

## **MONITORING REPORT**

### **LA VENTA II**

CDM REGISTRATION ON: June 25<sup>th</sup>, 2007.

REF NUMBER: 0846.

WEBLINK: <http://cdm.unfccc.int/Projects/DB/AENOR1168204945.7/view>

CREDITING PERIOD: 01 July 07 - 30 June 14 (Renewable).

MONITORING REPORT COVERING THE FIRST YEAR OF THE CREDITING  
PERIOD:  
July 1<sup>st</sup>, 2007 – June 30<sup>th</sup>, 2008.

AUGUST 22<sup>nd</sup>, 2008 - VERSION 1.

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## TABLE OF CONTENTS

<b>1. Introduction.....</b>	<b>2</b>
<b>2. Monitoring Methodology.....</b>	<b>3</b>
<b>3. Calculation of the Emission Reductions of La Venta II.....</b>	<b>3</b>
3.1. Source and Data Reliability.....	3
3.2. ERs Achieved.....	4
3.3. Data Crosschecking.....	4
3.4. Calibration to Meter used for ER's Calculation.....	5
<b>4. Contribution to Sustainable Development .....</b>	<b>5</b>
4.1. Social Agenda.....	5
4.2. Environmental Agenda .....	7
<b>5. Annexes. ....</b>	<b>11</b>
5.1. Annex 1. Monitoring of Emission Reductions.....	11
5.2. Annex 2. One Line Diagram of La Venta II Power Station.....	11
5.3. Annex 3. Photographs.....	12

## 1. Introduction

La Venta II wind power plant ("La Venta II") consists of 98 wind turbine-generator engines ("WTGs") each of 0.85 MW capacity, which add up to 83.3 MW total capacity. The WTGs are distributed in 4 rows approximately 600 meters away from each other. The WTGs are approximately 130 meters away from each other; the height of the WTGs is 44 meters.

The spatial extent of La Venta II boundary is the Integrated Mexican National Grid ("IMNG"). La Venta II is integrated by 5 electric circuits which collect the energy generated by the 98 WTGs and send it to the substation of the plant named La Venta II substation. La Venta II is connected to the IMNG through a 19 km-230kV-transmission line that connects to the Juchitán II substation of the IMNG. The total expected generated electricity is delivered to the grid and commercialized by CFE, which is the developer, operator and owner of La Venta II. La Venta II's minimum expected plant operating life is 21 years.

La Venta II was commissioned on January 5<sup>th</sup>, 2007, however the crediting period starts on July 1<sup>st</sup>, 2007. During the first year of the crediting period (July 1<sup>st</sup>, 2007 – June 30<sup>th</sup>, 2008), La Venta II generation registered by CENACE was 244,658 MWh. Intermittent falls of some turbines happened but were replaced according to the supplier's manual. The energy production was less than the expected one in months of strong winds, resulting in an overall less than expected energy generation. The chart below shows the monthly generation, which varied mainly due to the winds.

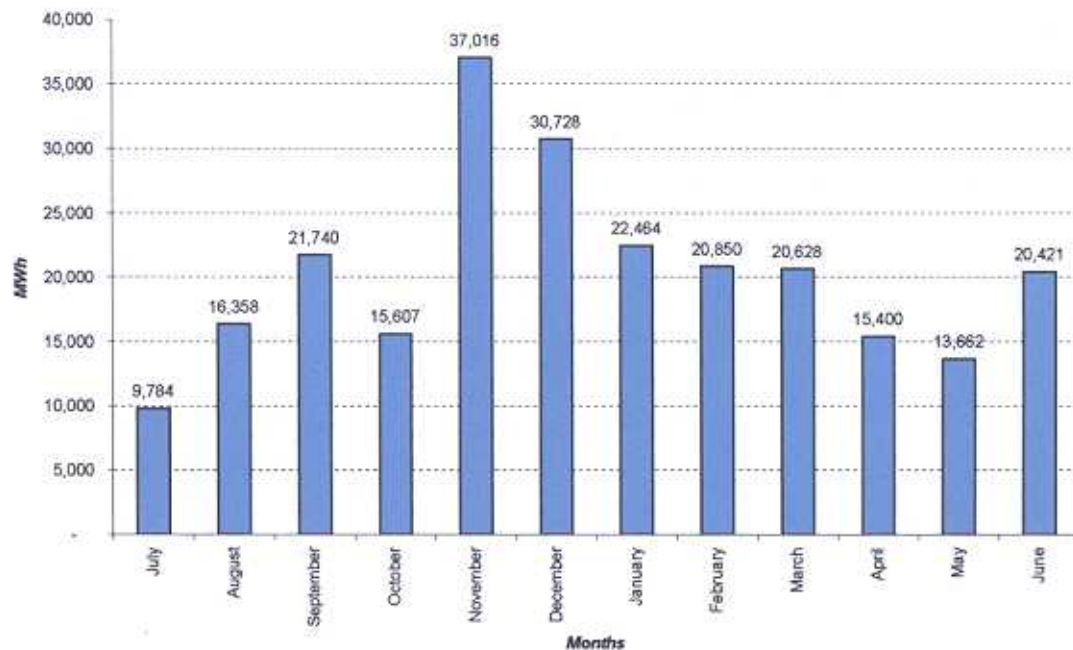


Figure 1. La Venta II Generation July 07 – June 08 (MWh)



## 2. Monitoring Methodology

Only one monitoring methodology will be used for La Venta II ERs calculation: ACM0002-Version 6.

## 3. Calculation of the Emission Reductions of La Venta II

Following ACM0002-Version 6, the emission reductions ("ERs") calculation is the emission factor ("CEF") times the electricity generation. In the PDD, the CEF for La Venta II was established at 0.62570 tCO<sub>2</sub>e/MWh, and is to be kept fixed for the first crediting period. Therefore the only variable to be monitored for the ERs calculation is La Venta II's electricity generation.

### 3.1. Source and Data Reliability

In La Venta II Design Document ("PDD") it is specified that Centro Nacional de Control de Energia ("CENACE") will be the solely provider of La Venta II's generation. The hourly measurement of the electricity generated by La Venta II that is recorded by CENACE is obtained in the ION 8500 meter located in La Venta II substation (see

Figure 2, Annex 2). The features of this meter, which will be used for the ERs calculation are as follow:

Voltage (L-L) (L-N)	0.1%
Frequency (47 - 63Hz)	±0.01Hz
Current (I1, I2, I3)	0.1% + 0.002%
Current (I4)	0.4%
kW, kVAR, kVA (Unity PF)	0.2% + 0.001%
kW, kVAR, kVA (±0.5 PF)	0.3% + 0.003%
kWh, kVARh, kVAh Class	0.2*
Power Factor at Unity PF	0.5%
Harmonics (to 63rd)	1%
Harmonics (to 40th)	IEC 61000-4-7
K Factor	5%
Crest Factor	1% Full Scale

This meter registers the hourly generation at 34.5 kV.

The measurement system in La Venta II is named *Sistema Integral de Medicion (SIME)*, which uses the communication Protocol DNP 3.0. The hourly measurement is stored in a concentrator placed in the same substation named *Concentrador de Informacion de Instalacion ("CII")*, this concentrator aside from recording the hourly generation sends the hourly generation information to a regional concentrator named *Nodo Secundario*,

placed in *Gerencia Regional de Transmisión Sureste - Tuxtla Gutierrez, Chiapas*<sup>1</sup>. Three times per day the *Nodo Secundario* extracts from its local base the hourly generation of La Venta II data<sup>2</sup> and sends this information to the Area de Control Oriental in Puebla, which stores the information in a file named *Hoja de Marcha*. The Area de Control Oriental in Puebla sends the information to CENACE in Mexico City, where it is stored in a file named *Balance de Energía*.

### 3.2. ERs Achieved

From July 1<sup>st</sup>, 2007 up to June 30<sup>th</sup>, the electricity generation of La Venta II was: 244,658 MWh, according to CENACE. ERs achieved are calculated as follow:

$$\begin{aligned}ER &= 244,658 \text{ MWh} \times \text{CEF}_{\text{ex-ante}} \text{ tCO}_2\text{e/MWh} \\ER &= 244,658 \text{ MWh} \times 0.62570 \text{ tCO}_2\text{e/MWh} \\ER &= 153,083 \text{ tCO}_2\text{e or ERs.}\end{aligned}$$

### 3.3. Data Crosschecking

According to CFE, there are no receipts of sales of the energy generated by La Venta II delivered to the next recipient of this energy: Transmission Area of CFE. Thus, receipt of sales cannot be used for cross-checking of La Venta's II generation. According to CFE, there is not any type of document (replacing a receipt of sales but it is treated as an internal CFE transaction) given by the Transmission Area of CFE to the Generation Area of CFE confirming the receipt of a certain quantity of energy delivered by La Venta II, so the only assurance the Transmission Area counts with of having received a specific quantity of energy from La Venta II is the measurement of such energy in the Transmission Area meter placed in La Venta II at 230 kV (below specified). Therefore, this latter meter is taken for data crosschecking.

CFE Transmission Area goes to La Venta II Substation every month and extracts manually the generation **every five minutes** from a specific meter, which records the energy generated by La Venta II at 230 kV (after its transformation from 34.5 kV). This meter at 230 kV is ION 8300 with the same characteristics of the ION 8500 from which CENACE receives the electricity generation data of La Venta II.

After the transformation from 34.5 kV to 230 kV, some transformation losses are expected. However, when compared to the 244,658 MWh figure- the total difference do not exceed 3% per month and 2% for the first year of the crediting period; so it is deemed that the 244,658 MWh figure recorded by CENACE for La Venta II's generation is plausible<sup>3</sup>.

<sup>1</sup> At the end of the day, the *Nodo Secundario* request CII complete the information in case there is a lost in the reading of the hourly incoming data.

<sup>2</sup> Along with the hourly generation data of other power plants.

<sup>3</sup> Please also note that the time intervals taken for measurement of the Transmission meter and the CENACE meter are different (the prior takes measurements every five minutes and the latter every sixty minutes).



### 3.4. Calibration to Meter used for ER's Calculation

Calibrations and maintenance of the meter ION 8500 at 34.5 kV were held by CFE on:

- September 2006 at the time of installation of the meters.
- From September 19 up to September 27, 2007.
- After September, 2007, calibrations dates are not yet available at the time of MR submission to the verifier.

The calibrations performed to La Venta II's ION 8500 meter, which measures the energy produced at 34.5 kV consisted in:

- Cleaning of the meter and turning of the screws further if they needed to.
- Processing per month the historical record of the generation measured by the meter.
- A monthly energy balance per installation.
- Daily remotely monitoring (by Internet) and in real time of the power, tension and other variables through a Nodo de Energia.

With these checks it is plausible to detect any errors that the meters may be presenting. Calibration certificates are available to the verifier.

CFE calibrations to La Venta II are performed by the *Laboratorio de Metrologia Sureste de la Gerencia Regional de Transmisión Sureste*, which is certified by CFE's *Laboratorio de Pruebas de Equipos y Materiales (LAPEM)*, which is certified by Centro Nacional de Metrologia ("CENAM"), which follows various international measurements standards.

## 4. Contribution to Sustainable Development

### 4.1. Social Agenda

#### 4.1.1. Act of December 2005 signed with Ejido La Venta

The sponsor opened a trust of 7,834,000 Mexican Pesos (783,400 US Dollars) that was spent in a social agenda agreed with the Ejido La Venta upon Act signed on December 12<sup>th</sup>, 2005. The social actions accorded to be covered by this budget were the following:

- A classroom for the local science and technology college of Oaxaca.
- Acquisition of computer(s) for the local school.
- Offices for the Ejido "house" or meeting room.
- Pavement of one street of the Ejido.
- Public electrification.
- Leveling of parcels that are within the area of direct impact of the project (where the WTG would be placed) named "*poligono de influencia*".

All of these actions listed above have been completed and the budget specified above has been spent completely.

#### **4.1.2. Other commitments of CFE with Ejido La Venta**

CFE offered the following to Ejido La Venta:

- Pay applicable compensations<sup>4</sup> in time, and annual rent to land owners affected by the project (landowners whose land is within the *Poligono de Influencia*).
- Restrict the activities of construction and assembling to avoid affecting additional land and/or agricultural land.
- Give training and promote the environmental consciousness among workers to facilitate the implementation of proper environmental measures.

All of these commitments listed above have also been carried. Furthermore the ejidatarios that are receiving an annual rent have been capable to continuing their farming, agriculture and construction activities that they normally carry out with the support of local and federal institutions such as: SEMARNAT, SEDESOL, *Secretaria de Salud*, *Secretaria de Hacienda*, CONAFOVIT y SAGARPA.

It is important to mention that at the end of 2007, CFE paid the committed annual rent to the Ejidatarios of La Venta that are within the Poligono de Influencia of La Venta II.

#### **4.1.3. Other social contributions**

##### **4.1.3.1. La Venta II Allowed**

- Hiring of 3 workers from Ejido La Venta and 20 additional workers from the *Istmo de Tehuantepec*.
- Serving as an example for future power plants since it is the first large scale power plant in operation in the *Istmo de Tehuantepec*.

##### **4.1.3.2. Indigenous People Development Program**

As the population in Ejido La Venta II has been characterized as indigenous, the World Bank raised a safeguard named Indigenous People, which mandates to build a document that summarizes all voluntary and mandatory social actions with Ejido La Venta, this document is the Indigenous People Development Program, which is a commitment between the two parties only and is to be monitored by The World Bank.

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<sup>4</sup> For losses suffered.



## **4.2. Environmental Agenda**

### **4.2.1. Programa de Monitoreo de Aves**

CFE and the *Instituto de Ecología, A.C. (INECOL)* conscious of the highest impact of La Venta II in the environment: Birds collision with the blades of the WTGs, accorded a 5-year-bird monitoring program, which initiated in 2004 and consists in the monitoring of the birds with the purpose of determining their habitat use, conduct responses (migration routes, height of flight, etc.) and identification of the zones of highest collision probability to establish preventive measures<sup>5</sup>. This monitoring will be completed on December 31<sup>st</sup> 2008. This program is a commitment of the *Condicionante 4* established in the *Termino Sexto* of the Environmental Authorization issued by SEMARNAT for the construction and operation of La Venta II<sup>6</sup>. In 2004 and 2005 the monitoring was performed on the Fall during September, October and November and from 2006 also includes March, April and May (Spring).

### **4.2.2. Manual de Vigilancia de la Avifauna y Quirópteros**

This manual was implemented from September 2007, and it covers all of the requirements of the Programa de Monitoreo de Aves described above with the only difference that must be performed during all of La Venta II's operating life. Both: The Programa de Monitoreo de Aves and the Manual de Vigilancia de la Avifauna y Quirópteros involve an integrated and coordinated job between CFE (La Venta II operation and follow up of mitigating and preventive measures) and INECOL (monitoring of the birds and the bats).

This Manual forms part of the obligations the World Bank requests to CFE upon the ERPA for La Venta II.

### **4.2.3. Results of The Programa de Monitoreo de Aves and of the Manual de Vigilancia de la Avifauna y Quirópteros**

Two further measures were taken:

- Setting of strategic places for bird observation to evaluate the efficacy of the mitigation measures already established.
- Installation of a special marine radar to detect large flock of birds and bats coming to La Venta II during migration period (Fall) and be able to warn CFE to stop operating the WTGs.

On February 1<sup>st</sup>, 2008, CFE and INECOL gave to SEMARNAT the results of the monitoring of the first year of La Venta II's operation (Spring 2007 and Fall 2007); the total reported number of collisions was 110 between bats and birds. However on April

<sup>5</sup> Such as relocation of the WTG or temporary stopping of the WTG, etc.

<sup>6</sup> Oficio resolutive No. S.G.P.A./DGIRA.DEL836.04 July 29th, 2004.



24<sup>th</sup>, 2008, SEMARNAT requested additional information through Letter SGPA/DGIRA/DESE/0440/08 because it found inconsistencies in the number reported. On May 22<sup>nd</sup>, 2008 CFE replied to SEMARNAT with the requested information through Letter HA000/RMG/0541/08, in where it modified the total number of collisions from 110 to 115; SEMARNAT accepted these latter results and it had no more questions about them as of today.

The table bellow shows the result of the monitoring of bats and birds during the first year of the crediting period (July 1<sup>st</sup> 2007 - June 30<sup>th</sup> 2008):

1 <sup>st</sup> year crediting period	July 07-June 08	Bats (Monitored up to 50 meters from the base of each WTG <sup>7</sup> )		Birds (Monitored up to 50 meters from the base of each WTG)	
		Number of Collisions	Species	Number of Collisions	Species
Accepted by SEMARNAT as of today <sup>8</sup> .	Fall 2007	76	<b>Insect-fed bats:</b> <i>Pteronotus davyi</i> , <i>Lasiurus intermedius</i> <i>Mormoops megalophylla</i> <i>Cynomops mexicanus</i> <i>(Molossus molossus)</i> <i>Balantiopteryx plicata</i> <i>Eumops spp</i>  <b>Fruit-fed bats:</b> <i>Centurio senex</i> <i>Artibeus intermedius</i>  <b>Nectar-fed bats:</b> <i>Glossophaga soricina</i>	21	14 species (5 of them Cernicalo Americano ( <i>Falco sparverius</i> )) <i>Cathartes aura</i> <i>Buteo albicaudatus</i> <i>Leptotila verreauxi</i> <i>Dendroica petechia</i> <i>Dendroica fusca</i> <i>Aimophila ruficauda</i> <i>Ortalis poliocephala</i> <i>Wilsonia pusilla</i> <i>Molothrus sp.</i> <i>Archilochus colubris</i> <i>Numenius phaeopus</i> <i>Quiscalus mexicanus</i> <i>Coccyzus americanus</i>
Not presented to SEMARNAT yet (these results are recorded by INECOL in an official book).	Spring 2008	13	<i>Pteronotus davyi</i> <i>Mormoops megalophylla</i> <i>Pteronotus parnellii</i> <i>Pteronotus sp.</i> <i>Molossus molossus</i> <i>Murciélagos w/o ID</i>	22	<i>Poliophtila albiloris</i> , <i>Cathartes aura</i> , <i>Colinus virginianus</i> , <i>Columbina passerina</i> and <i>Leptotila verreauxi</i> .

<sup>7</sup>Although there is not an specific radio to which the monitoring must be performed by any compromise or mandate, INECOL has been performing the monitoring up to 50 meters from the base of the WTGs; as of today bats and birds corpses have been found only up to 35 meters away from the base of the WTGs.

<sup>8</sup>Please note that SEMARNAT does not validate the results presented by CFE/INECOL. SEMARNAT only validates the execution program SGPA/DGIRA/DEL/0519/05 that dates as of Feb 23<sup>rd</sup>, 2005. The first official report of the monitoring of bats and birds (covering all year 2007) was presented to SEMARNAT on February 1<sup>st</sup>, 2008, through letter HA000/RMG/0131/08.

					Cathartes aura Buteo albicaudatus Icteria virens Colinus virginianus Chordeiles acutipensis Wilsonia pusilla
	Total	89	32 unidentified. 57 insect-fed bats (Pteronotus)	43	Specified above.

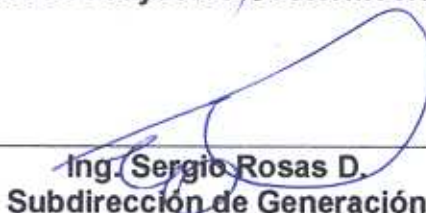
Please note that birds that crossed La Venta II were 267,844; and these are 8.8% of the total of birds that crossed the region (3,027,211 of 70 different species).



**Monitoring Plan Steering Committee:**



**Ing. Roberto Cadenas Tovar**  
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**Ing. Sergio Rosas D.**  
**Subdirección de Generación**



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**ERCP Management:**



**Ing. Carlos Sánchez Cornejo**  
**Gerencia de Proyectos Geotermoeléctricos**

## 5. Annexes.

### 5.1. Annex 1. Monitoring of Emission Reductions.

Table 1.- La Venta II's Generation (kWh) Monthly Cross-Checking

La Venta II's Generation (KWh) Monthly Cross-Checking				
Month	CENACE	Transmission	Difference	% Difference
July	9,784,415	9,665,533	118,882	1.22%
August	16,358,100	15,991,910	366,190	2.24%
September	21,740,117	21,359,979	380,138	1.75%
October	15,607,385	15,201,082	406,303	2.60%
November	37,015,800	36,354,297	661,503	1.79%
December	30,728,029	30,263,746	464,283	1.51%
January	22,463,774	22,036,050	427,724	1.90%
February	20,850,018	20,400,243	449,775	2.16%
March	20,627,800	20,205,173	422,627	2.05%
April	15,400,295	15,066,509	333,786	2.17%
May	13,662,000	13,278,288	383,712	2.81%
June	20,420,630	20,011,385	409,245	2.00%
	244,658,363	239,834,195	4,824,168	1.97%

Source: CENACE

### 5.2. Annex 2. One Line Diagram of La Venta II Power Station.

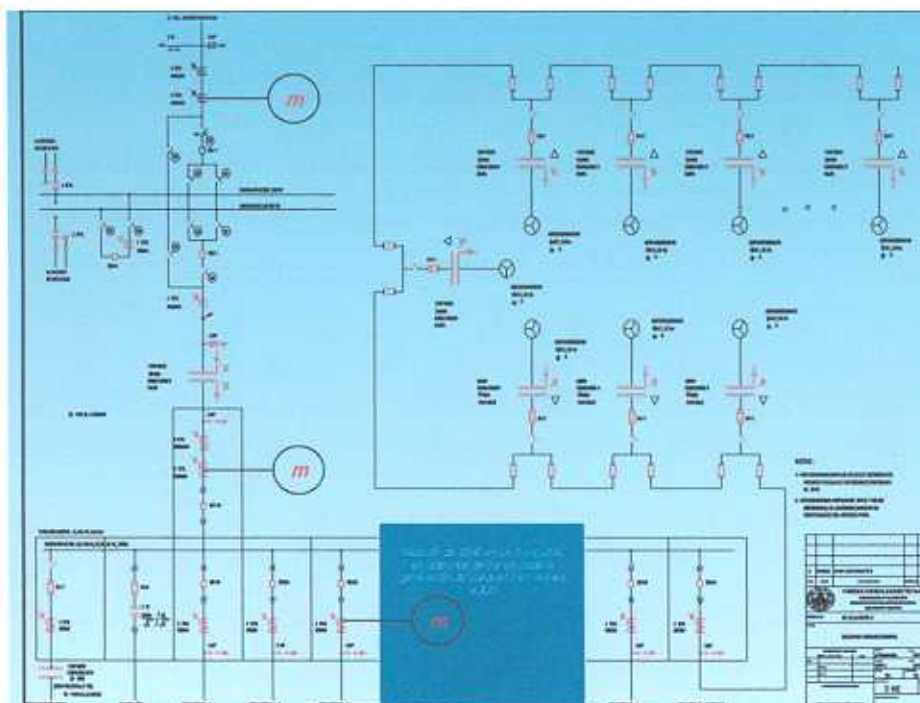


Figure 2.- One Line Diagram of La Venta II Power Station indicating the location of ION8500 meters in both sides 34.5kV and 230KV. Source: CENACE



**5.3. Annex 3. Photographs.****Social actions performed:**

Source: CFE.

Description: Asphalting of the street where La Venta's high-school is located.



Source: CFE.

Description: Asphalting of the main street of La Venta.



Source: CFE.

Description: Construction of the classrooms of the school *Bachillerato de Excelencia EMSAD 53* in *La Casa Ejidal*.



Source: CFE

Description: Asphaltting and construction of the benches of the main street of La Venta.

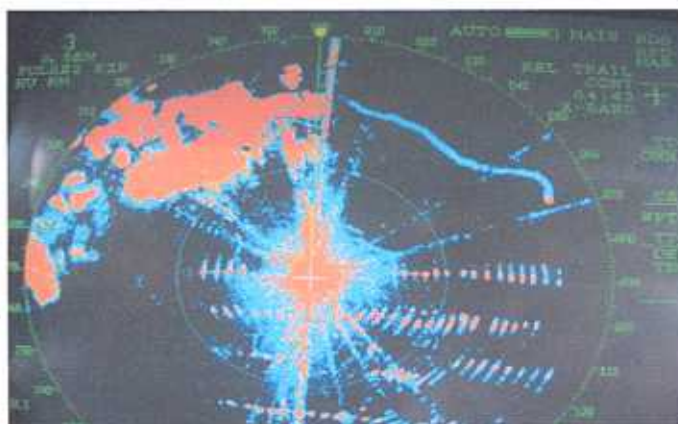


Source: CFE

Description: Computer lab built as part of the commitments with Ejido La Venta.



**Environmental actions performed:**



Source: CFE.

Description: Radar Monitoring Screen.



Source: CFE.

Description: "Tordos" flying



Source: CFE.

Description: White pelicans flying.



Source: CFE.

Description: Looking for the radar's best placement/location.



Source: CFE.

Description: Birds monitoring station.