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RESEARCH ARTICLE

THE YACYRETÁ HOUSING COMPLEX: 20 YEARS LATER

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Abstract

Dams tend to have both positive and negative social, economic and environmental impacts in their area of influence. This article focuses on the social impacts, especially those related to the housing of the relocated population in the San Roque González de Santa Cruz neighborhood, also known as the Arroyo Porá Housing Complex, located in the municipality of Cambyretá (Paraguay), 20 years after the first wave of relocations (1999). The objective of the study is to describe the current situation of these housing units, considering aspects such as housing tenure, conformity, modifications and maintenance, to mention some variables, according to the passage of time. For this purpose, it uses a semi-structured survey to a sample of the aforementioned population. The study found that the displaced population had to adapt the house given to them for relocation purposes to their needs, mainly due to an increase in the population per family unit. Additionally, during this research new owners were identified, as well as caretakers and tenants, who settled after the relocation period, resulting in a loss of homogeneity of the population. These situations could indicate that the recommendations related to the management of involuntary resettlement processes were not taken into account in this case.

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Introduction:-

The Yacyretá hydroelectric power plant is one of the 130 dams located on the Paraná River (Kopas and Puentes Riaño, 2009), managed by the Yacyretá Binational Entity (EBY) of the governments of Paraguay and Argentina. It is located in the region of the Yacyretá-Apipé falls, about 300 km southeast of Asunción and 1,000 km north of Buenos Aires (Entidad Binacional Yacyretá, 2021). The undertaking began in 1973, with the signing of the Yacyretá Binational Treaty, whose main objective is "the hydroelectric exploitation, the improvement of the navigability conditions of the Paraná River at the height of Yacyretá Island and, eventually, the attenuation of the predatory effects of inundations caused by extraordinary floods" (Entidad Binacional Yacyretá, 2020).

Several authors agree on the great impact of this engineering work in the area of direct and indirect influence of the dam in the Paraguayan departments of Itapúa, Misiones, and Ñeembucú; and in the Argentine provinces of Corrientes and Misiones (Flores Flores, 2009; Kopas and Puentes Riaño, 2009; Carísimo, 2017; Monzón, 2017; Beletzky, 2017; Giménez Castro, 2020). In general, the adverse effects refer to flooding of natural habitats, loss of

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biological diversity, deterioration of water quality, hydrological changes, increase in the rate of waterborne diseases, emission of greenhouse gases, involuntary displacement of people and/or communities, loss of cultural assets; and, the positive effects are summarized in taking advantage of complementary civil works, tourism development projects, improvement of navigability conditions, flood control, to mention a few.

Involuntary displacement of people is often the main adverse social impact of hydropower projects (Ledec and Quintero, 2003), specifically, it refers to the process by which the local population is forced to give up land for a project, such as a dam, and is relocated elsewhere as part of a compensation package (Vanclay, 2002). When involuntary displacement occurs without the implementation of measures necessary to avoid negative consequences, people's human rights are often transgressed, such as the right to free movement, private property, housing and adequate compensation, as well as the right to work and adequate food (Kopas and Puentes Riaño, 2009; Kornfeld, 2012; Stockholm International Water Institute, 2020; Homa, 2020).

To achieve the filling of the reservoir to 83 masl and the full operation of the dam, EBY carried out a series of complementary works and others included in the Yacyretá Completion Plan (PTY), as part of its mitigation and compensation plans for the 122,000 hectares flooded and the 82,242 people displaced in both countries (Fulco, 2011; Brites, 2015; Brites and Catullo, 2016). This fact meant the construction of 14,247 units distributed in 13 housing developments between 1983 and 2010 (Thomas, 2013); of which 7,393 units are located in five housing developments in the cities of Garupá and Posadas in Argentina, and 6,854 units in eight housing developments in the cities of Encarnación, Cambyretá and Carmen del Paraná in Paraguay.

Most of the resettled population were relocated from flood-prone and socially vulnerable areas that lacked basic services, such as schools, daycare centers, and health centers, as well as security (Thomas, 2013). Initially, housing complexes for resettled populations did not have a socio-community component. After claims made by the resettled communities, the EBY agreed to provide complementary infrastructure, basic services, and community facilities, with the aim of mitigating the adverse effects of uprooting Argentine population (Brites and Catullo, 2016). These types of measures were later incorporated on the Paraguayan side; however, these sites are located in the peripheral area of the city of Encarnación, coinciding with the practices of construction companies of that time in Latin America, which opted for remote lands, considered peri-urban, a selection was justified by a relatively low cost of land (Brites, 2015). Despite the social components added into the housing developments, placement in a peri-urban area is unfavorable due to the consistent lack of opportunities linked to it (Thomas, 2013; Brites, 2015; and Céspedes, 2016). A dwelling must also respond to the concept of habitability, which refers to the qualities that a dwelling must have to be habitable, such as being the set of equipment capable of satisfying the essential needs of people to live, but goes beyond the mere shelter of the home, and includes public spaces, infrastructure and services (Barreto, Benítez, and Puntel, 2015).

Therefore, the involuntary displacement of people due to the complementary works of the hydroelectric plant can be considered a social drama (Radovich and Balazote, 1996) that must be mitigated, the main response to which is resettlement in housing complexes. These areas should be planned with the active participation of those affected and provide adequate compensation for the territorial space lost (World Bank, 1990).

In most of the housing complexes, the spaces are structured in individual lots of 12 x 30 m, with brick walls, tile roof and ceramic structure; they have a bathroom, gallery and space for future expansion (Ecosistema Urbano, 2015). The housing units destined for relocated populations in general are constructed of masonry and are homogenous due to the standardization of housing complex designs (Brites, 2012). As such, the space allocated to each of the rooms did not take into account the variable number of people that would occupy each of the dwellings, nor the growth of the relocated family units. The number and dimensions of the rooms were not designed according to the particular needs of each family. Therefore, with the passage of time, many of the relocated settlers have made modifications and adaptations to the houses (Brites, 2011) to adapt them to their needs, as well as in response to the progressive deterioration of the houses that were delivered by EBY.

Modern Western families are inclined to create “nuclear” families in which two generations, consisting of parents and children, live together (Pucheta 2008). In Paraguay, the nuclear household is composed of a married couple with or without unmarried children, as well as the head, male or female, with unmarried children (Céspedes, 2016). It has been found that, in displaced family units, the average number of persons per family group is 4.4 (Fulco, 2011).

Relocations generate social, economic and environmental impacts in their area of influence. This article presents results related to social aspects of the Arroyo Porá housing complex in the San Roque González de Santa Cruz neighborhood, located in the municipality of Cambyretá (Paraguay), a population relocated in 1999. Therefore, the objective is to describe the current social situation of the relocated population according to the passage of time. The results presented in this article are part of the doctoral thesis in Environmental Management of the Graduate School of the National University of Itapúa (Paraguay).

Materials and Methods:-

The research approach is quantitative, descriptive, non-experimental and cross-sectional. It seeks to specify properties and important characteristics of the phenomenon to be analyzed (Hernández Sampieri, Fernández Collado, and Baptista Lucio, 2014) and the purpose is to characterize a specific event or situation, indicating its peculiar or differentiating features (Ander-Egg, 1995) and to describe a phenomenon or temporospatial situation (Cerdeña Gutiérrez, 2011) within a particular context (Hurtado de Barrera, 2000); in this case, the houses of the Arroyo Porá housing complex in the San Roque González de Santa Cruz neighborhood.

The study population consists of 1,194 families relocated by EBY. Of these, 178 families were selected by systematic random sampling, with a 90% confidence level and a margin of error of ±6%. Although the study is focused on the population of the housing complex, it was observed that 18.54% of the initial sample was made up of family units that were renting, had acquired or fulfilled the role of caretaker of the dwelling and, therefore, do not meet the condition of having been relocated as part of the complementary works of the Yacyretá dam. For this reason, these responses were excluded from the present analysis, resulting in a sample unit of 145 families.

Primary data collection was based on a semi-structured survey form that was applied between June and July 2018. Respondents were consulted regarding the number, sex and age of the residents in the dwelling; tenure, compliance, modifications, improvements and maintenance of the dwelling; as well as the availability of complementary constructions on the property, subsequent to the relocation. In addition, a direct non-participant observation with photographic records of the housing complex was carried out. The results obtained were coded and processed using a free statistical software called PSPP. Tables and descriptive figures were generated for each of the variables studied, which were then triangulated with other previous studies.

Results and Discussion:-

Number of persons per household.

The average number of persons per household was 4.6 in 2018, and 4.4 persons per household in 2005. This implies a growth of 4.55% in this period. Thus, an average household is occupied by 1.46 adult men, 1.38 adult women, 0.86 boys, 0.66 girls and 0.30 adults over 65 years old. The complete distribution can be seen in Figure 1:

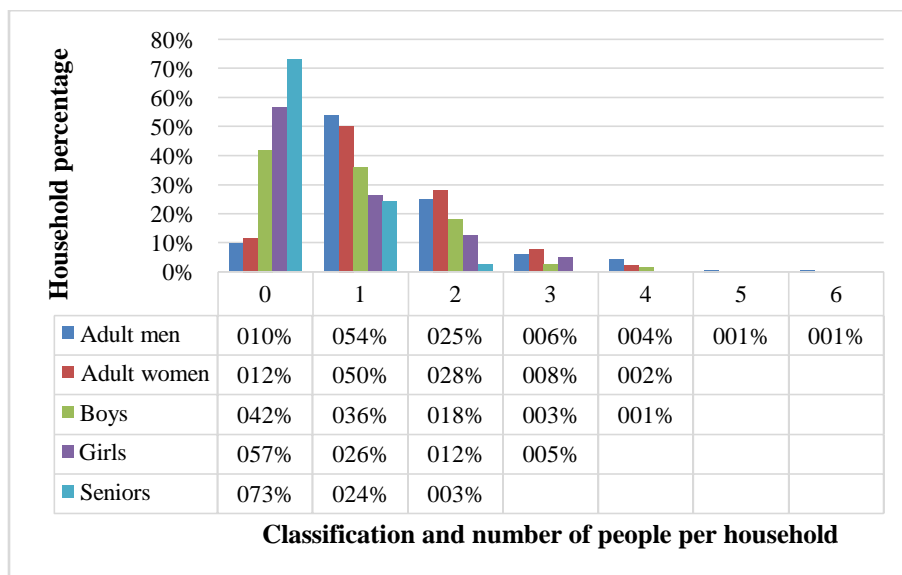


Figure 1:- Characteristics of the people living in the homes studied.

Conformity with the quality of the housing.

A total of 59.31% of those surveyed said they were very satisfied with the quality of the housing, while only 9.66% said they were not satisfied. A similar situation occurs in the different housing developments located in Encarnación where, 65.08% said they are "very satisfied" with the quality of the housing in which they reside while only 1.59% said they are "not very satisfied" with it (Velázquez Haurón et al. 2019). In other housing developments, such as San Pedro in Encarnación, neighbors expressed complaints regarding the quality of the housing constructions, which with few years of use, present problems such as cracks in the walls, construction without foundations and deficient electrical installations (Monzón 2017).

Modifications made to the dwelling.

86.21% of respondents said that the dwelling has undergone some type of modification since occupancy as a result of the relocation process. Modifications include those made to the rooms of the dwelling, as well as the construction of new ones. The total number of dwellings that have undergone modifications, according to survey responses, are distributed as follows:

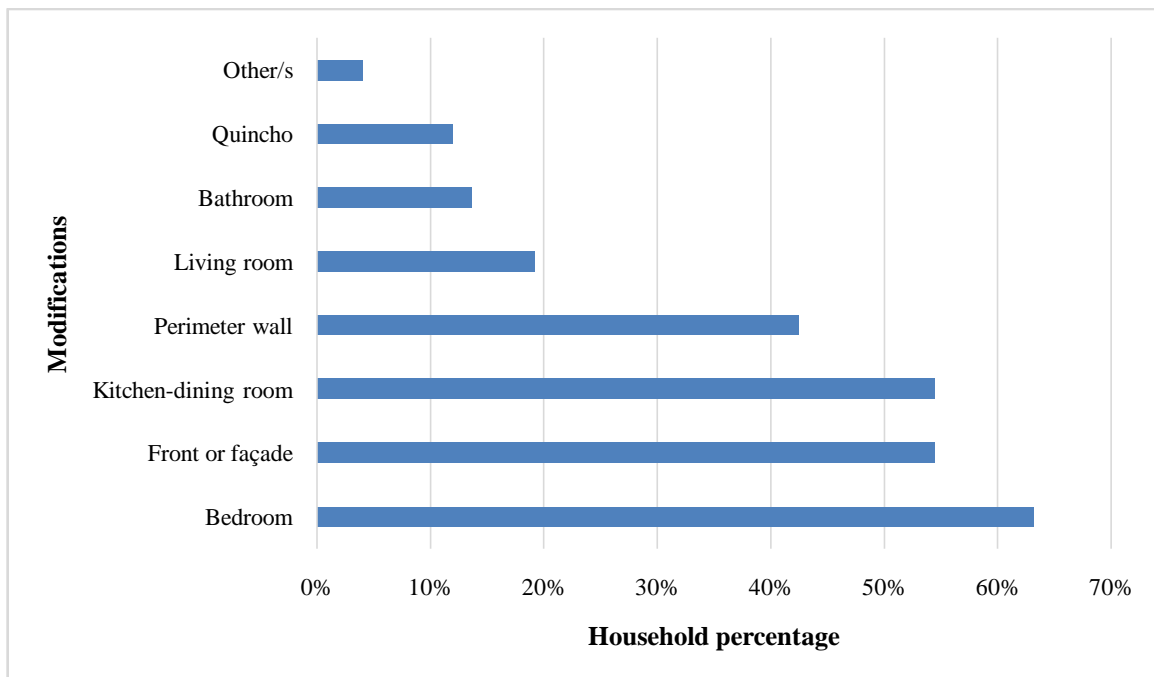


Figure 2:- Modifications made to the houses.

As seen, the bedroom is the most frequently modified, followed by the front or *façade* of the house, then the kitchen-dining room, and the perimeter wall. This is followed by the living room, the bathroom, the *quincho*¹, and others, such as the garage. In one case, it was mentioned that the entire house was modified. This type of modification can also be observed in other housing complexes in 71.43% of dwellings in Encarnación, according to the results of a study conducted in 2017 (Velázquez Haurón et al., 2019).

Improvements made to the dwelling.

Of those surveyed, 74.40% said that the improvements made were motivated by the need for space; 52.80% for comfort; 4.80% for aesthetics; 2.40% for repairs; and 3.20% indicated other reasons such as security, to work, or to start a business.

Housing maintenance.

A total of 98.62% of the people consulted stated that housing maintenance is carried out. Considering that the last stage of relocation took place in 2007, on average, the houses are 15 years old, so the maintenance of the electrical and/or sanitary installations, painting, and roof could indicate that this population is rooted in the new environment.

¹A *quincho* is an annex to the house, generally used to prepare meals on the grill and then to eat under it

Availability of complementary constructions within the housing property.

These constructions refer to independent dwellings and others to carry out some enterprise or business. The details can be seen below:

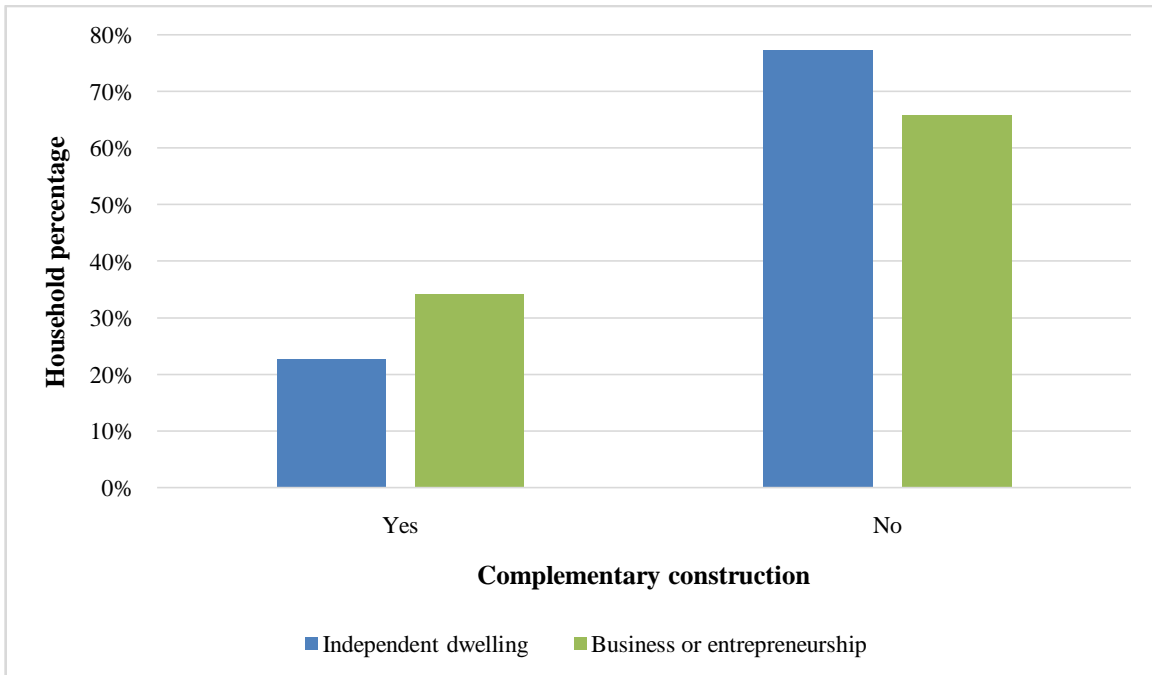


Figure 3:- Availability and type of complementary constructions.

As seen, most (77.24%) of the relocated individuals have not built an independent dwelling, nor a space to carry out a business or enterprise (65.71%) within the housing property. On the other hand, among those who did build an independent dwelling within the property, 78.79%, have done so for a family member, and 18.18% to rent.

It is striking that the responses of the neighbors consulted do not reflect what was observed during the different visits, in which a greater proportion of complementary constructions, extensions and modifications of the dwelling for different purposes were observed. The difference between what was stated in the surveys and what was observed could be due to the neighbors' fear of paying real estate tax, since the municipality of Cambyretá calculates this based on the constructed surface area.

Conclusions:-

The San Roque González de Santa Cruz neighborhood, also known as the Arroyo Porá Housing Complex, in the municipality of Cambyretá (Paraguay), was designed and built to exclusively house part of the population affected by the complementary works of the Yacyretá dam. This neighborhood has received 1,504 families between 1999 and 2005, and is made up of standardized housing, regardless of the number of people per family unit. Prior to the involuntary displacement, this population was located in riverside areas, with high social, economic and environmental vulnerability. These houses, provided by the Yacyretá Binational Entity (EBY), were delivered as compensation for the flooded area, free of charge and with title deeds to be managed by the head of household.

The characteristic of homogeneity of the neighborhood population is no longer visible 20 years after the relocation process, since, during this research, new owners were identified, as well as caretakers and tenants. This situation is also observed in other housing developments in the neighboring district of Encarnación, also built by EBY, under the same conditions and with similar characteristics of both the population and the housing. The main reasons for this are the increase in the cost of living and the payment of public services, the greater distance to places of work and study, as well as the difficulties in settling in the new space. In spite of this, a large number of those surveyed said they were very satisfied with the quality of the housing, which would be an improvement with respect to the context of high social, economic and environmental vulnerability of their original environment.

On the other hand, the increase in the average number of persons per family group forced the modification and expansion of the houses. Additional modifications include the periodic revisions of the electrical and sanitary installations. As for additional construction, those who reported having built an independent dwelling on the same property were motivated by the need to provide space for a family member. However, there is a difference between the responses given and what was observed in the studied neighborhood, since many of the individuals refused to declare whether there was an additional dwelling in the property or not. Their refusal could be related to the payment of the real estate tax, given that it is calculated on the basis of the constructed surface area.

20 years after the first relocation, it can be concluded that the population displaced by the Yacyretá dam, located in the San Roque González de Santa Cruz de Cambyretá neighborhood (Paraguay), was forced to adapt the houses provided by the Yacyretá Binational Entity (EBY) as compensation to meet family growth needs. Had the population being displaced participated in the decision-making process regarding the construction of the housing development, additional modifications may not have been needed. This, alongside the finding of new owners, caretakers and tenants, who settled after the relocation period, could indicate that the recommendations related to the management of involuntary resettlement processes were not taken into account.

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