Status of Hydroelectric Development in the Marañón River, Stakeholders and Review of Relevant Literature.

Context

The Marañón River is a headwater of the Amazon, often referred to as the *hydrological source of the Amazon.* The Amazon River is born at the confluence of the Marañón and Ucayali Rivers. From humble beginnings at 4200m in the Andes, the waters and sediments of the Marañón flow over

1600km to where they nourish the most biodiverse freshwater ecosystems on Earth.(1) The Marañón basin supports a diverse range of life, from highly endemic *seasonally dry tropical forests* to lowland Amazon Rainforest, from highly endemic birdlife to equally endemic freshwater ecosystems; including at least four endemic freshwater species listed as threatened. (1) The Marañón basin is home to hundreds of thousands of people who rely on it for their livelihood, many indigenous. It is a vital element of the Amazon River basin with regard to sediment cycles, nutrient flow and migratory fishes; thereby plays a role to support the people and ecosystems that depend on the main stem Amazon below (2). Many of the Marañón's freshwater ecosystems are data defficient and require further study (1).

The Tropical Andes Hotspot covers 158.3 million hectares. Out of the 36 hotspots around the world the Tropical Andes tops this list for species richness and endemism. It contains about one-sixth of all plant life in the world, including 30,000 species of vascular plants, making it the top hotspot for plant diversity. It has the largest variety of amphibian, bird and mammal species, and takes second place to the Mesoamerica Hotspot for reptile diversity.(3)

In the Andean Amazon there are plans for 151 new dams greater than 2 MW over the next 20 years. These dams would be built over five of the six major Andean tributaries of the Amazon. Sixty percent of the dams would cause the first major break in connectivity between protected Andean headwaters and the lowland Amazon.(2)

The Issue

In 2011, the Peruvian government declared (declaración 020-2011-EM) that it was a matter of national interest to build twenty hydroelectric dams on the Marañón, based on a study that was conducted in the 1970's.(4) If built, those dams would cover 27% of the territory in Peru that is titled to indigenous populations. Of the 20 proposed dams, three have since been approved, two more are going through the approval process and several more are undergoing feasibility studies. (5)(6)

So far, much-needed public debate on these dams and Peru's future energy strategy, accompanied by the necessary media attention, has been absent. Dam projects on the Marañón have been fraught with social, political and environmental problems.(7)(8)(9) These facts form the basis of the Marañón Waterkeeper campaign for protection of the Marañón River in its free flowing state.

Energy Reality

Dams on the Marañón are proposed to generate hydro-electricity however Peru currently has an energy over-generation of almost 50%. This surplus will last approximately 5 years (until 2020), after which new capacity will need to be created. (10)(11)

Recent energy auctions in Peru have demonstrated that renewable technologies (wind and solar) can provide energy where it is required at a more competitive price than hydroelectric dams while avoiding the enormous social and environmental costs associated with mega-dam construction (5) (12).

A Political Perspective

In October 2016 the Peruvian government announced that it would not be constructing dams in the jungle, and that it was having difficulties to create economic signals to aid the construction of any large dams due to the current overgeneration of energy. (11)

Although this announcement is good news in the short term, no project on the Marañón has been officially canceled, and feasability studies in the lowland jungle continue. Also, there has been no

acknowledgment by the government surrounding the importance of Andean-Amazonian interconnectivity, nor any move to quantify these impact of breaking this.

The Marañón River remains at risk and as soon as the energy surplus is depleted, or when a new government enters office it is possible that construction of dams on the Marañón will resume.

A Need for Protection

Forest & Surrounds

The Marañón Valley includes a rare combination of both nationally representative yet globally unique plant species, which makes it an ideal conservation target. Woody flora of the Marañón is extremely rich in endemic species (33%) and genera (2%). These values are comparable to other biodiversity hotspots such as the native vascular flora of Galápagos. Despite the accumulating data showing that the Marañón valley hosts a wealth of unique plant and animal species, there are no protected areas within the valley.(13)(14)

There are proposals to establish 6 conservation areas inside a larger biosphere reserve covering the Marañón corridor, this proposal is being led by *Naturaleza y Cultura Peru*.

Freshwater Ecosystems

The Marañón River exhibits extremely high levels of freshwater endemism, many of these species are categorized as threatened. In three categories for measuring aquatic biodiversity (fish, mollusks, aquatic plants) the Marañón River is considered data deficient and is recommended for further investigation by the IUCN. (1)

When the Marañón enters lowland Amazonia, around 80% of fish landings are of migratory species whose life cycles would be severely disrupted by dams. The river plays an enormous role in food security for local populations. (15)

Annual sediment flows and natural fluctuations in river level play a critical role in maintaining health of this ecosystem, necessitating the need to protect this river in its free flowing state from the source. As Finer states “The Amazon River has been intimately linked to the Andes mountains for over 10 million years, and major breaks in connectivity could bring severe and unpredictable impacts. The Andes supply the vast majority of the sediment, nutrients, and organic matter to the main-stem Amazon, fueling a floodplain ecosystem that is among the most productive on Earth”.(2)

Social Impacts:

Downstream impacts on food security and water quality for the 100 000 people living alongside the Marañón River remain largely unknown. As mentioned above “major breaks in connectivity could bring severe and unpredictable impacts” (2). There has been no attempt to understand these dynamics through a basin scale assessment.

Dam projects have already created social unrest in regions of direct influence where populations will need to be relocated. There are reports from local communities that consultation processes have been completed fraudulenty, such as paying people from distant areas to attend meetings while barring entry to citizens who will truly be impacted. This is done in order to gain social licenses from the government. Many communities have expressed their complete rejection of these projects, and remain adamant that the companies have not followed laws put in place for proper consultation. (9)(7)(8) There are reports that these projects have lead to systemic criminalisation of local leaders, and in one case the murder of a village mayor.(8) A 2015 report by Earthrights international outlines that at least 60 local leaders have been investigated for improbbable crimes such as agravated kidnapping, intent of homicide and terrorism among other charges.(16)

Status of Dams on the Marañón

Official Data Sources:

- Decrees & Ministerial Resolutions made by the government are published ' El Peruano'. Information can be found by searching this site. http://www.elperuano.com.pe/
- MINEM: Provides a list of projects who's EIA's are undergoing evaluation. http://www.minem.gob.pe/descripcion.php?idSector=2&idTitular=7585
- OSINGERMIN: Impartial overseer of energy development regularly releases updates on projects that have been approved for construction. http://www.osinergmin.gob.pe/empresas/electricidad/proyectos/publicaciones

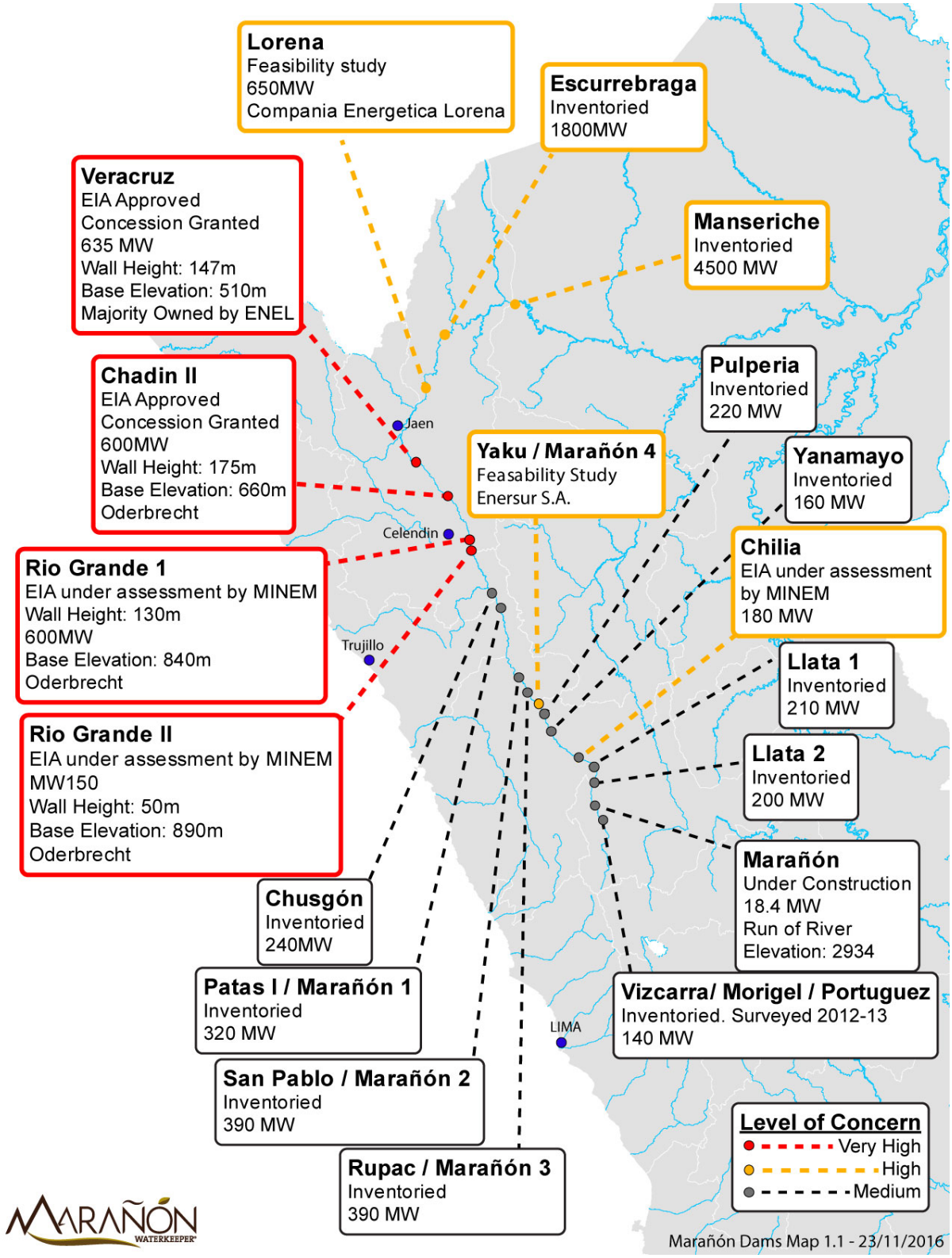

Figure 1: Status of Dam Project, Basic Details & Subjective Level of Concern

List of Dams & Details

For the full list of dams and additional details about each project, follow this link to see the full spreadsheet:

https://docs.google.com/spreadsheets/d/1lHbPurq2MmFguFF_Gd6g7STmVNGDjIluoQJQAgcBBBQ/edit?usp=sharing

An abstract of this information is included here:

	Dam Name	Official Status	Subjective Level of Concern	Wall Height	MW	Base of Wall Elevation (m)
1	Manseriche	Inventoried, declared in national interest.	2. High		4500	
2	Escurrebraga	Inventoried, declared in national interest.	2. High		1800	
3	Lorena	Undergoing feasibility study	2. High		650	
4	Veracruz	EIA Approved, Concession Granted	1. Very High	147m	635	510
5	Chadin II	EIA Approved, Concession Granted	1. Very High	175m	600	660
6	Rio Grande 1	EIA under assessment by MINEM.	1. Very High	130m	600	840
7	Rio Grande II	EIA under assessment by MINEM.	1. Very High	50m	150	890
8	Chusgón	Inventoried, declared in national interest.	3. Medium		240	
9	Patas I / Marañón 1	Inventoried, declared in national interest.	3. Medium		320	
10	San Pablo / Marañón 2	Inventoried, declared in national interest.	3. Medium		390	
11	Rupac / Marañón 3	Inventoried, declared in national interest.	3. Medium		300	1650
12	Yaku / Marañón 4	Feasability Study	2. High			
13	Pulperia	Inventoried, declared in national interest.	3. Medium		220	
14	Yanamayo	Inventoried, declared in national interest.	3. Medium		160	
15	Chilia	EIA under assessment by MINEM.	2. High	117m	180	2200
16	Llata 2	Inventoried, declared in national interest.	3. Medium		200	
17	Llata 1	Inventoried, declared in national interest.	3. Medium		210	
18	Marañón	Under Construction	3. Medium	NA - Run of River. 89.5m drop	18.4	2 934
19	Vizcarra / Morigel / Portuguez	Inventoried, Surveyed 2012-2013	3. Medium		140	2900

Table 1: Abstract of Information about individual dam projects on the Marañón. See full table of data here.

Recent & Upcoming Reports:

- Renewable Energy Alternatives & the Marañón, Sami Energy Consulting, WWF, (To be released, 2016)
- Summary of Dams and Local Situation, ECODSS, International Rivers, (To be released, 2016)
- Futuro de la energia en Peru, International Rivers, (June, 2016)
- Earthrights International: Energía, Bosques y Pueblos en el Marañón - Chadin 2 – los impactos Invisibilizados. (2015)

Review of Available Literature:

Economics & Energy:

Peru has extremely good access to renewable energy which is also situated close to many population centres, which reduces the cost, risk and loss due to long distance transmission. Peru has some of the most relaible wind energy in the world with factor of plant as high as .6, along with access to the best solar in the world (17)(18). As shown in Figure 1, prices of renewable energies in Peru have decreased significantly over the past 7 years. In Peru's fourth energy auction in 2015, Solar sold for $48.1/MWh, Wind for $37.7/MWh and small scale hydroelectric for $43.8/MWh.(19)

The generally accepted cost of large scale hydroelectric in 2016 is $66.1/MWh (12), however there is reason to expect that costs of large dams on the Marañón would exceed this cost. The cost of a dam increases exponentially with its scale, eg. a 100 m high dam wall is four times more costly than a 50 m wall. Dams on the Marañón fly in the face of current international trends to reduce size and reduce impact, with several mesuring over 150m in height.(20)

Hydroelectric energy is considered a mature technology, therefore it is not decreasing in price. However according to IRENA, in 2025 solar energy will have reduced by 59% of its 2015 price, while wind will reduce 26-35% of the 2015 price. (21)

With this information in mind, even if a large dam started building today, by the time it was constructed wind and solar would be significantly cheaper, and can be constructed over a much shorter time period, which significantly reduces the economic risk for the country constructing the project. (20)

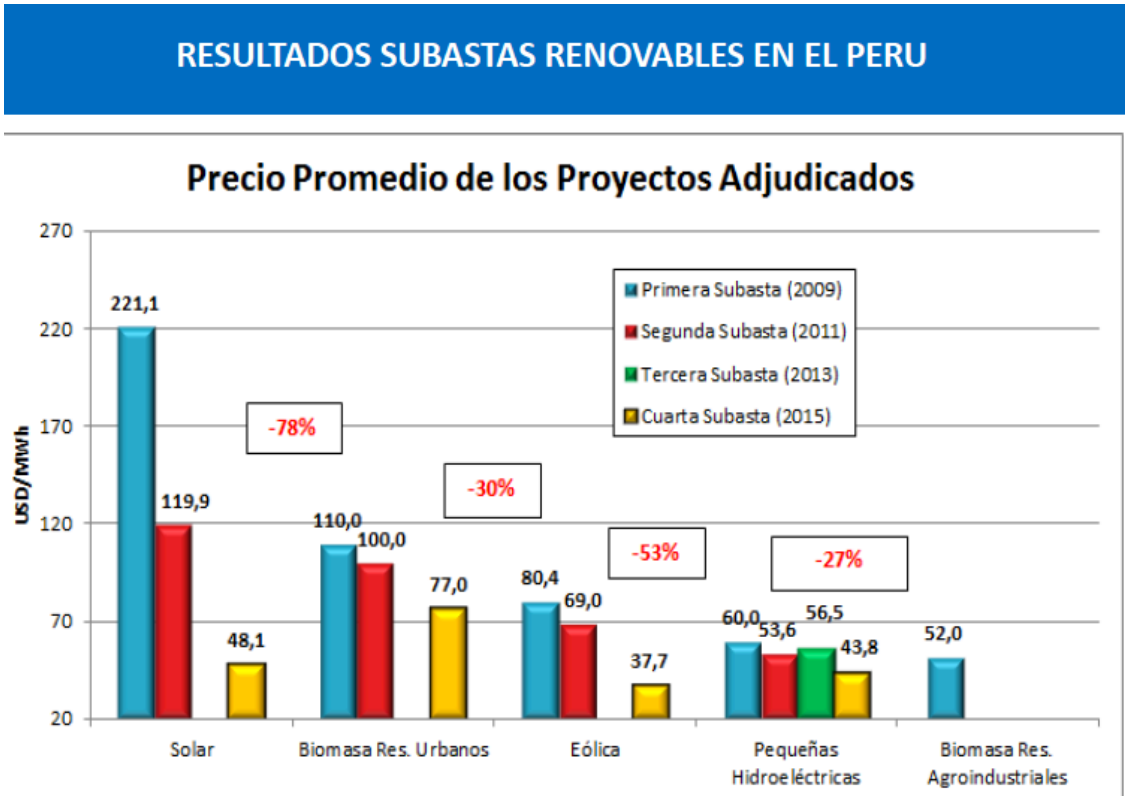

Figure 1: Results of Renewable Energy Auctions in Peru. (5)

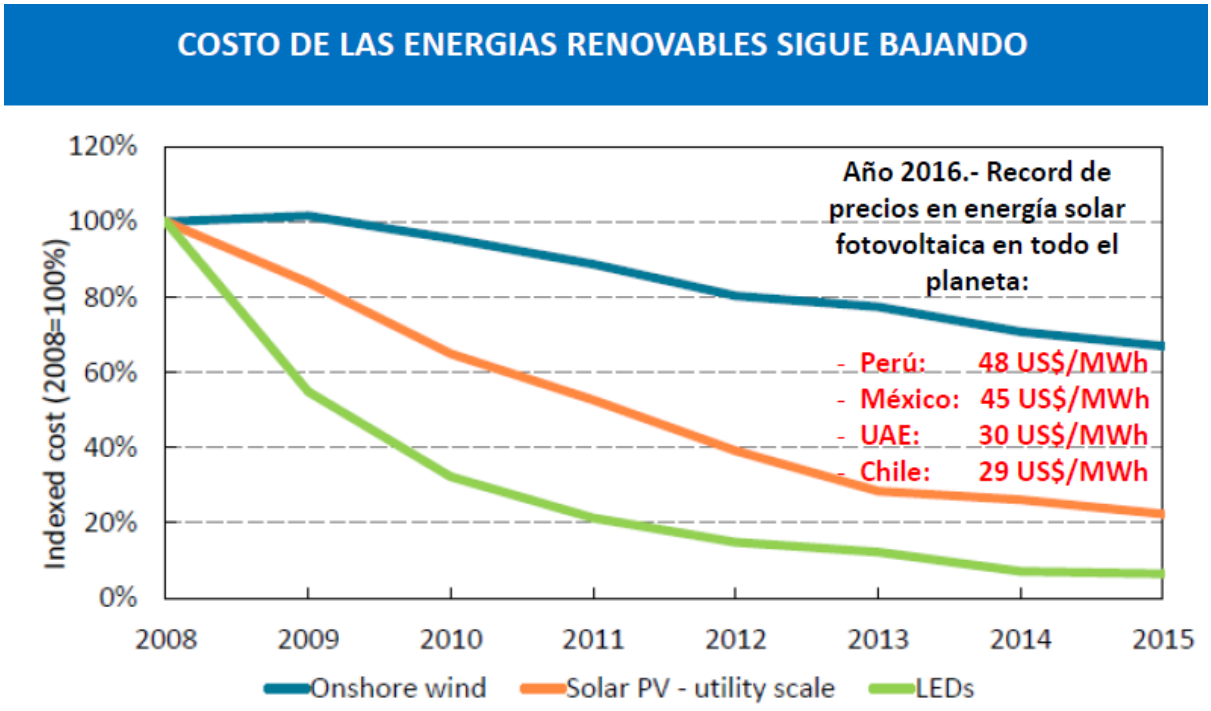

Figure 2: Reducing costs of renewable energy at a global scale. (22).

True Cost of Large Dams – A growing body of knowledge:

Since the 2011 announcement by President Garcia that building 20 dams on the Marañón was in the national interest (4), the the costs of energy production have changed dramatically. The cost of

alternative energies has decreased significantly; while the true economic, environmental and social costs of large dams has been shown to be increasing (20).

After completing the largest study of existing dams, Ansar et al state “We find overwhelming evidence that budgets are systematically biased below actual costs of large hydropower dams—excluding inflation, substantial debt servicing, environmental, and social costs.”(20)

The view taken by Ansar suggests “in most countries large hydropower dams will be too costly in absolute terms and take too long to build to deliver a positive risk adjusted return unless suitable risk management measures outlined in this paper can be affordably provided. Policymakers, particularly in developing countries, are advised to prefer agile energy alternatives that can be built over shorter time horizons to energy megaprojects.”(20)

Large dams are extremely prone to cost overruns, Ansar observed that: (20)

- Three out of every four large dams suffered a cost overrun in constant local currency terms.
- Actual costs were on average 96% higher than estimated costs; the median was 27% (IQR 86%). The evidence is overwhelming that costs are systematically biased towards underestimation
- The actual costs more than double for 2 out of every 10 large dams and more than triple for 1 out of every 10 dams. This suggests that planners have difficulty in computing probabilities of events that happen far into the future.

Through study of 245 large dams, built between 1934 and “the typical forecasted benefit-to-cost ratio was 1.4. In other words, planners expected the net present benefits to exceed the net present costs by about 40%. Nearly half the dams suffered a cost overrun ratio of 1.4 or greater breaching this threshold after which the asset can be considered stranded—i.e. its upfront sunk costs are unlikely to be recovered. This is assuming, of course, that the benefits did not also fall short of targets, even though there is strong evidence that actual benefits of dams are also likely to fall short of targets. For example, the World Commission of Dams reported that for large hydropower dams “average [hydropower] generation in the first year of commercial operation is 80% of the targeted value”.(20) Cost estimations have not improved over time, there has been little learning and improvement over almost 100 years of dam building. “Forecasts of costs of large dams today are likely to be as wrong as they were between 1934 and 2007.”(20)

Based on these findings, Ansar recommends four policy propositions to assist decision makers:(20)

- Policy proposition 1. Energy alternatives that rely on fewer site specific characteristics such as unfavorable geology are preferable.
- Policy proposition 2. Energy alternatives that rely on fewer imports or match the currency of liabilities with the currency of future revenue are preferable.
- Policy proposition 3. The best insurance against creeping inflation is to reduce the implementation schedule to as short a horizon as possible. Energy alternatives that can be built sooner and with lower risk of schedule overruns, e.g. through modular design, are preferable.
- Policy proposition 4. Energy alternatives that do not constitute a large proportion of the balance sheet of a country or a company are preferable. Similarly, policymakers, particularly in countries at lower levels of economic development, ought to avoid highly leveraged investments denominated in a mix of currencies.

Recent reports show that most dams emit greenhouse gases, sometimes this can occur in such high quatities that it results in higher emissions than per MW than coal fired powerplants. Therefore, decision makers should be hesitant to call hydro power clean energy, this is particulary true for tropical dams. (23)(24)

Environmental Significance

Andean-Amazonian Interconnectivity

It would seem that for policiy makers, there is an almost limitless amount of untapped rivers for use as energy sources. As river basins become disjointed and disconnected due to haphazard development, the role of the remaining free flowing basins becomes increasingly important. Hydroelectric dam construction if necessary, must proceed with careful basin scale planning, alongside assessment of any viable alternatives.

There is a clear need for a strategic plan to maintain free-flowing connectivity from the Andean highlands to the Amazon lowlands, which would safeguard remaining free-flowing major river systems from hydropower development, from headwaters to estuary (2). No such plan exists for basin scale assessment of the Marañón, let alone a national plan in Peru, let alone at the international scale between Amazonian nations.

Multi-factor planning and assessment could reduce potentially profound ecological impacts. Under the present system of project-level environmental impact, which is being used by projects on the Marañón, each project is evaluated on an individual basis prior to construction with no assessment of cumulative or basin scale impacts. Under this business-as-usual scenario, planning and construction of dams in the Andean Amazon will continue as a chaotic, project-focused endeavor with little regard for the larger regional picture (2).

Figure 2 shows the results of a broad impact assessment completed for all proposed dams over six main Amazonian tributaries, designating dams as low, moderate, or high impact. As can be seen from the streak of red dots along the Marañón River, the dams planned along the main stem of the Marañón are high impact. The most notable high impact dam would be Manseriche for creating the first major break in connectivity of the main-stem and for its impacts on migratory fish (2).

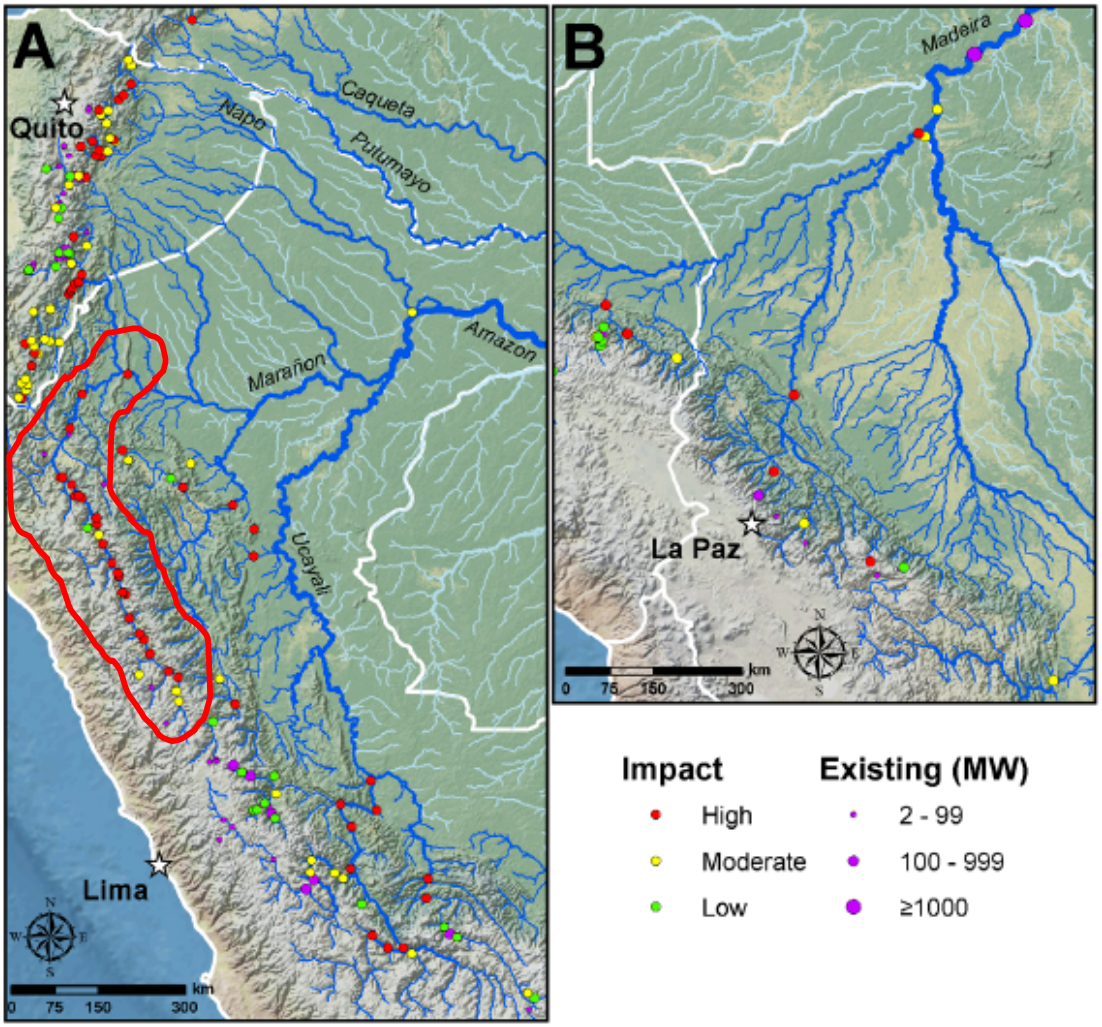

Figure 2: Results of ecological impact analysis of planned dams on Andean tributaries to the amazon. The Marañón River is circled in red. (2).

Terrestrial Conservation Priority:

Seasonally Dry Tropical Forests (SDTF's) in Latin America are highly fragmented due to natural and anthropogenic factors, they are among the most threatened tropical forests in the world (25). It is estimated that only 5% of the original SDTFs remain in the Neotropics. The Latin American and Caribbean Seasonally Dry Tropical Forest Floristic Network (DRYFLOR) recommends "If we are to conserve the full floristic diversity of Andean dry forest from north to south, future conservation planning must prioritize areas in Peru and elsewhere in the Andes that are globally unique but entirely unprotected."(26). Likewise, Pennington et al stress that Conservation actions are urgently needed to protect dry forest's unique biodiversity—many plant species and even genera are restricted to it and reflect an evolutionary history confined to this biome. (14)

The Marañón Valley includes a rare combination of both nationally representative yet globally unique plant species, which makes it an ideal conservation target. Woody flora of the Marañón is extremely rich in endemic species (33%) and genera (2%). These values are comparable to other biodiversity hotspots such as the native vascular flora of Galápagos. Despite the accumulating data showing that the Marañón valley hosts a wealth of unique plant and animal species, there are no protected areas within the valley (13).

In 2011 Sarkinnen reported that the Marañón's dry forests were poorly known and under studied. Many new species had been discovered since the year 2000, leading to the conclusion that levels of species diversity in the valley had been underestimated. [Sarkinnen, 2011]. Moving ahead five years, the knowledge base has grown, however much remains to be discovered. The study completed by Peña et al in 2016 represents the first extensive study of the largest known inter-Andean SDTF fragments in the Marañón valley of northern Peru. The floristic composition, species richness and endemism of these forests reveal that Marañón flora is a good representative of the Peruvian SDTF flora as a whole, and should be considered as a conservation priority at the national level to establish the first conservation areas within SDTF in the country. The high level of endemism structured within elevational zones in the Marañón Valley implies that conservation areas should be established across elevational zones in order to maximise the protection of this globally unique flora (13).

The authors of the Peña study "strongly urge that governments at the national, regional and local levels, as well as NGOs, research institutes and universities, prioritize studies on the threats to the SDTF biome and its endemic species in the Marañón valley, and promote the creation of regional, municipal and private conservation areas. The valley is relatively small but substantial in terms of its biological heritage."(13)

The proposal of a Biosphere Reserve along the Marañón corridor which would contain 6 distinct conservation areas is supported by the study mentioned above. This proposal is currently being headed by *Naturaleza y Cultura Peru*.

Analysis of the geographical distribution pattern of the endemic species indicates that the northernmost area of the Marañón river valley (designated S1) contains the highest number of endemic species. The analysis of the elevational distribution of endemic species shows that, within S1, most of the endemic species are confined to the lowest elevational zones below 1100 m. Sixteen of these species are restricted to the lowest elevations, 300–700.

Freshwater Conservation Priority:

As stated in the recent IUCN report titled '*The State of Conservation and Distribution of Freshwater Biodiversity in the Tropical Andes',* "Many development projects are underway or are planned for the region, which will surely have or will have an impact on freshwater ecosystems and associated biodiversity. Therefore, it is necessary to have adequate information on the distribution, habitat requirements and conservation status of freshwater species to guide decision making in the region. The absence of this information will hamper freshwater biodiversity to be considered in development projects in the region, and the consequences for freshwater systems could be severe."(1)

In three out of four categories for measuring aquatic biodiversity in the IUCN report (fishes, mollusks, aquatic plants) the Marañón River is considered data deficient and is recommended for further investigation. The report also noted two threatened species of fish, and two threatened species of plant in the Maranon basin. The fishes are Astroblepus supramollis (VU) and Chaetostoma branickii (VU) and the plants are Hypericum callacallanum (VU) and Isoetes hewitsonii (CR). (1) Other studies have highlighted the importance of the Marañón River as a global diversity epicenter of highly specialized wood-eating catfishes. However, it should be noted that aquatic biodiversity of the Marañón watershed has been incompletely surveyed and many new and endemic species are still likely to be discovered.(27)

To compile the IUCN report a team of experts identified 967 freshwater species endemic to the

Tropical Andes and found that 17.5% of the species with sufficient data, are globally threatened and twenty-three species were critically endangered. Where the report discusses the limitations of data, it is mentioned several times that the Marañón River requires further exploration.

In Andean rivers the number of species of fish changes along the gradient of the river. There is a greater number of species found in the lower zones than in the higher zones, however, the levels endemism are higher at greater elevations. The distribution of ichthyofauna along Andean rivers is influenced by the temperature and velocity of water associated with each elevation; these physical characteristics create zones within which particular species may be endemic. This explains why conservation and investigation of the entire Marañón Watershed from source to lowlands is required, before hydroelectric development changes these characteristics making the river uninhabitable for certain species.(28)

Freshwater Fish

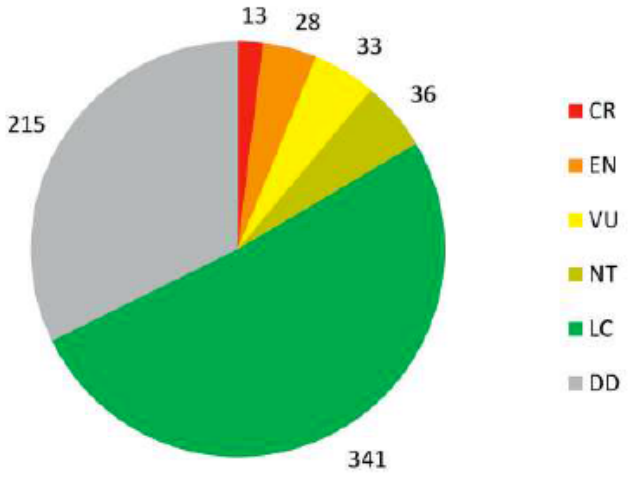

Figure 3: Number of endenic freshwater fish species from the Tropical Andes in each category on the Red List.(1)

From Figure 4 it can be seen that overall, the Marañón is one of the basins with highest levels of endemic fish species. Figure 5 shows weighted levels of endemism, allowing us to distinguish between sub basins; once again, the entire Marañón River ranks as one of the areas with highest endemism, the upper stretches of the Marañón basin are given the second highest raking in terms of endemism.

Out of the species identified in this study, several on the Marañón were data deficient as shown in Figure 6. The report goes on to state that little or incomplete information exists for the Marañón basin.

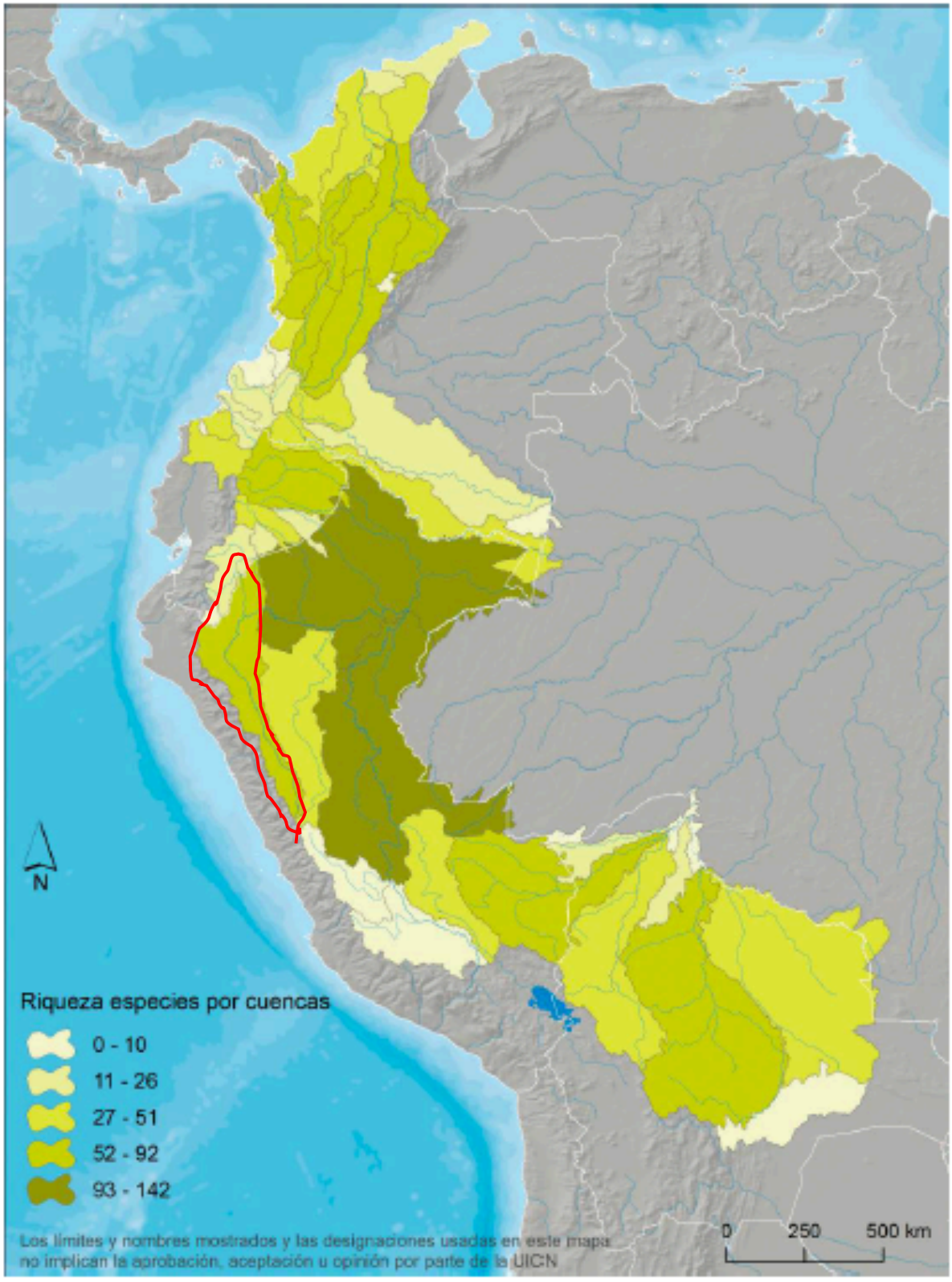

Figure 4: Number of endemic species per basin in the tropical andes. (Marañon circled in red). (1)

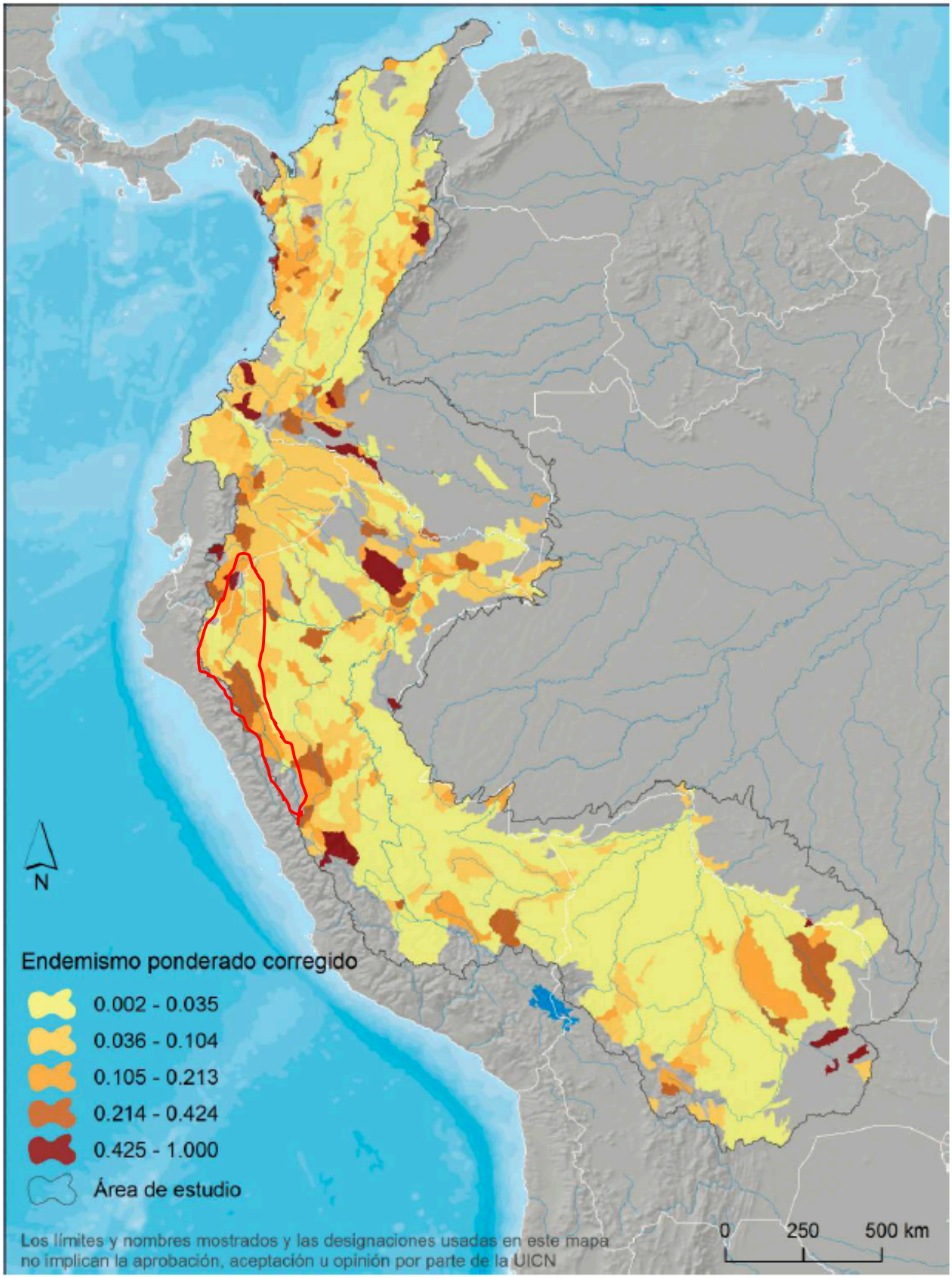

Figure 5: Distribution of endemic fish weighted & corrected. (Marañón circled in red)

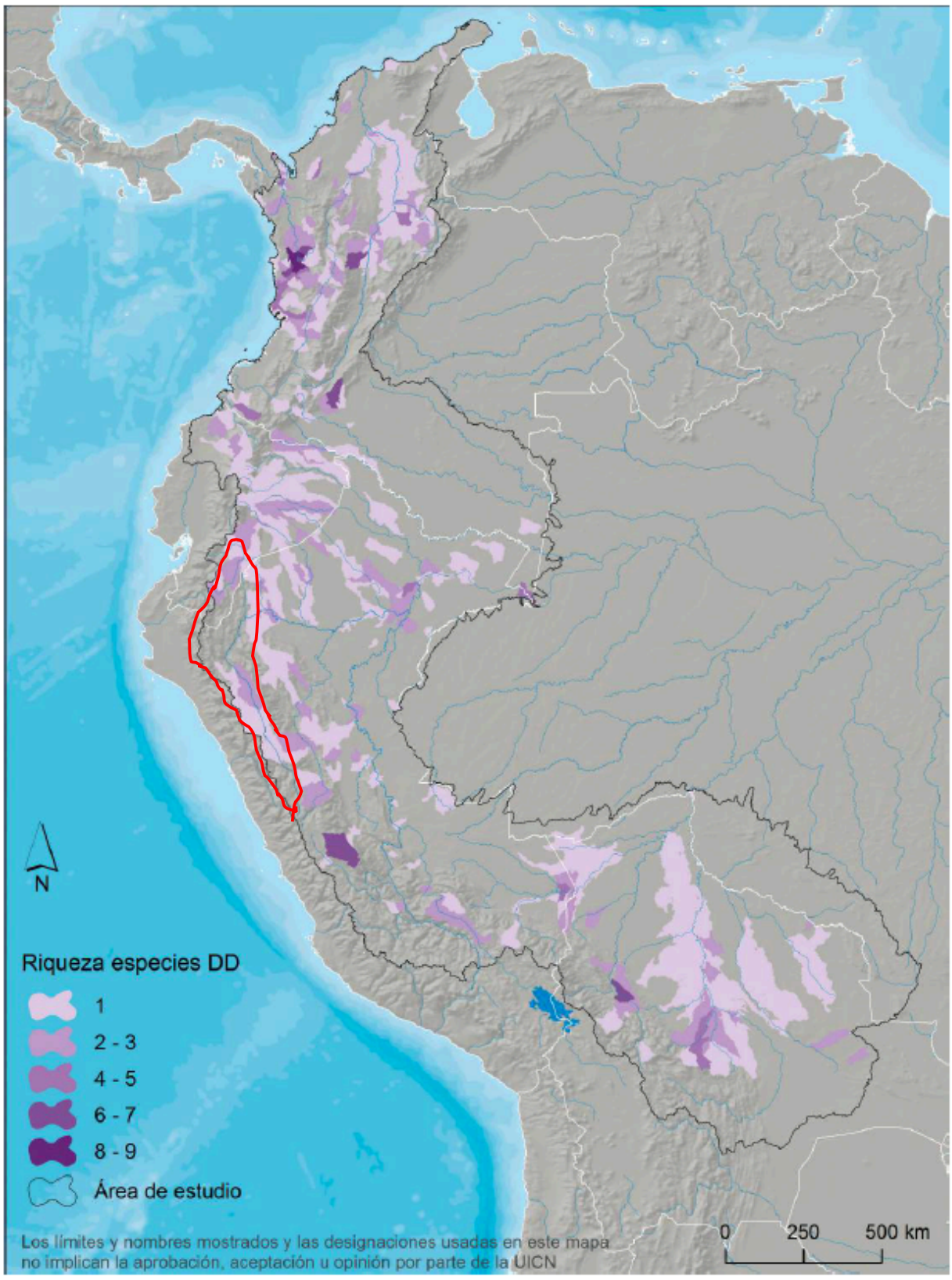

Figure 6: Distribution of endemic freshwater fish in the Tropical Andes that are considered data defficient. (Marañón circled in red).(1)

Freshwater Mollusks

More than 50% of the species of freshwater mollusks in the tropical andes that were evaluated, do not have sufficient data to apply criteria of the Red List. “The greatest concentration of species that are data deficient are found high in the Rio Cauca basin in Columbia and in the Marañón River in Peru”. Of the area assessed, the Marañón basin has the highest level endemic freshwater moluscs in Peru, as shown in Figure 7. It is also worth noting that none of the endangered species of moluscs are found any form of protected area.(1)

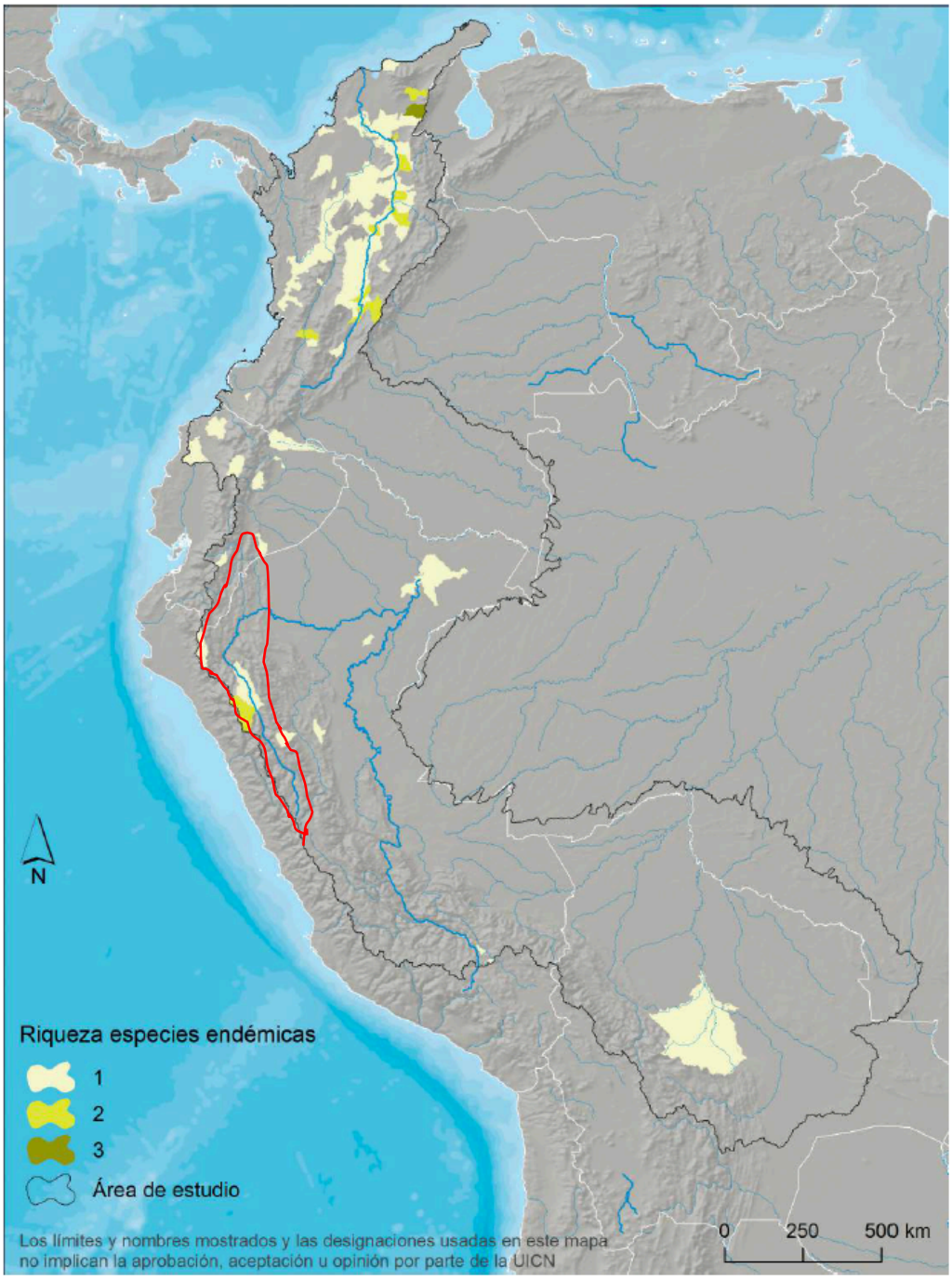

Figure 7: Distribution of endemic freshwater molluscs in the Tropical Andes.(1)

Aquatic Plants

In Peru, the greatest concentrations of endemic plant species are found in the Urubamba-Vilcanota and Marañón basins. As can be seen in Figure 8 the entire tract of the Upper Marañón basin hosts high levels of endemic plant species. As shown in Figure 9, Peru has the highest number of endangered aquatic plant species over the entire study area. Once again, the Marañón Basin is noted as the most data deficient area in Peru.

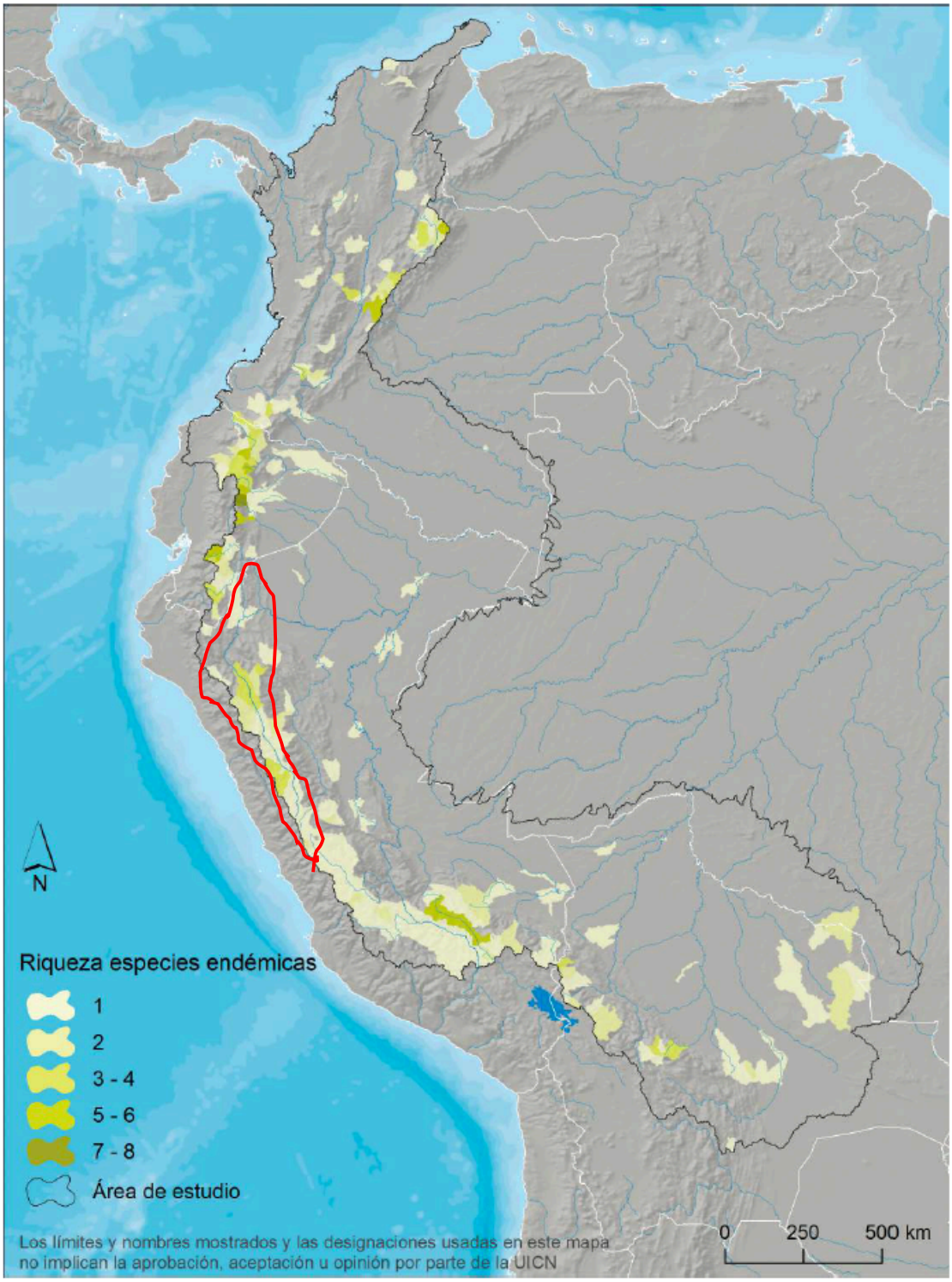

Figure 8: Number of endemic aquatic plants per sub-basin in the Tropical Andes. (Marañón circled in red).(1)

Figure 9: Number of endangered endemic aquatic plants per sub basin (Marañón circled red).(1)

Zones for Basin Management & Key Biodiversity Areas

Data derived from the Red List assessments were used to identify and delineate freshwater Key Biodiversity Areas (KBA) for the region. Key Biodiversity Areas have been deliminated to direct the

establishment of new protected areas in relation to freshwater biodiversity. Catchment Management Zones (CMZ) are catchments at the landscape level which provide information on the wider geographical and hydrological context for effective management of species located within the individual KBA. The criteria to identify KBA were the presence of threatened or range restricted species within a sub catchment; species meeting the criteria are called trigger species.

It is important to note that aquatic plants and mollusks were not included in this process of delineating KBA's due to poorer quality and availability of data. The Marañón Basin is one of the areas with the highest number of endangered aquatic plants over the entire study area.

As shown in Figure 10, the Upper Marañón is categorised as a Catchment Management Zone with 3-6 trigger speices present. Figure 11 highlights the KBA on the Marañón

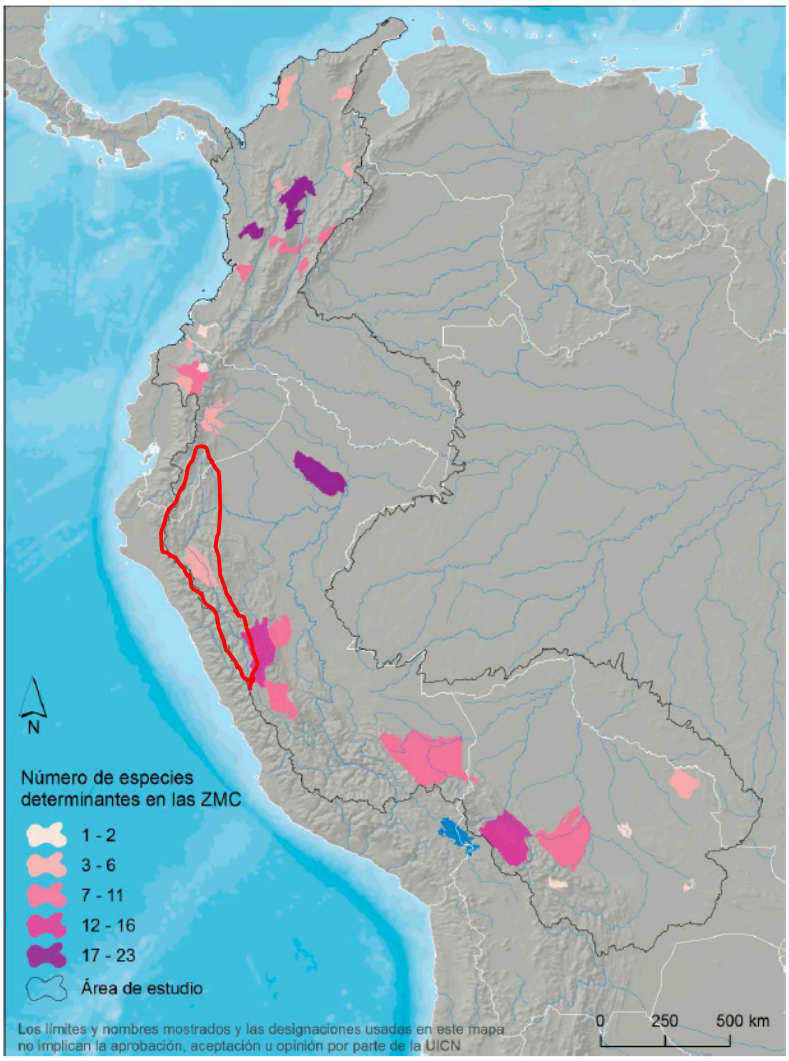

Figure 10: Catchment Management Zones and number of trigger species inside each zone. (Marañón circles in red).(1)

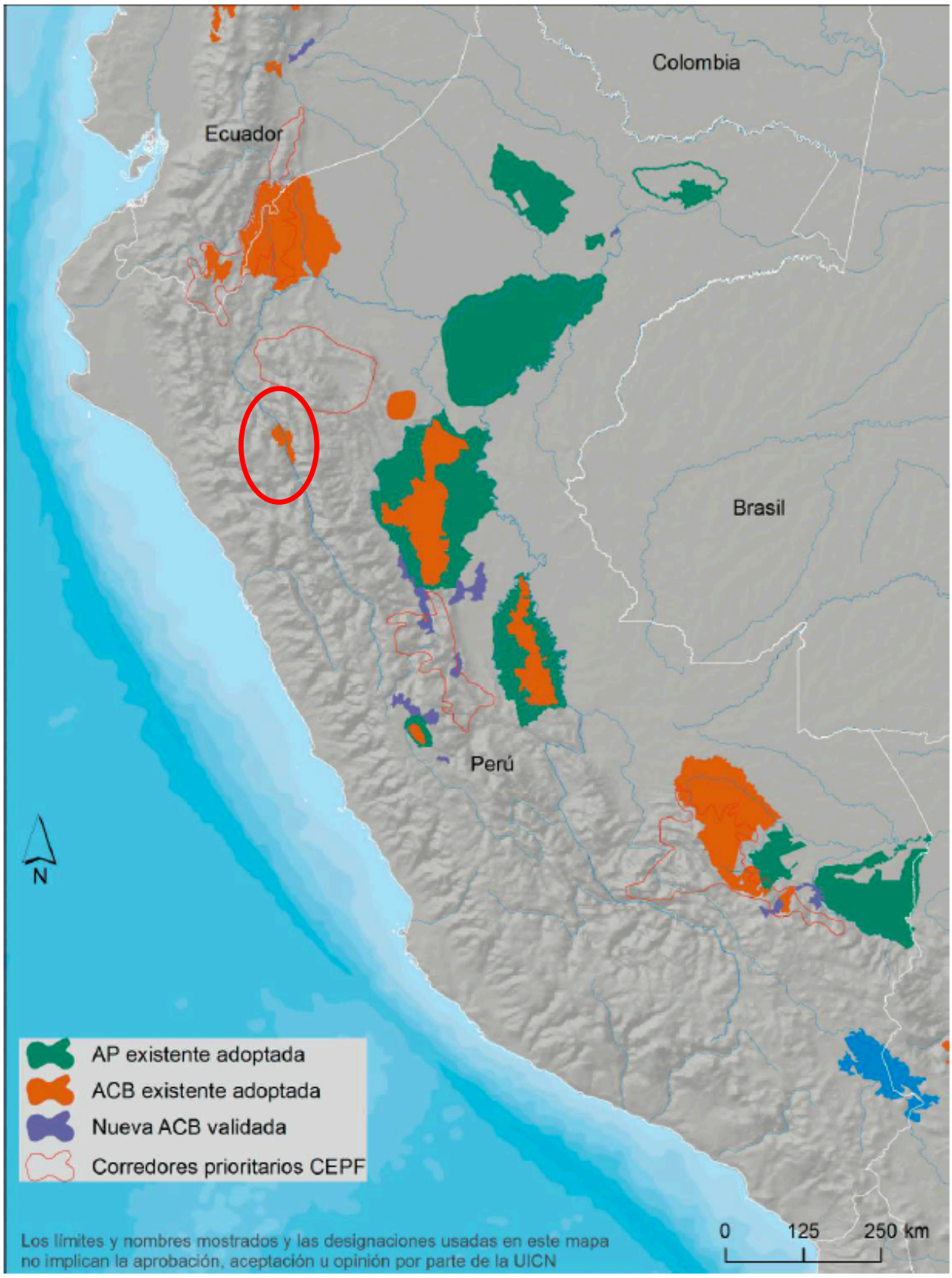

Figure 11: Existing and new Key Biodiversity Areas (KBA's) (Existing Marañón KBA highlighted)(1)

Overview of all Data, Combined & Weighted

The basins in Peru with the greatest concentration of endangered species are the Marañón & Ucayali, Figure 12. As shown in Figure 13, the upper Marañòn River is data defficient, particularly higher in the catchment which justifies further study of aquatic species in this catchment.

As shown in Figure 14, the Marañón is one of the areas most ednangered from modification of natural systems, in this case, from the hydroelectric dams proposed along its length.

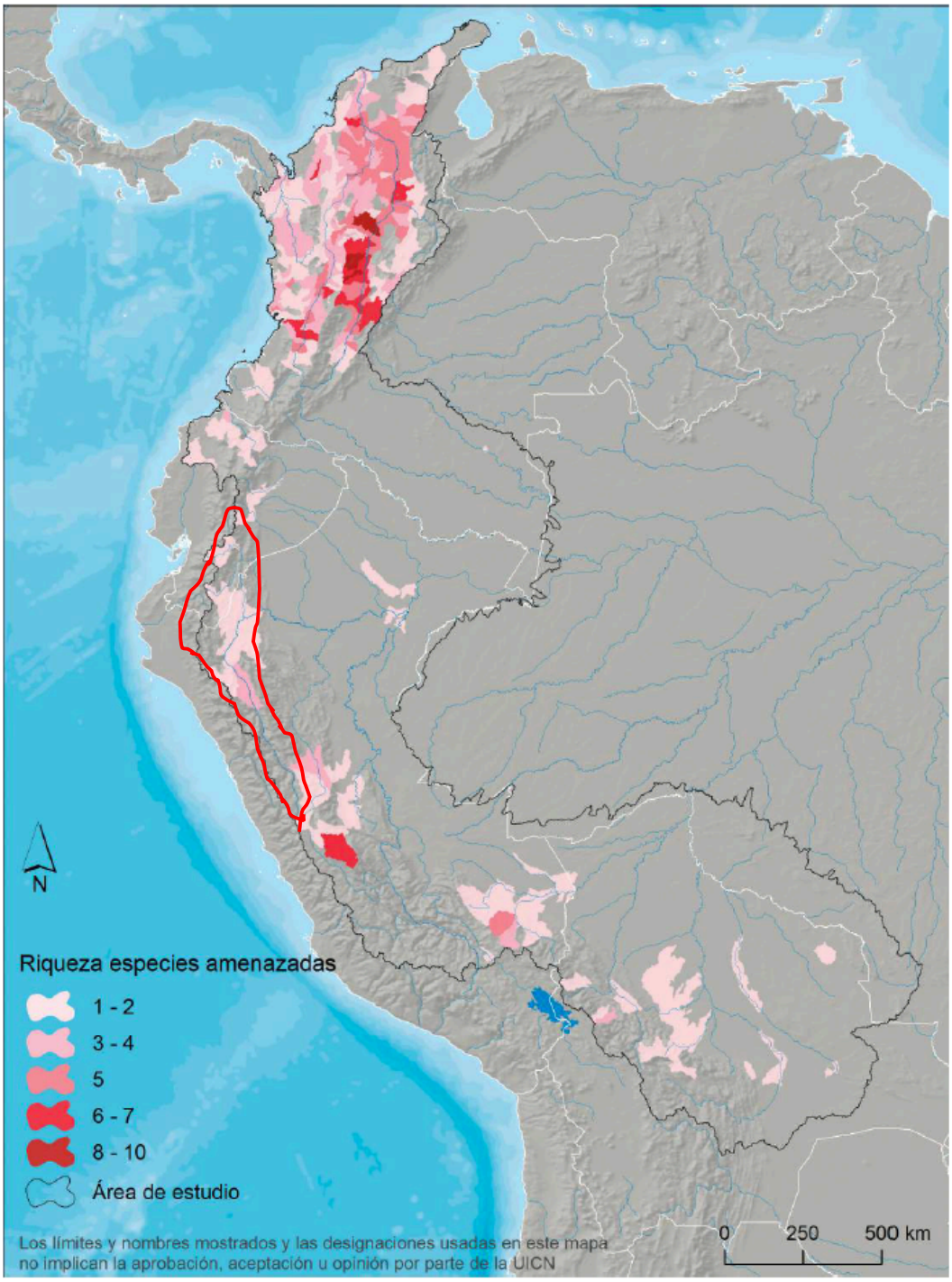

Figure 12: Distribution of threatened freshwater species per sub catchment in the Tropical Andes. (Marañón outlined in red).(1)

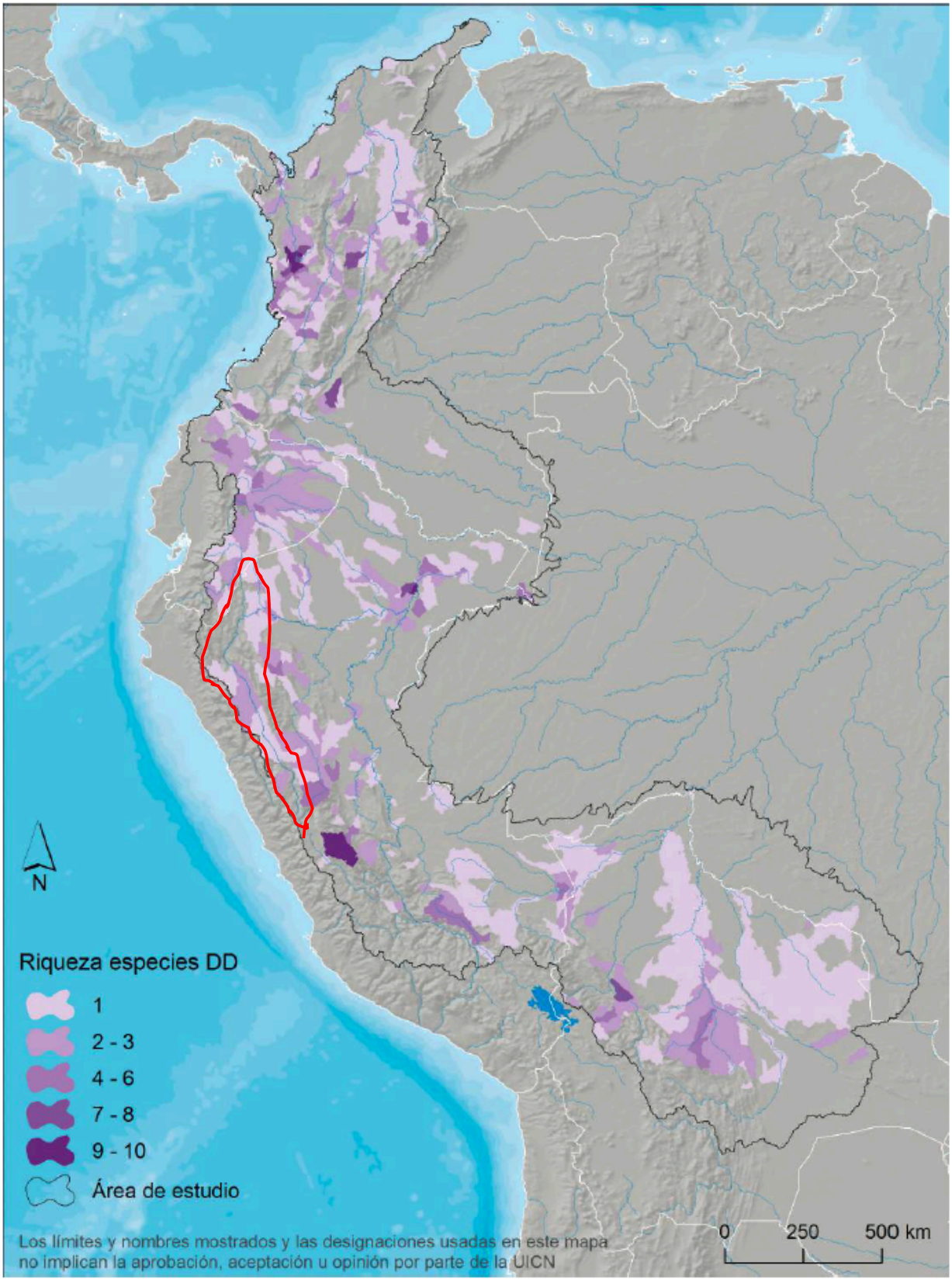

Figure 13: Distribution of species which are data defficient per sub catchment in the tropical andes. (Marañón outlined in red).(1)

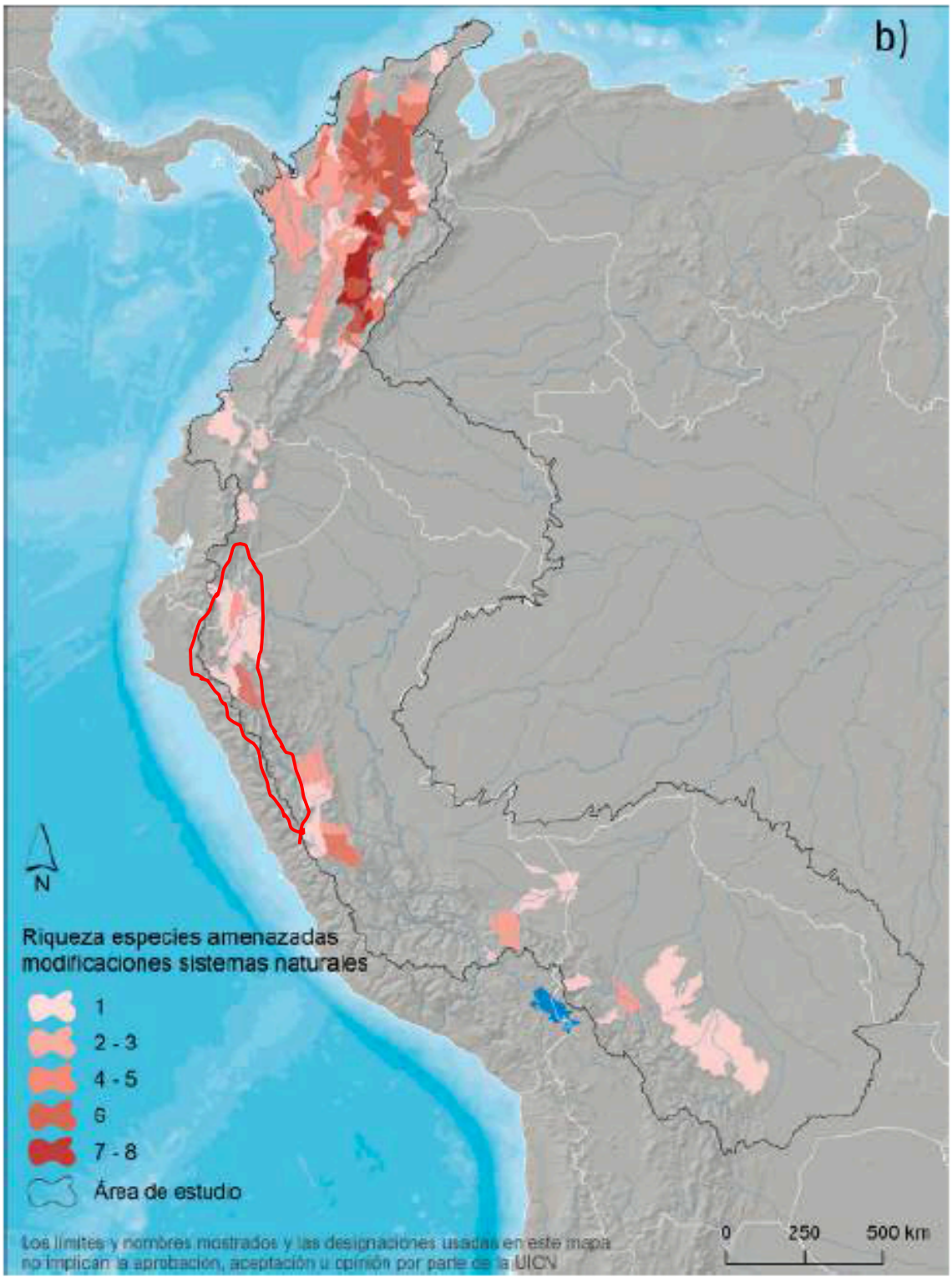

Figure 14: Species at risk from Natural System Modifications per sub-catchment (Marañón outlined in red).(1)

Alternative Opportunities for Economic Development:

Ecotourism

421 tourists have participated in tours on the Marañón River from 2012-2016, as estimated by Marañón Waterkeeper and Sierra Rios.

Estimated average expenditure from this activity is $3500 per person for each tour down the Marañón (including flights, onward travel in Peru, tour cost, hotels and additional expenditures.). This equates to a total economic activity of $1,473,500 over four years.

Tours themselves cost in the range of $2000-3500, estimated half of this goes into local economies through transport, food purchases, guiding fees and accommodation.

This has potential to grow enormously. 20,000 people raft the the Grand Canyon in the US per year. Other world class rafting destinations in South America such as Futaleufu have grown significantly over the past 10 years.

Figure 15: Number of tourists on the Marañón per year 2012-2016.

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