

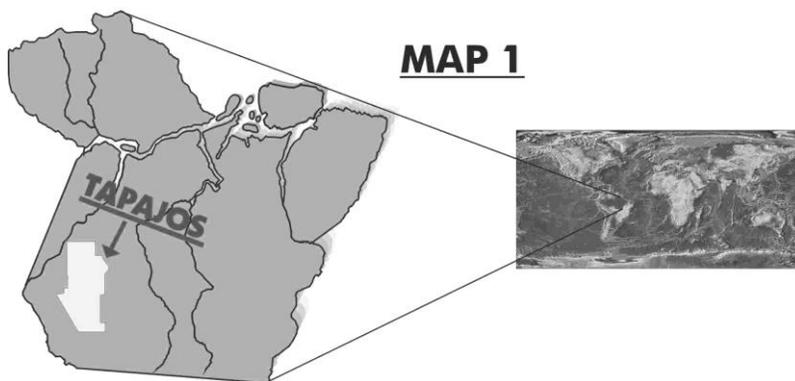
TAPAJOS GOLD GARIMPOS

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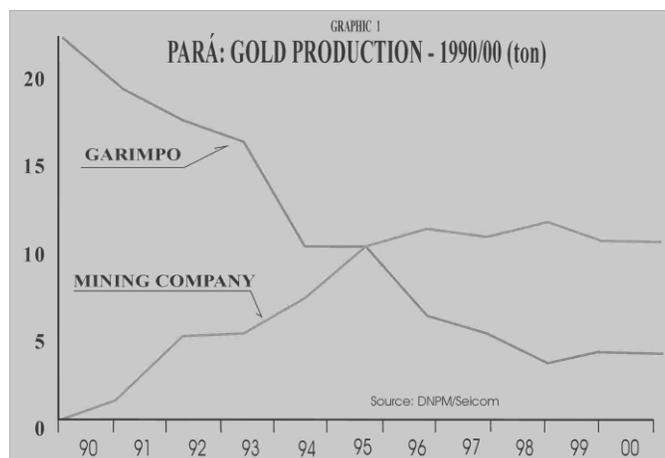
1. GENERAL ASPECTS

The Tapajos Region is situated in the Southwest of the Para State, 1,300 km straight line from Belem. The principal access is from Itaituba through commercial and private flight mainly monoengining (small air taxi) and through Tapajos River and Transamazonica and Santarem-Cuiaba road (map 1)



The Para gold garimpagem is very important to the regional economy. Its was considered the biggest mining gold production until 1995 (graphic 1).

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In the Amazon Region, the garimpagem (map 2) has an area of 236,000 km² (4,34 per cent of the total area). In the Para State, these areas reach 150,000 km² being Tapajos the largest garimpeira area in the world – 100,000 km² – and the most important garimpeira gold producer in Brazil (map 3). From 1979 to 1984, the federal government delimited a series of “Official Garimpeira Reserves” that correspond to 31,500 km² (13,3 per cent of the total area – table 1).



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Concerning to the heavy mineral history, we can observe that the main gold discoveries belong to individual works. The biggest world gold rush such as the Urais Mountain (Russia - 1744), the California (USA - 1849), the Australia (1851), the Klondike (Canada - 1896), the Witwatersrand (South Africa - 1896), the Tapajos (1958) and Serra Pelada (1980 both in Brazil). All lot them were characterized for a great number of people whom, empirically, looked for their economical independence, by individual work.

The gold is present in the Brazil's chronological history, since 1500, when the Letter of Pero Vaz de Caminha mentioned Brazil as a gold producer. The Magna Letter of 1603, which instituted the tax called gold fifth (quinto do ouro), already mentioned Para as a gold producer. In 1747, it was discovered, for the first time, gold in the Tapajos Region, and, in 1853, the same occurred in the Amapa State.

In 1958, the great first gold rush began in the Tapajos Region, transforming that area in the principal gold producer in Brazil. It was supplanted only by Serra Pelada's garimpo that was discovered in 1980 and whose the gold production decreased year by year from 1983.

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Another important step to the Brazilian gold market occurred in 1986, when the Sao Paulo Stock Market (BMF) started up the organization of the Gold Brazilian Secondary Market, an idea of the Brazil Central Bank. The Federal Constitution of 1988 according to Law nº. 7.766, of 1989, considered gold as a financial asset. The last progress occurred in August, 1994, when the Para State Government, through the Camga-Tapajos Program, tried to implant the Gold Regional Secondary Market, in Itaituba. The task force had the collaboration of many institutions, but the Brazil Central Bank led the operation. The Gold Regional Secondary Market did not obtain success, however, it began the garimpos model transformation, including the official areas legalized in the Tapajos Region.

Table 1 – Garimpeira Official Area

Place	DNPM number	Date	Area (ha)
Rondônia	1,345	10/07/79	18,935
Rondônia	1,034	21/07/80	26,642
Roraima	143	03/02/84	12,000
Itaituba – Pará	882	28/07/83	2,874,500
Serra Pelada – Pará	Law number 7,194	11/06/84	100
Cumarú do Norte – Pará	25	10/01/84	95,145
Peixoto de Azevedo – Mato Grosso	550	10/05/83	121,000

Source: DNPM

The gold has been present in humanity's history for 20,000 years, since Paleolithic period in Egypt, where had begun the gold metallurgy and techniques. The gold metal attracts many people from all the world, because of its beauty, rarity, durability and considerable valorizations. Among centuries, investors and countries have considered the gold as the most efficient and secure way to maintain reserves and value. The General Charles De Gaulle, the France President, in the peak of the discussion of the gold standard in the international monetary system, in the 60's of the last century, indicated the gold as instrument that will be eternal and universally accepted as

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the only form of unalterable and constant reserve. For this reason, when occur international crises like strikes, wars or financial and inflationary instabilities, the investor falls back upon the gold as a refuge to assure your profitability.

The Amazon Region gold garimpos, the Tapajos Region particularly, has different periods of evolution. Until 1978, the activity was followed by Mining DNPM's Code, which characterized the garimpagem as a mining rudimentary research and individual work. Garimpeiros, when seeking the ore, followed the smaller creek and, when they found, for empiric processes, the auriferous anomalies, they exploited the baixões (gold alluvial flat). After that, garimpeiros isolated the strip for recovering the gold area in 10 meters by 10 meters, called "cata", or an area of 5 meters by 5 meters called "banda". For gold exploitation, at first, it is necessary to remove the overburden and the gravel to recover the gold. If the access was difficult, the next step would be built an airstrip. The airstrip would allow people, goods, equipments for gold exploitation to come in and out, all controlled by garimpo's owners.

The rose of gold prices in the international market, surpassing US\$ 800 per ounce, in London Metal Exchange (LME), reflected in the Brazilian and regional market. One of them was the new gold rush in the Amazon Region.

In addition, in the garimpos area, the exhaustion of gold alluvial flats, the logistics in garimpos (airstrip, shopping, etc.), and the gold's discovery in the active bed of the rivers, without or with reduced overburden, allowed garimpeiros to look for more investments in the mineralized areas providing garimpo gold production mechanization. And through suctions pump that exploited the active bed of the drainages, the garimpos mechanization started. The following steps were: the introduction of chupadeiras (two suctions pump, the first one, to remove the overburden and the other one, to make the suction of the gravel or mineralized level) in elluvial and colluvial deposits; and, in the primary gold, garimpeiros used scrappers and hammer mills.

For this reason, there was a contradiction: meanwhile, garimpeiros removed large ore volumes, in function of potent equipment utilization, the final concentration continued in the traditional cobra-fumando (sluice for recover the gold). Then, the garimpeiros

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exploitation exhausted the secondary deposits, accumulating great tailing dams volume. After that, they began to detect primary gold mineralization, whose exploitation technology is not well dominated by them. In fact, there were great environmental impacts and the discovery of a series primary gold mineralizations occurrence. Nowadays, primary gold mineralizations show the transformation of the garimpagem model, such as in South Africa, Canada, United States, Australia, etc.

In international level, the artisanal mining has been discussed in a series of events:

- United Nations Seminar – Zimbabwe (1993) – called orientations for the development of the small and medium scale-mining. It involved the following themes: financial, legal, and fiscal aspects; technical, environmental and social aspects; and investments aspects; marketing and government support. The main final decisions were: definition of alternatives for the small scale-mining; maximization of benefits of the small-scale mining; creation of conditions to legalize the small-scale mining and to improve small-scale mine performance, through government support; use of clean technologies, involving all small-scale mining; and offered equipments for the small and medium scale-mining.
- World Bank Conference to the artisanal mining (garimpo) – Washington (1995) – discussed the following points: support to the garimpo as an economical and sustainable activity for people without resources in underdeveloped and developing countries; evaluation of the economical potential associated to the activity; and, recovery of degraded areas. The principal conclusions were: the garimpo has many facets and it imposes a series of complex and controversial subjects; the garimpo is associated to poverty, but also to opportunities; reforms in the garimpo request an unified strategy; and, the principal objective is to transform the garimpo in small-scale mines.
- Second Conference of African Ministers responsible for the development and utilization of mineral and energy resources – Durban, South Africa (1997) – in this event the panel included: Small-scale mining, contribution for the poverty reduction and perspectives for technical cooperation in Africa.

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- Conference on Shifting Sands: changing investment climate for the International Mining Industry - Toronto, Ontario (1999) – a forum of the event was the Commitment to social responsibility: easier, and probably cheaper than you think.

The United Nations Organization (UN) maintains a department of economic and affairs, with a special consultant for small-scale mining.

The research Excavating, loading and haulage equipment, accomplished by Parker Bay Company, in February, 1999, indicates that the small-scale mining involves 13,742 equipments, with a value of US\$ 30.4 billion, operated in 760 places and 63 countries

2. GARIMPO'S MODELS

In the Amazon Region there are different gold garimpos model:

- Madeira River – this exploration occurs in the active riverbed, with the use of potent pumps, whose infrastructure is above the one that it is used in the other areas. The rafts remove a big volume of material, whose suction caliber is around 10 inches. The level mineralized recovered are layers of gravels or laterites concretion, with local called as “mocaroro”. The ore recovered can be made inside or in the margins of the Madeira River, causing a great environmental impact, since the overburden or the mineralized level is removed, or yet for the effluents released and for the own metallic mercury.
- Tapajos – garimpos activity consisted in selected the strip selection, demarcating barrancos (garimpos site) and removing overburden, followed by gold recovered. Until 1978, the mechanization improved and use of dredges or rafts was started. Later, with the gold discovery out of flat alluvial, it was started also the gold exploitation in sequeiros (elluvial and colluvial ores), through chupadeiras (two suction pumps, the first one, to remove the overburden and the other one, to make the suction of the gravel or mineralized level). After 1990, it was discovered in the garimpos the primary gold mineralization in the rocks or quartz lode. Nowadays, there is a great amount of occurrences primary

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gold that attracts mining companies to make joint ventures with the garimpo owners. This model is also applied to the North of Mato Grosso Region.

- Southeast of Para – this area contains young drainages, mainly because of the high erosion degree. The predominant gold exploitation is by chupadeiras and hammers mills. This model is also applied to the area of the Yanomamis, in Roraima State.
- Serra Pelada – this garimpo is different from the others, in the Amazon Region. Although the garimpagem began in a creek - Grota Rica –, the gold exploitation was dislocated quickly to the small hill drained by Grota Rica, called “Babilonia”, where, the gold was found in semi-altered sandstones breccias rocks and grew manganeseiferous siltstone. The Serra Pelada’s garimpo presented a high gold and garimpeiros concentration. For this reason, the “catas” (gold exploitation site in the garimpo) dimension were 3 meters by 2 meters. The total Serra Pelada area is 30,000 m² and its form is like an ellipse, more similar to a bean grain. Another important Serra Pelada’s characteristic was the high number of “bamburros” (discovery of high gold concentration in reduced area), which provided, also, great “reques” or “recos” (donation of small amounts of ore, with high auriferous concentration), reaching sometimes gold’s kilograms. In addition, the federal government applied investments to remove the overburden in more than 1,500,000 m³ to maintain the pit for garimpagem and to the correction of the pit’s border. There are more 4,000 “catas” in Serra Pelada. The excavation in the pit reached the water table, so it was necessary to use bigger water bombs to drain all the water of the pit bottom to allow the garimpeiros will be able to work in the area.
- The nineties – several Federal Government economical plans, the evolution of the price of the petroleum higher than the price of the gold, the declination of the prices gold ounce in the international gold market, reflecting in the Brazilian gold market; the end of the conflict between garimpeiros and mining companies, the reducing of the secondary gold deposits, followed by discovery of primary gold in rock, demanding cleaner technologies unknown by garimpeiros; the environmental pressures of the organized civil society; the legislation exigencies, as well as, the garimpeiros

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organization in union and association, created the new conscience in the garimpo owners.

Today, there is a harmonic and democratic coexistence between garimpo owners and the mining companies. The first one, consider the joint venture the only alternative to advance in the garimpos evolution. And the second one are conscious that the work of the garimpeiros is very important to eliminate the research's initial risk, because when garimpeiros discovered the primary gold mineralization, the mining company's research will be facilitated.

Nowadays it is very common in the Para State, mainly in Tapajos Region, joint ventures between mining companies and garimpeiros. State Government promotes these partners.

3. RESEARCHES

The garimpagem in the Tapajos Region has been usually researched for government institutions. The first research was executed by Assistance Garimpeiros Foundation (FAG), in the 60's of the last century. The National Department for Mineral Promotion (DNPM), Federal Government, has made some research in the Tapajos Region. The Para's State Secretary for Industry, Commerce and Mining (Seicom) has also made important research looking for organizing and transforming the actual garimpos model.

In the beginning of 80's, ecologists and communities accused garimpeiros of a great environmental degradation. Meanwhile, the mercury was identified in the garimpos and it caused big reflexes in the national and international media.

Researches Studies:

- DNPM – it is responsible for the first collection of samples dosed for total mercury, including qualitative evaluations, environmental impacts studies, garimpeiros statistics, and environmental education, this one included in the Camga-Tapajos Program.
- Commission of the European Union (CUE), Sol 3 – Center for Studies and Researches of Europe, London's Imperial College, Seicom and Group for Studies and Defense of the Ecosystems of the Lower and Medium Amazonas (Gedebam) - the goal was to

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study the Tapajos Valley, however it just realized the first project phase for Mercury contamination on the Brazilian Amazon. It was collected samples in four areas, two considered as critics, both inside of the garimpos area (Crepore and Cuiu-Cuiu), and two outside of the garimpos area (Jacareacanga and Itaituba).

- Commission of the European Union (CUE), Imperial College Consultancy (Icon), Seicom, DNPM, Evandro Chagas Institute (IEC) and Tapajos Gold Association (Amot) – this project was considered as second phase of the first project financed by the Commission of the European Union. It had four goals: technical alternatives (improvement in the evaluation of the garimpeira sites, with introduction of preliminary evaluation whose purpose was to reduce the risk for garimpeiros, mercurial studies impacts, but targeting to the occupational health; laboratories to assist people affected by possible mercurial contamination; and environmental information, compatible with garimpeiros culture.
- Cetem, Seicom, Evandro Chagas Institute (IEC) and DNPM – this project was applied in the Rato Creek. The researches involved mercurial contamination and impacts evaluations.
- Tropical Medicine Center of the Para Federal University (UFPA) and Japan International Cooperation Agency (Jica) – represented by doctor's team that has studied mercury risk groups, located in the Tapajos River. The merit of this research is the clinical accompaniment of possible mercurial intoxication.
- Evandro Chagas Institute (IEC), DNPM, Seicom and Japan International Cooperation Agency (Jica) – responsible for occupational health and the mercurial contamination evaluation. The Evandro Chagas Institute keeps the largest mercury database in the Amazon Region, with about 16,000 samples, most of them already treated. It reaches about 6,000 in the Tapajos Region.
- Promin – it was elaborated still in the Camga-Tapajos Program. The Company for Researches Mineral Resources – Brazilian Geologic Survey (CPRM) executed studies in the second half of the 90's of the last century. The Tapajos Mineral Province Project (Promin) whose principal intent were to make the regional geological mapping, however it also executed a series of the primary gold evaluation occurrences, as well as mercurial

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contamination studies in some garimpo areas in the Tapajos Region.

- Camga-Tapajos Program – includes Tapajos Region it was executed since 1991, through the Para State Government, by Seicom. The Tapajos Region was chosen because the garimpeira activity is very important for the regional economy. For this reason, the Para State Government decided to study this area and created the Program for Garimpagem Controls (Camga-Tapajos Program), whose as final goal, in the medium/long-terms, was to minimize the great impacts in the garimpeira area as well as to transform the actual garimpo models. From that moment, the gold could be explored inside of the mineral, environmental and social legislation, with benefits to the communities involved in the garimpos exploitation and with focus to the sustainable development.

The reasons to develop the Tapajos Region program consisted in: being the largest Para and Brazil garimpeira area, involving the largest activity population, producing more of the half of the Para gold production, suffering the largest environmental impacts, and involving the largest number of garimpeiros leaderships.

The most important points to the Camga-Tapajos Program: being target to the Region, involving previous actions discussion, capitalizing positive effects from the other projects, partnership involving the public government and communities, responsibilities participation, promoting the activity organization (Amot), democracy in the actions.

The Camga-Tapajos Program concerned in six subprograms: social and economy, impacts studies, solid tailing dams contention, technological alternatives, environmental information as well as establishment for agriculture-extractivism, with garimpagem model's change.

The Camga-Tapajos Program research involved:

- Social and economy context – extractivist structures, including soil and subsoil occupation; garimpeiras shopping, the social relationships study in the gold garimpos sites; agriculture and “garimpeiros” workers – the relationship between the mineral extractive activity and the agriculture; women of the gold, the force

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of the feminine work in the garimpos; gold production unit study; and the urban nuclei studies

- Impact studies context – monitoration for mercurial contamination in the water and fish in the Tapajos River, study for the current environmental impacts of the mineral extrativism and mercurial pollution and mercury in Itaituba, coordinated by Cetem
- Environmental information context – informative campaigns and courses highlighting the main garimpeiras communities
- Establishment and transformation of the garimpagem model – increment to the gold production. The objective was to attract investments, through joint ventures between mining companies and garimpos owner. It is, in the specific case, necessary the promotion for Para State Government and all areas must be in mineral and environmental legalization. The first one by DNPM (Small-Scale Mining Permission) and the second one by Sectam (Environmental Licenses)

4. TAPAJÓS GOLD OFFICIAL PRODUCTION

The Tapajos area garimpeira corresponds to 100,000 km² (60 per cent of the Amazon garimpeiras area) and it is considered the largest gold garimpeira area in the world. Its area is larger than Portugal, also bigger than Switzerland and Netherlands, together. The official Garimpeira Reserves area is 28,000 km². Since 1958, it has a real production, on average, about 10-12 tons per year, has about 500 airstrips that support around 2.200 garimpos site. Its gold production is primary gold (rock and quartz lode) and secondary gold (alluvium, colluvium and elluviam). The Tapajos Region is the most researched in the whole Amazon garimpeiras areas and has the largest number of total and organic mercury samples collected (around 6,000 samples). Other important point is garimpeiros organization such as Tapajos Gold Association (Amot) that involves the principal garimpeiro owners and the experiences on joint venture with mining companies (about 26 joint venture for gold evaluation executed in the second half of the 90's last century).

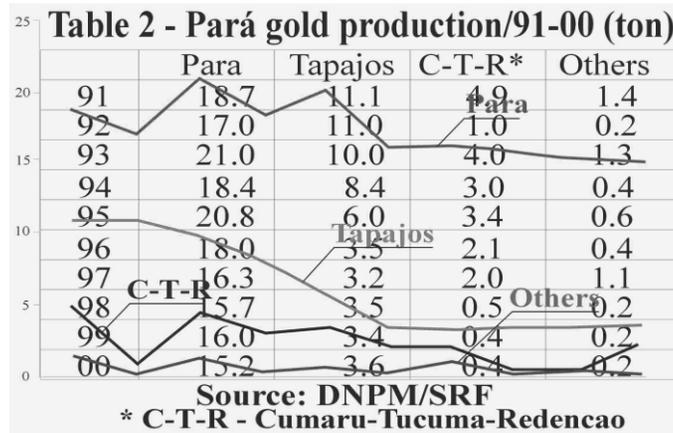
The progressive gold exploration in the Tapajos Region permitted garimpeiros to discover around 500 occurrences for primary

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gold, including about 200-quartz lode, of which 50 are in activity. The new reality imposes to the Tapajos auriferous province a new profile and the production is mostly from veins and quartz lodes that corresponds to 60 per cent of the Tapajos gold production.

5. TAPAJOS GOLD PRODUCTION

The Tapajos official gold production (table 2), between 1991 and 2000, represented 36 per cent of the Para gold production, three times more than the Cumaru-Redeção-Tucumã Region and ten times more than any other Para gold production area. It is very important that Para gold performance influenced by Igarape Bahia gold mine in the Carajas mineral province (Companhia Vale do Rio Doce) which produces around 10 tons per year.



6. ENVIRONMENTAL IMPACTS

In the last fifty years, the environmental impacts in the Amazon Region mineral industry projects were divided in three phases:

- No environmental impact conscience – the best example is the Icomi project in the Serra do Navio, in the Amapa State. It was responsible for a big environmental impact, including topography

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alteration, aggression to the forest and a considerable tailing dam volume.

- Minimum environmental impacts conscience – the best example is Mineracao Rio do Norte project, in the Trombetas Region that polluted the Batata Lake and invested US\$ 80 million to recover it and change the bauxite mine exploitation.
- Maximum environmental impacts conscience – this is the current phase and the best example is Carajas (iron, manganese and gold) project.

However, the garimpeira activity, mainly because of its semi-artisanal exploration, has caused serious damages to the environment, some almost irreparable, for instance: the anthropic activity, physical chemistry and biological degradation, reflecting in drainages.

- Anthropic activity – the garimpagem does not differ from the other mining activities regarding to the forest degradation. The deforestations are limited to the garimpos sites, reaching the ciliary's forests (vegetation along drainages) and the areas where they build their villages or currutelas (communities population nuclei). When the access is difficult, it is necessary to construct airstrips, the main logistic support to the garimpeiros (personal goods and equipments movement). In fact, there are not many garimpeiras areas with agricultural activities and cattle, this last one has caused intensive anthropic degradation though.

The currutelas were formed without any previous planning causing the population increase and a chaotic dispersion. Therefore, sanitation and public health is not usually a concern to these communities and it reflects in forest alteration.

- Physical degradation – the garimpos gold exploitation occurs inside or next to the drainages causing great environmental impacts to the water, and reflections in the alteration of the drainages, provided by overburden removal in the unconsolidated deposits (alluvium, elluvium and colluvium) and levels mineralized recovered. The physical degradation occurs in any exploitation mining, manual or semi-mechanized (“chupadeiras”, dredges or rafts) provoking a considerable solid effluents in the river and

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resulting in a great visual environmental impact observed hundreds of kilometers downstream.

The environmental impacts in the drainage alters the waters coloration, reducing visibility and expelling life from their natural habitats and, it imposes the elimination and removal of the original phlore and fauna in the ecosystems.

The physical impact effects are well characterized in the drainages worked by garimpeiros. They cause the appearance of small lakes dammed by the gold recovered in the garimpeiros propriety, that are truly endemic focuses.

Another environmental impact, even more reduced, but equally serious, is trash left by garimpeiros in the area, such as recipients and food packages (canned and plastic, mainly). They are thrown near home and carried for the drainages or dammed in depressions.

▪ **Mercury**

- Chemical degradation – considering that the drainage receives all the impacts, the chemical degradation includes gold exploitation phases from the removed overburden to the gold recovered.

In the garimpos area, the petroleum derivates are the most important for gold exploitation. Nowadays, gold exploitation is mechanized and the diesel and oil lost is not controlled.

The mineralized column, mainly in the overburden, has abundance in fine sediments (clay predominance) and in the pre-concentration in “cobra-fumando” (sluice for recover the gold) of which the fine fraction is a barrier for the gold recovery, because it creates a superficial tension in the water. Since then, the garimpeiros add excessive detergents and break this tension, contributing again to the chemical aggression in the ecosystem

The metallic mercury or Hg (chemical symbol) is a silver liquid metal whose density is 13,5 times more than the water. It is also highly volatile, has cumulative character, forms amalgam with the gold and is used, frequently, in the gold recovery in the Amazon and Tapajos Region garimpagem area. From the mercury used in the gold recovered, a small part form the amalgam (mercury and gold league) and the other one goes to the main drainage. The incorporate fraction

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in the drains is divided in two segments: one is buried in the metallic form, and the other one goes to the hydrographic basin in the metallic form. When the mercury is transformed from metallic to inorganic and to the organic form using reaction with bacteria in the limnologic habitats, it can cause great damages for all ecosystems, including the human life.

There is no trade between mercury amalgam and the gold so it is necessary to separate the mercury before the commercialization. In most of the garimpos area, this separation is made improperly and causes the mercurial vapor release that is extremely harmful for the environment, polluting the area and contaminating the garimpeiros.

- Biological degradation – the most affected is the human being, mainly in the garimpos area. The mercury reaches the trophic chain and becomes very dangerous to the ecosystem, mainly if there is the transformation to organic mercury, which is the most toxic derivative.

The organic mercury contaminates the algae, then the fish that eats these algae will be contaminated and, subsequently, the human being that will eat this fish. Mostly, the victims are riverside habitants whose fish from the river is their main food. This is mercurial contamination through trophic chain.

Another kind of mercurial contamination is the vapor of the amalgam burn. The average absorption of the human body is 70 per cent of this vapor. In some cases, it can reach until 100 per cent. The mercury vapor is the most common mercurial contamination in the garimpos area.

Other biological degradation comes from the anthropic activity, because of the absence of sanitation and public health in the garimpos area. The biological degradation reflects in and out of the garimpos area, for example, through the destruction of ecological niches and biomass loss as economical resource.

The alteration of original habitats, mainly the fauna and flora in the aquatic habitat, as well as the biota contamination are considered the main negative aspect for artisanal gold exploitation.

The Pan-American Organization of the Health web site shows the main use of the mercury, such as: grains, seeds, several cultures,

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ink, leather, naval shipyards, batteries, photographic cameras and industrial parks, including the use in dental amalgam. The mining presents a small portion, around 1 per cent, in which it is not contemplated the garimpos gold consumption. Therefore, the mercury is out of the official statistics.

Nowadays, the mercurial contamination can be also caused by soil erosion, forests burn and lakes formed by hydroelectric. Moreover, it is observed the decline of garimpos gold production and the mercury release in the ecosystem. According to current researches, the environmental and human health is important; however the first priority should be the communities education for accomplishing it.

To solve the mercurial contamination in the gold garimpos area, it is necessary clean technology, based on environmental and human health aspects. The first consists in looking for healthy and sustainable technologies, with technical alternatives and regularization garimpagem sites by DNPM and Sectam. The second involves the environmental education through appropriate campaigns according to the reality of the garimpos area, in order to change the current garimpeira culture. The result would be creating a sustainable standard to the gold garimpos.

In regards to the human health, case studies, involving risks groups, are important as well. For instance, there is the one made by Tropical Medicine Center with clinical and therapeutic studies.

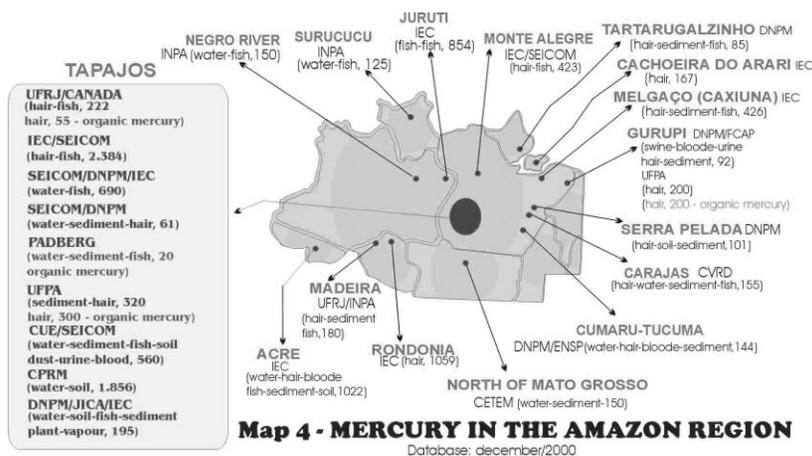
If both – clean technology and human health – are taken in consideration in the gold garimpos area, there will be an appropriate and modern gold garimpos exploration benefiting the regional communities.

If the Tapajos Region mercurial contamination is compared to the Minamata contamination in Japan, there are big differences between them. In the first one, the environment is tropical, the area is infinitely larger, the mercury used in the gold garimpos area is metallic form, the residence of the mercury in the air is unknown in the tropical atmosphere as well as the regional background in the gold garimpos area.

In addition, while the Tapajos Region has only 43 years of gold garimpagem activity, the Minamata contamination has 68 years (1907

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– 1975) which affected the time needed for mercury methylation. In fact, maybe it is unlikely to have the Minamata disease in the Tapajos Region.



7. SAMPLES

In the Amazon Region, there are 11,284 samples of mercury (table 3 and 4, and map 4), almost all already analyzed. Most of those samples come from the Tapajos Region (53 per cent) with some exceptions such as those from Monte Alegre and Juruti Municipalities, a small part from Tapajos Region collected for regional background and samples from Acre State. According to the researches, 575 samples were analyzed for organic mercury, and the Tapajos Region represents 375 (table 4).

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Table 3 – Total mercury samples

Place	Sample	Total Samples
Tapajós-Pará	Hair, water, blood, sediment, sool, dust, urine, plant, vapour	5,951
Rio Negro-Amazonas	Water-fish	150
Surucucu-Roraima	Water-fish	125
Juruti-Para	Fish	300
Monte Alegre-Pará	Hair, fish	423
Tartarugalzinho-Amapá	Hair, sediment, fish	85
Gurupi-Pará	Swin, blood, urine, hair, sediment	292
Serra Pelada-Pará	Hair, soil, sediment	101
Carajás-Pará	Hair, water, sediment, fish	155
Cumaru/Tucuma-Pará	Water, hair, blood, sediment	144
Norte do Mato Grosso-Mato Grosso	Water, sediment	150
Rondônia	Hair	1,059
Rio Madeira – Rondônia	Water, sediment, fish	180
Acre	Water, hair, blood, sediment, soil	1,022
Melgaço (Caxiuana) – Pará	Hair, sediment, fish	426
Cachoeira do Arari-Pará	Fish	167
TOTAL		11,284

Source: DNPM/IEC/CPRM/ESICOM/CETEM/NMT-UFBa/INPA/ PADBERG/SOL 3/GEDEBAM

Table 4 – Organic mercury samples

Place	Sample	Total Sample
Tapajós – Pará	Hair	355
Tapajós – Pará	Water, sediment, fish	20
Gurupi – Pará	Hair	200
TOTAL		575

Source: DNPM/SEICOM/CETEM/NMT-UFPa/Quebe's University/ PADBERG/SOL 3/GEDEBAM

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