

# Complicated development of wind energy projects in the Isthmus of Tehuantepec, Oaxaca, Mexico

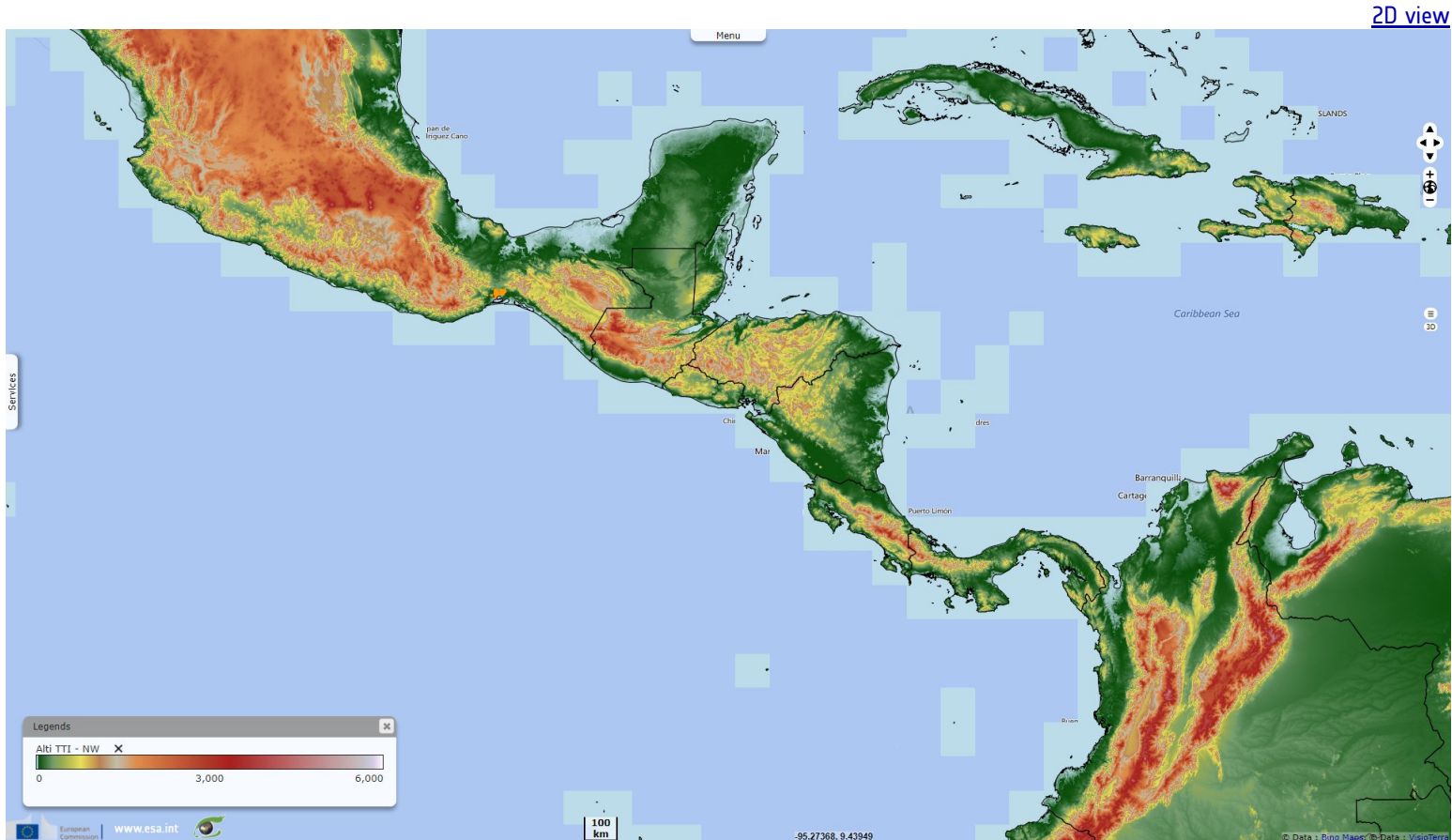
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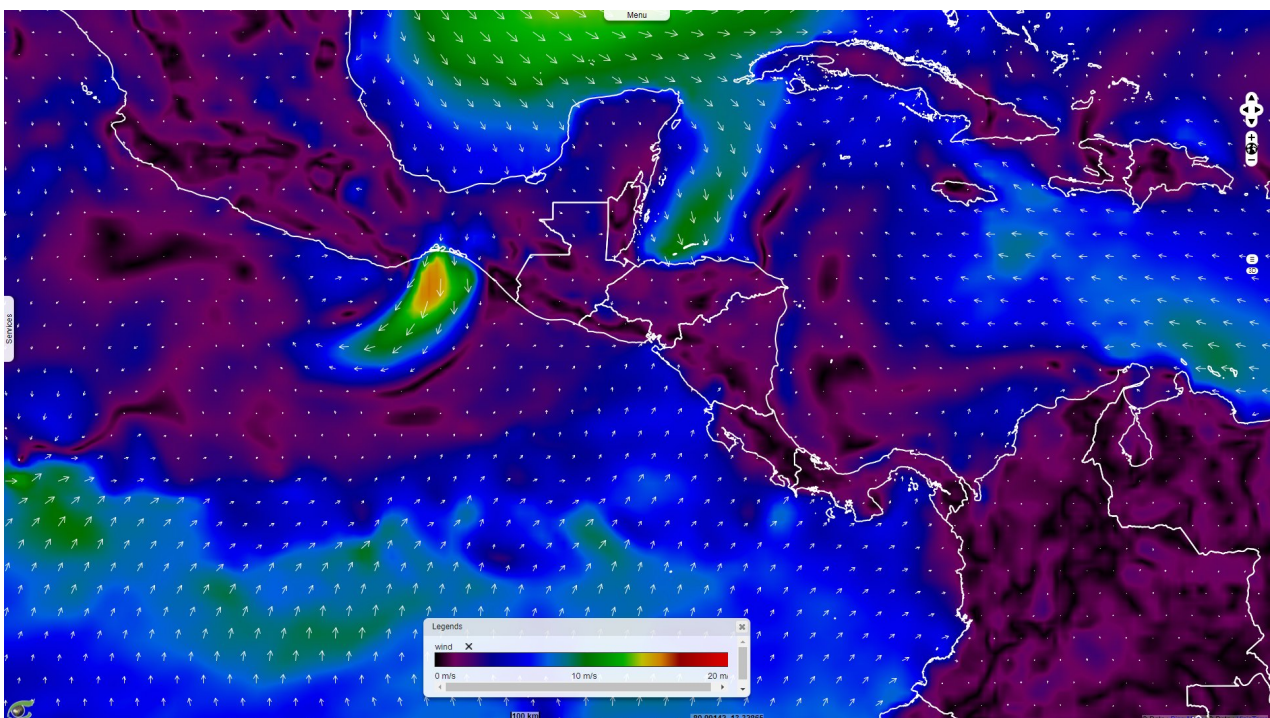
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Fig. 1 - COP DEM - Along with the Isthmus of Panama and the Isthmus around Lake Nicaragua, the Isthmus of Tehuantepec is one of the few between the Atlantic and the Pacific Oceans.



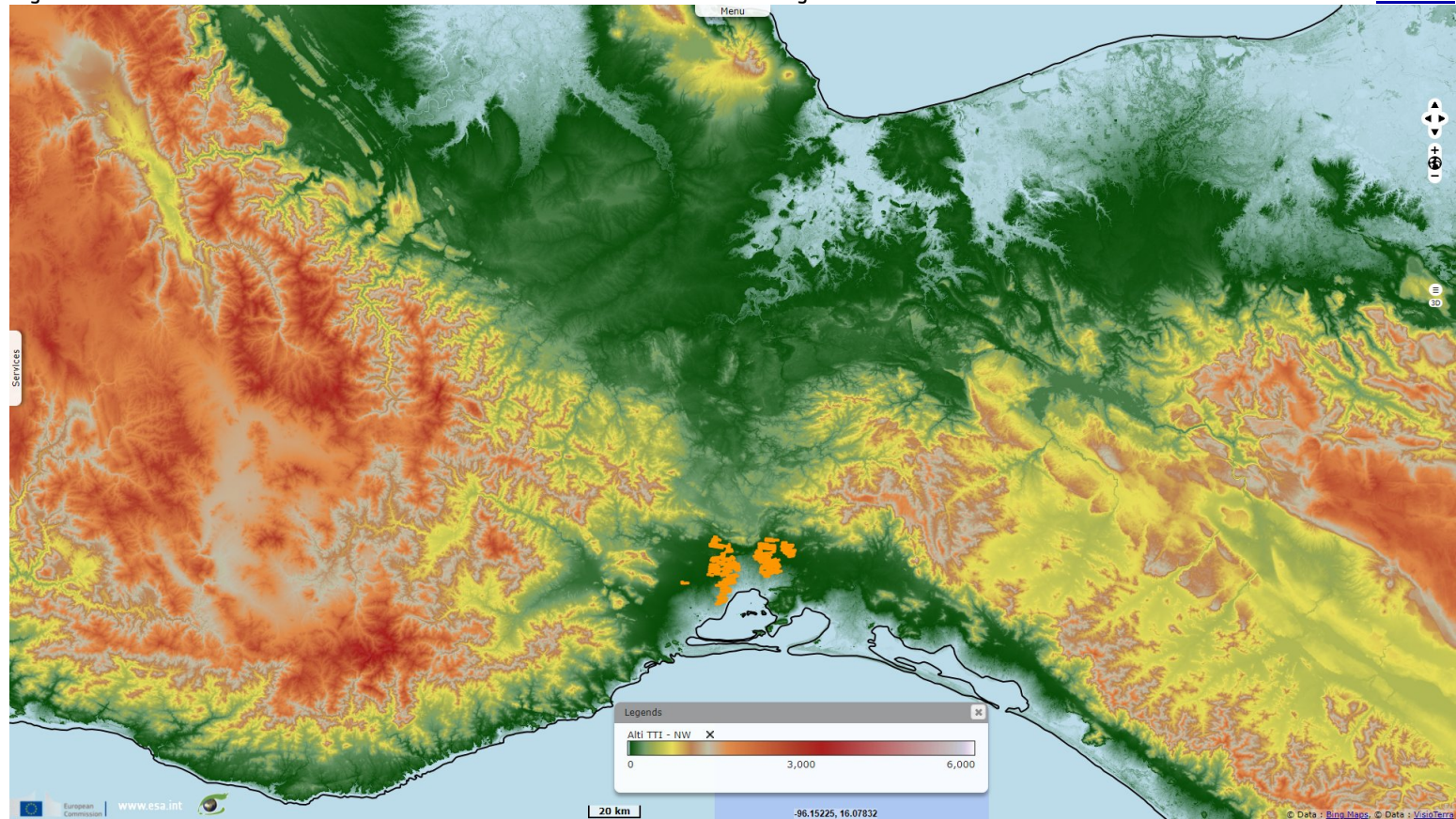
The plains of the Pacific side are one of most windy areas of Central America.



Hourly Wind speed at 10 meters above sea level estimated by ECMWF C3S ERA5 on 29 October 2021 at 23:00 - View in [VtWeb](#).

Fig. 2 - COP DEM - The isthmus is located on lowland between two mountain ranges.

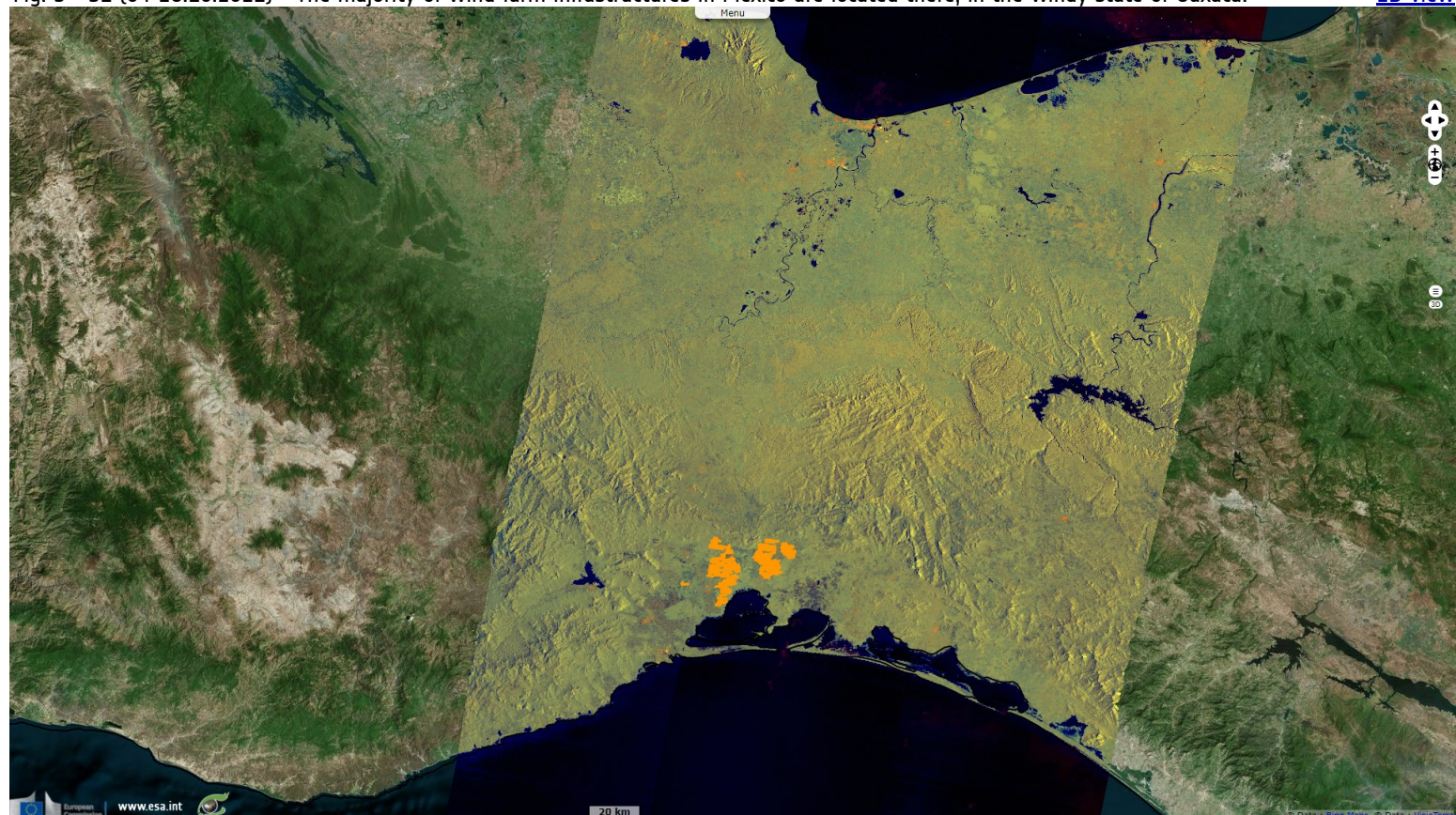
[2D view](#)



In his article [Wind energy in the Isthmus of Tehuantepec: conflicts and social implications](#) written by Eduardo Martínez-Mendoza and published on 04 January 2021 in Environment, Development and Sustainability, the author wrote: "*Wind energy has been, until now, the most profitable of renewable energy sources, achieving rates comparable to conventional generation sources (with, and without subsidies). Between 1983 and 2017, their installation costs decreased from USD 4 880 to USD 1 477/kW, reaching costs of 4 cents (US) per kWh, with the lowest in Brazil, Canada, Germany, India, Mexico, and Morocco. Significant wind energy development is due, in addition to its cost efficiency, to its low environmental impact, the creation of jobs, the saving of water, the benefits to public health, the saving of polluting emissions, and its contribution to the security, and diversification of energy supply.*"

Fig. 3 - S1 (04-28.10.2021) - The majority of wind farm infrastructures in Mexico are located there, in the windy state of Oaxaca.

[2D view](#)



"Wind energy is considered one of the less polluting sources of energy. However, the damage it causes is called into question by its contribution to the alteration of the landscape, noise pollution, damage to various species of birds, the alteration of natural environments, flickering of turbines, and interference with TV, and radio signals, intermittent supply and controversy over the visual impact. In many European countries (United Kingdom, Sweden, Denmark.) the sensitivity towards rural landscapes, and the strong social controversy facing wind farm projects, have become the main obstacles to the continuation of their growth."



"While the acceptance of wind energy, in general, remains high, specific wind developments are often opposed. One of the most commonly referred to as explanations for this gap in attitudes has been the NIMBY (Not-In-My-Backyard) phenomenon. NIMBY can be defined as people that combine a positive attitude, and resistance motivated by calculated personal costs, and benefits. That is to say that while someone may enjoy the benefits, or the idea of new infrastructure from a distance, they are opposed to bearing the costs of heaving this infrastructure in their proximity."

"Social acceptance is very important in wind power projects, but in recent years, the justice energy concept has become relevant. According energy justice can be used as a framework to identify when, where, and how injustices occur within energy systems, and can these be eliminated. Energy justice is sustained by three pillars: distributional, procedural, and recognition justice.

- *Distributional energy is an inherently spatial concept, is about the local distribution of monetary benefits. Governance mechanism, and coordination among different levels of policy-making.*
- *Procedural justice is referent equitable procedures that engage all stakeholders in a non-discriminatory way, which is the quality of the sitting, and planning processes in terms of good governance.*
- *Recognition justice establishes individuals must be fairly represented, that they must be free from physical threats, and that they must be offered complete, and equal political rights, beyond the tolerance, this implies to recognize the divergent perspectives rooted in social, cultural, ethnic, racial, and gender differences."*

Fig. 5 - S2 (04.02.2021) - Zoom on the hundreds of wind farms built in the area.

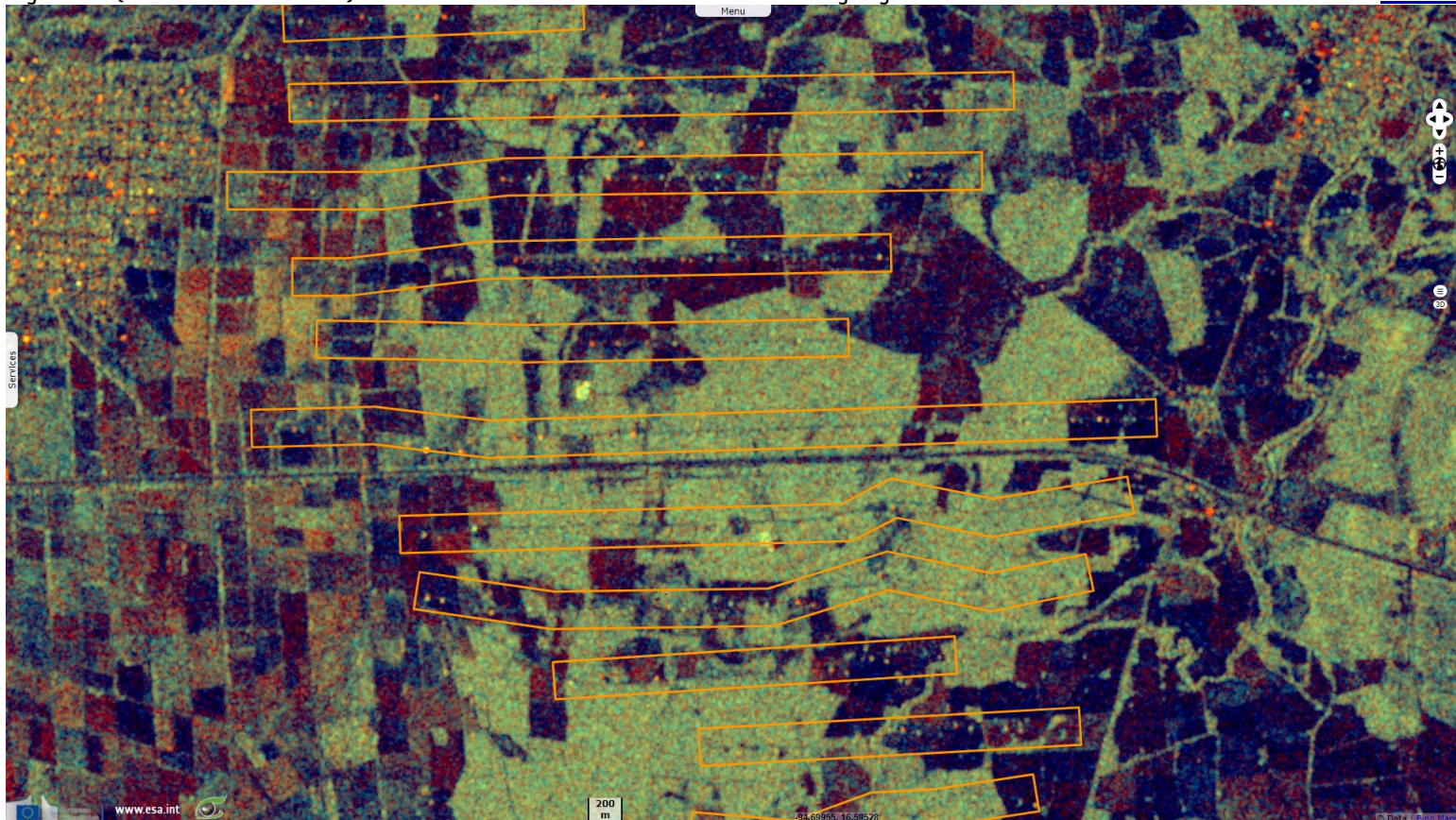
2D view



"Until 2018, 49 wind farms were installed in the country, representing 4176 MW of capacity. Of these, about 49% is located in Oaxaca (Isthmus of Tehuantepec), and produce 60% of the wind farm energy in Mexico. From 2004 to 2017, this sector has added 6,900 million dollars of investment, and it is expected that this dynamism will continue in the coming years; in the year 2022, Mexico plans to reach 12,000 MW of installed wind capacity, by 2040 it is expected that 35% of electricity generation will be from renewable sources, and of these, 40% will come from wind power."

Fig. 6 - S1 (07.04.2021-01.05.2021) - View of the infrastructures east of Santo Doming Ingenio

2D view



"Among the predicted advantages of wind development in the Isthmus of Tehuantepec are; stimulus to employment, (both in the field of construction, and in the maintenance, and operation of the facilities), economic spillover at the local level, (such as the transportation, food, and lodging expenses of the people who work in that area; and direct benefits to the owners, from security in possession of the land, to payments for rent. However, local wind development has not managed to develop a high-value chain, its arrival in Oaxaca has not had the expected effect in improving the living conditions of local communities. In the Isthmus of Tehuantepec, 15 wind farms that were installed before 2013. 4700 direct jobs, 4900 indirect jobs, and 300 jobs in the operation of these plants were generated during the construction of these farms."

Fig. 7 - S2 (04.02.2021) - The turbines form linear patterns, some of them among forested areas.

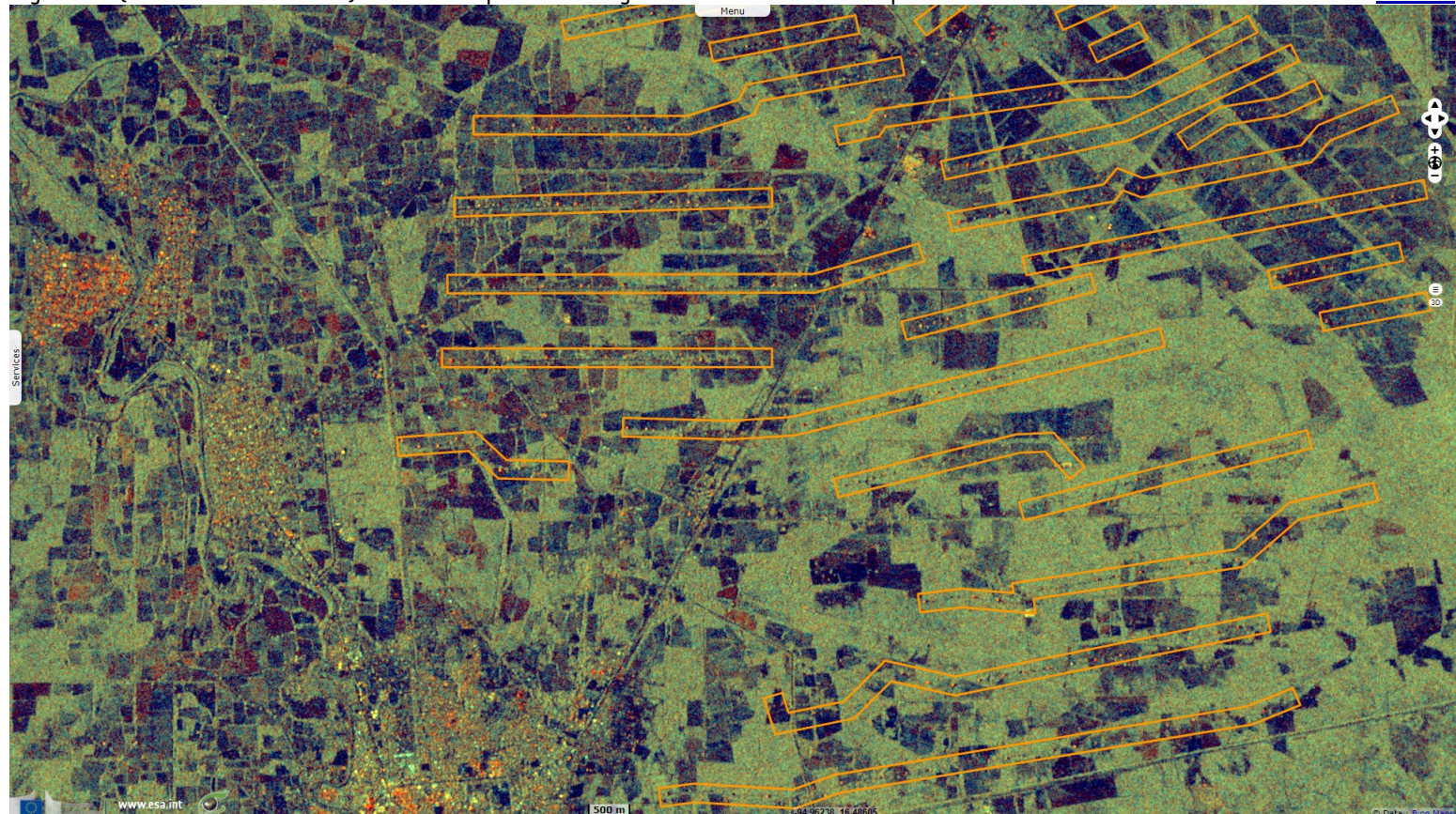
[2D view](#)



"Wind farms have been installed in these municipalities in the plain zone: Asunción Ixtaltepec, El Espinal, Heroic City of Juchitán de Zaragoza, Santo Domingo Ingenio, Union Hidalgo. These municipalities have social indicators that indicate the existence of a marginal or vulnerable population, except for El Espinal. It is worthy to note that the levels of schooling in the municipalities studied fall below the national average of 9.1 years of schooling except for El Espinal, which is 9.7 years. This combination of low schooling, and high marginalization has led to landowners signing lease contracts with conditions that are not favourable to them, and not in line with the international payment standards."

Fig. 8 - S1 (07.04.2021-01.05.2021) - Zoom on a part of the large wind farm between El Espinal and the well-named La Ventosa.

[2D view](#)















The article concludes:

- "The qualitative analysis conducted in the Isthmus of Tehuantepec allows us the construction of a vision according to the stakeholder evaluating it. For the companies, it has been positive. Less so for the municipal authorities, however it is still looked at favourably. Similarly, landowners are who benefited directly. However, for the communities, and opposition groups, the impacts have been predominantly negative."

- *The environmental impact has been ambivalent: positive for the intrinsic benefit that the generation of clean energy supposes, especially in the reduction of polluting emissions, or the lessening of damage to birds' species in the surrounding areas. The aspect with the most impact has to do with noise, and landscape in the communities. International criteria have not been respected, with wind turbines being placed 300 m from inhabited areas. Communities, therefore, face visual contamination, noise, and shadows, which, as reported in the literature, have effects on people's health.*
- *The economic impact has also been ambivalent. Positive, due to the production of the zone contributes to increase the production of clean energies in the country, behaviour that will continue in the medium, and long term. It has been negative in the sense that Oaxacan parks receive half of the average international income, companies pay less than half of the international standard, and the lack of inclusion of local actors in decision-making has contributed to the creation of social conflicts."*

*The views expressed herein can in no way be taken to reflect the official opinion of the European Space Agency or the European Union.  
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