Chapter 38

Solar Distiller - A Profitable And Sustainable Strategy, Capable Of Developing And Promoting The Population's Access To Treated, Quality Water.

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Bárbara Stuhr dos Santos Lopes
Graduanda em Humanidades pela Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, Brasil (barbara.stuhr@ufvjm.edu.br)

Paula Andréia de Jesus Brito
Graduanda em Licenciatura em História pela Universidade Federal dos Vales do Jequitinhonha e Mucuri, Diamantina, Brasil

Flaviana Tavares Vieira Teixeira
Docente do curso de Engenharia Química e Tutora do PET-Estratégias, Diamantina, Brasil

ABSTRACT
It is estimated that in Brazil the number of people without adequate access to the water reaches 35 million. In this sense, it is essential to create alternatives capable of supplying the population's needs. With this in mind, this work proposes the implementation of a study area at the Federal University of Jequitinhonha and Mucuri Valleys, focused on research with solar distillers, and equipment capable of cleaning water at a low cost.

Keywords: Profitability, Sustainability, Renewable Sources.

1 INTRODUCTION

On March 31, 2021, the Federal Senate approved a proposal for an amendment to the Constitution (PEC) that includes, the Federal Constitution, access to drinking water among the fundamental rights and guarantees of citizens. This project, according to the author Senator Jorge Viana, intends to recognize water as a fundamental right, since it is commonly associated with an economic good, which excludes from its access the most vulnerable layers of the population (AGÊNCIA BRASIL, 2021).

In line with the senator's justification, research (National Sanitation Information System) shows that 35 million Brazilians do not have adequate access to drinking water, with the North and Northeast regions being the most affected. In this sense, thinking about profitable and sustainable strategies, capable of developing and promoting the access of this part of the population to treated and quality water is fundamental. Meeting these criteria, the solar distiller shows itself as a viable alternative to provide this bridge between population and drinking water.

More than two thousand years ago, Aristotle already described processes for cleaning water by using the heat of the sun. Solar distillation uses the natural process of water purification (evaporation,

condensation, and precipitation) reproduced on a smaller scale, in an extremely simple system, according to Maluf:

> "this equipment (...) consists of a shallow tank with a transparent glass top, forming a watertight volume. Solar radiation passes through the glass and heats the water, increasing its evaporation rate. The water vapor rises and condenses in contact with the colder glass, and the distilled water flows until it is captured by a gutter, leaving behind salts, other minerals, and most impurities, including microorganisms harmful to health (MALUF, 2005, p. 6).".

Despite being a piece of simple and sustainable equipment, the number of existing solar distillers is low, this is justified by two factors: high cost and low efficiency when compared to other models, such as models that use the burning of fossil fuels as a source of energy. However, for presenting great potential as a sustainable and non-polluting equipment, the solar distiller deserves attention from researchers, so that, based on experimentation and scientific support, it can be improved and used on a larger scale, mainly due to bring quality water to people who still do not have it.

In this sense, this project aims to implement a reserved space at the Universidade Federal dos Vales do Jequitinhonha e Mucuri for research purposes with solar distillers, aiming at the improvement of existing models and the development of new ones, to create alternatives capable of providing efficient and affordable equipment, so that, in this way, the possibilities for more people to have access to the fundamental right, drinking water, are increased.

2 MATERIAL AND METHODS

The project aims to reuse importable water through solar distillation, its systematization uses the heat of the sun and extracts the evaporation of water from the container to condense on a surface. Considering what was put in the justification of this project, the solar potential of Minas Gerais points positively to the development of activities that use the sun as an energy source. The methodology consists of developing a research project at the Federal University of Jequitinhonha and Mucuri Valleys - Diamantina Campus, in a space prepared next to the Humanities Laboratory building. First of all, it is essential to establish a connection between students, teachers, the institution, and, consequently, the community. Then, it is of utmost importance to move debates, conversations, field activities, and moments of reflection, always aiming to approach themes and situations that portray the reality of those involved greatly. These are necessary strategies to understand the reasons behind the difficulties in the correlation between university and community, and the methods used need to intrinsically follow the result of what will be diagnosed through this first stage. After this analysis, the distiller's construction stage will occur.

After installing the distillers (costs and materials described in the next topic), we can follow the distillation process: Solar radiation will invade the distiller and cause the dirty water to increase in temperature. High temperatures cause evaporation, so the atmosphere inside the distiller tends to become quite humid. Due to the humidity-saturated environment, the contained water evaporates and consequently condenses in contact with the glass. The condensation droplets accumulate and begin to slide by gravity to

the bottom of the glass through the channels. The hoses that will be inserted at both ends of the glass are responsible for collecting the clean distilled water, which finally reaches the gallon-pet, from where it will be removed for use.

3 RESULTS AND DISCUSSION

Following the national trend, Minas Gerais presents a total of almost four million people without access to drinking water. Thus, implementing measures that seek to reduce this number is essential. In this sense, the public university, which, in its conception, proposes to rely on the triad of teaching, research, and extension, has the social function of developing and improving studies and techniques capable of finding solutions to the problems faced by society. Having as its social background the society of Minas Gerais, the Federal University of Jequitinhonha, and Mucuri Valleys (UFVJM) must pay attention to monitor the demands and propose strategies for coping.

UFVJM is present in four cities in Minas Gerais: Diamantina, Teófilo Otoni, Unaí, and Janaúba, which belong respectively to the mesoregions Jequitinhonha, Vale do Mucuri, Noroeste, and Norte de Minas Gerais. Image 1 shows the regions where UFVJM is located.

Figure 1. UFVJM teaching units in Minas Gerais Source: UFVJM in numbers

In a study covering different analyses of the state of Minas Gerais, the Energy Company of Minas Gerais (CEMIG) built the document entitled "Solarimetric Atlas of Minas Gerais", which, among other information, presents the solar potential of the state, which, according to the document, is between 5.5 and 6.5 kWh/m² of annual average global solar radiation. This value points positively to the development of activities that use the sun as an energy source. Image 2, taken from the Solarimetric Atlas of Minas Gerais, demonstrates the solar potential of the state of Minas.

Figura 2. Radiação solar média diária anual em Minas Gerais.

Fonte: CEMIG

The regions of Minas Gerais where UFVJM is present benefit from a great solar potential, which can enable the implementation of various activities using the sun as a "driving force". Given this, this project proposes the construction of a space for academic research with solar distillers at UFVJM. This space will allow professors, students, and technicians to research and develop different types, shapes, and sizes of solar distillers, seeking models that demonstrate profitability, affordability, and good performance so that they can meet the needs of the population of Minas Gerais present in the study region since they will share the same climatic conditions and solar incidence.

Through research and the development of new technologies and materials, it is intended to improve the functioning of solar distillers, promoting better construction techniques, better thermal insulation systems, reducing heat loss, and, for the construction, the use of locally available materials. In this way, it is hoped to achieve more efficient and more economically accessible models of solar distillers.

Furthermore, during the development of this project, the university, and the communities involved will be able to make associations with other alternative energy, environment, and public health programs, to popularize and make local populations aware of the importance of the sustainable use of natural resources, by giving lectures, publishing scientific articles, and developing projects in schools and community cooperatives. In this sense, through this work, it is hoped that besides the search for the improvement of solar distillers, more people can have access to drinking water and quality, through mechanisms developed regionally and with scientific support.

Therefore, as far as direct impacts are concerned, we can understand the increase in water purification in the municipalities covered by the project, through profitable and sustainable strategies, capable of developing and fostering the reach of treated, quality water for this part of the population. Therefore, indirect impacts, such as bringing the university closer to the community, reducing the lack of water in municipalities, as well as raising awareness of the adaptation of sustainable and profitable means from large to small institutions, may be notorious.

4 CONCLUSION

It can be considered, however, that the project aims to turn the attention to the potabilization of water and to be aware of the region's situation to solve it. To characterize an entire region by negative attributes when one can do the same with positive characteristics that represent it more than the previous ones, is to contribute to the construction of an erroneous, mistaken image that hinders the growth of countless areas of that place while despising and ignoring an entire population. The improvement and production of solar distillers, besides bringing an impact on the quality of life of the population where they will be installed, will also serve as an opening (and model) for the conversion of more sustainable universities and municipalities.

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