons	Diesel oil	Thousand gallons	19, 848.96
Geothermal	Geothermal steam	Thousand tons of steam	2, 055.39
Hydroelectric	Water	Thousand M^3	578, 645.79
Cogeneration	Sugar cane bagasse and firewood	Metric tons	1,132,703.96

INE statistics, 2007.

Emissions from Fossil Fuels Used

- Carbon Monoxide
- Carbon Dioxide
- Lead
- Particulate Matter
- Sulphur Oxides
- Nitrogen Oxides
- Volatile Organic Compounds
- Heavy Metals (cadmium, chrome, cobalt, mercury)
- Dioxines & Furans
- Formaldehides
- Among Others.

AIR QUALITY STANDARD (NTON 05 012 02
MAXIMUM PERMISSIBLE AIR POLLUTANT EMISSION LIMITS

POLLUTANT	SYMBOL	MAXIMUM PERMISSIBLE LIMIT μg/m³ /(ppm)	MEASUREMENT PERIOD
Total Suspended Particles	TSP	75 /(n a.) 260/ (n.a)	Annual[1] [IRM1][IRM2] 24 hours[2]
Particulate Matter 10 micrometers or less	PM_{10}	50/ (n.a) 150/ (n.a)	Annual[1] 24 hours[2]
Sulphur Dioxide	SO_2	80 / (0.03) 365 / (0.14)	Annual [1] 24 hours[2]
Nitrogen Dioxide	NO_2	100 / (0.05) 400 / (0.21)	Annual[1] 1 hour[2]
Ozone	O_3	160 / (0.08) 235/ (0.12)	8 hours[2] 1 hour[2]
Carbon Monoxide	CO	10,000 / (9.0) 40,000 / (35.0)	8 hours[2] 1 hour[2]
Lead	Pb	0.5/ (n.a) 1.5/ (n.a)	Annual[1] Quarterly

Annual[1] : Annual arithmetic average
[2] : Continuous
n.a. : Not applicable because the μg/m³ / ppm ratio is only valid in cases where pollutant is a gas, instead of a particle.

Control Elements
Decree on Effluents
Effluents from Thermal Power Plants
Measurement Parameters, Art. 43

• Temperature	50 ^{0}C
• Ph	6-9
• Suspended Solids	60mg/l
• BOD	90mg/l
• COD	200mg/l
• Cu	0.8mg/l
• Total P	5mg/l
• Zn	2mg/l
• PCB	NA
• Greases and Oils	20mg/l
• Hydrocarbons	2mg/l

Case Example

Tipitapa Power Generation Plant
Interconnected System

Generation Type	Thermal
Location	Km. 19 Old Road toTipitapa, Departament of Managua
Commissioning date	March 1999
Installed capacity	52.20 MW
Number of Units	5
Storage Tanks	4
Oily Water Treatment	Treatment system
Mud & Oil Discharge	Authorized company
Water Discharge	La Mocuana River
Effluent Monitoring	Semiannually
Air Quality	Semiannually


Fuel Tanks
28/05/2008

Water Treatment

Mud tank and daily fuel tanks


Pipelines and tanks
28/05/2008


Engine room
1
28/05/2008


Smokestacks
28/05/2008

Case examples

Puerto Cabezas Power
Stranded System Plant
Originally State-Owned. 1.5 MW Capacity
Location: Bilwi city urban grid,
North Atlantic Autonomous Region

Generation type	Thermal
Generation fuel:	Fuel Oil No. 6
Current installed capacity:	7 MW
Current number of tanks	7
Number of units installed in engine room	5
Condition of units	Poor
Fuel pretreatment:	Centrifugation
Oily water and purge treatment:	Separator
Water destination:	Company yards
Baseline study before current administration accession:	Nonexistent
Effluent monitoring	Not done


Engine room
Wuxi units
20/03/2007 11:20


Bratizlava unit
20/03/2007 10:32

Aerial view. Plant emissions

Houses neighboring the plant.
Notice roof conditions

Aerial view of plant and tanks

Tank and cooling area

Location of firefighting system valves