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PERCEPTION OF CHANGES CAUSED BY THE PACIFIC ROAD IN THE BORDER BETWEEN BRAZIL AND PERU

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ABSTRACT - Road construction may cause environmental, economic and social changes that may have an impact into human health. While major changes are associated with such entrepreneurs, only a few studies has been done about the construction of the Pacific road in Acre and Peru, most of them related to environmental changes only. In this study, we have analyzed the perception of changes caused by the construction of the Pacific road (connecting Brazil, Peru and Bolivia to the Pacific Ocean) among the inhabitants of Assis Brasil (Brazil) and Iñapari (Peru). These are two neighboring cities in the border between Brazil and Peru. About 108 subjects were interviewed in both cities using a questionnaire with qualitative and quantitative questions, applied by Brazilian and Peruvian researchers in order to minimize cultural differences. Our study showed that for some topics, perception of changes fostered by the road varied between cities, while for other topics, similar opinion was prevailed. Paving of the road was perceived as causing improvement in the local commerce and in the quality and variety of food available, but at the same time it was associated with increased violence and drug traffic.

PALAVRAS CHAVE: Social perception, border areas, International highway

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INTRODUCTION

Determinants of diseases and its relationship with the environment have been studied by Dahlgren and Whitehead (Dahlgren et al. 1991), who proposed a model in which four layers of determinants affect human health: individual intrinsic factors (such as age, sex and genetic factors), individual lifestyle factors and behavior (which may be modulated by external determinants, such as cultural factors), social and community influence (which may modulate by lifestyle), and general socioeconomic, cultural and environmental conditions, including education, work environment, food production, living and working conditions, employment opportunities, water and sanitation, housing conditions and health care services (Dahlgren et al. 1991).

Road building may cause environmental, economic and social changes (Leonel et al. 2008; Naime. 2002), that according to Dahlgren and Whitehead´s model may have an impact into human health (Dahlgren et al. 1991). Such changes are water, soil and air quality impairment, economic losses due to land expropriation, lifestyle changes, community disruption, increased population mobility and landscape modifications (Naime. 2002). Road building or paving may lead to other structural changes such as hydroelectric, mining camps, timber extraction and manufacturing and large agricultural entrepreneurships, as well as causing an accelerated urbanization process (Leonel et al. 2008).

Roads facilitate both immigration and emigration, causing changes in the demographic profile of a community and its social behavior, possibly increasing violence (Brown et al. 2002). It can also facilitate the introduction of new diseases and pathogens, such as diarrhea cases in Ecuadorean Amazon (Eisenberg et al. 2007), malaria prevalence in Brazilian Amazon (Coimbra. 1988), increased dengue vector along new roads in India (Dutta et al. 1998), and elevated number of HIV cases in Uganda (Carswell. 1998). Non-transmissible diseases can also be modified, if food production or supplies are affected.

In 2001 the Brazilian government started to build the Pacific road (now called Interoceanic road), connecting the Amazon portion of Brazil, Peru and Bolivia to the Pacific Ocean. This road has 340 km in the Brazilian territory and 2,500 km in Peru. It costed 440 million dollars and it was build to connect the Atlantic and Pacific coast and promote the economic integration of these countries within themselves and with the US, Canada, Singapore, China, Thailand, South Chorea, Japan and India (Agência de notícias do Acre, 2009).

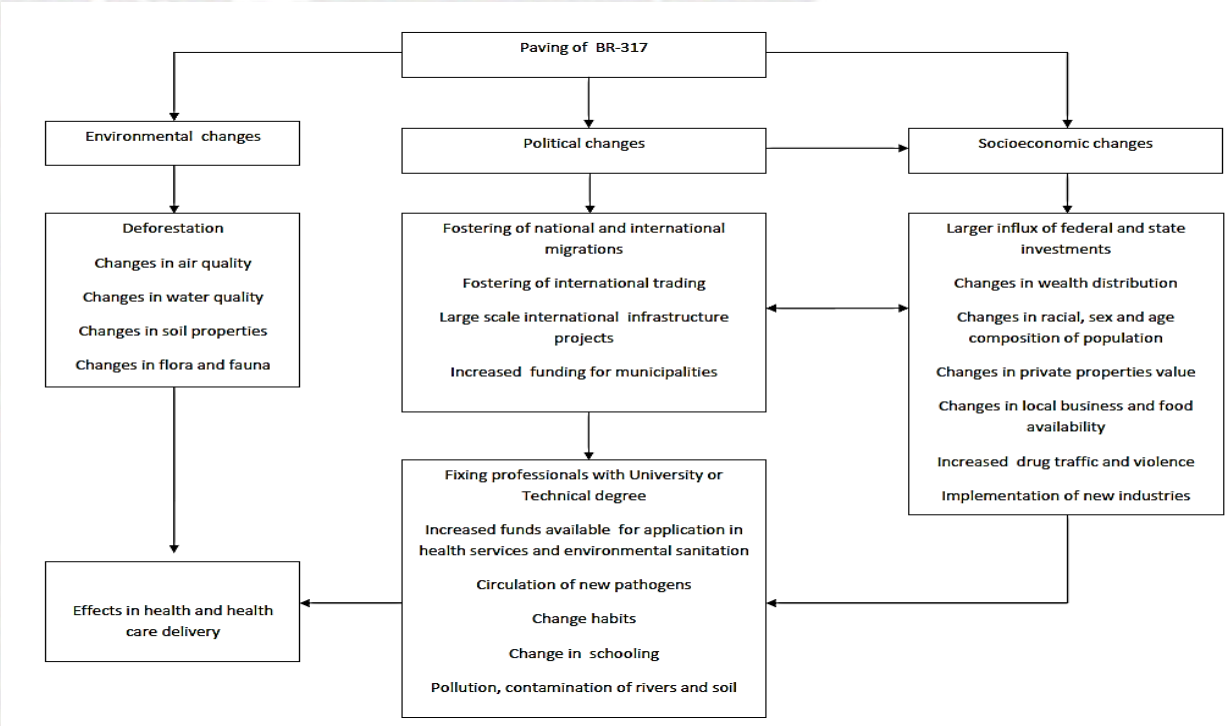
Brazil, Peru and Bolivia all have small cities that are being connected by this road. Assis Brasil, Acre, Brazil, Iñapari, Peru and Bolpebra, Bolivia, are three cities that border each other, and the first two are placed along the Pacific road. The physical connection provided by the road also has a political influence and brings both a political and social connection, since people from the three countries can circulate along the road between the three countries without a visa. Brown et al. (2002) calculated the area of influence of the Pacific road in about 120,000 km2, involving 500,000 inhabitants that live in the three countries.

The Brazilian portion of the road was inaugurated in December 2002, but the bridge over the Acre river, between Acre and Peru, was only finished in August 2004. Before that, all traffic between Rio Branco, the capital of Acre, and Assis Brasil, was done on an unpaved road, taking several days. By middle 2006, the portion between Assis

Brasil, in Acre, and Puerto Maldonado, in Peru, was initiated, and it was finalized by middle 2009, except for the last ten km. The road between Puerto Maldonado, in the Peruvian Amazon, and Cusco, in the Peruvian Andes was ready by 2011, and finally the bridge over Madre De Dios River, in Peru, was delivered in July 2011.

The aim of the present study was to analyze the perception changes caused by the construction of the Pacific road several years latter its finishing among the locals from Assis Brasil, Brazil and Iñapari, Peru, both small towns directly affected.

Figure 1 - *Conceptual model of possible changes caused by paving of the Pacific road.*



Source: Modified from Naime, 2002 and Leonel *et al.,* 2008.

METHODOLOGY

Study area and population

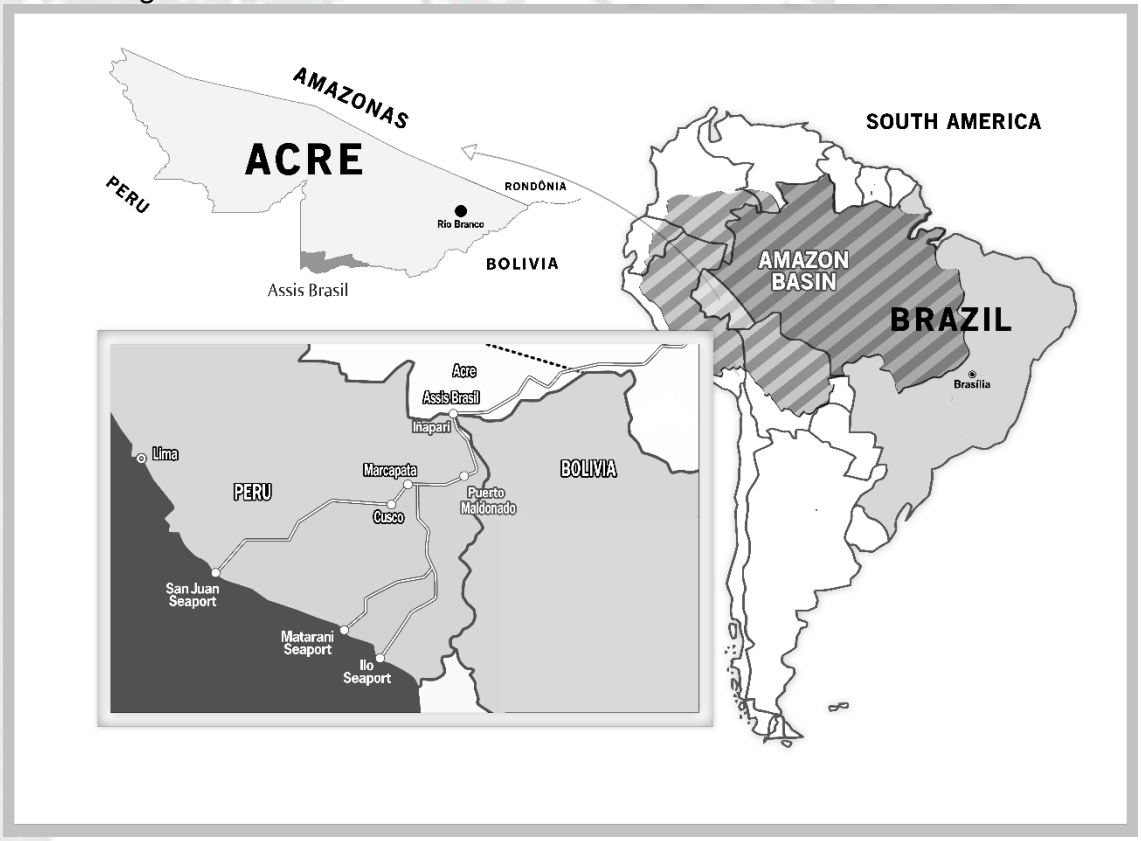
Assis Brasil, a city created in 1976 from old established communities in areas of rubber plantations, has a population of 6,075 inhabitants (IBGE, 2010), of which 39% reside in rural areas. It has an area of 4,974 km2 distant 344 miles southwest of Rio Branco. The city borders the municipality of Brasileia to the east, the cities of Iñapari (Peru) and Bolpebra (Bolivia) to the south, and the municipality of Sena Madureira to the north (Figure 1). The climate is equatorial hot and humid. It features a predominantly rainy season between November and April and a predominantly dry season between May and October. The average annual temperature is 24.5 ° C, ranging between 20 ° C and 32 ° C. The relative humidity is 80-90% throughout the year. The annual rainfall is between 1,600 mm and 2,750 mm. The native vegetation is open rain forest with palm trees and tropical rain forest (SEIAM, 2006).

The human development index (HDI) estimated in 2000 for the general

population of the municipality is 0.670 (SEIAM, 2006), with a mortality rate of nine per 1,000 live births (IBGE estimate for 2009, data not published). The illiteracy rate is 29.05% (PNUD, 2000).

The municipality of Iñapari, with 21,126 km^2, is located in the department of Madre de Dios province of Tahuamanu, in Peru. It is bordered by the Acre River (Brazil) and Yaverija River, in Bolivia (Figure 2). This city is 241 km far from Puerto Maldonado, the capital of Madre de Dios state. In 2007, it had 996 inhabitants (INEI, 2008), and the projected population for 2010 is 1,434 people (Instituto de Urbanismo y Planificación Del Perú, 2009). There is no published data for Iñapari, but the mortality rate for Madre de Dios department for 2001 was 17 deaths for each 1,000 live births (Mesa de concertación para la lucha contra la pobreza, 2002).

Figure 2 - Map showing the location of Brazil, the Amazon, Acre state and the municipality of Assis Brasil. The map inside the box shows the Interoceanic Highway connecting Brazil to the Pacific Ocean.



Study population and sampling strategies

The study was conducted in Assis Brasil in February 2010 by the Brazilian interviewers, who spent 45 days collecting the data. One of the interviewers (MdaSN) also spent a month in Assis Brasil in 2003, so she knew the city before the road was paved.

In order to cover for the entire space and due to limited resources, we chose to interview four subjects per street block, randomly selecting one house in each face of the block. Seventy-eight individuals were randomly selected in Assis Brasil. The criteria included being older than 18 years-old, and living in Assis Brasil before 2003.

In February 2011 the interviews were conducted in Iñapari by Peruvian researchers, who stayed in the city for 30 days. Due to the smaller population and urban area size, only 30 adults over

18 years-old that had been living there before the year 2004 were interviewed. These adults were randomly chosen, four per each street block.

Figure 1 shows a conceptual model of possible changes caused by the construction and paving of the Pacific road, modified from Naime, 2002 and Leonel et al., 2008, including environmental, political and socioeconomic changes. This conceptual model was used to create the questionnaires used in the interviews.

Two questionnaires were applied, one containing questions about demographic information (age, sex, race, years of schooling, place of birth and citizenship, religion, marital status, occupation and time of residence in the city), and a second one with quantitative questions about the perception of the individual about the following topics: education, health care, local business, food diversity and availability, job offer, general infrastructure of the city, sewage system, water supply, garbage disposal, violence, drug traffic, newcomers, environmental changes, stipend, life in general. Each subject was asked if there were any perceived changes in each topic and if they were for better or for worse.

Taking into account the cultural aspects of each country, the qualitative responses were analyzed respectively by Brazilian and Peruvian researchers for better understanding of the results, who had previously stayed in each city for a long period of time.

Ethical considerations

The study was performed according to ethical guidelines from both countries, and received ethical clearance in both countries prior to its start (number 23107.008153/2010-92-Brazil and number 2010-CI-59 – INS - Peru).

RESULTS

Subject characteristics

In Assis Brasil, 34.6% of the subjects were males and 65.4% were females. The declared race was 21.1% white, 10.5% black and 68.4% mulatto. In relation to the citizenship, 97.4% were Brazilians and the others were either naturalized, in the process of legalization or without a visa. The average age was 37.43 years, and the median age was 35.0 (minimum age 18 years and maximum age 86). About 47.4% were born in Assis Brasil, 16.7% in Brasileia, 15.4% in Sena Madureira (all municipalities of Acre state), 17.7% are from other municipalities or other state of Acre in Brazil, and 2.8% from other cities in Peru.

The religion was Catholic in 57.3%, Evangelical in 33.3% and other in 9.3%. The marital status of the population showed the following values: 20.6% were single, 44.1% were married, 22.1% were in a stable relationship, 7.4% were divorced and 5.9% were widowed. Regarding education 90.7% of respondents attended or were attending school (40.0% had completed the elementary school, 42.9% completed high school and only 17.1% had a university degree), 8.0% were illiterate and 1, 3% did not attend school but could read and write. The respondents worked in the public service (32.1%), private jobs (10.3%), as housewives (25.6%) or other jobs (informal economy, unemployed, student or retired). The mean and median time of residence in Assis Brasil was 24.88 and 22.50 years respectively, with a maximum of 62 years and a minimum of 8 years (Table 1)

In Iñapari, 52.0% of the subjects were males and 48.0% were females. The declared race was 4.0% white, 92.0% black or indigenous and 4.0% mulatto. In relation to the citizenship, 96.0% were Peruvians and 4.0% were

Brazilians and the others were either naturalized, in the process of legalization or without a visa (Table 1).

Table 1 –Characteristics of subjects interviewed in Assis Brasil, Brazil (2010) and Iñapari, Peru (2011).

	Assis Brasil (n=78) (%)	Iñapari (n=30) (%)
Sex		
Male	34.6	52.0
Female	65.4	48.0
Declared race		
White	21.1	4.0
Black	10.5	0.0
Indigenous origin	0.0	92.0
Mulatto	68.4	4.0
Citizenship		
Brazilian	97.4	4.0
Peruvian	2.6	96.0
Years of schooling		
None	1.3	1.9
1 to 4 years	40.0	5.8
5 to 8 years	41.6	24.0
> 8 years	17.1	68.3

Source: Data collected by authors, 2010 and 2011.

Perception of changes caused by the Pacific road in both cities

Table 1 shows the general perception of changes caused by the Pacific road for each city. In Assis Brasil, the majority (52.6%) responded that there were good and bad changes, 39.5% (n = 30) found that there were only good changes, 2.6% (n = two) found that there were only bad changes, and 3.9% (n = three) found no changes. In Iñapari, the perception tended to be towards mixed changes (70.0% related improved and worsened conditions), only 26.7% (n=eight) found that there were only changes for the better, and 3.3% (n=one) found that there were only bad changes.

Analyzing the perception of the changes brought about by the construction of the road to Assis Brasil (Table 2), one can observe that most respondents perceived improvements in the following items: education (83.3%), healthcare (74.4%), local business (88.5%), variety and supply of food (89.7%), job opportunities (59.0%), structure of the city (89.7%), water supply (68.9%), garbage collection (92.4%), new residents (57.3%) and life in general (87.2%). On the other hand 80.8% of people surveyed said that drug trafficking or drug use in the city

worsened after the construction of the road, as well as violence (73.1%).

Environmental changes regarding the climate and rivers of Assis Brasil also worsened for the majority of people surveyed (67.9% and 51.3 %, respectively). There were no perceived changes in the sewage system of the city for the majority of respondents (66.0%). There was no association between gender, legal status, marital status, income, religion, race, education level and occupation with the perception of the changes brought about by the construction of the Road (α = 0.002, Chi-square test).

Table 2 – Perception of the changes brought by the Pacific Road for the inhabitants of Assis Brasil, AC, 2010.

	Not changend (%)	Improved (%)	Worsened (%)	Good and bad changes (%)	Does not know (%)
Education (n= 78)	7,7	83,3	3,8	0,0	5,1
Healthcare (n=78)	14,1	74,4	5,1	5,1	1,3
Local trade (n=78)	1,3	88,5	5,1	2,6	2,6
Range and food supply (n=78)	6,4	89,7	1,3	0,0	2,6
Job offer (n=78)	17,9	59,0	11,5	3,8	7,7
Changes in your job (n= 65)	44,6	32,3	10,8	1,5	10,8
City structure (n=78)	3,8	89,7	3,8	0,0	2,6
Sewage (n= 53)	66,0	17,0	11,3	3,8	1,9
Water supply (n=45)	20,0	68,9	8,9	0,0	2,2
Garbage collection (n=66)	6,1	92,4	0,0	0,0	1,5
Violence (n=76)	14,1	10,3	73,1	0,0	2,6
Traffic or drug use (n=78)	3,8	5,1	80,8	0,0	10,3
Newcomers (n=75)	8,0	57,3	10,7	14,7	9,3
Rivers of Assis Brasil (n=78)	28,2	7,7	51,3	2,6	10,5
Climate of Assis Brasil (n=78)	16,7	9,0	67,9	0,0	6,4
Rain of Assis Brasil (n=74)	33,8	10,8	45,9	0,0	9,5
In its monthly rent (n=62)	37,1	40,3	14,5	1,6	6,5
In your life in general (n=78)	10,3	87,2	1,3	0,0	1,3

Source: Data collected by authors, 2010.

Analyzing the data about the perception of the changes in Iñapari (Table 3), one can note that improvements were felt by the majority of respondents in the local business (86.7%), supply and variety of food (96.7 %), job opportunities (76.7%), structure of the city (76.7%), personal income (60.0%) and life in general (80.0%). The main unfavorable changes were perceived in the items violence (73.3%), rivers (50.0%), climate of the city (46.7%) and rainfall patterns (50.0%). Most of the inhabitants of Iñapari did not notice a change in education (53.3%), and the sewage system (56.7%). Regarding the item health services, 80% felt that there was no improvement or that it worsened after road construction. As for the garbage collection, 46.7% found that it improved, while 46.7% felt no change. The perception about new residents was of improvement for 43.4% and good and bad changes for 43.3%. Interestingly, almost half of the respondents chose not to opine on drug trafficking in the city.

Table 3 – Perception of the changes brought by the Pacific Road for the inhabitants of Iñapari, Peru, 2011 .

	Not changend (%)	Improved (%)	Worsened (%)	Good and bad changes (%)	Does not know (%)
Education (n= 78)	53,3	16,7	23,3	3,3	3,3
Healthcare (n=78)	40,0	20,0	40,0	0,0	0,0
Local trade (n=78)	3,3	86,7	6,7	3,3	0,0
Range and food supply (n=78)	3,3	96,7	0,0	0,0	2,6
Job offer (n=78)	16,7	76,7	3,3	3,3	0,0
Changes in your job (n= 65)	3,8	73,1	11,5	11,5	0,0
City structure (n=78)	23,3	76,7	0,0	0,0	0,0
Sewage (n= 53)	56,7	30,0	3,3	10,0	0,0
Water supply (n=45)	46,7	40,0	6,7	6,7	0,0
Garbage collection (n=66)	46,7	46,7	3,3	3,3	0,0
Violence (n=76)	16,7	10,0	73,3	0,0	0,0
Traffic or drug use (n=78)	6,7	13,3	33,3	0,0	46,7
Newcomers (n=75)	3,3	43,3	10,0	43,3	9,3
Rivers of Assis Brasil (n=78)	50,0	23,3	23,3	3,3	10,5
Climate of Assis Brasil (n=78)	43,3	6,7	46,7	3,3	0,0
Rain of Assis Brasil (n=74)	30,0	10,0	50,0	6,7	3,3
In its monthly rent (n=62)	36,0	60,0	4,0	0,0	0,0
In your life in general (n=78)	13,3	80,0	6,7	0,0	0,0

Source: Data collected by authors, 2011.

Subject´s speech and Perceptions of changes

Education

Although 83% of the population of Assis Brasil perceived improvements in education, the majority was not able to identify in which way the road directly modified education levels. Most people said the improvements were the construction of a university campus at the city and the arrival of new professors. A small percentage of those interviewed pointed out a direct change caused by the road, which was the facilitation of the access between the rural and urban areas (“In old times children did not attend school because there were no ways of coming to the city. Several times they would take a boat and that was expensive, nowadays the road facilitates the transport of the students, and it increases the number of teachers that come even from other states”). We believe the paved road connecting Assis Brasil with Rio Branco and other cities allow greater mobility and favours the circulation of qualified human resources that could not circulate before due to geographical isolation.

On the other hand, these changes seem not to have happened in the neighboring city Iñapari. Most of the people interviewed did not perceive any changes (“Schools remain the same, disorganized, only the teachers changed. Parents have to pay for the infrastructure”, “The education is poor, teachers are not trained, they do not follow the curriculum, the infrastructure is not appropriate, the education programs of the government take long to

arrive", " We follow the same curriculum of 10 years ago"). Although the road brought new people to the city, it seems that it is not attracting qualified workers to Iñapari, as opposed to what happened to Assis Brasil. It is possible that the implementation of the University campus in the Brazilian side has had no effect in the Peruvian city. Other difference is that the perception of Brazilians is directed towards physical access to the school, while the Peruvian perception is more concerned about the quality of the school.

Health care

About 25% of subjects interviewed in Assis Brasil referred and improvement in the health care system. This could be due to the possibility of referral of emergency cases to other cities with better health care delivery. As one subject said: "At the beginning when somebody was sick they had to ask for a helicopter, or they had to suffer three days in the road, or in the river." The road facilitated the removal of patients as well ("The buses would stay several days in the unpaved road, the pregnant women that were being sent to deliver their babies in other cities did not have time to arrive there, they need a cesarian surgery and would die during the trip because there was not enough time to get to the hospital due to the conditions of the road"). A few subjects mentioned the construction of new health care units after the completion of the road.

Health Services are still perceived as a deficient area by 40% of the population in Iñapari. For some people, the road was not able to bring new doctors or improve the availability of drugs ("It remains the same, without water in place, medical students, shortage of medicines, lack of human resources, inadequate infrastructure"), while for others, the road made it harder to have human resources fixed in the health system (Before the doctors stayed in the post for more time, medical attention was better, now doctors travel a lot. When there is an emergency we have to go to Assis Brasil").

Therefore, the perception of the effect of the road is the opposite between the two cities: while Brazilians see the road as facilitating the arrival of new doctors and the referral of sick patients, Peruvians see the road as a reason for less medical care.

Local business

The possibility of easier access fostered by road paving changed the local business in Assis Brasil, since people and goods take less time to arrive to the city. The subjects also commented on the increased number of local business, what diversified the options and incurs in cheaper goods ("The business in Assis Brasil increased, the monopoly that used to be is not present anymore, there are no persons saying "I am the only person selling this", the competition increased"; "Now we have more options of commerce: before the gas would come from Rio Branco, they put the price they wanted, and you had to give the exact change because they would not change your money, now there is competition and the prices are lower, they even delivery it to our homes.")

The perception of Iñapari people about the local business is similar. They perceived an improvement due to increased number of stores, increased availability of Brazilian products, and opening of new restaurants. ("The city grew, merchants came from all over, the number of restaurants increased", "There was an increase in the number of products for sale and Brazilian products come more easily and in larger quantities than before", " New locations were opened"). The construction of the bridge allowed an intense transit during

the weekends, fostering the opening of new restaurants in the Peruvian side, which offer cheaper food than the Brazilian side due to economical differences (at the time of the study one real was worth 50% more than the Peruvian money).

Food availability and diversity

Before the Transocean road, the diversity of food in Assis Brasil was based in subsistence agriculture. This was due to few options in the local commerce, as discussed above, and difficulties in the delivery of food to the city. The road facilitated the arrival of fresh food, what was impossible before during the rainy season. At that time only poor quality food was delivered by the river, and that would take a long time ("The goods now arrive faster, before it came by boat and it took a long time, the boat stranded, and most of the food used to get rotten").

The impact that the road brought to the diversity of food was so huge that 90% of the people interviewed in Assis Brasil referred a substantial improvement, and the situation of lack of food in the past is vividly remembered by all: "In old times people had to grow their own vegetables because there were no vegetables to buy, we had to wake up very early to buy meat, there was only one cow per week for the whole city, many people were starving. Now there are four big supermarkets in the city that offer fresh meat in large quantities"; "Before there was only pork and beef and in very small quantities, we had to wake up at dawn to buy meat, today with the road there is more fresh meat and greater variety of food"; " In old times we did not find fruits from other cities in the market, today we can buy fruits even from the south region in the markets, as well as fruits from other countries like Peru."

In Iñapari the perception of changes in food availability and diversity is similar to Assis Brasil. The road is also facilitating the arrival of fresh food and products that were not available before, and at the same time these foods are getting cheaper ("Nowadays the trucks bring vegetables once a week, it used to be once a month before", "One can find even fish from the sea", "The road allowed a larger variety of food that are cheaper"). The sea food comes from the Pacific ocean, directly from Lima to Puerto Maldonado by plane and then delivered by road to Iñapari. The arrival of fresh sea food is only possible because the road is now paved between Puerto Maldonado and Iñapari.

Job offer and personal income

The improvement in job offer follows the improvement of local business and the possibility of arrival of new goods in the city. Those that perceived an improvement in this topic in Assis Brasil put great emphasis in commerce changes, what make us believe that the increase in job offers are due to business expansion fostered by paving of the road ("Now there are lots of people with a job, before there was almost no commerce, now there are many for the people to work). One subject interviewed referred that the local business only increased due to the arrival of newcomers ("More people came to the city what increases the commerce and increased job offers"). The improvement in personal income was mostly associated with increased offer of public jobs. None of the people interviewed connected these changes directly with the road construction.

Better job opportunities are perceived in all areas in Iñapari, but especially in the timber extraction. ("All types of jobs increased, especially in the business of timber extraction"). People that perceived improvements in their own jobs refer that it improved because the selling is better and it is easier to

buy products to sell ("It has more customers, it is easier to get products to sell. Wholesalers come to Iñapari, but before you had to go to Puerto Maldonado to buy products to sell").

General Infrastructure of the city

Many people in Assis Brasil perceived an improvement in the city infrastructure. "They built the University campus, a new hospital, changed the square, did the football pitch, built a high school, did sidewalks." "At first there was mud in the whole city, now there are many places we can walk better than before". However only few people could make a direct connection between road paving and primary or secondary effects into the city, as one said: "It is easier for people now to bring building materials, now we can build lots of things", and "People are more worried now how the city looks like because there is more people passing by, no way to leave it as it was before"

The structure of Iñapari was also described as better because due to new sidewalks, improved paving of the streets and more recreational areas ("There are more sidewalks, more drainage pathways for the rains, more paved roads, more parks and squares").

Water supply and garbage treatment

Three speeches show the old problems in water supplies: "In old times there was no water, the truck would come only once and now everything is good", "Before there was frequent lack of water and now there is no lack anymore, in old times the city was not paved and there was a lot of mud, the truck could not pass due to it.", "The water delivery system improved, before there were frequent rationings. " One speech shows how people perceive the new water system delivery: "Water was from mines and it was good, now it comes from the river and it is treated, but it is full of chlorine". Although the general perception was of improvements in water supply, nobody correlated it directly to road construction. We believe the changes in water delivery system are due to public policies than a direct effect of road paving.

The same perception is present about waste disposal. In the quantitative analysis this was the item that showed greater improvement (92,4%). None of the subjects interviewed related it to the road, suggesting this improvement was due to better public policies than to a primary effect of road paving. These speeches show how it was before: "Everything was left in open spaces… Improved a lot, before dogs and vultures fought for the garbage, today we don't see garbage in the streets anymore", "There was a lot of garbage in the middle of the street, vultures, but the sewage system is still the same", " it was full of dogs and vultures… If there is one thing that improved was garbage disposal.

In the Peruvian side, the predominant perception was of absence of changes. The majority of the people did not notice an improvement neither in the sewage system ("It is the same, deficient"), nor in the water system ("The water system remains the same, the treatment is not good, sometimes they put too much chlorine in the water", "It remains the same, there is water supply only for two hours per day."). No changes were perceived in the garbage removal as well, since no special treatment is given to the city waste ("It remains the same, only the main streets there is garbage removal every day, so far there is no specific place where to accommodate all the garbage of the city.").

Violence and drug traffic

Many subjects (73.1%) believed there was an increase in violence in the city, what is possible due to newcomers

and more people in transit by the city. However, during the second day of interviews there as a murder in the city, and this may have had an acute impact in their perception. The fact that the road has facilitated the income of new people and travelling to other places may also influence the level of violence, as they say: “The violence increased, there are lots of people from other places and their habits are different”, “Young people go to the capital Rio Branco and when they come back they are in the big city ‘pace’, and there are lots of people from other places as well.” The majority of subjects interviewed in Assis Brasil perceived an increase in the drug traffic, relating it to easier ways to deliver the drugs (“ It increased due to the road access, the road facilitate the arrival of the drugs to the consumers”, “ Now with the bridge between Brazil and Peru it is easier to bring the drug to this city”, “It is crazy now, I don’t know if it is due to toe bridge or the road, but it is madness that goes on here, the drugs pass the international borders”). However one interviewed believed that drug traffic is more controlled now due to Customs and road oversight: “Before the road there were two people that were caught with drugs, now with the road more than 30 young people were arrested, real drug dealers.”

In Iñapari most people interviewed did not want to answer this question, replying they did not know to evaluate the changes (46.7%), but two speeches show that the drug traffic has also increased in the city (“ Drug traffic has increased, the police does not perform an adequate inspection, many of them receive bribes to let the drug pass. The teenagers very early in life start to serve as mules so they can earn some money” and “Iñapari is a new route for the drug traffic”). We believe that the differences between Assis Brasil and Iñapari reflect reluctance or fear of talking about drug traffic in Peru.

Newcomers to the city

Regarding the newcomers, more than half of the subjects interviewed in Assis Brasil believed there was a change for better, relating this with the new things these people can incorporate to the city. One subject said: “We did not have cattle raising activities, the newcomers brought it to here. Everybody that arrived contributed somehow to the development of the city. “At the same time, some people associated the arrival of newcomers with increasing violence: “Newcomers contributed to the development of the city, but as many people we have more violence we have. Some people arrive with different ways of life, what is troublesome.” Another subject commented that most of the newcomers were in fact people moving from the rural areas to the urban areas: “There is more people in the city, because many people that come to the city are farmers that leave the rubber tree plantation and come to the city, and that decreases the rubber production.

In Iñapari the road is also perceived as an instrument of connection between people, bringing newcomers and relatives to visit, but at the same time facilitating other things to happen. (“The road …allows the arrival of new residents to Iñapari”, “Now people from far away come to visit us, with the construction of the road that is easier”, “There are new residents in the city, they bring more expenditure, employment, but also violence and drugs.”)

Environmental changes

The subjects interviewed were not able to correlate the changes in Assis Brasil rivers with the construction of the road, but they pinpointed several changes, such as “less fish, less water, the boat used to come loaded with 18 tons, now if it comes like that it will not

be able to travel. The deforestation that occurred at the margins of grotas and mines trashed the Acre River. These small mines contributed to form the Acre River". Other subject correlated the increase in garbage following the growth of the city: "With the people that comes from the city the local river here has suffered. When the city gets bigger the river suffers with pollution and deforestation, as it occurs in big cities like Sao Paulo. "

Many of the subjects interviewed noticed a hotter weather in the Amazon: "Before there was winter and summer, now we don´t know if it is hot or cold, the weather is out of control.". We believe that can be partly caused by the road construction, due to the deforestation process and the urbanization process , as we can see in the speech of two subjects (" It is hotter now, the city is bigger, it has three or four new districts, then the deforestation gets bigger and it gets hotter" and "More people arrives, more trees get cut and it gets hotter…"), but it may also be related to the global heating process (" The weather changed due to the deforestation, fire outbreaks, construction, and paving of roads and streets…").

The perception of environmental changes in Iñapari also tended to be for worsening, although the participants could not establish a clear connection between the road and the environment. The weather was perceived as hotter (The heat increased in recent times, it prevents us from working, even farmers are harmed. The cold has diminished, there is no cold season anymore"), and the rains as more destructive (The previous year it rained from November to January, now it is raining until March").

Life in general

The road seems to have brought many socio-economic changes that resulted in a new perspective of life ("People did not see a future in life, today they speak of a better future, even for their children"). The road favored local business and the implementation of a local university. This contributes for a better qualification of human resources, what together with increased job offers increased people´s income ("It gets easier now to have a degree and get bigger incomes").

When we investigated the topic " life in general" many people referred an improvement, this is due to changes in job offer, health services, education, food supplies, among others, what demonstrates that the quality of life of the population of Assis Brasil increased and some inequalities decreased (" with the road I can eat better, spend less, my salary can buy more things, my son can go to the University here" and " It is much better now, you can plan your life, take vacations, you can travel being sure that you will be able to go and come back, before the road this could not be taken for granted").

People at Iñapari also believe their life in general has improved and things got easier with the road ("I am in a better economic situation now, I am building my house", "it is easier to live here, there are more jobs and it is easier to travel from here to other places").

DISCUSSION

The paving of the Interoceanic road brought many changes to both cities in the Brazilian border, mostly seen in the local economy and easier access to other places. With a paved road time to arrive to other places was reduced from days to hours, and the road was permanently accessible throughout all seasons (Leonel et al. 2008). That helped the fixation of human resources and contributed to an increased health team work available in the city (Guimaraes 2012). It also facilitated the referral of sick patients to

larger cities, and the arrival of better food to the city, both influencing directly the health of the inhabitants. However, some deleterious changes were also perceived by the population: increased violence, more pronounced drug traffic and drastic environmental changes.

Increased violence has been long related to the construction of new roads, since it facilitates travelling. Barcellos et al. (2010) also found an increase in homicide mortality along the way of the Cuiabá-Santarem road (BR-163) in the western part of the state of Pará state and the northern part of Mato Grosso, mainly in cities with more recent migration. These changes can be attributed to conflicts between newcomers and the traditional local population for land ownership and illegal timber extraction (Barcellos et al. 2010; Fearnside et al. 2007). The same implications can be assumed for Assis Brasil and Iñapari, but the drug traffic has also being pointed as an increasing problem by the people interviewed in our study. Such problems have been anticipated in scenario studies performed by independent analyzers and non-governmental groups (Análisis e impactos de la carretera interoceánica, 2005 ; Dourojeanni, 2006; Diàz et al. 2008).

Paved roads can facilitate the access to natural resources and that will ease the delivering of goods such as food to the cities (Perz et al. 2008). At the same time, official roads constructed by the government increase the value of intact land and foster the opening of unofficial roads by common people, what by its turn accelerate the degradation of the environment and can change the climate locally (Perz et al. 2008; Trombulak et al. 2000). It will also improve local commerce, as seen in Assis Brasil and Iñapari and also in other studies (Holl et al., 2004).

This has happened in the case of the Pacific Road. Perz et al. (2008) and Almeyda-Zambrano (2004) reported that in Assis Brasil, the paving of the Pacific road led to increased timber commercial value, resulting in lack of timber in the city and fostering of illegal commerce of timber from Peru. Also, the increase in land pasture led to decreased soil water reserves and potential lack of water in the border between Brazil, Peru and Bolivia.

We also noted that the major focus of attention in each city was different. The impact of the Pacific road in each side of the border between Brazil and Peru is different in some aspects and that may explained by different development experiences that occurred in each country. It can also be explained by the fact that the early unpaved road in Brazil started in the seventies, while in Peru it took longer to have road access. Brazilians were always commenting about the improvement in physical access, but very few showed concern about the quality. On the contrary, Peruvians were much more concerned with the changes in quality over time than changes in access. This may be explained because Assis Brasil is only 331 km away from the capital of the State, with a population of 336,038 inhabitants, while the largest Peruvian city close to Iñapari is only 60,000 inhabitants (Puerto Maldonado).

The differences perceived in health care delivery between Assis Brasil and Iñapari can be explained by the fact that the medical systems in both countries are different. While health professionals are hired by municipalities in Brazil and therefore they are free to choose their job, in Peru professionals are obliged to serve for one year in a remote locality chosen by the government in order to get their permanent license. So the road may have attracted Brazilians professionals to Assis Brasil that would not want to go

there without easy road access at the same time that it enabled Peruvians already fixed in an obligatory service to travel over the weekends, or to go to larger cities to complement their professional education, such as the health courses offered in Puerto Maldonado, now only a two-hour-drive from Iñapari by the paved road.

There were two major limitations of this study. The first limitation was that some of the subjects interviewed could not directly connect the Pacific road construction with the perceived changes, and therefore some inferences had to be made. The second limitation was the scarcity of published studies in this topic to compare our results with external sources.

CONCLUSION

In Assis Brasil, the possibility of access to other localities caused by the road was able to improve the people's quality of life, although decreased some social inequities in health and education. This happened because the community was allowed to have cheap and rapid road access to larger urban centers in case they needed, and this easiness of access fostered the local fixation of better qualified manpower to work and live in the city. On the other hand, the road probably fostered an increase in drug traffic and violence, due to increased mobility, creating or increasing other social inequities.

In Peru, cultural and governmental differences resulted in a somewhat different perception of the effects of road construction, such as decreased fixation of qualified manpower. People in both countries agreed that the road allowed the arrival of better food and more jobs, though.

It is clear with this study that eight years after the completion of the road along Assis Brasil and Iñapari the flux of people and commerce between the two countries was improved as expected, bringing benefits to the health of both cities, but also generating some deleterious results such as environmental changes and increased drug traffic that may have an impact in human´s health.

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