REPORT

DECEMBER 2023

RIVERS BETWEEN DESTRUCTION AND OBLIVION:

THE EFFECTS OF MINING EXTRACTIVISM ON THE RIVERS OF SOUTHERN VENEZUELA

CLIMA21 OBSERVATORIO VENEZOLANO DE DERECHOS HUMANOS AMBIENTALES

OVDHA OBSERVATORIO VENEZOLANO DE DERECHOS HUMANOS AMBIENTALES

REPORT
DECEMBER 2023

Rivers between destruction and oblivion:

The effects of mining extractivism on the rivers of southern Venezuela

CLIMA21-CARACAS

Information: clima21.ddhh@gmail.com

Citation: Ríos entre la destrucción y el olvido:
Efectos del extractivismo minero
en los ríos al sur de Venezuela
Venezuela. Clima21.

https://clima21.net/

December 2023

The river is my sister—I am its daughter.
It is my hands when I drink from it,
my own eye when I am weeping,
and my desire when I ache like a yucca bell
in the night.
The river says, Open your mouth to me,
and I will make you more.

Because even a river can be lonely,
even a river will die of thirst.

I am both—the river and its vessel.

It maps me alluvium. A net of moon-colored fish.
I've flashed through it like copper wire…

I am it and its mud.
I am the body kneeling at the river's edge
letting it drink from me.

Natalie Diaz, Postcolonial Love Poem. 2020 (Fragmento)

We certainly have an unspoken understanding
But a lot of things unsaid as well

"Things Left Unsaid" Pink Floyd, Track 1 del album:
"The Endless River" 2014

Contents

Executive Summary

Rivers hold a fundamental value to human populations because of their contributions to all aspects of people's lives. For this reason, a close relationship exists between human rights and the health of these ecosystems. However, the rivers of the Venezuela´s Amazon are at serious risk due to the impacts of mining.

This report aims to contribute to the understanding of the socio-environmental situation of the rivers of southern Venezuela and the current impact of the extractive mining industry on them.

Below are the main findings of our work:

Illegal gold mining is the main threat to the rivers of southern Venezuela. Although the damage dates back to more than a century ago in some cases, it has increased significantly in the last 20 years. For this reason, more than thirty rivers in the south of the country are being affected by this activity (a 106% increase in 6 years) while the use of mining rafts has been documented in 16 of them. All major basins are threatened by sedimentation and mercury pollution from gold mining. In the basins of the Cuyuní, Caroní and Caura rivers, there is evidence of the negative effects of this form of pollution on human populations. None of the Protected Areas in the south of the country seem to be meeting their objective of preserving the ecosystems included in their territories, including the rivers that cross them.

All major basins are threatened by sedimentation and mercury pollution from gold mining.

In the case of bauxite mining, the environmental liabilities of the industry pose a serious threat to the Orinoco River and the population living on its banks. Regarding the mining of coltan, the government's opacity prevents the grasp of the magnitude of the impact generated by the activity.

Based on the information available, an approximation was made to the health of the ecosystems of a group of large rivers in southern Venezuela. Only the Cuyuní River appears to be in critical condition, but in most cases, there is evidence of a significant deterioration of their environmental health. However, the lack of updated data prevents a thorough assessment of the current situation.

This situation of river degradation might worsen with the impacts of climate change forecasted for the southern region of Venezuela. Even though their extent is not known in detail, they will very likely have a negative impact on the region's waterways. No information is available that the Venezuelan State is taking effective and sustained action to protect the fluvial wealth of the south of the country.

Not only has the Venezuelan State the task of acting in these situations and protecting the environment and the rights of the population in the region but also the future mission of advancing toward the recognition of rivers as subjects of law.

Based on this situation, a series of recommendations are made to the Venezuelan State, including the elimination of mining extractivism, the observance of environmental protection standards, the environmental re-institutionalization of the country, the support for scientific research, the ratification of the Minamata Convention, the adoption of the Escazú Agreement and the discussion of the recognition of the rights of Venezuela's rivers, particularly the Orinoco river.

Caura Black Rocks
Photography Alberto Blanco Dávila

Introduction

Rivers are a source of water, food, energy and raw materials; They are important channels of communication that facilitate development, trade and exchange between people and nations; as well as fundamental elements of the cultures of many peoples.

For these reasons, a close relationship exists between human rights and the health of rivers. Healthy rivers are fundamental to guarantee rights such as health, food, water and sanitation, work, employment, culture, rest and leisure. This relationship is not limited to the human settlements along their banks or basins, as many communities located at a great distance from the waterways depend on their contributions and services in areas such as water, energy, food and culture, among others.

Despite their value, rivers have been under permanent attack throughout Venezuela's history -particularly in the last 100 years-, in a phenomenon that seems to be increasing and deepening in the present century.

In this sense, deforestation along the basins of Venezuela's rivers has resulted in continuous damage to these ecosystems; the contamination of their waters; the modification and damming of their channels, and damage to their fluvial dynamics. As a result, a significant number of Venezuela's rivers are currently at risk.[1] [2] [3]

1 Rodríguez-Olarte, D., Araujo, A., Bianchi, G., Boher, S., Castillo, O., Cordero, Y., Escudero, J., Fernández, A., García, J. E., Lasso-Alcalá, O., Martínez, M., Marrero, C., Mendoza, M., Morón-Zambrano, V., Rodríguez, P., Segnini, S., Seijas, A. E. & Velásquez, J. 2019. Los ríos en riesgo de Venezuela y la ruta para su conservación. Ecotrópicos. 31:1-8.

2 Machado Allison, A., 2017. La conservación de ambientes acuáticos: petróleo y otras actividades mineras en Venezuela. (pp: 189-201). En: Rodríguez-Olarte, D. (Editor). Ríos en riesgo de Venezuela. Volumen 1. Universidad Centroccidental Lisandro Alvarado (UCLA). Barquisimeto, Venezuela.

3 Rodríguez-Olarte, D. (Editor). 2017. Ríos en riesgo de Venezuela. Volumen 1. Universidad Centroccidental Lisandro Alvarado (UCLA). Barquisimeto, Venezuela.

Photography: Alberto Blanco Dávila

By the end of the 20th century, most of the environmental degradation of Venezuelan rivers was concentrated in waterways located in coastal-mountainous axis of northern Venezuela where most of the country's population lives. On the contrary, only a few references could be found of the deterioration of rivers in the Venezuela´s Amazon as a result of gold mining and urban and industrial development.[4] [5]

Beginning in the second decade of the 21st century, the rapid expansion of illegal gold exploitation in Venezuela led to a significant increase in the environmental degradation of a growing number of rivers, mainly in the south of the country.

Based on these circumstances, this report aims to contribute to the understanding and assessment of the current situation of rivers in the south of the country and the impact of extractive mining activities on them.

This work will consider the rivers that flow toward the right bank of the Orinoco River, as well as the waterways in the basin of the Cuyuní and Negro rivers (Figure 1).

4 Blanco, H., Najul, M.V., y Sánchez, R. 2015. La calidad dela agua y su contaminación. En: Gabaldón, A. y col. (Editores) Agua en Venezuela: Una riqueza escasa. Fundación Empresas Polar. Caracas, Venezuela.

5 Machado Allison, A., Chernoff, B., Royero León, R., Mago Leccia, F., Velázquez, J., Lasso, C., López Rojas, H., Bonilla Rivero, A., Provenzano, F., Silvera, C. 2000. Ictiofauna de la cuenca del Río Cuyuní en Venezuela. Interciencia, vol. 25, núm. 1, enero-febrero, 2000, pp. 13-21.

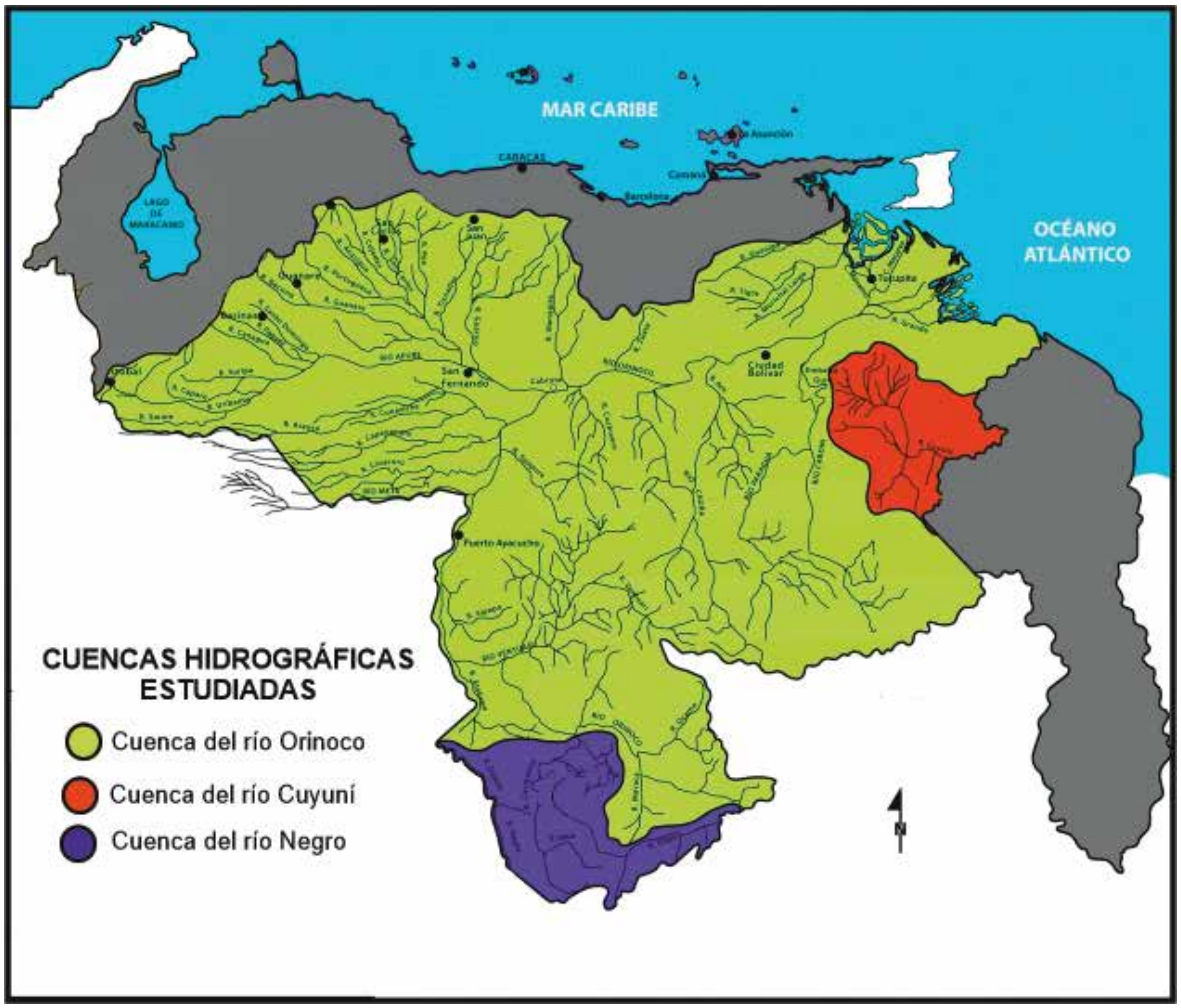

Figure 1. Watersheds included

Sources of Information

The following sources of information were used to prepare this report:

- Academic articles and technical reports published by domestic and foreign institutions and organizations, as well as government agencies.
- Interviews with key informants and the opinion of experts.
- Data and assessments derived from the study of satellite images.
- News published in domestic and international media, social networks and websites.

Very important information gaps exist as a result of the loss of the research capabilities of Venezuelan universities;[6] [7]; the lack of information transparency by the Venezuelan government, and insufficient media coverage in areas far from large cities.

6 Aula Abierta. 2021. Afectaciones a la educación ambiental de calidad y a la biodiversidad en las universidades públicas venezolanas. Informe preliminar. Disponible en: https://aulaabiertavenezuela.org/wp-content/uploads/2021/03/2DO-INFORME-PRELIMINAR-AMBIENTE.pdf

7 Vilanova, E. 2020. Collapse of Venezuelan science threatens the world's most sustained monitoring of tropical forests. Nature Ecology and Evolution. Disponible en: https://natureecoevocommunity.nature.com/posts/65506-collapse-of-venezuelan-science-threatens-the-world-s-most-sustained-monitoring-of-tropical-forests

Figure 2. Alluvial mining. Taken from Mongabay Photography: Ana Gisela Pérez

Results

Gold mining

The accelerated expansion of illegal gold mining without control, environmental impact studies or consultation with indigenous communities has generated multiple environmental and social impacts and violations of the human rights of the local population.[8] [9]

But the greatest impact of this form of mining has taken place on the rivers of the south of the country.[10] This situation is a consequence of the extraction methods and the fact that alluvial mining is the most common type of mining in the Venezuela´s Amazon.[11]

The present work will focus on the most common form of mining along the rivers of the Venezuela´s Amazon, namely small and medium-scale mechanized or semi-mechanized mining carried out on alluvial banks and river beds[12] (Figure 2).

8 Asamblea Mundial por la Amazonía. 2020. Situación de la Amazonía venezolana en tiempos de pandemia. Informe de diagnóstico y propuestas para la Asamblea Mundial Amazónica. Disponible en: https://watanibasocioambiental.org/wp-content/uploads/2020/09/Informe-situacion-Amazonia-Venezuela.-AMPA-2020.pdf

9 OHCHR. 2022. Detailed findings of the independent international fact-finding mission on the Bolívarian Republic of Venezuela: The human rights situation in the Arco Minero del Orinoco region and other areas of the Bolívar state (A/HRC/51/CRP.2)

10 Machado Allison, A., 2017. Op. cit.

11 Mining activities carried out on river banks or channels.

12 Accumulations of sediment transported by the river and deposited along their banks and inside their channels.

The environmental impacts associated with this type of mining are the alteration in the channels and dynamics of the rivers; the deforestation of gallery forests; the destruction of landscapes; the erosion and undermining of river banks, and the deterioration of the quality of water due to mining waste, the use of mercury and leaks of fuel and lubricants, as well as organic waste from mining settlements and the increase in turbidity.[13] [14] [15] All of this, in turn, generates the destruction of some smaller rivers, loss of biodiversity[16] [17] [18] and increased risk of flooding.

Likewise, evidence has been found of the relationship between the presence and expansion of mining activities and the increase in deforestation associated with agricultural activities, the increase in vegetation fires[19] and the discharge of solid waste into waters.[20]

One of the most detrimental impacts on the environmental health of rivers is the loss of forest cover in their basins.

The studies addressing deforestation in the Venezuelan Amazon indicate that 470,219 hectares of forest were lost in the period spanning from 2001 to 2020, and the projections indicate that the loss of forest coverage in 2025 is expected to exceed the loss of the previous five years.[21]

On the other hand, different types of vessels are used to extract gold from the sediments at the bottom of rivers, such as rafts or dredges designed to capture the alluvial material deposited on the bed of these waterways.[22]

13 Yasno Bermeo, F. 2014. Impacto Medioambiental por la explotación ilegal de Oro en el Departamento del Chocó. Universidad Militar Nueva Granada Facultad de Ciencias Económicas Especialización en Finanzas y Administración Pública.

14 Machado-Allison, A. (2017). Op. cit.

15 Lozada, J. R. 2016. Una visión histórica de la minería de oro en la Guayana Venezolana. Technical Report. Universidad de Los Andes.

16 Machado-Allison, A., A. Rial y C. A Lasso, 2011. Amenazas e impactos sobre la biodiversidad y los ecosistemas acuáticos de la Orinoquia venezolana. Pp 62-87. En: C. A. Lasso, A. Rial, C. Matallana, W. Ramírez, J. C. Señaris, A. Díaz-Pulido, G. Corzo y A. Machado- Allison (Eds). Biodiversidad de la Cuenca del Orinoco: II Áreas prioritarias para la conservación y uso sostenible.

17 Rahm M., Jullian B., Lauger A., de Carvalho R., Vale L., Totaram J., Cort K.A., Djojodikromo M., Hardjoprajitno M., Neri S., Vieira R., Watanabe E., do Carmo Brito M., Miranda P., Paloeng C., Moe Soe Let V., Crabbe S., Calmel M. (2015). Monitoring the Impact of Gold Mining on the Forest Cover and Freshwater in the Guiana Shield. Reference year 2014. REDD+ for the Guiana Shield Project and WWF Guianas. pp.60.

18 Mol, J. H., y Ouboter, P. E. 2004. Downstream Effects of Erosion from Small-Scale Gold Mining on the Instream Habitat and Fish Community of a Small Neotropical Rainforest Stream. Conservation Biology, 18(1), 201–214.

19 Finer , M. and Mamani N. 2022. MAAP #155: Deforestation hotspots In the Venezuelan Amazon. https://www.maaproject.org/2022/deforestation-venezuela/

20 Sarmiento, G., Lawson, F. y Uhlherr, P. 1980. Control de la Contaminación de Aguas en la Industria Minera. Revista de la Universidad de La Salle, (6), 43-48.

21 RAISG. 2022. Deforestación en la Amazonía: pasado, presente y futuro. https://watanibasocioambiental.org/deforestacion-en-la-amazonia/

22 SOS Orinoco. 2020. La Minería Aurífera en el Parque Nacional Yapacana, Amazonas Venezolano (actualización) https://sosorinoco.org/wp-content/uploads/2020/08/ActualizacionPNY_20200602.pdf.

The damage generated by this form of gold exploitation is similar to that of mining practiced on the ground, but in this case, toxic substances deposited in the beds are removed, alterations in channels are produced and the biological diversity of organisms that live in the sediments of the river bed is affected.[23] (Figure 3)

This form of river mining was already used at the end of the last century but restricted to a few rivers such as Atapabo, Caroní and Paragua.[24] Nowadays, references can be found to the presence of vessels carrying out mining activities in at least 16 rivers in the states of Bolívar and Amazonas (See Appendix 1).

In this regard, Resolution No. 0010 of the Ministry of Ecological Mining published in the Gaceta Oficial (Official Gazette) in April 2020 established procedures for the development of river mining in certain areas of the Cuchivero, Caura, Aro, Caroní, Yuruari and Cuyuní rivers, all of them located within the territory of the Orinoco Mining Arc.[25] [26]

Although the news was later released that this Resolution had been repealed, to date it has not been possible to verify this account.[27]

Nonetheless, the presence of this type of vessel in a significant number of rivers in the Venezuelan Amazon has been consistently reported.

An important part of the information collected on the presence of these vessels in rivers of the Venezuelan Amazon comes from official sources that report on control and eradication operations. However, the scarce and sometimes ambiguous information provided in the documents makes it impossible to assess the effectiveness or suitability of the operations.

23 UNODC/ Gobierno de Colombia. 2016. Explotación de oro de aluvión Evidencias a partir de percepción remota. https://www.unodc.org/documents/colombia/2016/junio/Explotacion_de_Oro_de_Aluvion.pdf

24 Machado-Allison, A. (2017). Op. cit.

25 Gaceta Oficial 6.526. https://efectococuyo.com/wp-content/uploads/2020/04/GOE-6.526.pdf.pdf_compressed.pdf

26 CERLAS. 2020. Resolución N° 0010: Una medida ilegal que agrava la destrucción y envenenamiento de nuestras fuentes de agua. https://www.ecopoliticavenezuela.org/2020/05/13/resolucion-n-0010-una-medida-ilegal-que-agrava-la-destruccion-y-envenenamiento-de-nuestras-fuentes-de-agua/

27 OEP. 2020. ¿Derogó el gobierno de Maduro la resolución 0010 que legalizaba la minería en los ríos de la Amazonía en Venezuela? https://ecopoliticavenezuela.org/2020/10/30/derogo-el-gobierno-de-maduro-la-resolucion-0010-que-legalizaba-la-mineria-en-los-rios-de-la-amazonia-en-venezuela/

Figure 3. Raft operating on the Icabarú River

Finally, the extent of the impact of gold mining on the rivers of the Venezuela´s Amazon is enormous; in 2017, at least sixteen rivers were reported to be affected by this activity.[28] This work was able to document the presence of mining in 33 rivers, an increase of more than 106% in a period of six years (See Appendix 1).

Bauxite mining

Another factor in the degradation of rivers in the Venezuela´s Amazon is the exploitation and processing of bauxite in the middle and lower course of the Orinoco River.

The main bauxite deposit under exploitation in Venezuela is an open pit mine, currently inactive, located in Los Pijiguaos, Cedeño municipality, in western Bolívar state. The site and its service infrastructure sit at the lower basin of the Suapure River, a tributary of the Orinoco.

28 Machado Allison, A., 2017. Op. cit.

Figure 4. Red mud ponds Image from Google Earth

The process of extracting the mineral leaves the soil without protection, which, together with the construction of the mine's service infrastructure, caused important processes of erosion and sediment production that affected the water courses of the surrounding areas.[29]

Although no information is available on the environmental impact of this activity on local water bodies, satellite images of the area show that the waterways and their riparian forests have been altered. Likewise, the waters and organisms of these streams are presumed to also be affected.

The extracted bauxite is transported through the Orinoco River to the facilities of Bauxilum, a processing plant located in Ciudad Guayana where the production of alumina (aluminum oxide) takes place.

The process generates a toxic and corrosive waste known as red mud, which is deposited in lagoons adjacent to the Orinoco River[30] (Figure 4).

29 Luque, R., Lisena, M., y Luque, O. 2006. Vetiver system for environmental protection of open cut bauxite mining at "Los Pijiguaos" –Venezuela. https://www.vetiver.org/ICV4pdfs/BA15es.pdf

30 Velasco, F.J. 2020. Entrevista realizada al Dr. Gustavo Montes Urdaneta. https://ecopoliticavenezuela.org/2020/05/14/entrevista-realizada-al-dr-gustavo-montes-urdaneta-lodos-rojos/

The drop in production at Bauxilum resulted in the abandonment of conservation programs for these lagoons[31], which generated leaks that are affecting nearby natural lagoons and possibly contaminating the Orinoco and the fish used for human consumption.[32]

Likewise, there is the risk of an accidental collapse of the lagoon containment dikes, which would spill millions of tons of waste into the river, causing an unprecedented disaster.[33]

Coltan mining

Recent years have witnessed the growth in the exploitation of coltan in the south of Venezuela, mainly in localities of the Cedeño municipality of Bolívar state, in the basin of the Suapure and Parguaza rivers, and the Atures municipality of Amazonas state.[34] [35] [36]

The exploitation of coltan is carried out in open pit mines where large quantities of material are removed from the substrate, causing a serious environmental impact through the destruction of the vegetation and the activation of erosion processes. These damages have a negative impact on the rivers that feed from water from the areas where the extraction is carried out.

Despite this, no information is available regarding any aspect of the exploitation of this mineral, nor on its possible environmental impacts in Venezuela.

31 Guzmán Bigott, E. 2005. El origen de los lodos rojos. https://cienciaguayana5.blogspot.com/2005/08/el-origen-de-los-lodos-rojos.html

32 Gibelli, M. 2023. Una planta de procesamiento de bauxita intoxica el Orinoco en Venezuela. https://www.opendemocracy.net/es/una-mina-de-bauxita-intoxica-orinoco-venezuela/

33 Mora, A., Laraque, A., López, J. L. 2017. El Bajo Orinoco: aspectos hidrosedimentológicos, geoquímicos e influencia antrópica. Capítulo 5. En: Rodríguez-Olarte, D. (Editor). Ríos en riesgo de Venezuela. Universidad Centroccidental Lisandro Alvarado (UCLA). Barquisimeto, Venezuela.

34 SOSOrinoco . 2020. Coltan | The Venezuelan's Regime Smuggling of "Blue Gold" 2020. https://sosorinoco.org/en/reports/coltan-the-venezuelans-regime-smuggling-of-blue-gold-2020/

35 Jaramillo, JC 2021. The Scale of Illegal Coltan Trafficking in Colombia and Venezuela. https://insightcrime.org/news/colombia-backdoor-for-venezuelan-coltan/

36 Molina, T. 2015. Denuncian que las FARC explotan oro y coltán en el sur de Venezuela. https://es.panampost.com/thabata-molina/2015/04/16/denuncian-que-las-farc-explotan-oroy-coltan-en-el-sur-de-venezuela/

Photography: Alberto Blanco Dávila

Threatened rivers

A good part of the rivers south of the Orinoco seems to still present a fair state of conservation as their natural characteristics predominate in their courses and basins, such as water with little sediment, protected riverbanks, extensive forest cover and little human intervention.[37]

However, since the end of the last century, concern has been mounting about the growing threats to the waterways of the Venezuelan Amazon. In particular, alarms had been raised about the increasing deterioration of some rivers -particularly the Cuyuní and Caroní- as a result of mercury contamination and the increase in the turbidity of their waters due to mining activities,[38] [39] [40] [41] deforestation, and urban and industrial growth along the banks of the Orinoco.[42]

The worries have increased in the last 20 years, mainly due to the accelerated expansion of mining largely along the rivers of southern Venezuela.

In several countries and regions, as well as on a global scale, evaluations have been carried out to assess the health of rivers and issue recommendations and guidelines for their adequate management, the protection of their services and contributions

37 Rodríguez-Olarte, D. et al. (2019). Op. cit.

38 Vásquez, E. 1989. The Orinoco river: A review of hydrobiological research. Regulated Rivers: Research & Management, 3(1), 381–392. doi:10.1002/rrr.3450030136

39 Bevilacqua, M., Cárdenas, L., Flores, A.L., Hernández, L., Lares B. E., Mansutti R.A., Miranda, M., Ochoa, G.J., Rodríguez, M., y Selig, E. 2002. Situación de los bosques en Venezuela. La región Guayana como caso de estudio. Fundación Polar. Caracas.

40 World Bank. 1999. Venezuela the Imataca Forest Reserve and environs: issues in resource planning, public participation and sustainable management. https://documents1.worldbank.org/curated/en/463311468128994299/pdf/181590pre20030000Official0Use0Only0.pdf

41 Vörösmarty, C. J., McIntyre, P. B., Gessner, et al. 2010. Global threats to human water security and river biodiversity. Nature, 467(7315), 555–561. doi:10.1038/nature09440

42 Comité Venezolano de la UICN. 1999. Conservación de Humedales en Venezuela. Inventario, diagnóstico ambiental y estrategia. Rodríguez Altamiranda, R. (Comp.) Fundación Polar; Provita; Junta de Andalucía; Comité Venezolano UICN. Caracas.

to human societies, and the recognition of their intrinsic values.[43] [44] [45]
Conducting a similar exercise in Venezuela is extremely difficult due to the scarcity of information regarding the conditions of the rivers in the south of the country.

However, this work presents an initial approximation to the situation of some of the rivers and basins in the region.

In some cases, categories similar to those used by the IUCN have been employed to assess ecosystem risk, but their use is merely descriptive since the amount of information necessary to carry out a formal scientific assessment is currently insufficient.

Orinoco

Orinoco river

The ecosystem health of the Orinoco river has been considered moderately good. Surprisingly, this assessment comes from a work carried out in Colombia based on the analysis of a series of indicators in the country's Orinoquia region.[46] In the case of the areas crossed by the river in Venezuelan territory, which represent 71.5% of the entire basin, a similar work does not seem to exist.

The size of the Orinoco river basin makes such work difficult because the area is not a homogeneous unit but rather incorporates diverse landscapes, environments and biotas throughout its extension and faces multiple risks across the different territories that comprise it.[47]

In the late 20th century, warnings were cast about the limited information available on the hydrological and biological characteristics and health of the Orinoco basin. However, it is considered that the river has inevitably been affected by the country's development needs.[48]

43 American Rivers. 2023. America's Most Endangered Rivers® of 2023. 10 Rivers. 10 Threats. 10 Solutions. https://www.american-rivers.org/wp-content/uploads/2023/04/AR_2023-Most-Endangered-Rivers_lowres-3.pdf

44 Wong, C.M., Williams, C.E., Pittock, J., Collier, U. y Schelle. P. 2007. World's top 10 rivers at risk. WWF International. Gland, Switzerland. https://www.wwf.org.uk/sites/default/files/2007-01/worldstop10riversatrisk.pdf

45 WWF. 2021. The world's forgotten fishes. https://europe.nxtbook.com/nxteu/wwfintl/freshwater_fishes_report/index.php#/p/1

46 WWF. 2016. Cuenca del río Orinoco. Reporte de Salud. Colombia. https://wwflac.awsassets.panda.org/downloads/reporte_de_salud_de_la_cuenca_del_orinoco_2016.pdf

47 Lasso, C. A., Machado-Allison, A., y Taphorn, D. C. 2016. Fishes and aquatic habitats of the Orinoco River Basin: diversity and conservation. Journal of Fish Biology, 89(1), 174–191.

48 Weibezahn, F.H., Álvarez. A. y Lewis, W.M. 1990. Prefacio. En: Weibezahn, F.H., Álvarez. A. y Lewis, W.M. Edelca / Fondo Editorial Acta Científica / CAVN /USB (Eds.)

An assessment carried out in 1990 of the pollution levels of the river, in the section between the mouth of the Apure River and the town of Barrancas, found high levels of Biological Oxygen Demand (BOD)[49] in the vicinity of important cities and ports and the presence of coliforms, oils and metals. In contrast, no significant signs of contamination were detected in the waters of the stretch of the Orinoco River before its confluence with the Apure River.[50]

Studies carried out at the beginning of the second decade of the 21st century showed clear signs of environmental deterioration of the basin coming from factors such as agricultural expansion, deforestation, alteration of water bodies, increased use of agrochemicals, industrial discharge, navigation and gold mining, as well as the introduction of foreign species and overfishing.[51] [52] [53] [54]

More information is needed on the environmental and social impacts of the closure of the Caño Mánamo distributary channel in the Orinoco Delta.[55] [56] [57]

Very little information exists about the current state of the Upper Orinoco, particularly the impacts generated by illegal gold mining in its sources, at the confluence with the Ventuari River and in many of its tributaries.

49 An indicator of contamination by organic matter.

50 Sánchez, J.C. 1990. La calidad de las aguas del río Orinoco. (pp.241-268) En: Weibezahn, F.H., Álvarez. A. y Lewis, W.M. El río Orinoco como ecosistema. Edelca / Fondo Editorial Acta Científica / CAVN /USB. (Eds.)

51 Mora, A., Laraque, A., López, J. L. 2017. Op. cit.

52 Lasso, C. A., Machado-Allison, A., y Taphorn, D. C. 2016. COp. cit.

53 Machado-Allison, A. 2015. La minería en Guayana, sus efectos ambientales y sobre la salud humana. Bol. Acad. C. Fís., Mat. y Nat. LXXV, 9–30.

54 Márquez, A. y Lemus, A, 2020., Riesgos ambientales por metales pesados en los sedimentos del río Orinoco. Capítulo 3 (57-76) En: Rodríguez-Olarte, D. (Editor). Ríos en riesgo de Venezuela. Volumen 3. Universidad Centroccidental Lisandro Alvarado (UCLA). Barquisimeto, Venezuela.

55 Monente, J.A. y Colonnello, G. 2004. Consecuencias ambientales de la intervención del delta del Orinoco. (pp. 114-124). En: Evaluación rápida de la biodiversidad y aspectos sociales de los ecosistemas acuáticos del delta del río Orinoco y golfo de Paria, Venezuela. Boletín RAP de Evaluación Biológica 37. Conservation International. Washington DC, USA.

56 García, Á. A. y Heinen, H. D. 1999. Planificando el desastre ecológico: Impacto del cierre del caño Manamo para las comunidades indígenas y criollas del Delta Occidental (delta del Orinoco, Venezuela). Antropológica 91, 31–56.

57 Kapé kapé. 2021. El cierre del caño Manamo alteró la vida de 22 mil waraos en Delta Amacuro. https://kape-kape.one/2021/06/22/el-cierre-del-cano-manamo-altero-la-vida-de-22-mil-waraos-en-delta-amacuro/

Cuyuní

Cuyuni River

The environmental health of this river and its tributaries suggests that it is critically endangered. This basin can be considered the most affected in the Venezuelan Amazon region. In fact, some of its tributaries are so degraded that without profound ecological restoration, they risk disappearing, which seems to have happened with the small streams that run through the Las Claritas sector (Figure 5).

The basin has been subjected to very intense mining activity since the 19th century, a situation that has increased greatly in the last decade.

This activity has caused high deforestation of the forests in the basin, the direct intervention of channels and banks, an increase in turbidity, the contamination of soils, waters and fish with mercury, and the discharge of sewage, fuels and lubricants.[58] [59] [60] [61] As a consequence, there has been a significant loss of biodiversity and some small tributaries have disappeared.[62] [63] [64]

58 SOS Orinoco. 2020. Cuyuni Corazón de Imataca: epicentro del Arco Minero de Maduro. https://sosorinoco.org/es/informes/cuyuni-corazon-de-imataca-epicentro-del-arco-minero-de-maduro/

59 Shrestha, K. P., y De Quilarque, X. R. 1989. A preliminary study of mercury contamination in the surface soil and river sediment of the roscio district, Bolivar State, Venezuela. Science of The Total Environment, 79(3), 233–239. doi:10.1016/0048-9697(89)90339-2

60 Lasso, C. A., Señaris, J. C., Rial, A., & Flores, A. L. (Eds.). (2009.). Evaluación rápida de la biodiversidad de los ecosistemas acuáticos de la cuenca alta del Río Cuyuní, Guayana Venezolana. Conservation International.

61 Sánchez, A. G., Contreras, F., Adams, M., y Santos, F. 2008. Mercury contamination of surface water and fish in a gold mining region (Cuyuni river basin, Venezuela). International Journal of Environment and Pollution, 33(2/3), 260. doi:10.1504/ijep.2008.019398

62 Lasso, E. C., et al. 2009. Peces de los ríos Cuyuní y Uey, cuenca del Cuyuní, Estado Bolívar (Venezuela): inventario, distribución, conservación y algunos aspectos ecológicos. Capítulo 6. En: Lasso, E,.C, et al. (ed.) Evaluación Rápida de la Biodiversidad de los Ecosistemas Acuáticos de la Cuenca Alta del Río Cuyuní, Guayana Venezolana. Boletín RAP de Evaluación Biológica

63 El Souki, et al. 2011. Composición y distribución de la comunidad de insectos acuáticos en un gradiente espacial del alto río Cuyuní, Guayana venezolana. Memoria de la Fundación La Salle de Ciencias Naturales Vol. 71 Núm. 175 (2011) 79–103.

64 Machado-Allison, A., B. Chernoff, R. Royero, F. Mago-Leccia, J. Velázquez, C. A. Lasso, H. López-Rojas, A. Bonilla, F. Provenzano y C. Silvera. 2000. Ictiofauna de la cuenca del Río Cuyuní en Venezuela. Interciencia 25:13-21.

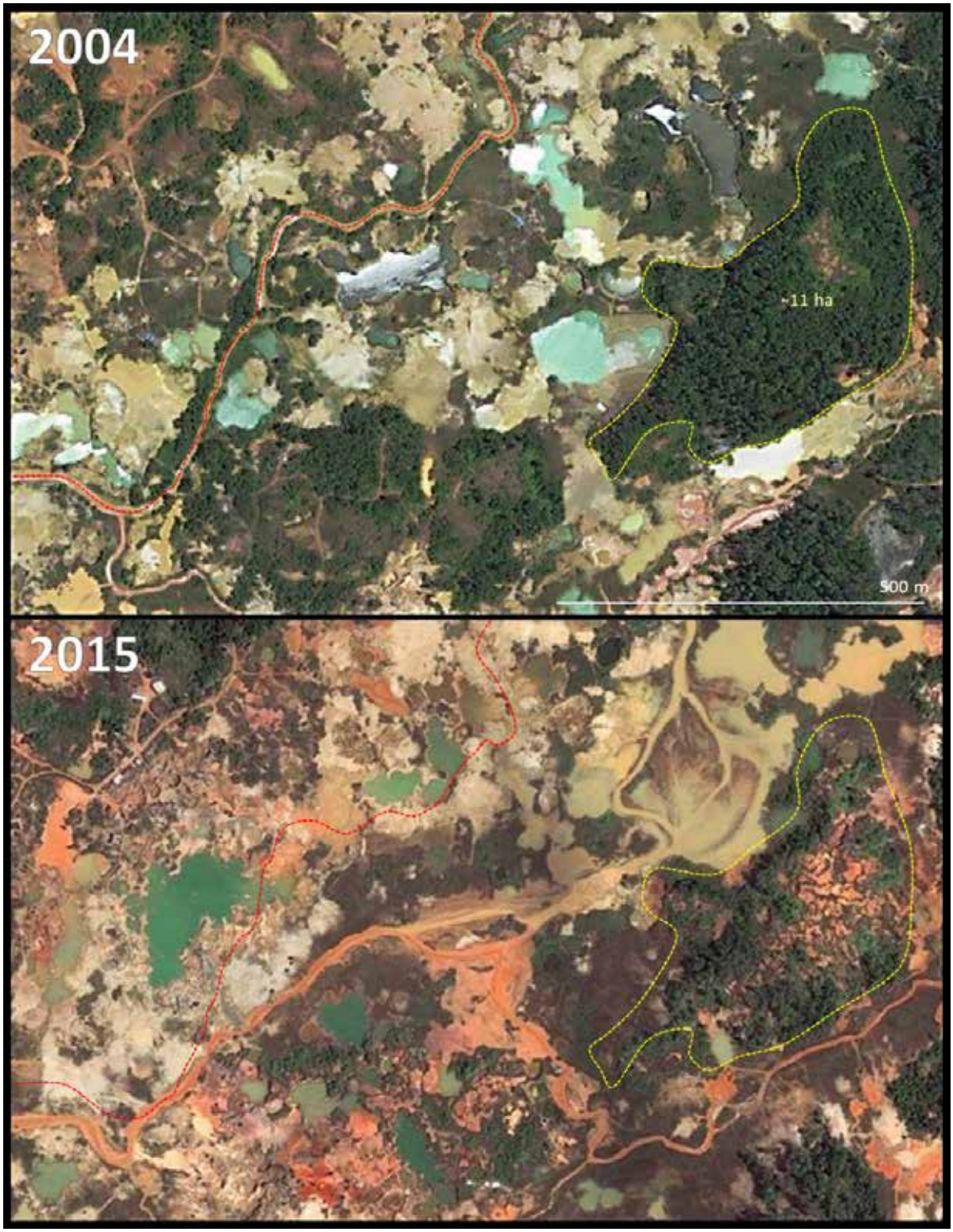

Figure 5. Claritas gold mining

Caroní

Caroni River

This river appears to be in a moderate to poor state of preservation. There are deep concerns about its current state due to the increase in illegal mining in different sections of its course and tributaries, many of which may be in a very poor state of conservation as a result of the intense mining activity along their banks and channels.

On the other hand, very little information is available on the possible negative environmental effects on the fluvial ecosystem of an existing set of dams and reservoirs in the lower course of the river.

The existence of degradation processes in this river has been known since the end of the 20th century. This situation was mainly the result of urban and industrial growth in the lower Caroní, mining, burning and the expansion of agricultural activity in the basin.[65] [66] [67]

Even though some authors considered mining activity in the region incipient by the early 21st century,[68] [69] information has been available since the 1990s on the presence of high levels of mercury contamination in the lower Caroní and its main

65 Machado-Allison A. 1999. Cursos de agua, fronteras y conservación. Pp 61-84. In: G. Genatios (Ed). Ciclo Fronteras: Desarrollo Sustentable y Fronteras. Comisión de Estudios Interdisciplinarios, UCV. Caracas

66 EDELCA-CVG. 2004. Estudio Plan Maestro de la Cuenca del Río Caroní. Síntesis. https://www.pilcomayo.net/media/uploads/biblioteca/libro_1116_LG-130.pdf

67 Rosales Hernández, A., y García Montero, P. 2015. Las cuencas hidrográficas y su gestión integral. Pp. 869-913. En: Agua en Venezuela: Una riqueza escasa. Gabaldón, A. et al. (eds.) Fundación Polar. Caracas.

68 Lasso, C. A., Usma, J. S., Trujillo, F. y Rial, A. 2010. Biodiversidad de la cuenca del Orinoco: bases científicas para la identificación de áreas prioritarias para la conservación y uso sostenible de la biodiversidad. Instituto de Investigación de Recursos Biológicos Alexander Von Humboldt, WWF Colombia, Fundación Omacha, Fundación La Salle de Ciencias Naturales, Instituto de Estudios de la Orinoquia, Universidad Nacional de Colombia. Bogotá, Colombia.

69 Machado-Allison A. 1999. Op. cit.

tributary, the Paragua River.[70] [71] [72] [73] [74], as well as upstream from the Guri reservoir.[75] In the case of this reservoir, the accumulation and biomagnification of mercury seem to be occurring, possibly derived from upstream mining activity.[76] [77]

In the last twenty years, there has been an accelerated increase in the degradation of the basin as a result of illegal mining. This situation is occurring mainly in the upper Caroní, both on the periphery and within the territory of the Canaima National Park,[78] [79] as well as in the basin of the Icabarú river[80]. In these areas, the operation of mining dredges, apparently without any official control, has been reported.[81]

In the case of the Canaima National Park, a very high number of mining sites have been detected, mainly located in the gallery forests of the southern and western border of the Park, on both banks of the Caroní River, both outside and inside the protected area[82](Figure 6). Likewise, the use of mining dredgers and rafts in the

70 Bermúdez, D et al. 1999. Mercury exposure throught fish comsumption in riparian population at reservoir Guri using nuclear techniques, Bolivar State Venezuela en Health impacts of Mercury Cycling in contaminated environments studied by nuclear techniques. International Atomic Energy Agency: Ljubljana, Slovenia. https://www.osti.gov/etdeweb/servlets/purl/20202763

71 Rodríguez, P.M., Carreño, P., García, S. 1990. Contaminación mercurial en mineros y afines del Bajo Caroní. Plexus Med. Ocupac., p 32. http://servicio.bc.uc.edu.ve/multidisciplinarias/saldetrab/vol1n2/art04.pdf

72 Lasso, C., Giraldo, A., Lasso, O., Rodríguez, J., León, O., Do Nacimento C., Taphorn, D., Machado-Allison, A. y Provenzano, F. 2008. Peces del alto río Paragua, cuenca del Caroní, Estado Bolívar, Venezuela. (110-115). En: Evaluación Rápida de la Biodiversidad de los Ecosistemas Acuáticos de la Cuenca Alta del Río Paragua, Estado Bolívar, Venezuela. RAP Bulletin of Biological Assessment 49. (Señaris, Lasso y Flores Eds.).

73 Paolini, J., Felipe; J.J. y Sureda, B. 2017. Threats to the sustainability of the Venezuelan Guiana watersheds. Academia Journal of Environmental Science 5(6): 102-107.

74 Machado Allison, A., 2017. Op cit.

75 Álvarez, L. A., y Rojas, L. A. 2009. Contenido de mercurio total en peces de consumo habitual en los asentamientos indígenas El Plomo y El Casabe-Estado Bolívar. Universidad, Ciencia y Tecnología, 13(51), 097-102.

76 Veiga, M. y Hinton, B. Mercury Bioaccumulation by Aquatic Biota in Hydroelectric Reservoirs: Review and Consideration of the Mechanisms. Paper presented at the 1st International Forum on Mercury Problem in Hydroelectric Reservoirs: The Guri Case, Bolivar State, Venezuela, Org. IAMOT/UNEG, Ciudad Bolivar, May 17-19, 2001. https://archive.iwlearn.net/globalmercuryproject.org/countries/venezuela/docs/Venezuela%20Guri%202001%20to%20Proceedings.pdf

77 Bermúdez, D. 2001. La bioacumulación de mercurio en el reservorio Guri y sus efectos sobre la salud de los pobladores en el área de influencia inmediata. Pg. 25 En: I Foro Internacional. El problema del mercurio en los embalses: El caso del reservorio Guri. Bermúdez Tirado, R.D. et al. (eds.) Ciudad Bolívar.

78 SOS Orinoco. 2023. Op. cit.

79 Lezama, J.C. y Narvaes, I. 2013. Análisis multitemporal para la detección de cambios ocasionados por actividades de minería ilegal en la cuenca media del río Caroní, Venezuela. Anais XVI Simpósio Brasileiro de Sensoriamento Remoto - SBSR, Foz do Iguaçu, PR, Brasil, 13 a 18 de abril de 2013, INPE. http://marte2.sid.inpe.br/col/dpi.inpe.br/marte2/2013/05.28.22.48.28/doc/p0156.pdf

80 SOS Orinoco. 2020. Minería en Icabarú, Cuenca Alta del Caroní: De la Incoherencia a la Anarquía. Criminal de Estado. https://sosorinoco.org/wp-content/uploads/2020/07/MineríaIkabarú_LogoNuevo_20200602.pdf

81 Ramírez, M. 2023. Los mineros invaden Ikabarú a punta de 'misiles'. https://armando.info/los-mineros-invaden-ikabaru-a-punta-de-misiles/

82 SOS Orinoco. 2023. Evaluación de las amenazas al Parque Nacional Canaima, Sitio de Patrimonio Mundial Natural. https://drive.google.com/file/d/1rf6ecf5hUH-XRSOUQlRdS-Rjt5AuDqOZ/view

Figure 6.
Canaima National Park mine. Taken from SOS Orinoco

Carrao River has been reported[83] [84] alongside mercury pollution, which affects local indigenous populations.[85]

Even though the national government has reiterated that mining in the Protected Area has been eradicated,[86] new reports arise every year about gold extraction on the banks of the river.[87]

On the other hand, the operation of mining dredges and rafts in the lower Caroní and Paragua rivers has been consistently denounced.[88] [89]

An additional effect of mining activity in the basin is the increase in sediments due to the erosion generated by mining,[90] [91] which threatens the production of the Simón Bolívar Hydroelectric Complex located in the lower Caroní.[92] This situation

83 SOS Orinoco. 2018. Situación Actual de la Minería Aurífera en el Parque Nacional Canaima: Sitio de Patrimonio Mundial en Venezuela. https://sosorinoco.org/wp-content/uploads/2020/07/CanaimaEspañol_PortadaNueva_ConA3.pdf

84 Boon, L. y Meléndez L. 2021. Canaima: el paraíso envenenado por el oro. https://www.elpitazo.net/investigacion/canaima-el-paraiso-envenenado-por-el-oro/

85 Ramírez Cabello, M. 2021. La huella tóxica del mercurio llegó a la Gran Sabana. https://especiales.correodelcaroni.com/la-huella-toxica-del-mercurio-llego-a-la-gran-sabana/

86 YVKE Mundial. 2014. Operación Roraima libera completamente el Río Carrao de la minería ilegal (+Audio) http://radiomundial.com.ve/operacion-roraima-libera-completamente-el-rio-carrao-de-la-mineria-ilegal-audio/

87 World Heritage Watch. 2023. World Heritage Watch Report 2023. https://world-heritage-watch.org/content/world-heritage-watch-report-2023/

88 Lanz, A. 2017. Alrededor de 2 mil equipos mineros ilegales destruyen Lago de Guri. http://cievbolivar.blogspot.com/

89 Nueva Prensa Digital.2020. Dragas, misiles y balsas destruyen río Paragua. https://soynuevaprensadigital.com/npd/dragas-misiles-y-balsas-destruyen-rio-paragua/

90 Lezama, JC and Narvaes , I. 2013. Op. cit.

91 EDELCA-CVG. 2003. Op. cit.

92 Sánchez-Torres B., Vessuri, H. y Rosales, J. 2008. Una revisión del plan de manejo de la cuenca del rio Caroní Venezuela, desde una perspectiva de la valoración del recurso hídrico. Conferencia presentada en el VI Congreso Ibérico de Planeación y gestión del

may also be a factor that aggravates the flooding of the lands along the banks of the Caroní and Orinoco rivers[93] and threatens the supply of drinking water in Ciudad Guayana.[94]

Caura

Caura River

This river seems to be in a good state of conservation. However, there is concern about the threat to the health of the basin posed by the accelerated growth of illegal mining activity throughout the basin.[95]

At the beginning of this century, the region crossed by the Caura River was considered one of the largest tracts of pristine forest in the Guiana Shield, and the environmental condition of the river was largely regarded as excellent[96] [97] because mining was still small and isolated until the end of the last century.[98]

The situation changed dramatically in 2002 and afterward with the rapid expansion of illegal gold mining throughout the basin.[99] [100] By 2011, high levels of mercury had been detected in the water, fish and indigenous populations of the upper

agua. Vitoria España. https://www.researchgate.net/publication/281101043_UNA_REVISION_DEL_PLAN_DE_MANEJO_DE_LA_CUENCA_DEL_RIO_CARONI_VENEZUELA_DESDE_UNA_PERSPECTIVA_DE_LA_VALORACION_DEL_RECURSO_HIDRICO

93 Los #SinLuz. 2018. Manejo inadecuado del embalse de Guri incide en crecidas de los ríos Orinoco y Caroní. https://www.lossinluzenlaprensa.com/manejo-inadecuado-del-embalse-de-guri-incide-en-crecidas-de-los-rios-orinoco-y-caroni/

94 Rodríguez, I. 2015. Agua potable y saneamiento para Ciudad Guayana. Guayana sustentable 4. educación, productividad y vida. https://revistasenlinea.saber.ucab.edu.ve/index.php/guayanasustentable/issue/view/225

95 Machado-Allison, A. and Chernoff, B. (2020.). El río Caura: desde la pristinidad a su destrucción. (39-56). En Rodríguez-Olarte, D. (Editor). Ríos en riesgo de Venezuela. Volumen. 3. Universidad Centroccidental Lisandro Alvarado.

96 Machado-Allison A., Chernoff B. y Bevilacqua M. 2003. Introduction to the Caura River Basin, Bolivar State, Venezuela. In: Chernoff B., Machado-Allison A., Riseng K. J., Montaubault J. R. (editors). A Biological Assesment of the Caura River Basin, Bolivar State, Venezuela. Bulletin of Biological Assesment Nº 20. Washington, DC: Conservation International.

97 Chernoff, B., A. Machado-Allison, K. Riseng, and J. R. Montambault (eds.). 2003. A Biological Assessment of the Aquatic Ecosystems of the Caura River Basin, Bolívar State, Venezuela. RAP Bulletin of Biological Assessment 28. Conservation International, Washington, DC.

98 Bevilacqua, M., y Ochoa, J. (2001.). Conservación de las últimas fronteras forestales de la Guayana venezolana: propuesta de lineamientos para la cuenca del río Caura. Interciencia, 26(10), 491-497.

99 Clima21 / Todos por el Futuro. 2020. Pronunciamiento conjunto en apoyo a los esfuerzos de los pobladores del Caura por proteger sus derechos contra la minería depredadora. https://clima21.net/comunicados/pronunciamiento-conjunto-en-apoyo-a-los-esfuerzos-de-los-pobladores-del-caura-por-proteger-sus-derechos-contra-la-mineria-depredadora/

100 SOS Orinoco. 2021. Minería en Caura y su nuevo Parque Nacional. https://drive.google.com/file/d/1Udc2aUUgFiwwQ-nviaRIQR-3h4CYfLL40/view

and middle Caura.[101] Likewise, high levels of deforestation in the basin[102] and a significant increase in forest fires has been reported in recent years.[103]
The creation of the Caura National Park in 2017 has failed to improve the situation of environmental degradation and violence associated with mining in the basin.[104] [105]

Ventuari

Ventuari River

The environmental health of this river is largely unknown, even though it is the main tributary of the Orinoco in the state of Amazonas. However, the high rates of deforestation in its basin suggest the existence of serious disturbances to the health of the ecosystem.[106]

On the other hand, the existence of mining activity in the Yapacana National Park, a protected area comprising the confluence of the Ventuari and Orinoco rivers, has been known since the 1980s.[107] Although the park's aquatic environments suffered little intervention at the time, there was concern about the use of mercury in gold mining, the destruction of watersheds and the modification of water courses, the increase in water turbidity due to the alteration of soils and vegetation, and the overfishing of aquatic species.[108]

101 Pérez, L., Perera, L. y Penna, S. 2012. Evaluación del riesgo de exposición al metil-mercurio en poblaciones indígenas ribereñas del Río Caura (Bolívar, Venezuela) EDIH-FLASA, WCS Proyecto Caura, Universidad de Oriente Núcleo Bolívar. https://saqueada.amazoniasocioambiental.org/Informe_riesgo_exp_metilmercurio_Caura33d3e628542d2a8d85f6683d7df19de0.pdf

102 MAAP. 2022. MAAP #155: Deforestation Hotspots in the Venezuelan Amazon. https://www.maaproject.org/2022/deforestation-venezuela/

103 Carpio, H. 2021. Naturaleza en llamas. 20 años de incendios en Áreas Protegidas de Venezuela. https://prodavinci.com/naturalezaenllamas/index.html?home

104 Clima21 / Todos por el Futuro. 2020. Op. cit.

105 InsightCrime. 2020. Venezuela Indigenous Communities at Risk From ELN Mining Incursions. https://insightcrime.org/news/analysis/venezuela-indigenous-communites-mining/

106 RAISG, 2015. Deforestación en la Amazonia (1970-2013).

107 Castillo R. y V. Salas. 2007. Estado de Conservación del Parque Nacional Yapacana. Reporte Especial. En: BioParques: Programa Observadores de Parques. https://www.oas.org/dsd/AAPAD2/Docs/(iii)%20Reporte%20Especial%20PN%20Yapacana%20(Venezuela).pdf

108 Lasso, C. A., Señaris, J.C. Alonso L.E. y Flores A. (Editores). 2006. Evaluación Rápida de la Biodiversidad de los Ecosistemas Acuáticos en la Confluencia de los ríos Orinoco y Ventuari, Estado Amazonas (Venezuela). Boletín RAP de Evaluación Biológica 30. Conservation International. Washington DC, USA.

Figure 7. Yapacana National Park 2022. El País de España

In 2010, high concentrations of mercury were found in fish tissues collected at the confluence of the Orinoco and Ventuari rivers.[109]

In recent years, the growth of gold mining in the territory of this National Park has been reported (Figure 7), including on top of the Yacapana tepui.[110] [111]

109 Trujillo, F., Lasso, C., Diazgranados, M., Farina, O., Pérez, L., Barbarino, A., y González, M. 2010. Evaluación de la contaminación por mercurio en peces de interés comercial y de la concentración de organoclorados y organofosforados en el agua y sedimentos de la Orinoquía. Biodiversidad de La Cuenca Del Orinoco: Bases Científicas Para La Identificación de Áreas Prioritarias Para La Conservación Y Uso Sostenible de La Biodiversidad, 175–191.

110 MAAP 2022. MAAP #169: Mining on top of Yapacana Tepui (Yapacana National Park, Venezuela). https://www.maaproject.org/2022/tepuis_yapacana/

111 SOS Orinoco. 2020. La Minería Aurífera en el Parque Nacional Yapacana, Amazonas Venezolano (actualización) https://sosorinoco.org/wp-content/uploads/2020/08/ActualizacionPNY_20200602.pdf

...está ocurriendo un rápido proceso de degradación de los ríos de la Amazonía venezolana...

In response to these findings, the national government began a large military operation that included the eviction of miners and the destruction of their equipment and facilities.[112] [113] Likewise, promises were made to carry out activities to reverse the damage caused by mining.[114] [115]

Despite these measures, the great opacity that surrounds the operations[116]and the lack of scientific information that accompanies the alleged recovery plans raise doubts about their effectiveness.

112 EFE. 2023. Más de 25.000 militares desplegados en Amazonía de Venezuela para erradicar minería ilegal. https://www.swissinfo.ch/spa/venezuela-defensa_m%C3%A1s-de-25.000-militares-desplegados-en-amazon%C3%ADa-de-venezuela-para-erradicar-miner%C3%ADa-ilegal/48835920

113 Rangel, G. 2023. Van cerca de 11.600 mineros ilegales desalojados por la FANB en Yapacana. https://ultimasnoticias.com.ve/noticias/sucesos/van-cerca-de-11-600-mineros-ilegales-desalojados-por-la-fanb-en-yapacana/

114 CEOFANB. 2023. Arranca campaña de reforestación en la región de Guayana a través de la FANB. https://ceofanb.mil.ve/arranca-campana-de-reforestacion-en-la-region-de-guayana-a-traves-de-la-fanb/

115 MINEC. 2023. Comenzaron preparativos para la recuperación del Parque Nacional Yapacana. http://www.minec.gob.ve/comenzaron-preparativos-para-la-recuperacion-del-parque-nacional-yapacana/

116 TalCual. 2023. Muerte y opacidad en Yapacana: activistas rechazan criminalización de la población. https://correodelcaroni.com/region/muerte-y-opacidad-en-yapacana-activistas-rechazan-criminalizacion-de-la-poblacion/

Conclusions from an unfinished work

The collected information seems to indicate that a rapid process of degradation of the rivers of the Venezuela´s Amazon is occurring, mainly as a result of the expansion of uncontrolled illegal mining.

In this regard, the economic development model of mining depredation [117]imposed on the country can be considered the main threat to the future of the rivers of this region.

If the observed trends continue, many of the rivers in this region will be so seriously affected that they will lose the capacity to support life and provide water for human consumption, while some of them may generate socio-natural disasters. Likewise, the cultures of the indigenous peoples who live in these basins would be lost, as well as the potential for sustainable development and Earth conservation associated with these bodies of water.

Likewise, the Protected Areas established in the south of the country do not seem to be fulfilling their objective of preserving the ecosystems of their territories, including the rivers that cross them. No information is available on the existence of environmental management plans for these areas under legal protection aside from the militarization of some of them.

The situation may be aggravated by the effects of climate change. There is evidence that the Amazonian rainforest and rivers are losing their resilience to this phenomenon.[118] Although information on the possible effects of climate change

117 Sutherland, M., Bull. B. y Prieto, A. 2021. El emergente capitalismo depredador: el drama de la minería en Venezuela. Sin Permiso. https://www.sinpermiso.info/textos/el-emergente-capitalismo-depredador-el-drama-de-la-mineria-en-venezuela

118 Boulton, C.A., Lenton, T.M. y Boers, N. 2022. Pronounced loss of Amazon rainforest resilience since the early 2000s. Nat. Clim. Chang. 12, 271–278 https://doi.org/10.1038/s41558-022-01287-8

on the rivers of the Venezuela´s Amazon is scarce[119] [120] [121] the water regime of the region will very likely be affected and, consequently, the integrity and functioning of the rivers will be put at risk.[122]

The first obstacle to overcoming these problems is the scarcity of information on the environmental conditions of the area. This situation seems to be a product, on the one hand, of the deterioration and destruction of the capacities to carry out scientific research by universities and other specialized research centers in the country[123] [124]and, on the other, the information opacity established by the government as a State policy.[125] [126]

Other obstacles include the lack of environmental policies with adequate technical criteria for the complex challenges of environmental management in the current context of a Complex Humanitarian Emergency and the loss of the State's institutional capacity for the management of protected areas. In fact, there is no information that the Venezuelan State is taking effective and sustained action to protect the fluvial wealth of the south of the country.

On the other hand, the current situation of the rivers in this region poses a major obstacle to the country's advance toward the Sustainable Development Goals (See Appendix 2).

119 Méndez, C., Moreno, M., Montoya, J.V., Felicien, A,. Nikonova, N. y Buendía, C. 2017. Escenarios de cambio climático y la conservación de los ríos de Venezuela. Cap. 8 (pp: 173-188). En: Rodríguez-Olarte, D. (Editor). Ríos en riesgo de Venezuela. Volumen 1 Universidad Centroccidental Lisandro Alvarado (UCLA). Barquisimeto, Venezuela.

120 ACFIMAN-SACC, 2018: "Primer Reporte Académico de Cambio Climático. Resumen para Responsables de Políticas en Cambio CΩimático para Venezuela: Contribución de los Grupos de Trabajo I, II y III al Primer Reporte Académico de Cambio Climático (PRACC) de la Secretaría Académica de Cambio Climático (SACC) de la Academia de Ciencias Físicas, Matemáticas y Naturales (ACFIMAN) de Venezuela".

121 Viloria, J.A., Olivares, B.O., García, P., Paredes-Trejo, F., Rosales, A. 2023. Mapping projected variations of temperature and precipitation due to climate change in Venezuela. Hydrology 2023, 10, 96. https://doi.org/10.3390/hydrology10040096

122 Paredes-Trejo F., Barbosa-Alves, H., Moreno-Pisani, M.A., y Farías-Ramírez. A. 2020. Cambio climático: ¿altera el régimen de precipitaciones y caudales en Venezuela?. Sección II (pp: 137-147). En: Rodríguez-Olarte, D. (Editor). Ríos en riesgo de Venezuela. Volumen 3. Universidad Centroccidental Lisandro Alvarado (UCLA). Barquisimeto, Venezuela.

123 Aula Abierta (2021) Situación de los espacios universitarios de conservación ambiental en Venezuela (Enero 2019 – Agosto 2020) http://aulaabiertavenezuela.org/wp-content/uploads/2021/04/Informe-Preliminar-Situaci%C3%B3n-de-los-espacios-universitarios-de-conservaci%C3%B3n-ambientalen-Venezuela-VOL-2.pdf

124 Bonalde, I. y Montañez, B. 2023. Producción de conocimiento en Venezuela 1970-2022. Boletín de la Academia de Ciencias Físicas, Matemáticas y Naturales Vol. LXXXIII, n.° 2, pp. 1-11. https://acfiman.org/wp-content/uploads/2023/12/bacfiman83.2.1.pdf

125 Clima21. 2023. Acceso a la información, participación y justicia en temas ambientales en Venezuela. https://clima21.net/noticias/acceso-a-la-informacion-participacion-y-justicia-en-temas-ambientales-en-venezuela/

126 Espacio Público. 2020. Sin acceso a la información sobre el ambiente en Venezuela. https://espaciopublico.ong/acceso-a-la-informacion-publica-y-problemas-ambientales-venezuela/

Photography: Alberto Blanco Dávila

It is clear that environmental damage interferes with the exercise of human rights.[127] Hence, States must avoid and minimize environmental damage, protect the population against the effects of this damage and adopt effective measures to guarantee the conservation and sustainable use of ecosystems and their biological diversity.

In this sense, the Venezuelan State has the obligation to establish and implement environmental management policies aimed at the protection and conservation of the rivers of the Venezuela´s Amazon as fundamental elements of the protection of the human rights of both the population settled in their basins and elsewhere in the country.

Beyond the obligations of the States, it is necessary to overcome the rationale that considers rivers as mere aquatic highways, natural resource sources and recipients of waste from human activities.

Consistent with the global movement for the recognition of rivers as entities with legal standing and rights,[128] Venezuela needs to advance towards the recognition of the right of rivers to exist, prosper and evolve according to the laws of nature. This action is urgent in the case of the rivers of the Venezuela´s Amazon and, particularly, the Orinoco River.

127 Office of the High Commissioner for Human Rights (OHCHR). 2018. Framework principles on human rights and the environment. https://www.ohchr.org/en/special-procedures/sr-environment/framework-principles-human-rights-and-environment-2018

128 Universal declaration of the rights of Rivers. https://www.rightsofrivers.org/#declaration

Recommendations

Given the enormous value of the fluvial ecosystems of the Venezuelan Amazon and their impact on human rights, the Venezuelan State shall urgently assume the following recommendations:

- Implement effective actions to eliminate both illegal mining and mining extractivism as a means of financing the State;
- Effectively comply with the legal regulations aimed at the conservation of rivers and their biodiversity;
- Establish a process of environmental re-institutionalization of the country, including the technical, political and financial strengthening of the institutions that must guide and implement the country's environmental policies;
- Ratify and implement the Minamata Convention on Mercury, for which National Action Plans must be established for the total eradication of the use of mercury in mining in the shortest possible time;
- Establish a national policy of research funding that supports the conduction of scientific studies, assessments and plans for the management of the fluvial ecosystems of southern Venezuela;
- Promote a national discussion that leads to the recognition of the rights of rivers as protected subjects,
- Establish policies for access to information, public participation and justice in environmental matters concerning Venezuela's rivers following the provisions of the Escazú Agreement.

Appendix 1

Rivers with reports of mining activity

N°	River	State	Municipalities	Presence of raft*
1	Alto Orinoco	Amazonas	Alto Orinoco	X
2	Ocamo	Amazonas	Alto Orinoco	X
3	Padamo	Amazonas	Alto Orinoco	
4	Caño Iguapo	Amazonas	Alto Orinoco	
5	Cunucunuma	Amazonas	Alto Orinoco	
6	Parú	Amazonas	Atabapo	
7	Caño Yagua	Amazonas	Atabapo	X
8	Atabapo	Amazonas	Atabapo	X
9	Caño Cabeza de Manteco	Amazonas	Atures	
10	Sipapo	Amazonas	Autana	
11	Cuao	Amazonas	Autana	
12	Autana	Amazonas	Autana	
13	Caño Piedra	Amazonas	Autana	
14	Guayapo	Amazonas	Autana	
15	Ventuari	Amazonas	Manapiare	X
16	Orinoco medio	Amazonas	Manapiare	X
17	Negro	Amazonas	Río Negro	X
18	Aracamuni	Amazonas	Río Negro	
19	Siapa	Amazonas	Río Negro	
20	Casiquiare	Amazonas	Río Negro	
21	Paragua	Bolívar	Angostura	X
22	Aro	Bolívar	Angostura	X
23	Yuruarí	Bolívar	El Callao-Sifontes	
24	Carrao	Bolívar	Gran Sabana	X
25	Icabarú	Bolívar	Gran Sabana	X
26	Aponguao	Bolívar	Gran Sabana	
27	Kukenán	Bolívar	Gran Sabana	X
28	Caroní	Bolívar	Gran Sabana - Angostura – Angostura del Orinoco - Caroní	X
29	Cuyuní	Bolívar	Sifontes	X
30	Yuruan	Bolívar	Sifontes	X
31	Quebrada Amarilla	Bolívar	Sifontes	
32	Botanamo	Bolívar	Sifontes	
33	Caura	Bolívar	Sucre	X

* Vessels assembled or equipped for mining exploitation through dredging or suctioning of the sediments deposited at the river beds.

Fuente:
Elaboración propia a partir de información recabada en noticias publicadas en informes técnicos, medios de
Own elaboration based on information collected from technical reports, news articles and social media.

Appendix 2

United Nations Sustainable Development Goals (SDGs) and targets affected by the environmental deterioration of the rivers of the Venezuelan Amazon

Goal	Target
3. Ensure healthy lives and promote well-being for all at all ages.	3.9 By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.
6. Ensure availability and sustainable management of water and sanitation for all.	6.3 By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally. 6.5 By 2020, protect and restore water-related ecosystems, including mountains, forests, wetlands, rivers, aquifers and lakes.
9. Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.	9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities.
12. Ensure sustainable consumption and production patterns	12.4 By 2020, achieve the environmentally sound management of chemicals and all wastes throughout their life cycle, in accordance with agreed international frameworks, and significantly reduce their release to air, water and soil in order to minimize their adverse impacts on human health and the environment.
15. Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.	15.5 Take urgent and significant action to reduce the degradation of natural habitats, halt the loss of biodiversity and, by 2020, protect and prevent the extinction of threatened species.

CLIMA21
OBSERVATORIO VENEZOLANO DE DERECHOS HUMANOS AMBIENTALES

OVDHA
OBSERVATORIO VENEZOLANO DE DERECHOS HUMANOS AMBIENTALES