REPERCUSSIONS OF ENVIRONMENTAL TRANSFORMATIONS PRODUCED BY HYDROELECTRIC POWER PLANT CONSTRUCTION FOR THE HEALTH OF LOCAL FAMILIES

LISIANE DA ROSA[1]
MARIA ASSUNTA BUSATO[2]
LUCIMARE FERRAZ[3]
SILVIAMAR CAMPONOGARA[4]

Introduction

Human beings are subject to environmental conditions and transformations in them can lead to health problems and affect other aspects of social, political, economic or cultural importance (FREITAS, 2003). Consequently, the question of the relations between human health and the environment cannot be discussed on the basis of mechanicist thinking alone but, instead, should be based on presuppositions that contemplate and value the complexity of the relations between health and the environment (CAMPONOGARA, 2008).

According to the latter author, any discussion on environmental health should take into account the context of the respective populations and the multiplicity of social actors involved and endeavor to construct a new rationality that perceives the environment as part of daily life with its different scenarios and widely varied social practices.

Given the complexity of socio-environmental problems which involve aspects such as housing, sanitation, employment, income, education, and access to goods and services, issues associated to development require a systemic, inter-disciplinary and inter-sector approach (BARBOSA, BARATA and HACON, 2012). Those three axes make it possible to detect and study in greater depth the inter-relations of environmental impacts on human health (GURGEL et al., 2009).

1. M.Sc. in Health Sciences from the Community University of the Chapeco Region/Unochapeco, e-mail lisianerosa@unochapeco.edu.br
2. Ph.D. in Biology from the Community University of the Chapeco Region/Unochapeco, e-mail assunta@unochapeco.edu.br.
3. Ph.D. in Collective Health from the Community University of the Chapeco Region/Unochapeco, e-mail lferraz@unochapeco.edu.br
4. Ph.D. in Nursing from the Federal University of Santa Maria/UFSM, e-mail silviaufsm@yahoo.com.br

Hydroelectric power plant projects have brought about alterations to the environment that have had considerable repercussions for the health of families and communities involved. Accordingly, the effects on human health of environmental transformations stemming from the installation of such plants must be considered in all the respective environmental licensing processes.

Capra (2012) has reported that impacts stemming from environmental degradation can materialize in the form of illnesses such as cancer, cerebral vascular accidents and depression. In the social sphere they are expressed in the form of violence, suicides and alcoholism and accompanied by economic anomalies such as grossly unequal wealth and income distribution at both national and global levels (BARBOSA; BARATA; HACON, 2012).

The close relation between health and environment become apparent when environmental problems and the impacts they give rise to begin to reflect in the health, living conditions and other aspects experienced by those living in the context of those transformations. That being so, constructing new knowledge about such relations based on an ecosystem approach would make it possible to more adequately orientate the implementation of actions and policies aimed at stimulating individual and collective capacity in those subjected to such changes, thereby enabling them to face up to the vulnerabilities they are exposed to in terms of health and to the conditioning factors present in their surroundings (GÓMEZ; MINAYO, 2006).

To that end, it is essential to involve multiple disciplines and multiple sectors in addressing health and environment problems, given the complexity of such situations and their outreach to various sectors of society. One of the social aspects is the health of the population directly affected by problems originating from environmental transformations (CAMPONOGARA, 2008).

Given the importance of the effects on health stemming from environmental transformations brought about by large-scale hydroelectric power ventures, this study set out to identify the repercussions, for the health of the families involved, of the implantation of the Foz de Chapecó hydroelectric power plant, based on the families' own perceptions.

Methodology

The study is exploratory and descriptive and adopts a qualitative approach. Data analysis was done according to Minayo (2013) using the content analysis method and a thematic analysis approach.

Research was undertaken in the region of the Uruguay River basin in three municipalities affected by the Foz do Chapecó Hydroelectric Plant (HEP), namely, Caxambu do Sul, Guatambu and Palmitos, all situated in the Brazilian state of Santa Catarina.

13 farming families whose properties or workplaces had been totally or partially flooded by the HEP dam reservoir were selected for the study. Each one was identified by the letter F followed by a number identifying their position in the sequence of interviews. All the families resided in the rural areas of the affected municipalities prior to the implantation of the HEP and all had agriculture as their livelihoods.

The Snowball Sampling methodology as proposed by Goodman (1961) and Albuquerque (2009) was used to locate and determine the families to be interviewed. It is a non-probabilistic recruitment method as it does not allow for any calculation of the probability of selection of each sample participant. The first family selected, the so-called "seed" family, currently resides in the municipality of Guatambu/SC which was where the study began. That first family was located through indications made by neighbors of the researcher. The seed family knew a large number of other families in the same situation who had been their neighbors prior to the building of the dam. The sequence of sampling families passed from Guatambu/SC to Caxambu do Sul/SC and Palmitos/SC in that order as the 'seed' family indicated the next families.

The advantage of using that respondent-driven sampling methodology for complex social networks and hidden populations lies in the fact that one member of the population knows another in the appropriate situation and that facilitates faster and more effective identification and localization of the families (GOODMAN, 1961; ALBUQUERQUE, 2009). Sampling was interrupted according to the saturation criterion (MINAYO, 2013), that is, when sufficient diversity and intensity of information that was the object of the study had been achieved.

The interviews were carried out in the families' homes by means of random unannounced visits. The interview scripts were semi-structured and targeted information on the families' perceptions regarding the impacts the implantation of the HEP in their land had caused on their health. The questions were directed at the couple responsible for the family but if either the husband or the wife were absent it was conducted with the remaining partner. The responses were recorded and transcribed unabridged to maintain the integral authenticity of the declarations and to record the emotional moments some of the interviewees experienced. Data gathering was done in the months of September and October, 2014. The State of Santa Catarina Research and Innovation Support Foundation (Fapesc) provided financial support for the research.

The Ethics Committee for research involving human beings of the Chapecó Region Community University (UNOCHAPECO) documented approval of the original research project (Protocol n. 040/14, dated March 26, 2014). Research was conducted in compliance with the recommendations of Brazilian National Health Council Resolution Nº 466/2012.

Results and discussion

The results of this study were obtained from data gathered from families that had changed their place of residence due to the construction of the Foz do Chapecó HEP but continued to gain their living from agriculture. The orientation was to emphasize health aspects as perceived by the families as well as the environmental transformations and modifications and the impacts on the health of those families that changes gave rise to.

The first questions in the sequence addressed the families' *concept of health* and they were free to speak about any facts, feelings or aspects that they considered to be connected to their own personal health. Most of them spoke about biological factors as can be seen in the excerpts from their declarations below:

> *Health is being well. It's not about going to the local health care clinic. Living and enjoying life, a good, healthy diet, good water to drink.* (F01).
>
> *It is being able to work. As I am unable to work now I do not consider myself to be in good health.* (F03).
>
> *Being healthy is living well, eating well, not eating too much but eating more natural things, consuming less pesticide, producing more of your own food to eat.* (F04).
>
> *People think being healthy just means not being sick. Mental health above all; the mind must be well for the body to be well.* (F08).
>
> *It is being happy, living well.* (F09).
>
> *It's not having to take medicine, going to dances, parties, dancing. I was very happy but now I am not.* (F11).
>
> *A good place to live; water first of all, because I know what it is to be without water.* (F12).
>
> *Health is feeling good in the place where we are because when we are not feeling good with the place, we are jeopardized.* (F13).

Study participants understood their health and related it to aspects like diet, work, leisure, physical and mental health, amusement, way of life and also to having access to natural resources like water. All the health-related points identified by the families are important and should be taken into account when there is an intention to implant hydroelectric and other energy-sector projects that provoke great displacement of families.

Some of the statements emphasize the relations between health and the place of abode – attachment to things of the land – and the influence of such aspects on people's way of life cannot be ignored because they result in physical and emotional alterations when they are abruptly altered. Santos and Becker (2007) consider that the space where a person is born and spends most of his or her life is something that is consumed and constantly recreated, something that is renewed from generation to generation, that emerges and grows old together with the memories of other generations.

It can be seen that the territory is not merely the result of superimposing a set of natural systems or an agglomeration of man-made things on the ground. It is felt as being the sum of the ground with its respective population; that is, the creation of an identity, a sense of belonging to that which belongs to us. "The territory is the base for work, for dwelling, for the exchanges made in life whether they are material, social or spiritual, and that territory is used and utilized by a population" SANTOS, 2001. p.96).

Thus individuals identify with their living spaces and materialize their futures in the places where they live. It can be seen that when compulsory displacements take place the population is placed in a vulnerable situation and has little possibility of dealing with it.

In a way the affected families have transformed their ambience over the years through their use of the land, the natural resources and the force of their labor. Accordingly it can be seen that the space that has been recreated with the help of family members, friends and neighbors has been renewed in the course of generations, growing older alongside and together with their memories and attachment to the place. Suddenly no longer belonging to their territory of origin, according to the interviewees, generated personal conflicts that manifested themselves in the form of psychic and physiological disturbances

Somehow, the transformations in the family environment influence those elements that define and condition the health of such social groups. Accordingly, those inter-relations need to be demonstrated in advance so that the population involved in the process can be in a condition to adequately participate and evaluate the decision made regarding the venture in question and its impacts, including its impacts on their lives (RIGOTTO, 2009).

That leads us to conclude that health should receive multi-dimensional and inter-disciplinary attention involving different slants and it cannot be taken as other than something definitely complex and not hermetic (CAPRA, 2012). That vision of health is supported by principles that go beyond the biological and physical spheres and transcend the reductionist approach which predominated for many years in the description and study of health.

Lawinsky (2012) reinforces that idea of extending concern for health to reach well beyond the limits of disease and focusing attention on social, environmental and economic factors. That authoress identifies growing concern on the part of society for environmental problems and it has led to the creation of an ecosystem-orientated approach to health in an endeavor to take a new, different look at it and overcome the division separating human society from the ecosystems

Society's heightened awareness began with a certain uneasiness and ecological concern that Americans and Canadians started to feel for the great lakes in their territories which were beginning to be invaded by industrial and agricultural projects in the wake of their economic booms. At the time, in the 1970s, the prevailing idea was that man was highly superior to the ecosystems. Landowners of vast areas and industrialists believed that the ecosystems would be capable of supporting all man's nature-dominating processes (MINAYO, 2009).

The burgeoning environmental awareness at the time led the governments of the two countries to set up committees to discuss the question of the inadequacy of mono-disciplinary approaches for obtaining an understanding of the dimensions of problems generated by the disorder being provoked in the natural environment. Their findings led to the formulation of a new strategy that could be used at any time because it gave direction to the discussions and fostered the possibility of civil society and government participating in the creation of proposals designed to find solutions (GÓMEZ; MINAYO, 2006).

Thus the systemic model Minayo (2013) proposed attempted to move away from the traditional theories and construct new knowledge founded on three dimensions of knowledge identified as: *complex systems*, which address the themes under study as objects in a given context, integrated to everything that they are a part of; the idea of

instability, which holds that the world is always in a process of transformation in which the disorganization of its elements is seen as necessary to enable the living beings to attain greater degrees of complexity; and *inter-subjectivity* in the construction of reality and of knowledge which accepts the idea that subject and object only materialize at the moment they establish relations with one another.

Forget and Lebel (2001) state that the ecosystem approach to human health proposes fostering collective health by implementing a more sensible management of the environment involving trans-disciplinary, participative research. That approach seeks to identify the relations among the various components of an ecosystem in order to understand which of them are determinants for human health and its sustainability.

Given that on the one hand the complexity of those interactions requires the integration of various study disciplines, on the other it requires the active and effective participation of the community in formulating and implementing strategies for managing environmental factors that affect human health (WEIHS; MERTENS, 2013)..

Social participation means the integration of all interested and responsible parties in an endeavor to find ways to solve the problems. It embraces the notion of grassroots participation, of including ordinary people drawn from the group that is experiencing the health and environmental problems in question. Social participation is a broad organized form of collaboration among government authorities, businessmen, managers, employees and all social actors involved, collaborating to create a healthy perspective (GÓMEZ; MINAYO, 2006).

The above authors perceive gender equity, distinct from sexual differentiation of man and woman, to involve a series of socially accepted functions in the relations between them. They take into account the fact that in their routines in society, and in their work forms they play different specific roles. Thus they understand gender to be the value that defines behaviors in the relations between the sexes, corresponding to differentiated relations within the family nucleus and in the society in which they live and work.

That being so it is comprehensible that the ecosystem approach to health is based on the presupposition that manifestations of sickness and health may occur in a variety of different social and ecological contexts. It is also an approach that prioritizes the collective construction of information and knowledge in which local actors involved in the process actively participate, presenting demands and making decisions (FREITAS *et al.*, 2007). In that sense, Passos and Cutolo (2012) have reiterated the direction to be taken by a new generation of public policies on health that address and engage with the complexity involving human beings and the environment.

Bearing in mind the space where the families involved in this study lived and constructed their social ties in the course of their lives, we investigated the feelings they experienced triggered by the transformations and modifications of the environment they lived in and the respective impacts those changes had on their health; all of them reported long periods of suffering that had led to sickness and malaise, as witness their statements:

> *So very sad. We cried a lot because of it all. I was hospitalized for several days, had to take monitored medicines because I fell ill.* (F01)

> *I really wanted them to cancel the project because when I got to where we have to live [now], the house was falling apart. I went off into the woods to kill myself because I did not want to live here.* (F03)

> *It used to be a very good community. We liked it there and so we miss it a lot Here the customs are different. We have hardly been able to get used to them at all.* (F04)

> *We were upset and stressed in every imaginable way and now I have to take medicine for depression. Insecurity, having to leave the place where we were born and raised and seeing everything go under water* (F05)

> *After the dam was built we could see what we had lost because the rive as it was before cannot compare with the way it is now. We really felt the loss of that piece of nature.* (F08)

> *The routine has changed a lot; so very sad, having to leave all those people behind.* (F11)

> *Sadness, because when we look down below there; there we had neighbors, we had everything. Only an emptiness was left; there is not one resident left there.* (F13)

It was found that the interviewees revealed pain and sadness when referring to the process of removal from their surroundings of origin. Indignation and a feeling of insecurity were constant sources of stress for the study subjects, leaving them discouraged and apprehensive about the future

Rigotto (2009) refers to aspects of a similar nature associated to migration to the cities or other parts of the territory which is strongly associated to outbreaks of violence, suicides, traffic accidents, psychic and mental illness, alcoholism, sexually transmissible diseases, precocious pregnancies and other conditions. She considers that several of those harmful conditions are the result and effects of leaving their known environment on people's mode of subjectification – how people dwell, work, relate to one another and coexist socially in a community.

When contemplating the social effects of large-scale ventures and the transformations they cause in the spaces of the affected populations, and taking as a basis the understanding of the territorial aspect involved in the construction process, then it must be underscored that the said territory generates feelings of belonging in people and in that they consolidate their identities (ASTOLPHI; SILVA, 2016). Those authors also consider that such feelings can trigger events that engender illness and serious health problems.

In that regard, in each visit to families the pain and the resentment they felt were immediately apparent and they were intense and specific to each family group or individual interviewed. In the perception of the affected population their current social problems and health problems emerged as a result of the neglect they were subjected to and in their declarations they reveal the anxiety and apprehension they

felt at having to accept the challenge and tread new pathways abounding in uncertainty and anguish.

Scott (2006) carried out studies that showed how the processes in which local residents are forced to leave the areas of dam constructions can engender psychological traumas and disturbances given the consequences of insecurity, silencing and mistrust.

Thus it can be seen that the degradation of the natural environment where people live has corresponding effects on human health which appear in the form of sicknesses whose global indices are inexorably increasing. Among such conditions are physical illnesses such as cancer, cerebral vascular accidents; psychological ones like depression and social ones like violence, suicide and alcoholism all of which accompany economic anomalies such as grossly unequal income and wealth distribution in both the national and global spheres (CAPRA, 2012).

In regard to health-related aspects, the farmers and smallholders interviewed made it clear that the executors of the hydroelectric venture did not take them into account beforehand nor did they foresee any need to expand health service provision. There was no concern for the cultural changes involved or the social and economic consequences there would be for the affected families.

What we have obtained is a portrait of the insecurity experienced by the affected families who expressed that in their own words:

> *I was highly jeopardized; I even had to take medicine for depression and for stomach ache; that is all from nerves and the tension of being there without knowing what was going to happen.* (F01).

> *I,… well for me it got worse. Before I used to work and now I cannot work anymore. My pressure is high, I take medicine for depression, for my heart. All that was because I was so upset because I did not want to leave. I had my neighbors and we were always together.* (F03).

> *My husband here is taking medicine for high blood pressure which he never had to take before. His pressure went out of control when we had to move.* (F04).

> *Before I was perfectly healthy but all that changed. My husband takes medicine for depression. I too take medicine for depression.* (F05).

> *I can feel that it has had an effect on my health because when I am feeling alright everything is alright but when depression attacks…. I feel really bad and I have to take medicine for high blood pressure.* (F11).

> *It was very hard for my daughter who lost all her friends and because of that she experienced depression too; because of all that; she was only 13 or 14.* (F12).

> *My blood pressure started to rise on the day we went to Chapecó for the meeting about the dam and from there blood began to pour from my nose; I nearly died. I ended up in hospital.* (F13).

Those declarations marked the repercussions and effects on health stemming from changes and transformations in the environment and in the family ambience of those who experienced and still experience the alterations caused by the implantation of a hydroelectric plant. The most notable manifestations of impacts on physical health were hypertension, cardiac problems, gastritis, insomnia, insecurity, depression and others. The interviewees reported undergoing psychological treatment and treatments with medications that they may have to take for years or for the rest of their lives. All of that underscores the importance of taking a broader look and making a systemic assessment of the impacts that large-scale ventures of that kind can cause.

Another aspect that needs to be considered is the increase in spending on medicines that the people being moved away from their territories incur as they reported in their interviews. Again the process implies an increase in the onus on the public health services and costs with medicines and treatments it provides which may represent a considerable challenge for the authorities of those municipalities affected by big hydroelectric dam construction. These findings should be taken into account by health service administrators because, in Brazil as a whole, thousands of families undergo such reallocation due to hydroelectric dam construction.

According to the World Health Organization, the effects on health should be considered within the framework of the legislation governing environmental impact assessment (WHO, 2001) but that remains a largely theoretical proposition because what can be seen in practice is that they are usually very timidly or poorly assessed. What is most clearly observable in the legislation is concern for the physical and biological aspects of the environment while the social and symbolic effects on health related to the respective environmental changes and transformations are rarely included in the scope of the discussions and interpretations.

Environmental licensing studies and impact studies associated to large-scale ventures in the energy sector need to pay attention to the needs expressed by the affected populations. That being so, other professional persons including managers and technical staff working in the health sector, in agriculture, social assistance and education, representatives of higher education institutions and others should be heard and their contributions taken into consideration whenever there is an intention to construct such a power plant.

In Brazil; the federal; state and municipal government bodies responsible for environmental affairs do not have the powers or the structure necessary to conduct more in-depth analyses of health issues associated to environmental licensing processes (MACHADO, 2007). An inter-disciplinary multi-professional team, however, would be in a position to make an integral assessment of the possible repercussions for health stemming from the implantation of energy sector projects.

It must be stated that even the health sector itself finds it difficult to address environment-related issues where the challenges encountered may be of a technical,

institutional or administrative nature or associated to infrastructure problems. However it is an issue that has been increasingly addressed by movements in teaching institutions associated to government bodies that seek to develop studies and interventions to obtain solutions for social and health problems caused by transformations of the environment (BREGAGNOLI; ROTHMAN, 2014).

Those studies tend to target impacts arising from the implantation of hydroelectric plants, highways, railways, gas and petroleum industries and others and they tend to identify and construe the sets of problems for all aspects of the affected populations associated to the long-term effects of such installations (BREGAGNOLI; ROTHMAN, 2014).

It is absolutely indispensable that the families affected by the construction of hydroelectric dams and reservoirs and those in similar situations should participate in the discussions of the construction at all the different stages and participate in the discussion of the respective legislation and the the repercussions of the process for their lives, considering that they are the ones most affected by the impacts from the modifications.

Environmental Impact Studies and Environmental Impact Reports usually consider only those environmental impacts and transformations that directly or indirectly affect the soil, the air, the waters or the fauna and flora, without going into any detail about impacts on, or transformations in the health of the affected population.

Lastly it must be underscored that in spite of the avid demand for new territories and natural resources to address economic growth proposals, it is essential to consider that the supposed 'progress' to be obtained can readily generate environmental problems and health problems. For that reason the challenge of achieving good living and working conditions as well as environmental equilibrium must be met in order to form a basis for the consolidation of a development model that is equitable and sustainable (PORTO; ROCHA; FINAMORE, 2014).

Final Remarks

No one can deny the importance of electricity to any contemporary society. However, it is necessary to question the way that energy is being generated and whom it effectively serves. Various research studies have revealed the impacts and modifications that major hydroelectric projects generate on the environment and on the local populations affected. It is easy to identify the greed and covetousness of the big economic groups involved in such projects which, in their development, hardly ever address the needs of the great majority of the population.

It can also be considered that there is an effective scarcity of studies revealing what the impacts experienced by the families affected by such ventures really are or the transformations they bring about in the environment and the capacity of both to support them or adapt to them.

The construction of the Foz do Chapecó HEP caused social and environmental transformations and transformations in the health of the population directly involved. In regard to social issues, their references suddenly became more fragile, highly jeopardized by the dismantling of the communities and the destruction of their social coexistence

and the bonds of friendship among neighbors and families

In regard to repercussions stemming from changes in the physical and social environments affecting the health of the families, this research identified the following in the declarations of the interviewees: hypertension, depression, sadness, loss of motivation to face the changes and insecurity in regard to the future. The shattering of social relations with neighbors and relatives led to feelings of anxiety and pain and the process of adapting to the changes and environmental introduced various kinds of illness and malaise in the population.

The research results indicate that all processes involving the implantation of large-scale installations in the energy sector must take into account the effects on human health because the respective geographic area and the local populations can be directly affected in different ways by the installation activities and the operation of the plant. It is proposed that articulated inter-disciplinary and inter-sector actions be adopted and that there should be far greater integration of social, economic and health policies. It is up to the health professionals to engage in and commit themselves addressing environmental issues, whether they arise in their work environment, in their management proposals or in the process of qualifying health professionals.

References

ALBUQUERQUE, E. M. de. **Avaliação da técnica de amostragem "Respondent-driven Sampling" na estimação de prevalências de Doenças Transmissíveis em populações organizadas em redes complexas**. 2009. 99 f. Dissertação (Mestrado em Saúde Pública) – Escola Nacional de Saúde Pública Sérgio Arouca, Rio de Janeiro, 2009.

ASTOLPHI, J. D V. C.; SILVA, V. P. A relação entre hidroelétricas e riscos em saúde: experiência vivenciada no município de Nova Ponte (MG)-Brasil. **Revista Territorium**, n. 23, p. 5-16, 2016.

BARBOSA, E. M.; BARATA, M. M. de L.; HACON, S. de S. A saúde no licenciamento ambiental: uma proposta metodológica para a avaliação dos impactos da indústria de petróleo e gás. **Ciência & Saúde Coletiva**, v. 17, n. 2, p. 299-310, fev. 2012.

BREGAGNOLI, N. de D. N.; ROTHMAN, F. D. Impactos socioculturais: os efeitos da Usina Hidrelétrica Cachoeira do Emboque em sua comunidade atingida. **Revista Agrogeoambiental**, v. 6, n. 1, abr. 2014.

CAMPONOGARA, S. **Um estudo de caso sobre a reflexividade ecológica de trabalhadores hospitalares**. 2008. 278 f. Tese (Doutorado em Enfermagem) – Universidade Federal de Santa Catarina, Florianópolis, 2008.

CAPRA, F. **O ponto de mutação**. 30. ed. São Paulo: Cultrix, 2012.

FORGET, G.; LEBEL, J. An ecosystem approach to human health. **International Journal of Occupational and Environmental Health**, Philadelphia, v. 7, n. 2, abr./jun. 2001.

FREITAS, M. C. Problemas ambientais, saúde coletiva e ciências sociais. **Ciências & Saúde Coletiva**, v. 8, n. 1, p. 137-150, jan./mar. 2003.

FREITAS, C. M. et al. Ecosystem approaches and health in Latin America. **Cad. Saúde Pública**, Rio de Janeiro, v. 23, n. 3, p. 283-296, mar. 2007.

GÓMEZ, C. M.; MINAYO M. C. de S. Enfoque ecossistêmico de saúde: uma estratégia transdisciplinar. **Interfacehs**, v. 1, n. 1, jan./jun. 2006.

GOODMAN, L. Snowball sampling. **Annals of Mathematical Statistics**, v. 32, p. 148-170, 1961.

GURGEL, A. M. et al. Framework dos cenários de risco no complexo da implantação de uma refinaria de petróleo em Pernambuco. **Ciência & Saúde Coletiva**, v. 14, n. 6, p. 2027-2038, dez. 2009.

LAWINSKY, M. L. de J. **Diálogo entre os conceitos de abordagem ecossistêmica à saúde humana e de vigilância a saúde no Brasil**. 2012. 131 f. Dissertação (Mestrado em desenvolvimento sustentável) – Universidade de Brasília, Brasília, 2012.

MACHADO, E. A. **Cidades saudáveis**: relacionando vigilância em saúde e o licenciamento ambiental através da geografia. 2007. 132 f. Dissertação (Mestrado em Geografia) – Universidade de Brasília, Brasília, 2007.

MINAYO, M. C. de S. Saúde e ambiente: uma relação necessária. In: CAMPOS, G. W. S. et al. **Tratado de saúde coletiva**. São Paulo: Hucitec, 2009. p. 81-109.

_____. **O desafio do conhecimento**: pesquisa qualitativa em saúde. 13. ed. Rio de Janeiro: Hucitec; Abrasco, 2013.

OMS. Organização Mundial da saúde. **Avaliação do impacto na saúde como parte da estratégica ambiental**. Organização Mundial da saúde, escritório regional para Europa, nov. 2001.

PASSOS, H.; CUTOLO, L. R. A. Enfoque Ecossistêmico da Saúde. **Rev. Saúde & Transformação Social**, Florianópolis, v. 3, n. 2, p. 4-16, abr./jun. 2012.

PORTO, M. F. de S.; ROCHA, D. F. da; FINAMORE, R. Saúde coletiva, território e conflitos ambientais: bases para um enfoque socioambiental crítico. **Ciênc. saúde coletiva**, Rio de Janeiro, v. 19, n. 10, p. 4071-4080, out. 2014.

RIGOTTO, R. M. Inserção da saúde nos estudos de impacto ambiental: o caso de uma termelétrica a carvão mineral no Ceará. **Ciência & Saúde Coletiva**, v. 14, n. 6, p. 2049-2059, dez. 2009.

SANTOS, M. **Por uma outra globalização do pensamento único à consciência universal**. Rio de Janeiro: Record, 2001. p. 96.

SANTOS, M.; BECKER, K. B (org). **Território, territórios:** ensaios sobre o ordenamento territorial. Rio de janeiro: Lamparina, 2007.

SCOTT, P. Re-assentamento, Saúde e insegurança em Itaparica: um modelo de vulnerabilidade em projetos de desenvolvimento. **Saúde e Sociedade**, v. 15, n. 3, set./dez. 2006.

WEIHS, M.; MERTENS, F. Os desafios da geração do conhecimento em saúde ambiental: uma perspectiva ecossistêmica. **Ciência & Saúde Coletiva**, v. 18, n. 5, p. 1501-1510, maio 2013.

Submitted on: 08/10/2015
Accepted on: 23/01/2018
http://dx.doi.org/10.1590/1809-4422asoc0245r3vu18L1TD
2018;21:e02453
Featured Topics

REPERCUSSIONS OF ENVIRONMENTAL TRANSFORMATIONS PRODUCED BY HYDROELECTRIC POWER PLANT CONSTRUCTION FOR THE HEALTH OF LOCAL FAMILIES

***Resumo*: Introdução**: os efeitos à saúde humana devido às transformações do ambiente pela instalação de uma usina hidrelétrica podem ser de ordem física ou mental. **Objetivo**: identificar as repercussões na saúde decorrentes da implantação da Usina Hidrelétrica de Foz do Chapecó, a partir da ótica das famílias atingidas. **Método**: trata-se de um estudo qualitativo, realizado com famílias agricultoras atingidas pelo reservatório da Usina Hidrelétrica Foz do Chapecó. **Resultados**: a transformação do ambiente gerou repercussões na saúde humana, que resultaram principalmente em doenças como depressão, hipertensão, insônia e alcoolismo. **Conclusão**: diante dos resultados apresentados, faz-se necessário considerar, além dos aspectos ambientais e sociais, questões relativas à saúde das populações atingidas, quando se avalia os impactos gerados pela instalação de uma usina hidrelétrica.

***Palavras-chave*:** Saúde pública; Saúde ambiental; Ambiente; Energia elétrica.

***Abstract*: Introduction:** the effects on human health of environmental changes brought about by the installation of a hydroelectric power plant may be physical or mental. **Objective:** to identify health impacts from the implementation of the Foz do Chapecó Hydroelectric Power Plant in the perspectives of the affected families. **Methodology**: a qualitative study was conducted with farming families affected by the reservoir of the Foz do Chapecó Hydroelectric Power Plant. **Results:** the transformation of the environment generated impacts on human health engendering illnesses like depression, hypertension, insomnia, and alcoholism. **Conclusion:** results presented in this paper indicate that, in addition to environmental and social aspects, questions relating to the health of the affected population must be taken into account when assessing the impacts generated by the installation of a hydroelectric power plant.

***Keywords*:** Public health. Environmental health. Environment. Electricity.

***Resumen*: Introducción**: los efectos a la salud humana debido a las transformaciones del ambiente por la instalación de una hidroeléctrica pueden ser de orden física o mental. **Objetivo**: identificar las repercusiones en la salud decurrentes de la instalación de la Usina

Hidroeléctrica Foz del Chapecó, a partir de la óptica de las familias afectadas. **Método**: se trata de un estudio cualitativo, con método de análisis de contenido, realizado con las familias agricultoras afectadas por el reservorio de la Usina Hidroeléctrica Foz del Chapecó. **Resultados**: la transformación del ambiente generó repercusiones en la salud humana, que resultaron principalmente en enfermedades como depresión, hipertensión, insomnio y alcoholismo. **Conclusión**: frente a los resultados presentados, es necesario considerar, además de los aspectos ambientales y sociales, las cuestiones relativas a la salud de las poblaciones afectadas cuando se evalúa los impactos generados por la instalación de una usina hidroeléctrica.

***Palabras-clave*:** Salud pública. Salud ambiental. Medio ambiente. Energía eléctrica.