

WOMEN IMPROVING RURAL ROADS IN MEXICO

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ABSTRACT

The transportation infrastructure construction could be an area of opportunity to increase women's participation in the labor market, especially in rural road construction and maintenance activities that employ labor-intensive methods.

In the case of Mexico, it is available the participation of women in the Road Paving Program of the Secretariat of Infrastructure, Communications and Transportation. This article describes the web viewer (<http://rnc.imt.mx/caminos>) developed with open source software at the Mexican Institute of Transportation developed to highlight the participation of women in this program ([Gradilla-Hernández, L. A. and Morales-Bautista, E. M., 2023](#)); where the user can access to the georeferenced roads and visualize the percentage of participation of men and women.

In the 25 roads concluded in 2019, 642 women participated out of 2,640 workers, that is, 24.3 % of the participants were women. In the 33 roads concluded in 2020, 18.7% of the participants were women. In 2021, 33 roads were completed, with a participation of 15.8% of women. And finally, in 2022, women represented 18% of the total participants.

The workers belonged to the community and most of the women belonged to indigenous communities, some are heads of household, so their participation helped them to improve their quality of life and, in general, raise their self-esteem. In addition, female workers increased their participation in the community and in leadership roles, encouraging more women to follow their example.

To continue encouraging the participation of women from the community, a mission approach is suggested to address the social sustainability of rural road works, where an important part is the training of women and the adequacy of working conditions for their full immersion. Such a mission approach would also help to integrate the community and rescue traditions, as well as, to adapt rural roads to climate change. Since a mission helps to obtain a strategic planning and to define both the projects and the actors that must participate in order to achieve the mission's objective, which is usually the resolution of complex problems that must be addressed from different areas.

1. INTRODUCTION

For taking into account the needs of women in transport, it is not enough to study and understand the needs of women. It is also necessary to empower women in the transport sector, to try to reduce the gender gap in said sector; in other words, the involvement of women in decision-making on the transport agenda should be promoted, as well as their inclusion in the different levels of operational activities (drivers, inspectors, construction workers, maintenance technicians and mechanics).

In order to reduce the gender gap in the labor market, it is necessary to eliminate institutional barriers and create incentives for women to increase their participation quota, such as establishing specific guidelines in tenders for the construction of transport infrastructure. As well as, in concessions for the operation of such infrastructure or of the urban transportation services, which establish the obligation that women fill a percentage of the jobs.

In Latin America and the Caribbean, women represent about 3% of the total number of employees in the construction sector (Capistrán et al., 2020). Therefore, the transportation infrastructure, in construction subsector, could be an area of opportunity to increase women's participation in the labor market, especially in rural road construction, improvement or maintenance activities that employ labor-intensive methods.

In this regard, in Latin America some projects have been carried out to increase women's participation in the construction and rehabilitation of rural roads, for example, in Nicaragua, Argentina and Peru (BID, 2016).

One study (Casabonne et al., 2015) was also conducted to assess the benefits of women's participation in such projects; in which participants reported increased self-confidence, decision-making capacity, leadership and assertiveness, as a result of gaining new skills and knowledge; as well as greater participation in public spheres of community involvement.

In other countries, such as Costa Rica, El Salvador and Peru, road maintenance has been promoted through micro-enterprises, where the inclusion of women is encouraged. Paraguay has also encouraged the participation of women in the improvement of local roads under a training scheme, where participants learn to operate heavy machinery (BID, 2019).

In the case of Mexico, there is also the participation of women in the Program for Paving Roads to Municipal Head Offices of the Secretariat of Infrastructure, Communications and Transportation (SICT) (see Figure 1), and the Mexican Institute of Transportation (IMT) has developed a project to highlight the participation of women in this program, in Oaxaca.



"I came here because I also wanted to work, I have a three-year-old child, I am a single mother and I like to work. We women help to pick up rocks, we carry water and sometimes we help to haul mix and clean up. There are times when we end up sore, but we endure and here we are."

Guadalupe García, July 2019

"Now we women are also worth".

Martina Julián, July 2019

Figure 1- Photographs and testimonies of women improving rural roads in Oaxaca, Mexico
Source: Secretariat of Infrastructure, Communications and Transportation

2. WOMEN'S PARTICIPATION IN THE IMPROVEMENT OF RURAL ROADS

As mentioned above, the Government of Mexico has been promoting the Road Paving Program for Municipal Head Offices. Whose objective is to carry out actions to promote the development of municipalities with communities of medium, high and very high marginalization through the granting of subsidies for the paving of roads that provide access to municipal head offices, and which are still at the level of dirt roads, through the use of unskilled local labor. The implementation of this program began in the state of Oaxaca.

The paving of the roads consists of the construction of 20 cm thick hydraulic concrete tracks, in slabs of 3 meters long by 0.80 to 0.90 m wide; in the intermediate strips, stone is placed in concrete (SCT, 2020).

In the 25 pathways, concluded in 2019, 642 women participated out of 2,640 workers; representing 24.3% of the participants were women. In the 33 pathways, concluded in 2020, 682 women participated out of 3,638 workers, representing 18.7% of the total number of participants, a reduction compared to 2019. In 2021, 33 roads were completed, where 822 women participated out of a total of 5,196 workers, representing 15.8% of the total participants. And finally, in 2022, 46 roads were completed; 916 women participated in those out of a total of 5,090 workers, representing 18% of the total participants ([Gradilla-Hernández, L. A. and Morales-Bautista, E. M., 2023](#)).

For example, in 15 of the 25 roads that concluded in 2019, the participation of women was greater than 20%. However, in only 9 of the 33 roads, which were concluded in 2020, the participation of women was greater than 20%. In addition, in 3 of the 33 roads in 2020 there was no participation of women, so it is recommended that a minimum quota of women should be established to participate in the paving of roads, as a transition strategy to encourage greater participation ([Gradilla-Hernández, L. A. and Morales-Bautista, E. M., 2023](#)).

The workers, who participated in the program, belonged to the community and most of the women belonged to indigenous communities, some were heads of household, so their participation helped them to improve their quality of life for a few months and, in general, to raise their self-esteem. In addition, the workers increased their participation in the community, encouraging more women to follow their example.

Regarding the participation of women in other types of activities, we can mention that the SICT Center of Oaxaca had the participation of two women, as construction site residents, who are civil engineers, which represents a small advance with respect to the participation of only one woman, civil engineer, as a construction site resident in 2019.

2.1. Web viewer

A web viewer was developed to highlight the participation of women in the paving program in Oaxaca, with free licensing and open-source software, with the objective of visualizing the rural roads and the percentage of participation, both men and women in each of the roads, for the period 2019-2022. The web viewer is available through the following link: <http://rnc.imt.mx/caminos>

One of the advantages of using free licensing and open-source software for the programming of the Web viewer is that it does not incur annual expenses for the payment of fees and ensures its sustainability in the medium term. Figure 2 shows the design of the Web viewer, which allows dynamic consultation of the information on the works. This information is contained in spatial data layers. For example, the "Obras Oaxaca 2019" layer contains 25 road records, displayed in the map area as red lines. The "Obras Oaxaca 2020" and "Obras Oaxaca 2021" layers are composed of 33 records each one, they are shown with green and purple lines, respectively. The georeferenced location of the municipal

capitals is represented by elements with point-type geometry, which are symbolized with a red star for the 2019 information, and with a green star for the information corresponding to 2020. For 2021 and 2022, the star is purple and orange, respectively.

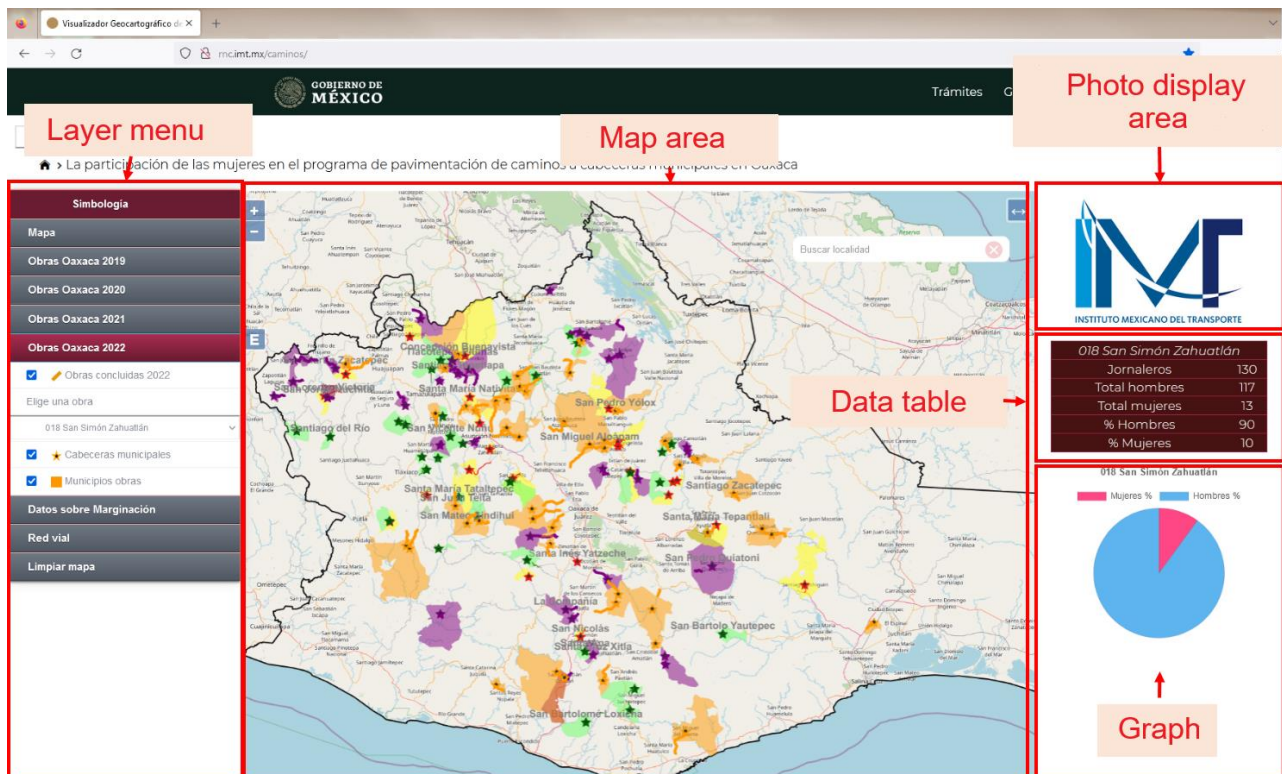


Figure 2 - Web design of the interface proposal
Source: [Gradilla-Hernández, L. A. and Morales-Bautista, E. M. \(2023\).](#)

The municipal boundaries are represented by polygon-type geometries, in yellow and light green, with transparency; Figure 3 shows an example of the visualization of these boundaries. The base map, which is initially loaded, corresponds to the map service of *OpenStreetMap*, which according to the user's interest, can be exchanged, in the "Map" menu option, for the "Bing Maps" image service or for the option of a base map with the state boundaries of the Mexican Republic. In this same menu option, it is possible to enable and disable by means of the checkbox the data layer of municipal boundaries, as well as the state boundary of the state of Oaxaca.

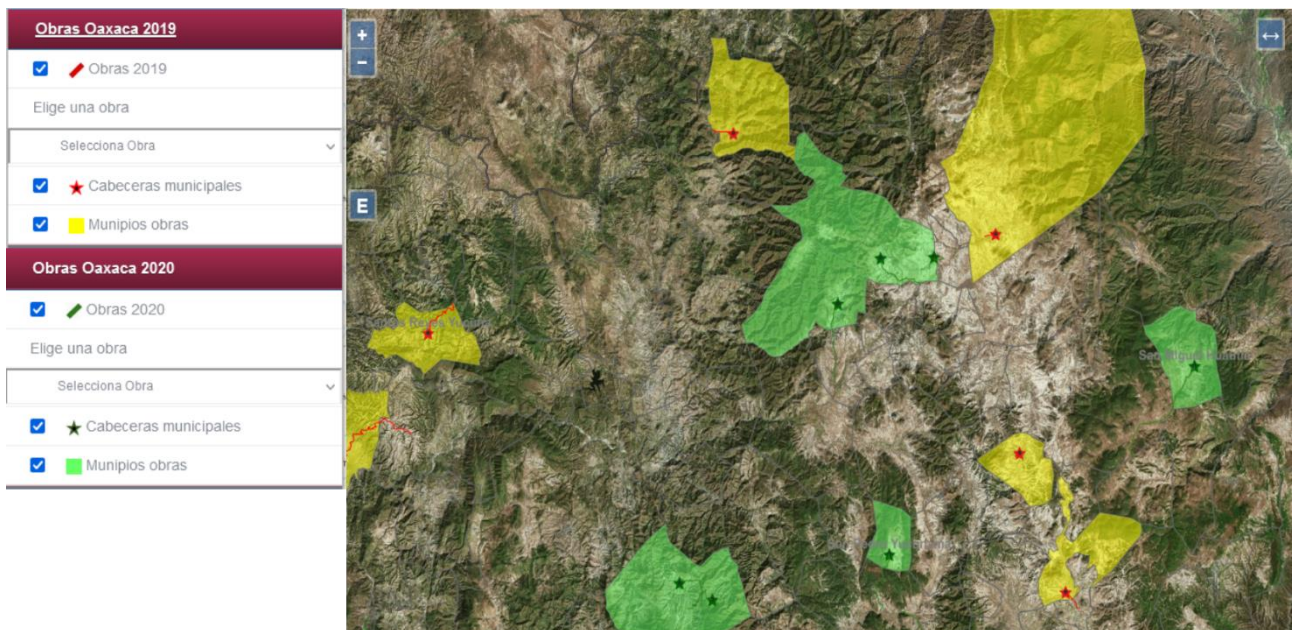


Figure 3 - Representation of municipal boundaries with transparency effect.
Source: Own elaboration

The viewer has a selection tool, through which the user can view the list of completed works for each year and choose the one he/she wants to consult. When the user clicks on the name of the work, it automatically scrolls on the map to show the location of the road. In addition, the information displayed in the area updates to show the data table and the graph. Figure 4 shows the visualization of the data of a paving work in the different elements of the graphical interface.

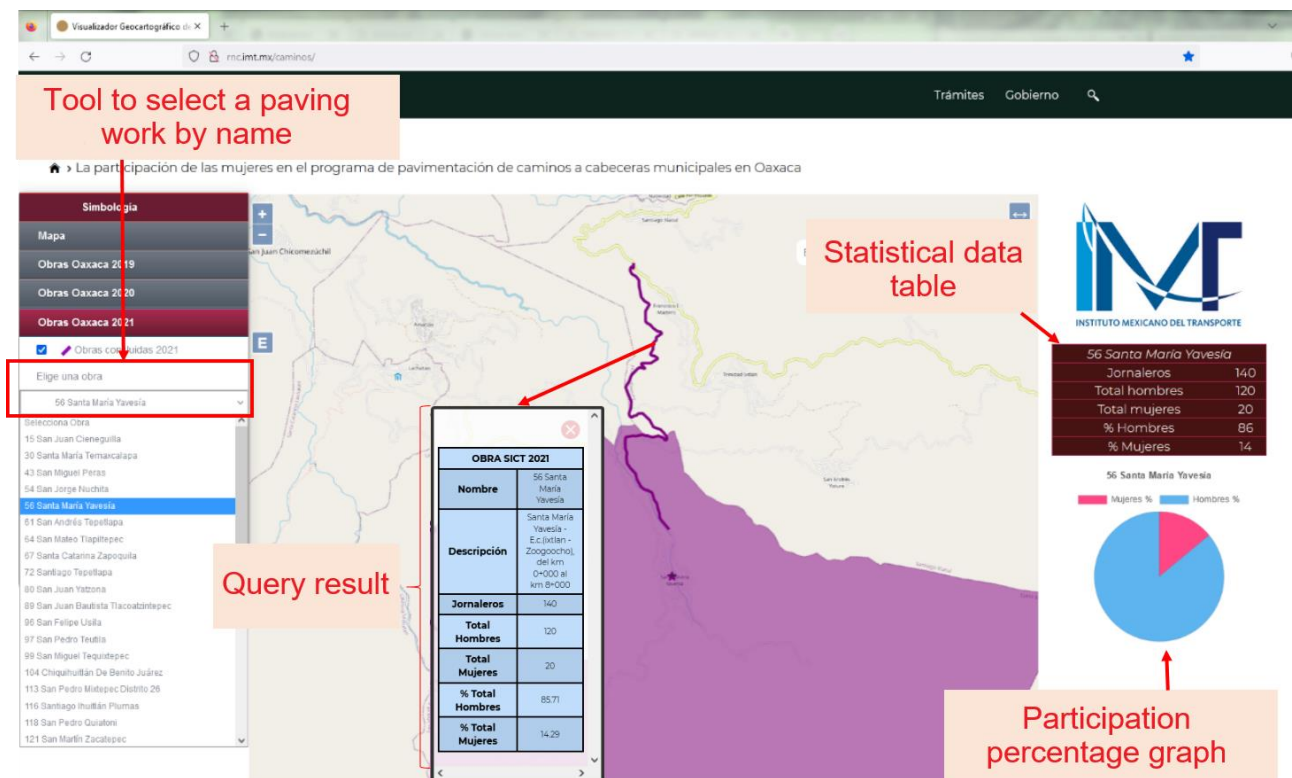


Figure 4 - Visualization of the data of a paving work in the different elements of the graphic interface

Source: [Gradilla-Hernández, L. A. and Morales-Bautista, E.M. \(2023\)](#)

Figure 5 shows, as an example, the result of a consultation of the information on the road to San Pedro Yucunama, in which the participation of women corresponds to 42.86%, one of the highest percentages for the year 2020. For this example, the activation of the satellite image (base map) of "Bing Maps" allows to appreciate geographical features of the area where the work happened. When clicking on the line representing the road, the information box shows the details of the record in the database. Likewise, the data table shows the totals corresponding to the day laborers who participated in the paving of the road in rounded numbers. Another element that allows the user a quick visualization of the percentage of participation of men and women is the pie chart, in which the mouse pointer shows the corresponding percentage for both groups.

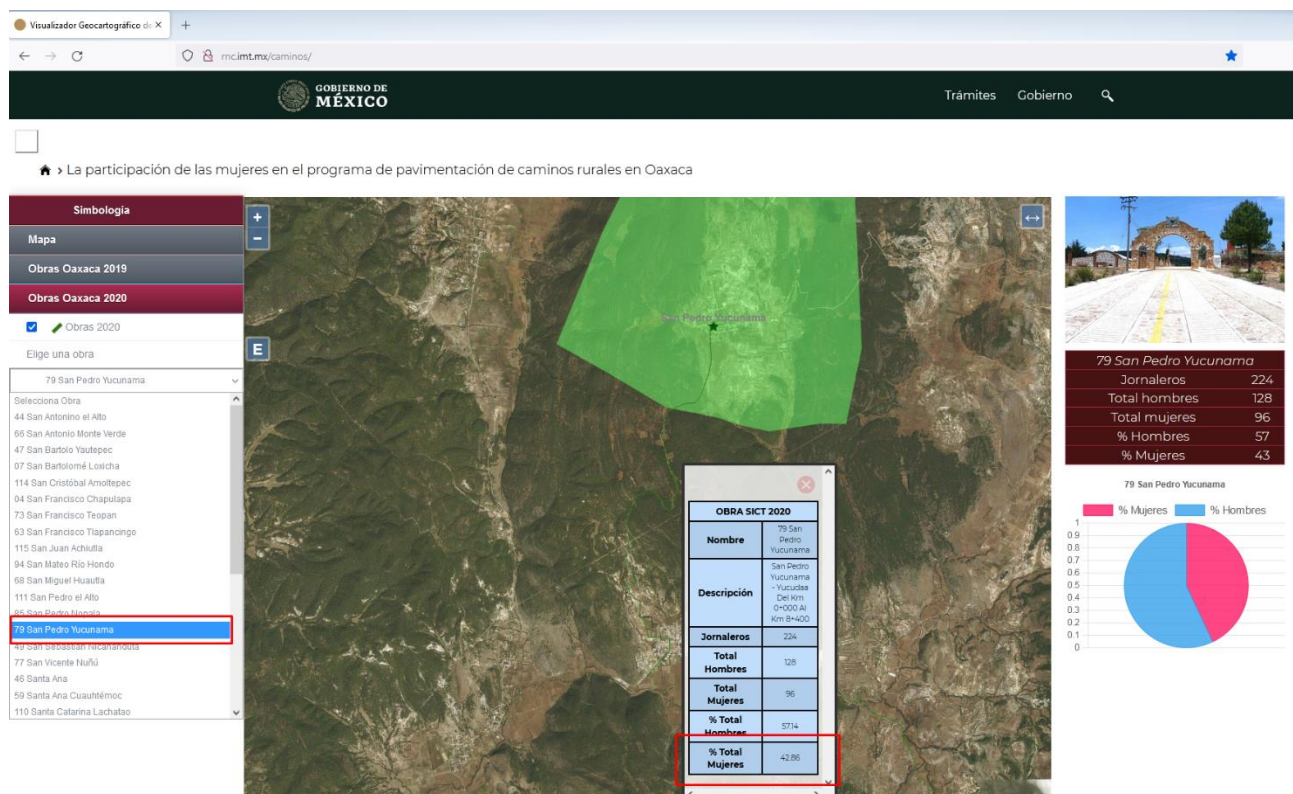


Figure 5 - Consultation of work 79 to San Pedro Yucunama

Source: Own elaboration

2.2. The mission approach

One of the most important elements of the road-paving program is the participation of the community, as the municipal authority, which receives the program subsidy, must call the general population to the election of a Community Committee for Social Participation. This committee consists of ten citizens who will carry out the monitoring tasks for the correct application of the program resources (SCT, 2020).

The integration of the community is very valuable and can be used to consider the best of their traditional knowledge, as well as to encourage programs that include more training for the women who participate in the improvement of the roads, so that they can be integrated into formal work in the future and continue preserving their roads. To achieve this, it is proposed to consider the mission approach, which is described below.

Based on the mission of the Apollo program to go to the Moon, Mazzucato, M. (2018) proposes to take this approach to address complex societal problems, such as achieving the Sustainable Development Goals. In other words, the so-called Mission-Oriented Policies (MOPs) allow anchoring a global approach to a mission to address complex challenges, in

such a way that the different dimensions of the problem and possible solutions are addressed (Dutrénit, G. et al. 2021).

Missions have defined and measurable objectives, where the proposition of a series of projects could enable their achievement, so they can be seen as a way to orchestrate the existing talent and expertise of potential stakeholders, at the national, regional and/or local level. The approach aims to create a portfolio of instruments to foster solutions from below. Where learning is fundamental, as trial and error and lessons learned become key assets to feedback and refine strategies to achieve the missions (Mazzucato and Penna, 2020).

For the great challenge of increasing women's participation in the labor market in Mexico, the mission approach could be used to generate programs designed to increase women's participation in the transportation infrastructure subsector, as well as to promote the changes required by regulations to encourage greater participation by women. Figure 6 shows a possible mission to improve the existing road paving program to encourage greater participation and training of women.

The mission would contribute to greater sustainability of road works by involving a larger number of stakeholders and sectors. In this way, the improvement of roads would also help to develop other economic activities in the areas.

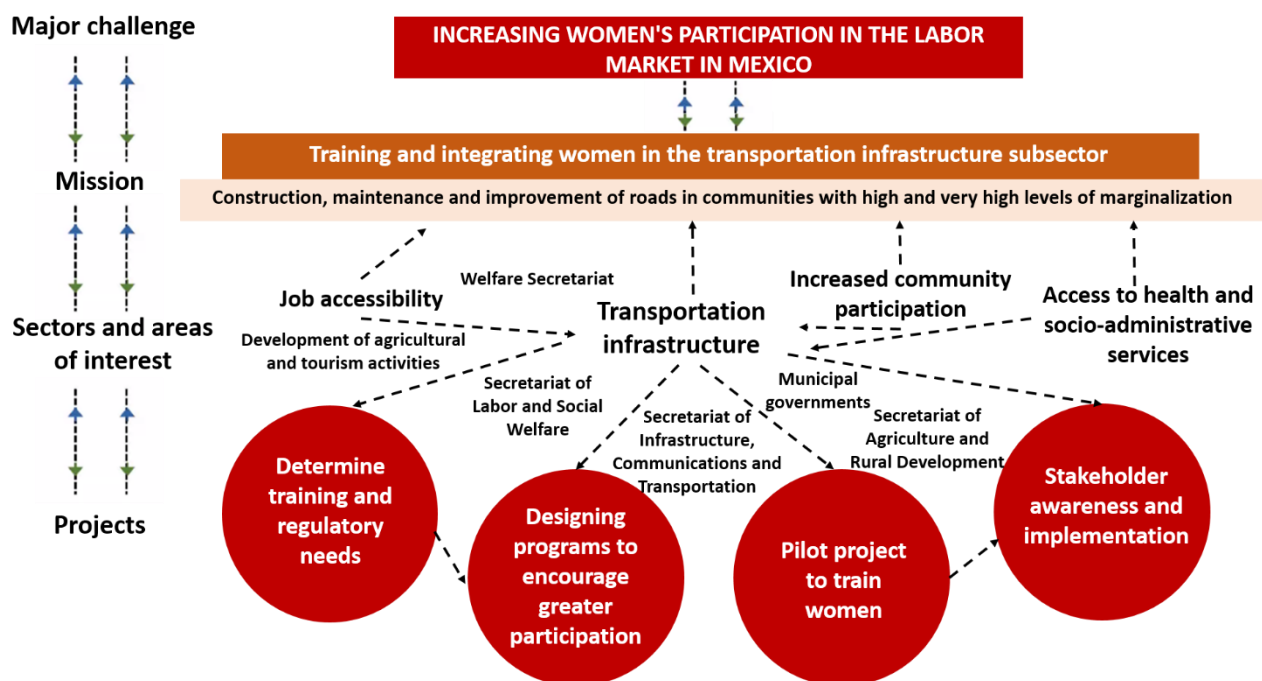


Figure 6 - Mission approach to promote inclusive program design

Source: [Gradilla-Hernández, L. A. and Morales-Bautista, E.M. \(2023\).](#)

3. CONCLUSIONS

Reducing the gender gap in different areas would benefit society as a whole, given that women with better education and equal access to job opportunities would help reinvigorate the economy, contributing to the transition towards sustainable development.

Women who belong to rural communities and who manage to enter formal labor markets, including female heads of household, benefit from receiving training for employment, as well as the opportunity to generate income to improve their quality of life and, in general, raise

their self-esteem. In addition, female workers increase their participation in the community and in leadership roles, encouraging more women to follow their example.

It is important to continue implementing programs with a gender perspective. Therefore, the recommendation is to use a mission approach for developing programs that allow the involvement of more stakeholders, so that the necessary adjustments are made to working conditions and more women are provided with certified training for the job, including areas of work traditionally classified as male, such as road construction, improvement and maintenance. It is also important to establish a minimum quota for women to participate in road paving as a transition strategy to encourage greater participation.

In the case of Mexico, it is important to continue making visible the participation of women in the Paving Program for Roads to Municipal Capitals of the SICT and, for which it is expected that the Web viewer, developed by the IMT, will contribute to the achievement of said purpose. There is a current ongoing effort into integrating to the Web viewer the information of the works completed in 2023.

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