



Database of industrial development projects within the range of the Western Chimpanzee (*Pan troglodytes verus*)

Report from the ARRC Task Force, November 2022

Background

This database was created with the aim of better understanding the overlap between industrial development projects and the Critically Endangered western chimpanzee's (*Pan troglodytes verus*) range. The main purpose of this database is to guide the activities of the IUCN SSC PSG SGA SSA ARRC Task Force, by highlighting areas under highest threat from industrial development projects. At the moment, we were only able to gather information on two sectors, i.e. mining and hydropower dams, but we aim to eventually expand this database to include information on other sectors, such as agribusiness and linear infrastructures, such as roads and rail lines.

Key Terms

- *Western chimpanzee range countries* - countries with confirmed populations of western chimpanzees; these include Mali, Senegal, Guinea-Bissau, Guinea, Sierra Leone, Liberia, Côte d'Ivoire, and Ghana.
- *Western chimpanzee range* - the current reported geographic range of western chimpanzees (*Pan troglodytes verus*) based on Kühl et al. (2017) plus a 10 km buffer. This buffer was added to account for possible inaccuracies in the published 2017 western chimpanzee range. Collectively the Kühl et al. (2017) range plus the buffer are referred to as the western chimpanzee range (570,368 km²) in these databases and reports.
- *Protected areas* - As defined by the IUCN, a protected area (PA) is a “clearly defined geographical space, recognized, dedicated, and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values” (Dudley, 2008). For these databases, we mapped only terrestrial PAs that had one or more of the

following designations: IUCN PA management category I-IV, UNESCO World Heritage Site, UNESCO Biosphere Reserve, National Park, and Nature Reserve (UNEP-WCMC and IUCN, 2022).

Relevant to the mining database:

- *Application phase* - first phase which includes applying for the permission or right to the mining permit.
- *Exploration phase* - phase which encompasses a range of activities aimed at determining the presence of minerals and their location and commercial viability of extraction.
- *Exploitation phase* - phase following validation of the Environmental and Social Impact Assessment, involves extraction of the minerals.

Relevant to the hydropower database:

- *Potential* - specific to Guinea, this is only a project phase category for sites listed in the AECOM database of potential hydropower locations in Guinea.
- *Candidate* - hydropower projects for which certain specific technical characteristics are known, but no concrete information on planned date of entry into service, construction, or financing agreements are available.
- *Committed/Planned* - Hydropower projects which are not yet constructed, but for which concrete technical information is available. For these, the earliest estimated years of entry into service are also provided in the database.
- *Existing* - hydropower projects in which plants and dams are already up-and-running and generating electricity.

Mining Database

We identified 1,071 mining projects located in western chimpanzee range (Richardson and Campbell, 2022). Data from Guinea-Bissau was not available, so Guinea-Bissau is not currently part of the database or analyses. Mining permits in western chimpanzee range cover a surface area of 174,209 km².¹ The summary of the data compiled in the mining database is presented in the tables and maps below. Please see [ARRC_WABiLED_mining_read_only](#) for details of each mining project.

Table 1. Overview of mining projects by country and project phase.

Country	Total no. of projects	No. of projects in application phase	No. of projects in exploration phase	No. of projects in exploitation phase
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Guinea	703	173	447	83
Mali	86	0	75	11
Côte d'Ivoire	73	44	24	5
Senegal	76	1	46	29
Sierra Leone	66	0	33	33
Liberia	59	0	56	3
Ghana	8	0	0	8
Total	1,071	218	681	172

Table 2. The six most mined minerals within western chimpanzee range according to their approximate total surface area (km²) covered by their permits within each country (excluding Guinea-Bissau for which no data was available).

Mineral	Guinea	Côte d'Ivoire	Liberia	Senegal	Mali	Sierra Leone	Ghana	Total
Gold	35,104	14,905	11,607	7,685	3,346	1,147 ¹	8,23 ⁴	74,619
Bauxite	58,071	0	0	0	13,10	430 ²	unk ⁵	59,811
Iron	13,177	2,766	4,549	1,331	800	unk ⁵	0	22,623
Nickel	3,874	4,368	0	0	0	0	0	8,242
Copper	1,924	4,029	0	0	0	0	0	5,953
Diamond	1,571	0	1,823	0.1	406	853 ³	0	4,653
Total	113,722	26,068	17,979	9,017	5,862	2,430	823	175,901

¹Four gold permit sizes are unknown in Sierra Leone, therefore these permits are not included in calculations or percentage of range covered.

²Two bauxite permit sizes are unknown in Sierra Leone, therefore these permits are not included in calculations or percentage of range covered.

³Four diamond permit sizes are unknown in Sierra Leone, therefore these permits are not included in calculations or percentage of range covered.

⁴Two gold permit sizes are unknown in Ghana, therefore these permits are not included in calculations or percentage of range covered.

⁵Unk = permit size is unknown, meaning the size of the permit was not listed in the source database and further information could not be found online.

Table 3. Percentage (%) of total western chimpanzee range covered by each of the top six mined minerals.

Mineral	Guinea	Côte d'Ivoire	Liberia	Senegal	Mali	Sierra Leone	Ghana	Total
Gold	6.2	2.6	2.0	1.3	0.6	0.2 ¹	0.1 ⁴	12.9
Bauxite	10.2	0.0	0.0	0.0	0.2	0.1 ²	unk ⁵	10.4
Iron	2.3	0.5	0.8	0.2	0.1	unk ⁵	0.0	3.9
Nickel	0.7	0.8	0.0	0.0	0.0	0.0	0.0	1.4
Copper	0.3	0.7	0.0	0.0	0.0	0.0	0.0	1.0
Diamond	0.3	0.0	0.3	0.0	0.1	0.1 ³	0.0	0.8
Country Total	19.9	4.6	3.2	1.6	1.0	0.4	0.1	30.8

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²Two bauxite permit sizes are unknown in Sierra Leone, therefore these permits are not included in calculations or percentage of range covered.

³Four diamond permit sizes are unknown in Sierra Leone, therefore these permits are not included in calculations or percentage of range covered.

⁴Two gold permit sizes are unknown in Ghana, therefore these permits are not included in calculations or percentage of range covered.

⁵Unk = permit size is unknown, meaning the size of the permit was not listed in the source database and further information could not be found online.

Table 4. Percentage (%) of western chimpanzee range within a given country that is covered by each of the top six mined minerals.²

Mineral	Guinea	Côte d'Ivoire	Liberia	Senegal	Mali	Sierra Leone	Ghana
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Gold	14.6	17.4	13.9	28.5	13.7	1.6 ¹	3.9 ⁴
Bauxite	24.2	0.0	0.0	0.0	5.4	0.6 ²	unk ⁵
Iron	5.5	3.2	5.4	4.9	3.3	unk ⁵	0.0
Nickel	1.6	5.1	0.0	0.0	0.0	0.0	0.0
Copper	0.8	4.7	0.0	0.0	0.0	0.0	0.0
Diamond	0.7	0.0	2.2	0.0	1.7	1.2 ³	0.0
Country Total	47.3	30.5	21.5	33.5	24.0	3.4	3.9

¹Four gold permit sizes are unknown in Sierra Leone, therefore these permits are not included in calculations or percentage of range covered.

²Two bauxite permit sizes are unknown in Sierra Leone, therefore these permits are not included in calculations or percentage of range covered.

³Four diamond permit sizes are unknown in Sierra Leone, therefore these permits are not included in calculations or percentage of range covered.

⁴Two gold permit sizes are unknown in Ghana, therefore these permits are not included in calculations or percentage of range covered.

⁵Unk = permit size is unknown, meaning the size of the permit was not listed in the source database and further information could not be found online.

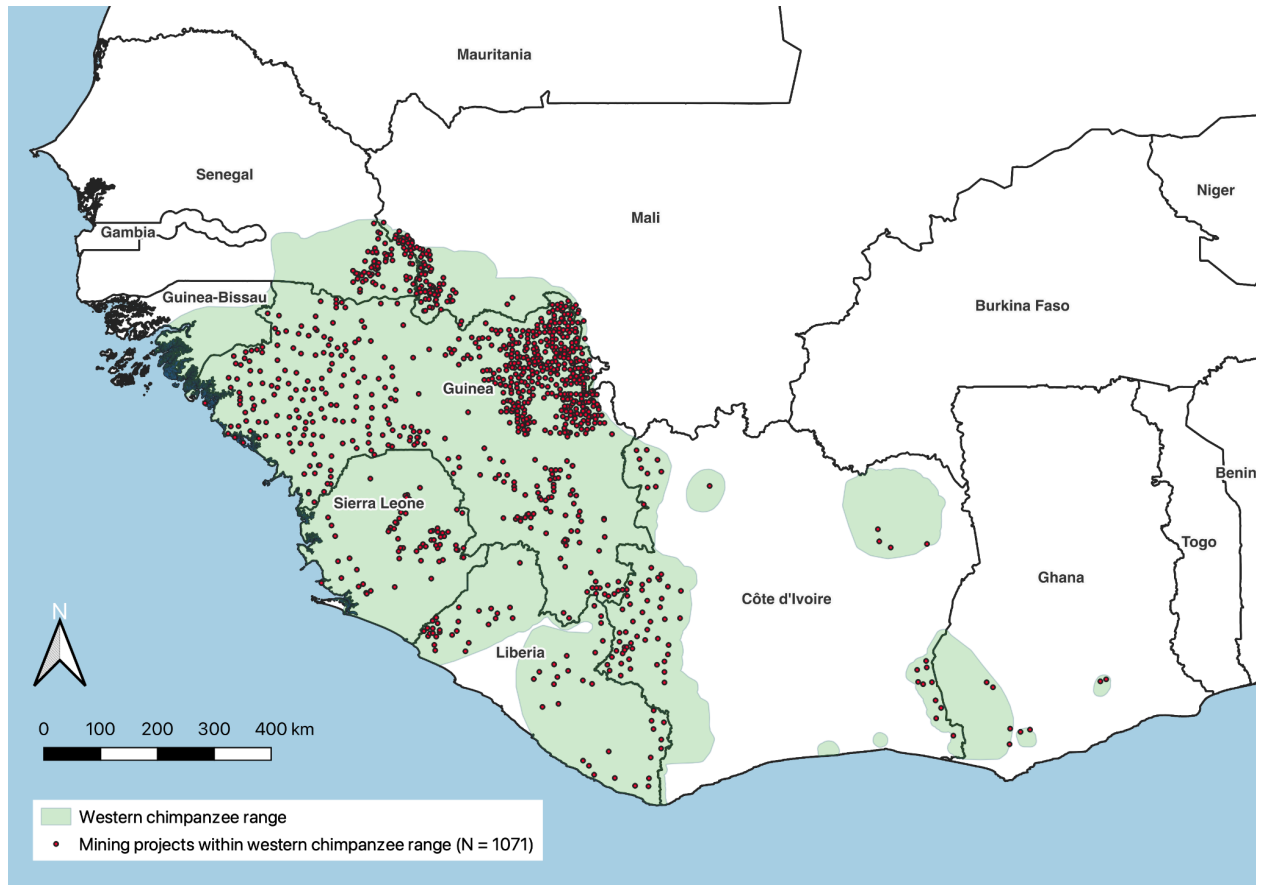


Figure 1. Map of point locations of mining projects (N=1,071) in western chimpanzee range.

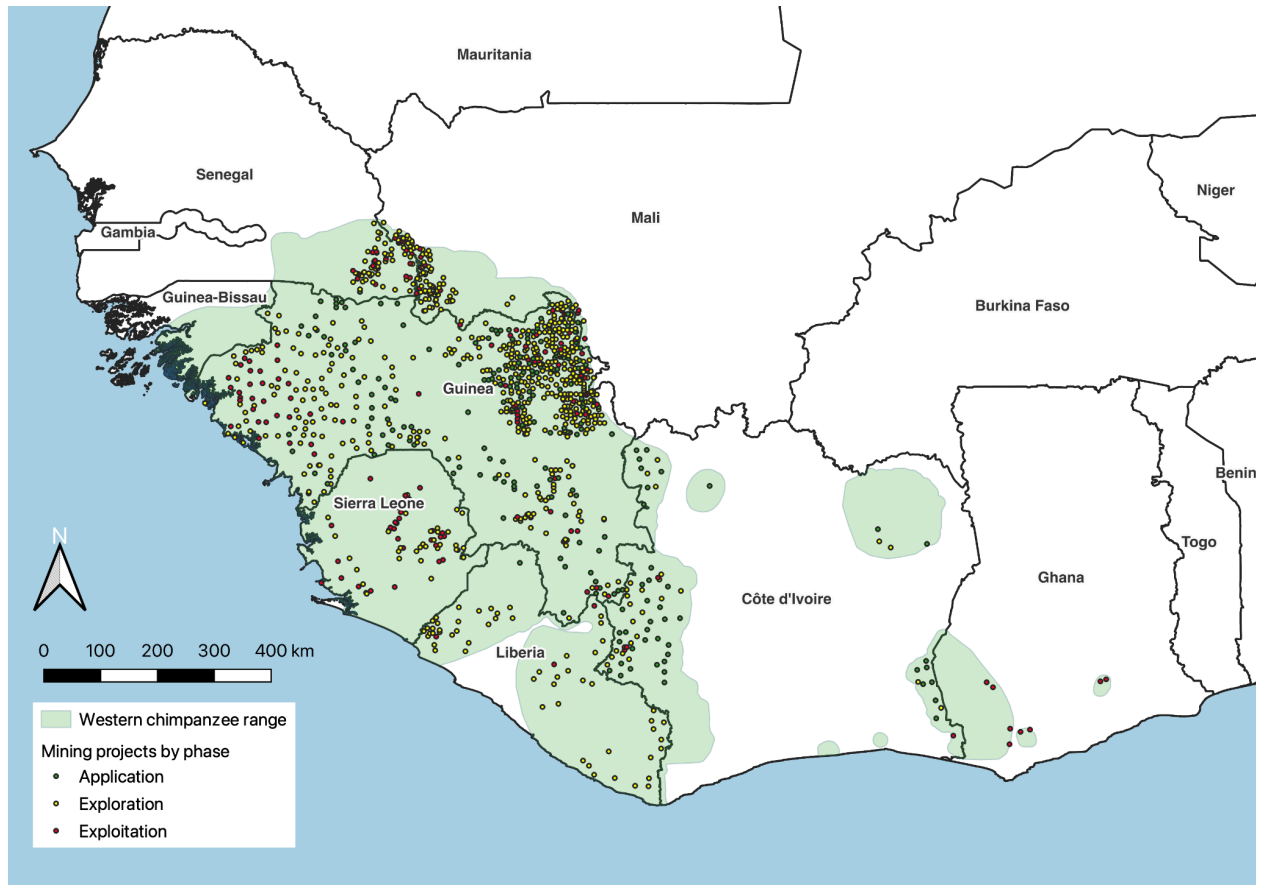


Figure 2. Map of point locations of mining projects (N=1071) in western chimpanzee range by project phase

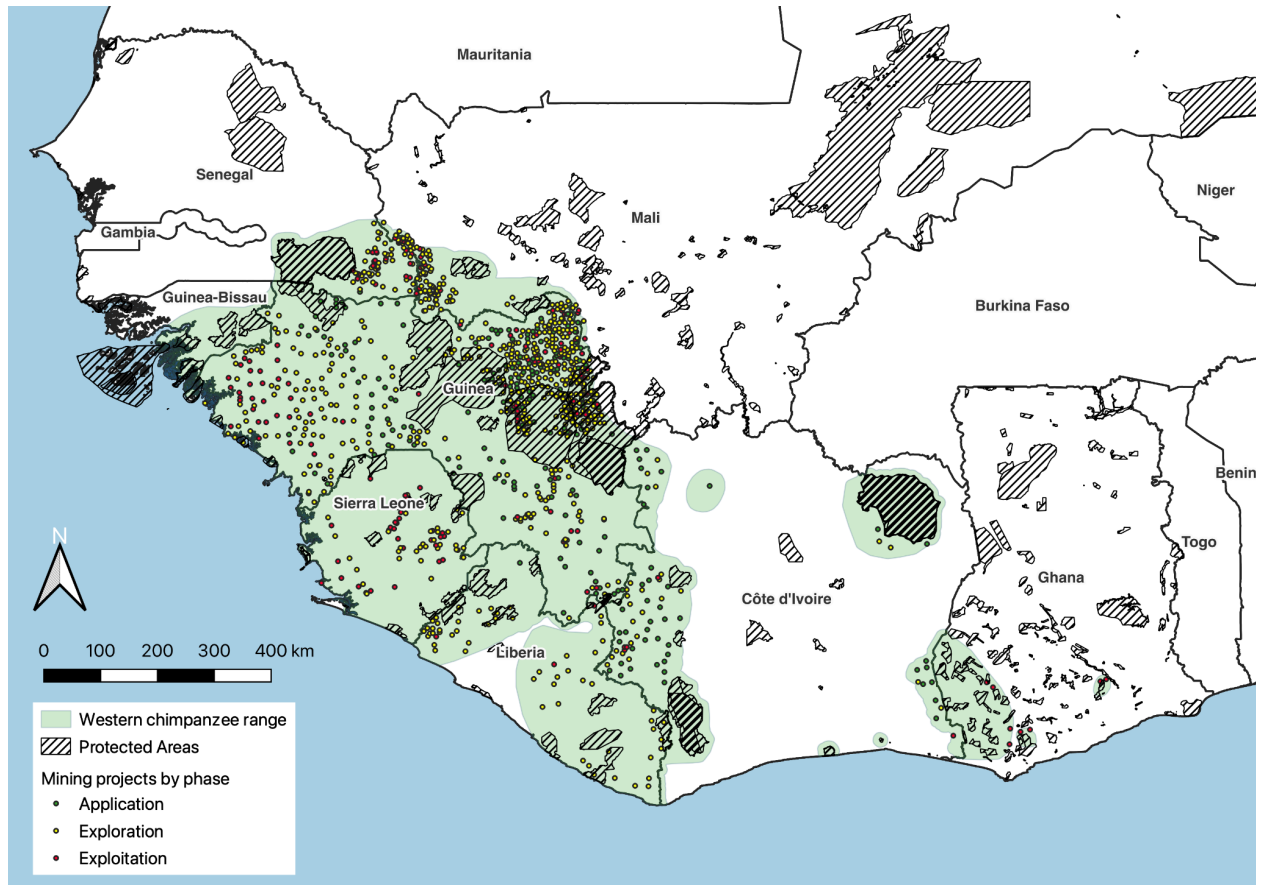


Figure 3. Map of point locations of mining projects (N=1071) and their location relative to PAs.

Hydropower Database

The hydropower database provides data on hydropower projects located within western chimpanzee range countries. The database is derived from three open-access databases on hydropower projects:

1. African Hydropower Atlas (Atlas) (Sterl et al. 2022)
2. The Future Hydropower Reservoirs and Dams Database (FHReD) (Zarfl et al. 2015)
3. Global Reservoir and Dam (GRanD) database (Lehner et al. 2011)

We identified 186 hydropower projects (including candidate, committed/planned, and existing; see Key Terms for definitions) within western chimpanzee range countries. Only 165 of the 186 identified hydropower projects had geospatial information (i.e. coordinates). And of those projects that had coordinates:

- 95 projects are located within the range of western chimpanzees.
- 70 projects are located outside of western chimpanzee range.

Below are tables and maps that provide an overview of what is found within the hydropower database. Please see [ARRC WABiLED hydro read only](#) for hydropower projects details.

Table 5. Overview of hydropower projects within western chimpanzee range by country and project phase.

Country	Total no. of hydropower projects	No. of hydropower projects with coordinates	No. of hydropower projects within western chimpanzee range	No. of candidate projects within western chimpanzee range	No. of committed /planned projects within western chimpanzee range	No. of existing projects within western chimpanzee range
Guinea*	46	44	44	21	14	9
Côte d'Ivoire	41	36	7	2	1	4
Sierra Leone	35	26	26	13	6	7
Ghana	29	27	5	5	0	0
Mali	19	17	3	3	0	0
Liberia	12	12	8	4	4	0
Guinea-Bissau	2	1	1	0	1	0
Senegal	2	2	1	1	0	0
Total	186	165	95	49	26	20

*NOTE: AECOM produced a list of potential hydropower sites in Guinea. Of the sites listed in their report, 277 sites are not listed in any of the other databases. Here we have not included those 277 sites in the region-wide overview, but we provide further details on these potential sites in Guinea in the database in a separate tab/sheet ("Guinea_AECOM data").

Table 6. Overview of hydropower projects within western chimpanzee range by country and project size. A project's size is defined by its energy production capacity (small < 10 MW, medium < 100 MW, and large ≥ 100 MW).

Country	No. of <i>small</i> projects	No. of <i>medium</i> projects	No. of <i>large</i> projects	No. of projects of <i>unknown</i> size
Guinea	8 ¹	16	17	3
Côte d'Ivoire	0 ²	3 ³	3 ⁵	1
Sierra Leone	0 ²	16 ⁴	3	1
Ghana	0	5 ³	0 ⁵	0
Mali	0	3 ³	0	0 ⁶
Liberia	0	3	4	1
Guinea-Bissau	0	1 ³	0	0
Senegal	0	0	1	0
Total	8	47	28	6

¹Two small projects did not have coordinates, therefore location relative to western chimpanzee habitat is not known.

²Four small projects did not have coordinates

³One middle project did not have coordinates

⁴Five middle projects did not have coordinates

⁵One Large project did not have coordinates

⁶One project of unknown size did not have coordinates

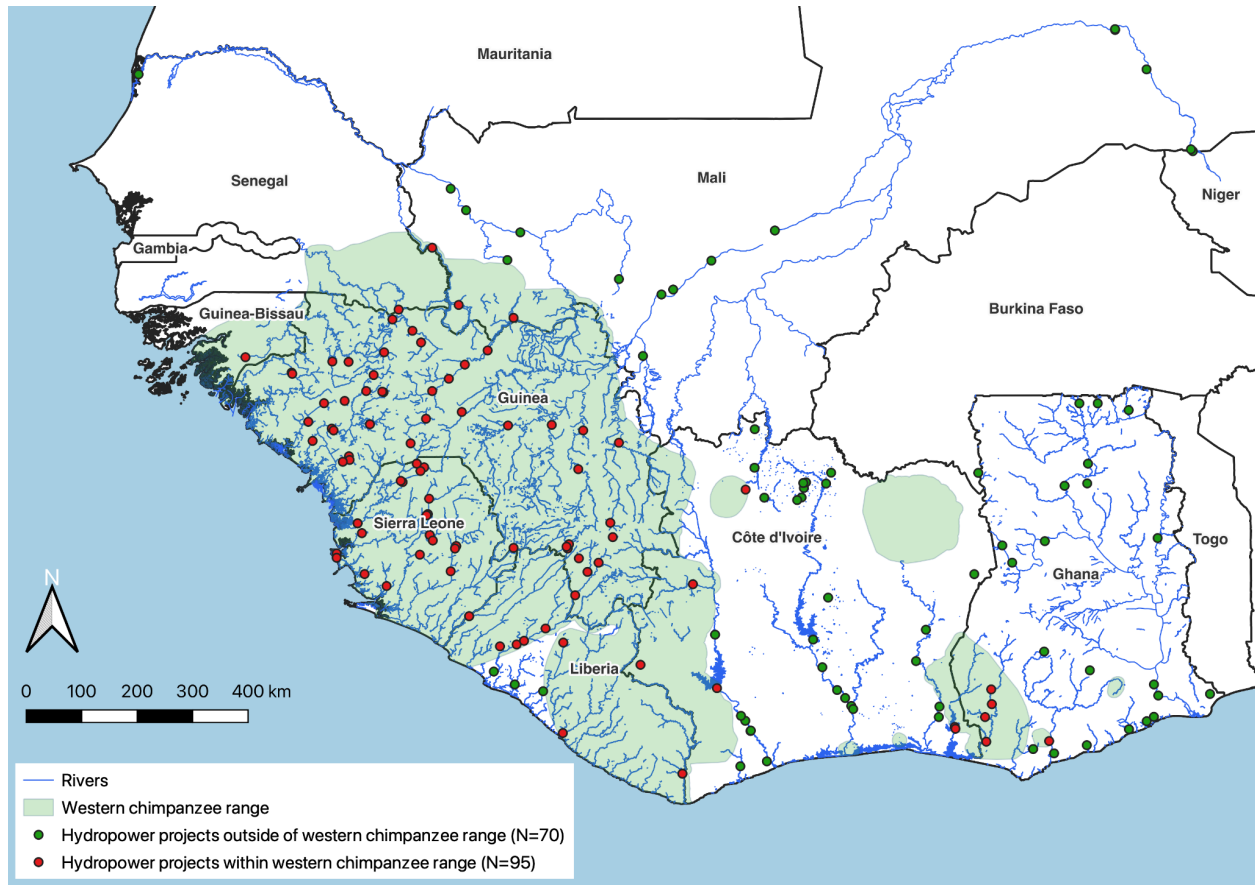


Figure 4. Map of hydropower projects (with coordinates; N=165) that are located within western chimpanzee range countries and their location relative to the range of western chimpanzees.

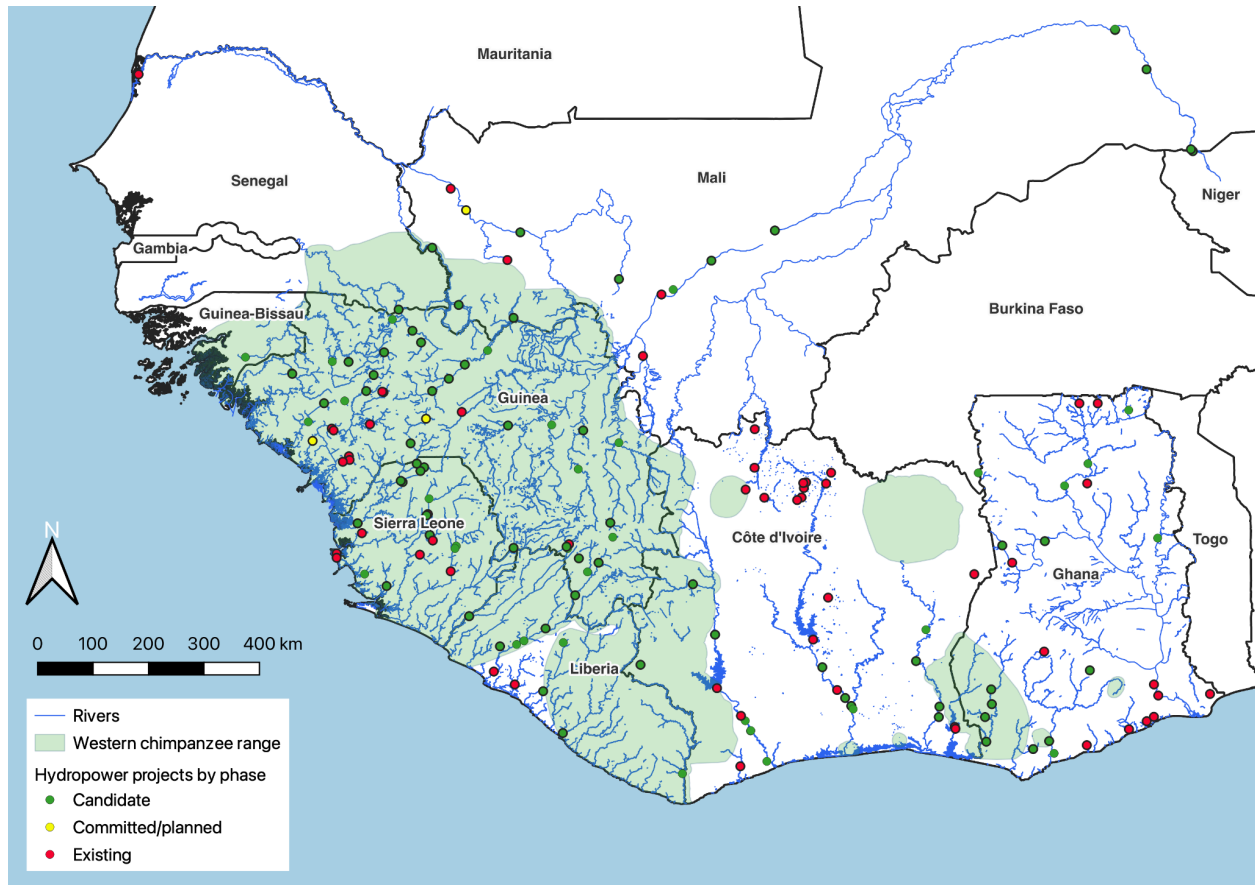


Figure 5. Map of hydropower projects (with coordinates; N=165) that are located within western chimpanzee range countries and their phases.

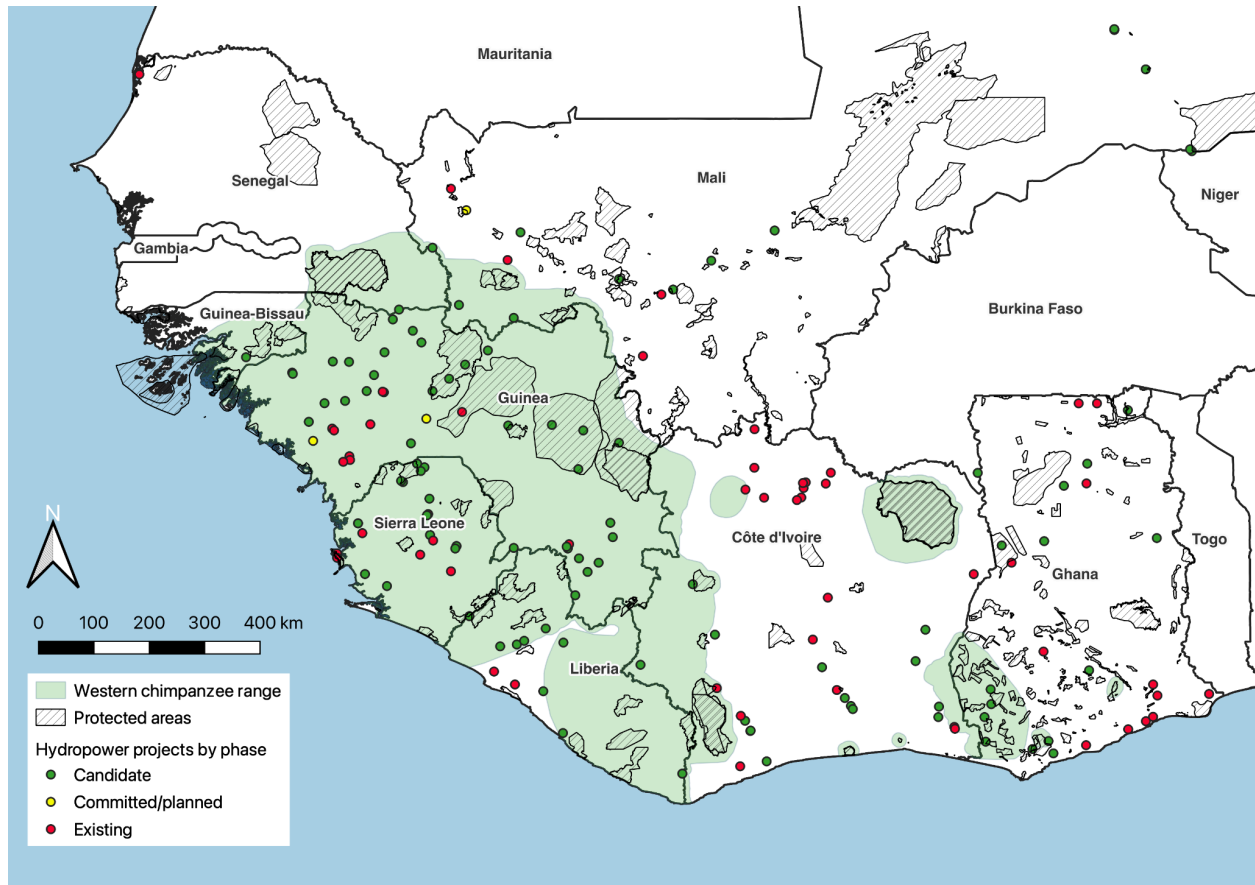


Figure 6. Map of hydropower projects (with coordinates; N=165) and their location relative to PAs and western chimpanzee range.

Key Takeaways

Information for just two industrial development sectors, i.e. mining and hydropower dams, reveals high overlap with the western chimpanzee’s range. Mining permits cover c.30% of the western chimpanzee’s range, with most permits found in Guinea (65% of permits). This country is a priority to address impacts from current and planned mining projects, especially given that Guinea harbors the majority of the remaining western chimpanzees.

The highest number of planned hydropower projects is also in Guinea. Many hydropower dams are planned on the same rivers; it is therefore important to anticipate potential cumulative impacts, but also to ensure that the location of these hydropower dams are optimal, i.e. balancing energy productivity and minimizing impacts on chimpanzees.

Endnotes

¹The total surface area for all mining permits is actually less than the total surface area for the six most mined minerals due to some double counting in situations where a mining project lists multiple mineral types.

²The percentage overlap of western chimpanzee range within a country and the surface area covered by the six most mined minerals does not equate to the percentage overlap of western chimpanzee range within a country and total surface area of mining (not taking into account mineral type). This is due to some double counting in situations where a mining project lists multiple mineral types.

References

- Dudley, N. (Editor) (2008). Guidelines for Applying Protected Area Management Categories. Gland, Switzerland: IUCN. x + 86pp. WITH Stolton, S., P. Shadie and N. Dudley (2013). IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, Best Practice Protected Area Guidelines Series No. 21, Gland, Switzerland: IUCN.
- Kühl, HS, Sop, T, Williamson, EA, et al. The Critically Endangered western chimpanzee declines by 80%. *Am J Primatol.* 2017; 79:e22681, <https://doi.org/10.1002/ajp.22681>
- Lehner, B., Reidy Liermann, C., Revenga, C., Vörösmarty, C., Fekete, B., Crouzet, P., Döll, P., Endejan, M., Frenken, K., Magome, J., Nilsson, C., Robertson, J., Rödel, R., Sindorf, N., Wissler, D. (2011): High-resolution mapping of the world's reservoirs and dams for sustainable river-flow management. *Frontiers in Ecology and the Environment* 9: 494–502. doi: 10.1890/100125.
- Richardson, J. and Campbell, G. (2022). Threats of mining of African Great Apes. ARRC Task Force Infographic.
- Sterl S, Devillers A, Chawanda CJ et al. A spatiotemporal atlas of hydropower in Africa for energy modeling purposes [version 3; peer review: 2 approved, 1 approved with reservations]. *Open Res Europe* 2022, 1:29 (<https://doi.org/10.12688/openreseurope.13392.3>)
- UNEP-WCMC and IUCN (2022), Protected Planet: The World Database on Protected Areas (WDPA) [Online], October 2022, Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net.
- Zarfl, C., A.E. Lumsdon, J. Berlekamp, L. Tydecks, and K. Tockner. 2015. A global boom in hydropower dam construction. *Aquatic Sciences* 77 (1): 161–170.