ZOFNASS PROGRAM
FOR SUSTAINABLE INFRASTRUCTURE
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ATOTONILCO WASTEWATER TREATMENT PLANT
MEXICO

Figure 01: Planta de Tratamiento de Aguas Residuales Atotonilco
Sources: Atotonilco Wastewater Treatment Plant team

Jesica Bello prepared this case study under the supervision of Cristina Contreras ENV-SP and Judith Rodriguez ENV-SP as part of the Harvard-Zofnass program directed by Dr. Andreas Georgoulias by initiative of IDB for the purposes of research and education.

Cases are not intended to serve as endorsements, sources of primary data, or illustrations of effective or ineffective project design or implementation.

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EXECUTIVE SUMMARY

This evaluation assesses the sustainability of the Atotonilco Wastewater Treatment Plant (PTAR) project, which was developed to treat wastewater generated in the Metropolitan Zone of the Valley of Mexico. This facility is located within the municipality of Atotonilco de Tula in the state of Hidalgo, and occupies 158.5 hectares traversed by the Mexico-Querétaro rail line, a state highway, and the Salto-Tlamaco Canal. At the time of the assessment, the first stage of construction was complete and had been in operation for almost a year. The PTAR is the largest wastewater treatment plant in Latin America and one of the largest in the world, with a capacity of 35,000 liters per second and an estimated lifespan of 50 years.

The consortium Treated Water of the Valley of Mexico (ATVM) was formed to construct and operate the Atotonilco treatment plant for 25 years through an agreement with the Mexican National Water Commission (Conagua). The project has been partially funded by Mexico's National Development Fund, which financed up to 49% of the total cost of the project, estimated at 9.389 million pesos, approximately US $686 million. Of the remaining cost, 20% has been funded by the consortium partners and 31% through commercial bank credit.

The PTAR will have tremendous positive impact on the quality of life of the communities in the region. Not only will they benefit from improved development in the area and job creation, but, by treating the wastewater from the Metropolitan Zone, the project will allow regional farmers to improve their irrigation practices for the benefit of local agriculture in the Mezquital Valley. Cleaner water is expected to significantly improve the health of about 300,000 inhabitants who live and work directly within the irrigation zone and have depended on water from the El Salto River and the Salto-Tlamaco Canal. The project team at the PTAR has considered the needs of the local community and has attempted to address them throughout the development of the project in the form of enhancements and restorations of community spaces.

The project team showed exceptional leadership in demonstrating sustainability as one of its core values and striving to make meaningful commitments to sustainable principles and practices. The project will improve public health and the environmental conditions of the area and will treat more than 60% of the wastewater from the Valley of Mexico. At the same time, the project has been designed to be self-sustaining, generating its own energy using biogas produced from by-products of the water treatment and in some cases natural gas, in order to minimize the amount of energy used from the public energy network.

The project team at the PTAR has developed a detailed manual for the operation and maintenance of the plant's equipment in order to maximize the efficiency and longevity of the

plant and its systems, and to better respond in cases of malfunctions or emergencies. In regard to resource allocation, the PTAR has made efforts to reduce waste and soil relocation during the construction period. The team has clearly identified the amount of waste material generated during construction and has designated spaces for its storage within the site until sorted for donation or recycling. Materials and soil excavated were often reused for other areas of construction within the site, such as fills.

More significantly, the PTAR has succeeded in reducing the plant's energy and water consumption. An outstanding quality of the project is the generation of electrical energy using biogas and natural gas, amounting to an estimated reduction of 81% per year in energy supplied from outside sources. Similarly, efforts to reduce the use of potable water by using recycled or treated water for the operations of the plant will reduce potable water needs by 92.5%. Even though the project site is not considered an area of significant ecological value or prime habitat, the project team has invested significantly in reforestation using native plant species, with the aim of recovering and improving the quality of environmental services in the site.

Water bodies within the boundaries of the project site are the El Salto River and the Salto-Tlamaco irrigation canal; these will most directly benefit from the cleaner water treated by the PTAR. Through the treatment of the water flowing into these water bodies, the project team at the PTAR succeeds in enhancing hydrologic connections, water quality, existing habitats, and the transportation of sediment, as there will be a substantial reduction of raw sewage continuing downstream. The design for the PTAR took into consideration the existing conditions on the site, minimizing land alterations with the intention of avoiding excessive erosion. Cut slopes, fills, and containing walls have been designed to minimize the effects of erosion due to natural causes like wind and surface landslides.

Regarding climate and risk, the project team at the PTAR considered possible emergencies or short-term hazards related to the operations of the plant and incorporated measures to prevent them or respond to them during the design and construction phases. Preventive measures such as training programs are in place involving regular emergency response drills for all staff at the plant. The PTAR has been designed to prioritize the production of electric energy on site; this energy supplied by the cogeneration system will be the preferred source of electrical energy for the operation of the plant and emergency systems. Because of this feature, the plant has been able to increase its resiliency and independence from external energy supply. ATVM estimates that a reduction of an average of 400,000 tons of CO_2e per year will be achieved through the PTAR.

The project's importance transcends its immediate area of influence, generating positive

impacts at a metropolitan scale and contributing to the area's environmental renewal and sustainability. At the same time, the evaluation has highlighted opportunities for improvement in order for the project to have an even bigger impact in the community.

There is significant room for improvement in providing a more inclusive plan that takes into consideration the needs of minorities and disadvantaged groups. The project team could also increase its efforts to understand the needs and opportunities of local communities, and to support the development of more comprehensive policies and regulations regarding the restoration and preservation of local character. Particularly, there is much opportunity for the project team to contribute to creating economic opportunities for women by, for example, offering targeted internships and workshops to support women's well-being and empowerment. Incorporation of energy-efficient equipment and processes beyond the production of energy could be considered to further decrease the project's consumption of energy, as could other alternative ways of producing energy such as solar panels or wind turbines. Similarly, the project team could consider alternatives to potable water use within the plant, such as recycled gray water and stormwater, to achieve a 100% reduction in the use of potable water and attempt to recycle water for the use of the nearby community.

Lastly, it would be beneficial for the project team to more systematically highlight the risks associated with the project and its operation and the measures taken to mediate those risks beyond industry requirements and standards. This analysis should address in detailed the risks associated with the new technology incorporated in the project.

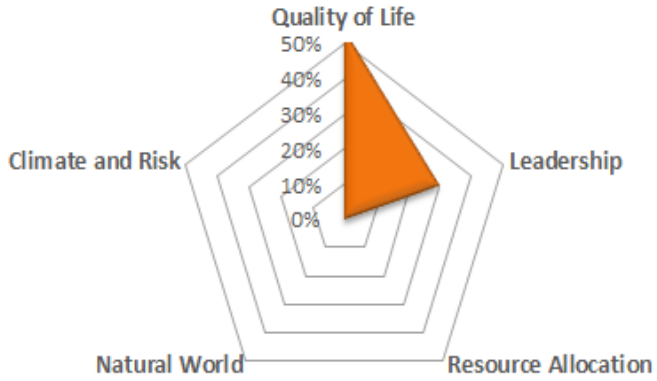

Figure 02: People & Leadership award Summary of results

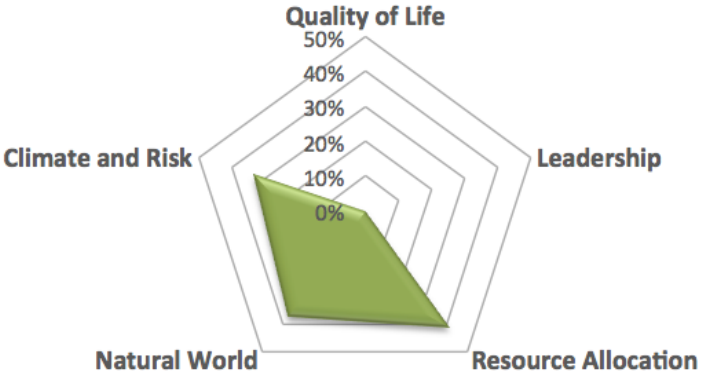

Figure 03: Climate & Environment award Summary of results

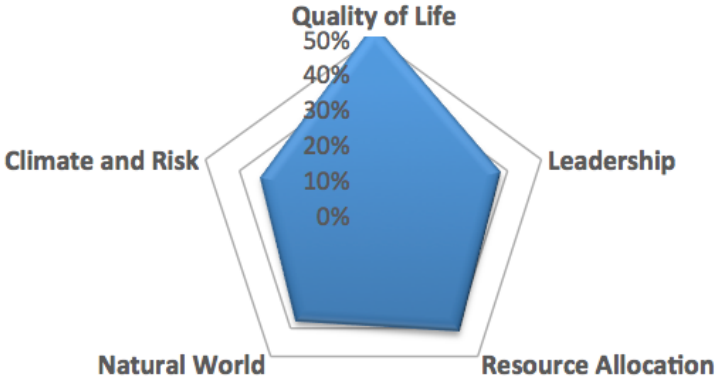

Figure 04: Infrastructure 360 award Summary of results