

## 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 SECOND YEAR OF THE CREDITING

PERIOD:

July 1<sup>st</sup>, 2008 – June 30<sup>th</sup>, 2009.

SEPTEMBER 21<sup>st</sup>, 2009 - VERSION 0.

Prepared by:

**Comisión Federal de Electricidad:**

Gerencia de Proyectos Geotermoeléctricos

Gerencia de Operación del Mercado-CENACE

## TABLE OF CONTENTS

<b>1. Introduction.....</b>	<b>2</b>
<b>2. Monitoring Methodology.....</b>	<b>2</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.....	4
<b>4. Contribution to Sustainable Development.....</b>	<b>5</b>
4.1. Social Agenda .....	5
4.2. Environmental Agenda .....	6
<b>5. Annexes. ....</b>	<b>10</b>
5.1. Annex 1. Monitoring of Emission Reductions.....	10
5.2. Annex 2. One Line Diagram of La Venta II Power Station.....	10
5.3. Annex 3. Photographs.....	11

## 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 project is located in the Southern State of Oaxaca, in the Municipality of Juchitan de Zaragoza, in the Ejido La Venta. The project site is 30 km northeast from Juchitan de Zaragoza City (capital of the Municipality of Juchitan de Zaragoza) and 310 km southeast from Oaxaca City capital of the state. The site coordinates are 16°35’24’’N and 94°49’11’’W.

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 second year of the crediting period (July 1<sup>st</sup>, 2008 – June 30<sup>th</sup>, 2009), La Venta II net generation registered by CENACE was 240,250 MWh. The chart below shows the monthly generation, which varied mainly due to the winds.

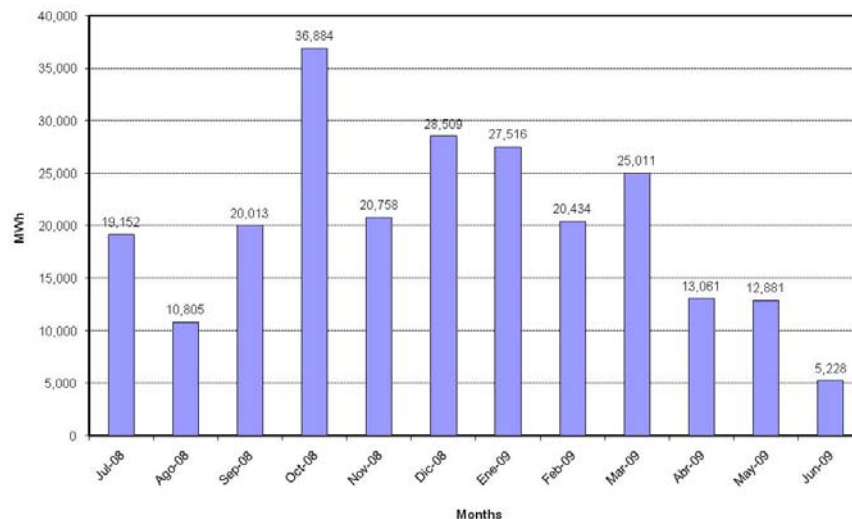


Figure 1. La Venta II Net Generation July 08 – June 09 (MWh)

## 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 parameter 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

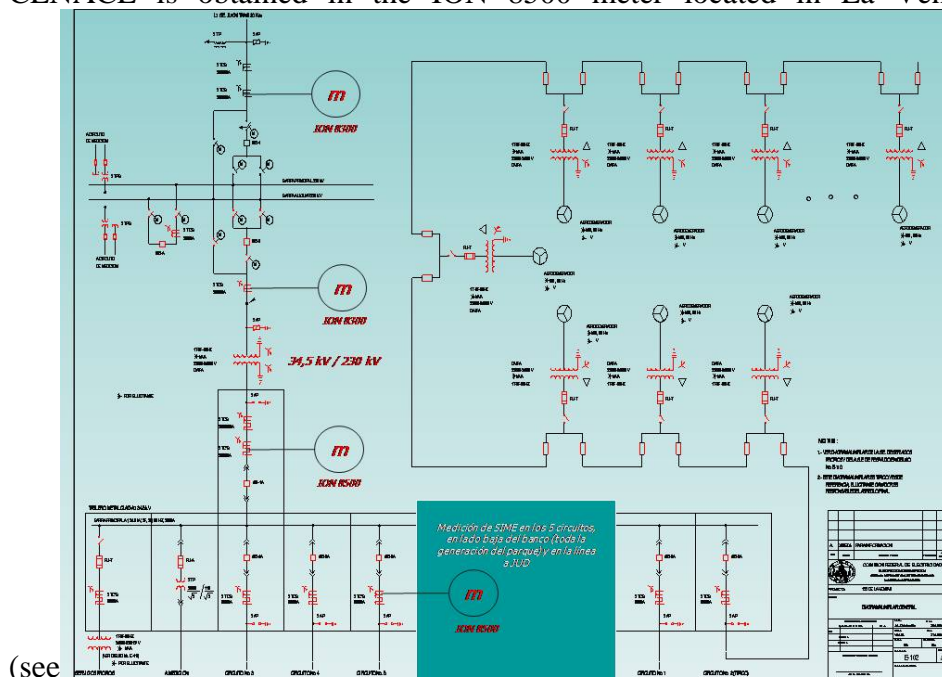


Figure 2, Annex 2). The features of this meter, which will be used for the ERs calculation are as follow:

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 *Area de Control Oriental in Puebla*<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 stores the information in a file named *Hoja de Marcha*. The Area de Control Oriental 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>, 2008 up to June 30<sup>th</sup> 2009, the electricity generation of La Venta II was: 240,250 MWh, according to CENACE. ERs achieved are calculated as follow:

$$\begin{aligned} \text{ER} &= 240,250 \text{ MWh} \times \text{CEF}_{\text{ex-ante}} \text{ tCO}_2\text{e/MWh} \\ \text{ER} &= 240,250 \text{ MWh} \times 0.62570 \text{ tCO}_2\text{e/MWh} \\ \text{ER} &= 150,325 \text{ tCO}_2\text{e or ERs.} \end{aligned}$$

### 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 Generation Area meter placed in La Venta II at 34,5 kV (below specified). Therefore, this latter meter is taken for data crosschecking.

<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.

CFE Transmission and Generation Areas every month conciliate the energy generated by La Venta II at 34,5 kV, it consists in an agreement for the energy delivered from Generation Area to Transmission Area. They sign an official internal document named “Cedula de Registro de Lecturas Mensual”. This document will be used in the cross-checking process.

### **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.
- From September 27 up to August 26, 2008.
- After August, 2008, 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 Metrología 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 actions listed in the act of December 2005 have been completed in the first crediting period.

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

CFE offered the following to Ejido La Venta:

- Pay applicable compensations<sup>3</sup> in time, and annual rent to land owners participating in the project (landowners whose land is within the *Poligono de Influencia*).
- Promote the environmental consciousness among community *Ejido La Venta*.
- Additional civil work inside the *Poligono de Influencia*. CFE improved the access to the land of landowners with ramps to in/out. Also, CFE has been worked with landowners to improve the water flow in their fields to avoid floods.

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.

It is important to mention that at the end of 2008, 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. 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.

### 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>4</sup>. This monitoring was 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>5</sup>. In 2004 and 2005 the monitoring was

<sup>3</sup> For losses suffered.

<sup>4</sup> Such as relocation of the WTG or temporary stopping of the WTG, etc.

<sup>5</sup> Oficio resolutivo No. S.G.P.A./DGIRA.DEL.836.04 July 29th, 2004.

performed on the Fall during September, October and November and from 2006 also includes March, April and May (Spring). In 2008 the monitoring was performed on the spring and fall. On March 2009 CFE and the *Instituto de Ecología, A.C.* (INECOL) continued with the monitoring plan covering the first period of 2009.

#### 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

CFE continues with the next two further measures:

- 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 September 2009, CFE and INECOL gave to SEMARNAT the results of the monitoring of the second year of La Venta II's operation (Spring 2008 and Fall 2008); the total reported number of collisions was 172 between bats and birds.

The table bellow shows the result of the monitoring of bats and birds during the second year of the crediting period (July 1<sup>st</sup> 2008 - June 30<sup>th</sup> 2009):

1 <sup>st</sup> year crediting period	July 08-June 09	Bats (Monitored up to 50 meters from the base of each WTG <sup>6</sup> )		Birds (Monitored up to 50 meters from the base of each WTG)	
		Number of Collision	Species	Number of Collision	Species

<sup>6</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.



		s		s	
Accepted by SEMARNA T as of today <sup>7</sup> .	Fall 2008	85	<b><u>Insect-fed bats:</u></b> (11) <i>Lasiurus intermedius</i> , (10) <i>Mormoops megalophylla</i> , (7) <i>Molossus molossus</i> , (1) <i>Balantiopteryx sp.</i> , (1) <i>Molossus rufus</i> , (1) <i>Lasiurus cinereus</i> , (1) <i>Balantiopteryx plicata</i> , (1) <i>Eumops bonariensis</i> , (30) <i>Pteronotus davyi</i> , (2) <i>Vespertilionidae</i> . <b><u>Fruit-fed bats:</u></b> (1) <i>Artibeus intermedius</i> , (2) <i>Centurio senex</i> <b><u>Nectar-fed bats:</u></b> (1) <i>Glossophaga sp.</i> , (1) <i>Glossophaga soricina</i> , (1) <i>Glossophaga morenoi</i> , <b>14 Indeterminado</b>	14	6 species (3) <i>Leptotila verreauxi</i> , (3) <i>Colinus virginianus</i> , (2) <i>Zenaida asiatica</i> , (2) <i>Tyranus forficatus</i> , (1) <i>Amaurolimnas concolor</i> y (1) <i>Cathartes aura</i> . 1 familia (1) <i>Trochilidae</i> 1 indeterminado
Not presented to SEMARNA T yet (these results are recorded by INECOL in an official book).	Spring 2009	60	<b><u>Insect-fed bats:</u></b> (3) <i>Molossus molossus</i> , (1) <i>Molossus rufus</i> , (4) <i>Lasiurus intermedius</i> , (7) <i>Mormoops megalophylla</i> , (22) <i>Pteronotus davyi</i> , (1) <i>Pteronotus personatus</i> , (1) <i>Pteronotus gymnonotus</i> , (1) <i>Molossus sp.</i> , (2) <i>Molossus sinaloae</i> , (1) <i>Pteronotus parnellii</i> , (1) <i>Lasiurus sp.</i> , (1) <i>Phyllostomus discolor</i> <b><u>Fruit-fed bats:</u></b> (3) <i>Centurio senex</i> , <b><u>Nectar-fed bats:</u></b> (1) <i>Glossophaga soricina</i> <b>11 Indeterminado</b>	18	(1) <i>Piranga flava</i> , (4) <i>Cathartes aura</i> , (2) <i>Leptotila verreauxi</i> , (1) <i>Mniotilta varia</i> , (1) <i>Hirundo rustica</i> , (1) <i>Colinus virginianus</i> , (1) <i>Buteo albicaudatus</i> , (2) <i>Dendrocynna autumnalis</i> , (1) <i>Columbina inca</i> , (1) <i>Icterus sp.</i> , (1) <i>Ardea alba</i> , 2 indeterminados
	Total	145		32	

Please note that birds and bats that crossed (local and migrating) La Venta II during spring and fall 2008 were 62,885; and these are 7.87% of the total birds and bats that crossed the region (798,722).

<sup>7</sup>Please note that SEMARNAT does not validate the results presented by CFE/INECOL. SEMARNAT only validates the execution program SGPA/DGIRA/DEI/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.

## **Monitoring Plan Steering Committee:**

---

**Ing. Roberto Cadenas Tovar**  
**Gerencia de Proyectos Geotermoeléctricos**

---

**Ing. Sergio Rosas D.**  
**Subdirección de Generación**

---

**Ing. Federico López de Alba**  
**Gerencia de Protección Ambiental**

## **ERCP Management:**

---

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

## 5. Annexes.

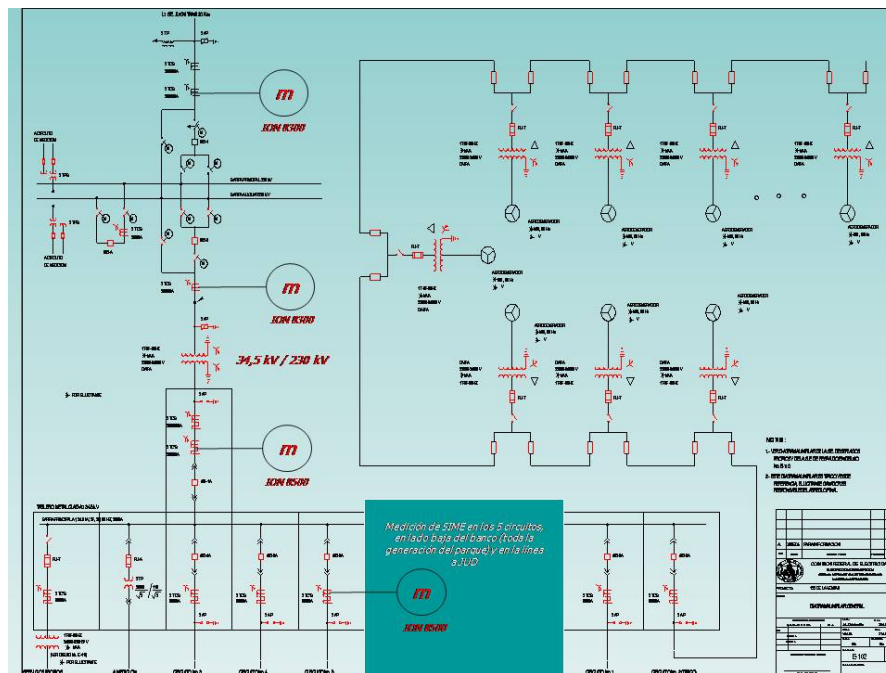
### 5.1. Annex 1. Monitoring of Emission Reductions.

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

	CENACE		CEDULA	
	Gross Generation	Net Generation	Net Generation	Diference, %
Jul-08	19,799.60	19,151.60	19,151.60	0.000
Ago-08	11,322.38	10,804.91	10,804.91	0.000
Sep-08	20,429.30	20,012.62	20,012.62	0.000
Oct-08	37,405.81	36,883.74	36,883.74	0.000
Nov-08	21,512.50	20,758.19	20,758.19	0.000
Dic-08	28,816.96	28,508.54	28,508.54	0.000
Ene-09	27,982.70	27,516.42	27,516.42	0.000
Feb-09	20,698.07	20,433.55	20,433.54	0.000
Mar-09	25,466.00	25,010.53	25,010.53	0.000
Abr-09	13,351.00	13,060.96	13,060.96	0.000
May-09	13,282.25	12,881.16	12,881.15	0.000
Jun-09	5,394.26	5,227.97	5,227.98	0.000
	245,460.83	240,250.17	240,250.16	0.00

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 and ION8300 meters in both sides 34.5kV and 230KV, respectively. Source: CENACE**

### 5.3. Annex 3. Photographs.

#### Social actions performed:



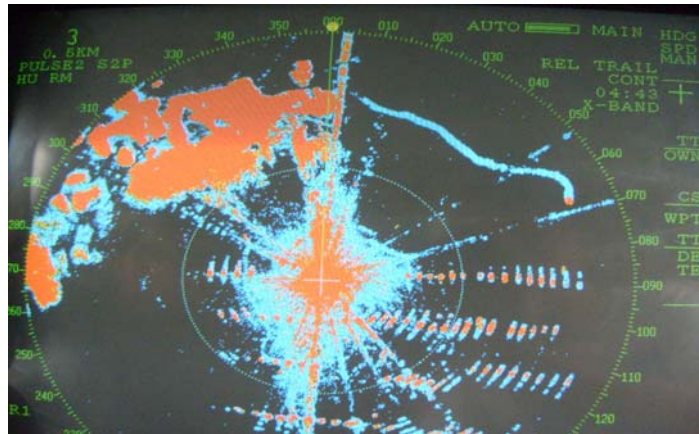
Source: CFE.

Description: Promoting the environmental consciousness between citizens.



Source: CFE.

Description: Promoting the importance of wild life in the Istmo de Tehuantepec.

**Environmental actions performed:**

Source: CFE.

Description: Radar Monitoring Screen.



Source: CFE.

Description: "Tordos" flying



Source: CFE.

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



Source: CFE.

Description: Birds monitoring staff.