Peak water not to blame in the escalation of Peruvian socio-environmental conflicts

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Biography

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Abstract

Over 1.5 billion people rely on more than 46,000 non-polar glaciers across the world for potable water, irrigation, industrial and hydropower uses. The melting of non-polar glaciers and its effects on socio-environmental conflicts are understudied in the rapidly expanding field of climate conflicts. Contrary to existing theoretical models, this article found that the Santa River Basin (SRB), having reached peak water, did not directly increase the number or length of the area's socio-environmental conflicts. The article identified and examined 23 socio-environmental conflicts in the Peruvian Ombudsman's monthly reports between 2004 and 2019. Instead of peak water, five other escalation variables were identified: violence, upstream–downstream dynamics, multiple stakeholder cooperation, decrease in the quality/quantity of water and the utilisation of roads for protests.

Keywords: Melting glaciers; Socio-environmental conflicts; Climate change; Climate conflicts; Water scarcity; Human Security

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Empirical climate conflict studies have overlooked the melting of non-polar glaciers

Melting glaciers and their effects on socio-environmental conflicts have been understudied in the rapidly expanding field of climate conflicts. As a key feature in various hydrological systems from Central Asia to the Andean mountain ranges, melting glaciers have been examined mostly on a theoretical level with a focus on their social and political dimensions (Drenkhan et al., 2015). More specifically, the phenomenon of "peak water" has not been analysed against empirical data. Peak water is reached when annual glacier run-off continues to rise until a maximum (peak water) is reached, beyond which run-off steadily declines along with the river's streamflow (Huss and Hock, 2018).

Over 1.5 billion people rely on more than 46,000 non-polar glaciers across the world for

potable water, irrigation, and industrial and hydropower uses (Carey et al., 2017){Carey, 2017 #152}. Most of these glaciers will reach peak water in the coming decades if they have not already done so. Thousands of these glaciers have been carefully studied, though not always from a peak water perspective (Gurung et al., 2017; Lutz et al., 2016; Mukherji et al., 2015). In order to prepare better for the future and to understand the socio-political effects of reaching peak water, more targeted qualitative research must be conducted.

This article examines the evolution of socio-environmental conflicts in the Santa River Basin in the context of climate change. Upon examining the gaps in climate conflict literature on glacier-related conflict studies, this article focuses specifically on Peruvian hydrology and the relevant socio-environmental conflict literature.

Climate change is an inherently social problem, and it has the potential to undermine human security, namely the needs, rights and values of people globally. The communities that are most dependent on natural resources for their livelihoods are often the most sensitive to environmental change (Barnett et al., 2010, pp. 17–19). Socio-environmental conflicts, and more specifically climate conflicts, stemming from environmental change can be both violent and non-violent in nature (Barnett and Adger, 2010, p. 128). Climate conflicts can spread from the local to the international level. Some scholars argue that historical shifts in global and regional climates are linked with the rise and fall of entire empires and civilisations, spanning from the Americas to Europe and Asia (Zhang et al., 2011; Haug et al., 2003; Zhang et al., 2006; Yancheva et al., 2007). Research into cases where modern climate change is considered the main causal factor of conflicts has been conducted on a wider and more diverse scale.

Climate conflicts as a topic of research have received an increasing amount of attention since the mid-2000s. A recent review found that 60% of articles related to climate conflict were quantitative, 18% were theoretical or review articles, 9% were qualitative, and the final 13% were a mix of various methods and designs (Ide, 2017). A plethora of dependent, conflict-related variables has been examined in these articles, from interstate war to local non-violent conflicts (Devitt and Tol, 2012; Koubi et al., 2012; Benjaminsen, 2008). Similarly, independent variables have included changes in rainfall, temperature, freshwater availability, land degradation, storms, floods, the Southern Oscillation and food prices (Salehyan, 2014). The conclusions of these articles vary greatly. Some found examples of climate-induced conflicts, while others did not. Meta-analysis reviews are similarly divided, with some skewing towards a strong relationship between climate change and conflict (Hsiang et al., 2013; Gleditsch, 2012). Most of the articles agree that, in the modern setting, climate change was not the main causal factor for interstate wars; instead, most conflicts caused by climate change happen on an intrastate level.

Qualitative examinations have the added benefit of being able to account better for local

complexities. This is especially true in climate conflict studies related to water scarcity, in which the sources and uses of the resource are many. These examinations have also been instrumental in discovering new exposure and vulnerability factors to climate change. For example, studies have examined the interconnectedness of cattle raiding and climate change in eastern Africa (Butler and Gates, 2012; Witsenburg and Adano, 2009). Qualitative examinations, which explored new variables, have also been juxtaposed with the findings of quantitative applications, such as risk indexes (Ide et al., 2014).

Climate conflict studies have had an extensive hydrological focus but the effects of melting glaciers and their connection to socio-environmental conflicts have not been fully explored. The various hydrological climate conflict studies have recognised that there is no simple or direct relationship between water scarcity and violent conflict. Some of the available studies have even demonstrated an increase in successful international water management efforts as a result of increased scarcity (Ide, 2018). The elevated risk of conflict has been associated more with increased shifts in water variability, such as sudden excessive rainfall and floods, rather than the steadily increasing risk of droughts (Raleigh and Kniveton, 2012). Previous studies have not examined the melting of glaciers and the reaching of peak water in relation to socio-environmental conflicts or as a climate conflict related to human security.

Glaciers are an important source of fresh water and they are rapidly disappearing due to climate change. They are not only a feature of notable mass ice sheet sites in Alaska, Patagonia, Greenland, Norway or Antarctica; they are also a key feature of complex hydrological systems in places like Italy and the Sierra Nevada in California, along the Central Andes, and in parts of Central Asia and Pakistan (Taillant, 2015). Reduced streamflow has the potential to initiate or intensify existing socio-environmental conflicts, as streams are a key feature in hydropower, irrigation and potable water systems, as well as in industries like mining.

Hydrological surveys are increasingly focusing on the concept of 'peak water' (Baraer et al., 2012; Bury et al., 2013; Bury et al., 2011; Chevallier et al., 2011). Peak water is reached when annual glacier run-off continues to rise until a maximum (peak water) is reached, beyond which run-off steadily declines along with the river's streamflow (Huss and Hock, 2018). Although cryosphere experts agree on the fact that glaciers are rapidly melting due to climate change, it is difficult to determine when a glacier and its rivers have eventually reached peak water. Glaciers are melting at different timescales, which depend on multiple factors. These include among others the glacier's latitude and altitude, its subglacial and supraglacial melt patterns, the existence of glacial lakes and debris cover, and a variety of human activities (Moore et al., 2009; Morán-Tejeda et al., 2018; Somers et al., 2018). These scientific studies, though numerous, have only rarely been linked with socio-political research elements and, specifically, conflict.

This article has chosen to focus on Peru, arguably the most water-stressed country in South

America (Bebbington and Williams, 2008). It uses the Santa River Basin from 2004 to 2019 as a case study. The research design and strategy sections further explain the case and temporal scale selection process. Peruvian glaciers have been the subject of many hydrological studies. Other reports examining social conflicts in the country have used a hydrological component. Most of these socio-environmental studies have addressed the consequences of mining and hydropower projects.

This article is the first to analyse socio-environmental conflicts in the context of glacial peak water for an extended period of fifteen years. Peru's dependence on glacier-fed water makes it highly vulnerable to climate change, as is the case with Ecuador, Bolivia and Chile (Briggs, 2010). The large body of hydrological investigations examining Peru's glaciers and their connected water system, along with its history of systematically recording social conflicts, sets the country apart from its neighbours (Baraer et al., 2012; Baraer et al., 2015; Huh et al., 2018; Mark et al., 2010; Saberi et al., 2019). An interdisciplinary literature review of hydrological, theoretical and general water management, previous climate conflict and mining-related articles demonstrates that peak water as a phenomenon has been understudied.

Those hydrological investigations that have included socio-political elements identify various stakeholders and vulnerability factors in the glacial run-off-based river basins (Vuille et al., 2018). A 2011 study combined hydrological and hydrochemical analyses of streamflow and glacial retreat in the watershed of the Cordillera Blanca with interviews and surveys, which were carried out in the Catac campesino community (Bury et al., 2011). Local household observations of hydrological variability demonstrated that shifting water resources, increasing weather extremes and climate-related threats to tourism were new perceived sources of vulnerabilities for livelihoods in the area. The worries of local households about glacial recession indicates that peak water and its connection to conflicts would be a socio-political factor worthy of analysis. Drenkhan et al. (2015) utilised an integrative review of water resource change and comparative discharge analysis in the Santa River (Cordillera Blanca) and Vilcanota River (Cordillera Vilcanota) (Drenkhan et al., 2015). The study combined this with an analysis of the drivers behind water demand and allocation in the river basins. It predicted that there could be 'increased water stress and potentially more conflicts between different water users in the lower Santa [river] and adjacent river catchments, particularly in the dry season' (Drenkhan et al., 2015, p. 724).

Articles such as the above have identified potential stakeholders and vulnerability factors which could be linked to violent and non-violent conflicts. Often, they lack an in-depth analysis of the conflicts themselves, especially on a timescale that could potentially capture the effects of peak water (Rasmussen, 2016). The interviews only provide a snapshot of the population's concerns and do not capture potential shifts or overlaps, which only a long-term analysis of data and sources could provide. Speculation over an increased number of conflicts can posit that these are either resolved or put aside for periods when there is more

water available.

Publications that approach vanishing glaciers and peak water directly as sources of climate conflicts only operate on a theoretical level (Postigo and Young, 2016). Theoretical papers lean towards worst-case scenarios and tend to sideline Peruvian agency and their collective efforts in organising sustainable water management structures (Drenkhan et al., 2015). Peru has a mediation strategy for hydrological conflicts, as well as a relatively functional Ombudsman's office, both of which should be considered when producing future water management models (Mills-Novoa and Taboada Hermoza, 2017; Moreno, 2016; Pegram, 2011).

Although important aspects relating to glaciers, peak water and the potential conflicts revolving around them are understudied, other socio-environmental conflicts in Peru have been widely covered. Such studies broadly concern either general water management or mining conflicts. Most of the mining conflicts are also water-related. Examining them can help outline how existing stakeholders are interconnected in terms of underlining power structures.

Conflict studies related to general water management cover a wide range of areas in Peru. Carey et al. (2014) argued that in the Santa River Basin, from 1954 to 2014, water management shifts were not driven by hydrological changes caused by the climate crisis but by five human variables: (1) political agendas and economic development; (2) governance; (3) technology and engineering; (4) land and resource use; and (5) societal responses. As the basis for its 'societal responses' variable, the study examined only three reservoir projects that were contested by the local populations. The report concluded that '[a] combination of local values, environmental impacts, irrigation needs, cultural perceptions, frustration with government management, concerns about future water supplies, and opposition to a foreign company fed local resistance to [the proposed reservoirs]' (p. 67). Arguably, the study misses the connections between the locals' concerns about future water supplies, their close relationship with the melting glaciers, and climate change. Also, it does not address the nature of the protests held by the locals, and whether they were violent, non-violent or cooperative among different stakeholders.

The small group of researchers who have explored the links between climate change and conflict in Peru have not had a specific peak water focus. A team of climatologists and social scientists compared farmers' perceptions of precipitation changes with precipitation records in the Santa River valley (Gurgiser et al., 2016). The precipitation records did not corroborate the study's perceived changes. This indicates that recent challenges to agricultural practices were not dependent on precipitation but other socio-environmental factors such as glacial shrinkage or changes in access to irrigation fed by river water. Another study in the Santa River valley published a few years earlier interviewed 50 water management leaders from the government, as well as from non-governmental institutions (Lynch, 2012). The study

concluded that rural communities at high elevations and poor urban neighbourhoods face an increasing threat of loss of access to a supply of clean water due to climate change and poor water management. Both studies address the key sources of conflict in the Santa River valley, including changes in water availability and management. Neither specifically addresses the melting of glaciers. Both studies note that they are restricted by people's subjective recollections of events and, thus, have a very limited temporal scale.

A vast number of reports examines different aspects of human security in relation to the expansion of the Peruvian mining sector (Gamu and Dauvergne, 2018; Himley, 2014; Lagos, 2018; Li, 2015; Loayza and Rigolini, 2016; Merino, 2018; Patrick and Bharadwaj, 2016; Salem et al., 2018). These reports incorporate a myriad of angles, including the ethnography of religious attitudes towards mining and glaciers, statistical studies on poverty rates in mining communities, and the mapping of communities' anti-mining efforts. Most of these investigations mention the disappearing glaciers, but do not connect the various mining conflicts to peak water. Instead, mining-related reports still maintain an overarching focus on water quality instead of its quantity (Salem et al., 2018). At the same time, they rarely address the fact that glacier retreat will also result in higher stream temperatures, possibly transient increases in suspended sediment fluxes and concentrations, and also toxic changes in water chemistry (Moore et al., 2009).

The publications point out that the number of socio-environmental conflicts has risen since the onset of the commodity boom in Peru, signalled by a sharp increase in the global demand for commodities in 2002, as a result of which the Peruvian economy grew at a remarkable pace of 6.4% for close to a decade. The economy has continued to expand but, in 2014, growth started to decelerate as the global demand for commodities decreased. This slowdown resulted in the annual growth rate dropping to 4.8% in 2014 and subsequently to 3.1% in 2015 (Dargent et al., 2017).

Studies largely agree that local communities experience few benefits from mining revenues. Instead, they face an increasing number of environmental problems including poorer quality of air, groundwater and surface waters. Several authors also point out that the government lacks the capacity and political will to regulate the industry. This lack of regulation has been connected to a weak and under-funded regulatory infrastructure, as well as the national leaders' desire to support neoliberal economic structures (Arellano-Yanguas, 2011). The mining companies have also been accused of inexperience in operating among Peru's traditional and campesino communities. Water-related mining conflict reports also have a distinct subfield, which specialises in the Peruvian indigenous peoples' rights regime (Andía, 2017; Comisión Interamericana de Derechos Humanos, 2015; Merino, 2018), and places emphasis on the right to prior consultation and land rights in general. The reports on indigenous communities, however, mention climate change briefly without explicitly examining it as a meaningful factor in the various socio-environmental conflicts.

Selecting the Santa River Basin for Direct Qualitative Content Analysis (DQCA) escapes common pitfalls of past climate conflict studies

Past climate conflict research struggles with the case selection process, often choosing cases based only on the availability of data. The article chose to study the Santa River Basin (SRB) for five reasons: the SRB has reached peak water; it is not solely characterised by violence; it eschews the streetlight effect; it hosts a diverse set of stakeholders; and there exist high-quality conflict data for a sufficient amount of time. The conflict data in question are drawn from the monthly conflict reports created by the Ombudsman's Office of Peru, which were deemed reliable because they successfully meet Scott's four-point quality criteria. In order to assess the quality of official state documents in qualitative social science research, Scott set the following four criteria: authenticity, credibility, representativeness and meaning. Meeting the quality criteria requirements is crucial because using poor quality state documents can result in doing research with skewed and generally unreliable data. State documents may include falsifications, the distortion of facts due to political pressure, abridged record keeping or be unrepresentative of the wider country.

The SRB has reached peak water. Studies which assess the influence of water quantity and quality on the prevalence of conflicts often only study rainfall, instead of glacial meltwater quantities, let alone glacial post-peak water developments (Bury et al., 2013). Alternatively, studies which take glacial meltwater into consideration do not accompany their sources with long-term conflict data (Drenkhan et al., 2015). Arguably, the 15-year period explored by this article captures the gradual decrease in water resources and the evolution of social conflicts in the SRB. The Santa River originates in Lake Conococha (4,000 metres above sea level) and flows 300 kilometres to the Pacific Ocean, gaining most of its water from the Cordillera Blanca glaciers, especially during the dry season. Peru has had many hydrological assessments of its glaciers, and the Cordillera Blanca and Santa River have been by far some of the most researched ones (Baraer et al., 2015; Huh et al., 2018). These hydrological assessments, however, have not systematically linked decreased water quantities with social conflicts. An extensive study of the Santa River Basin has argued that the river has reached its peak water due to the glacial meltwaters of the Cordillera Blanca, which have also reached their peak, and that water levels have been slowly decreasing since the 1980s (Baraer et al., 2012).

The SRB is not solely characterised by violence. Various climate conflict research papers explore the connections between violent conflict and climate change in places where conflict has been prevalent, meaning they have been sampling on the dependent variable (Adams et al., 2018). Sampling on the dependent variable can be seen in papers which solely focus on countries that experienced conflict following a cross-border environmental shock. Multiple papers, for example, concentrate on the conflicts which followed a regional drought in Syria after 2011, but do not include the relatively conflict-free cases of Lebanon and Cyprus, which were also affected by the drought (De Châtel, 2014; Gleick, 2014). This article sidesteps the

sampling problem by focusing on Peru, and more specifically the SRB, both of which have had high exposure to climate change but no clear major climate-driven conflicts, such as a civil war or a rebel uprising. This high exposure, coupled with relatively low violence rates, enables the article to explore the role of non-violent conflict and actors beyond armed rebel groups and other factions. For example, the SRB, which is located in the Ancash department, is far away from the Shining Path rebel group, which has had its centre of operations in the Ayacucho department since the 1980s (Burgoyne, 2010). Preliminary research for this article revealed an interesting pattern of social conflicts in the Ancash department, which cannot be readily categorised as violent or non-violent. Relatively low levels of conflict were observed between May 2004 and December 2006 with an average of 2.9 conflicts per month. From January 2017 to May 2019, the average number of social conflicts in the department increased to a national high of 27.0. It must be pointed out that the format of the Ombudsman reports changed several times during the 2004–2019 period. These changes coincided with the public's rising awareness of the Ombudsman's Office, and its duties and processes (Pegram, 2011).

The SRB eschews the streetlight effect, which involves conducting research only where it is convenient. Adams et al. (2018) found strong evidence of this in their extensive climate conflict literature review focusing on sampling based on convenient data availability. Such data belonged to already existing conflict datasets, skewing the research towards African countries, which have been the focus of large-N conflict studies in previous decades. The team also noted the extensive representation of former British colonies, which had readily available weather data for climate modelling. In general, English-speaking countries were more prevalent, possibly because the language is dominant in the international social sciences community (Hendrix, 2017, p. 252). Conversely, SRB is in a Spanish language region, outside the former British Empire and removed from an Afrocentric viewpoint on climate conflicts.

The SRB hosts a diverse set of stakeholders, which make the case study complex but generalisable across Latin America and globally, as other glacial peak water river basins around the world similarly attract a myriad of stakeholders, including energy generators, mining companies, large and small agricultural projects, population centres and tourist attractions. A highly detailed and helpful illustration of the SRB and its stakeholders is available for reference (Carey et al., 2014, p. 62).

Hydropower accounts for approximately 71% of electricity generation in Colombia, 49% in Ecuador, 32% in Bolivia and 56% in Peru (UNEP Global Environmental Alert Service, 2013). All these countries face diminished water flows due to the approaching or surpassed peak waters of their glaciers or rivers in general. Most of the Ancash department relies heavily on hydropower generated on the SRB. Electroperú and, more recently, Duke Energy formed after the late 1990s neoliberal privatisation, have been the major players in the hydropower field in the SRB. Two main friction points exist in this river basin: the Parón Lake with its

outburst flood risk, drainage tunnel, irrigation and tourism dimensions, and the Cañón del Pato hydroelectric station (Carey et al., 2012). These two have switched ownership and have been the topic of numerous debates and protests, mostly because the glaciers attached to the SRB have produced excess pre-peak water.

The mining industry has been a fixture of Latin American economies since the Columbian exchange. Its presence is so dominant that it features in most socio-environmental analyses. Unsurprisingly, industrialisation on the SRB is mostly marked by various national and international mining projects. Even after the end of the commodities boom in 2013, mining still represents over 50% of Peru's national economy. The mining companies gathered strength during the boom and the neoliberal decentralisation and privatisation processes that took place during the 1990s. The largest mining companies in the SRB include Barrick, near the region's main city Huaraz, Pierna Mine and Antamina. Local campesino communities have blamed these companies for the degradation of local water and soil conditions (Patrick and Bharadwaj, 2016, p. 475). Reduced water quantity, due to post-peak water streamflow declines, has also been linked to decreasing water quality, as the streams are not able to dilute all the toxins entering them. This decrease in water quality is related to mining, whose impact on the waters of the SRB is poorly understood (Carey et al., 2014, p. 67). It is telling that most Peruvian socio-environmental conflicts have a mining component (Salem et al., 2018).

Unlike in the West, agriculture is still a key feature of Latin American economic and social structures, as manifested by large commercial projects and small subsistence farming (Barrientos-Fuentes et al., 2014). The SRB features both. The two mass-scale irrigation and agricultural projects in the SRB are called Chavimochic and Chinecas. They both take irrigation water from the river and benefit over 600,000 people. Although the amount of water in the SRB has decreased over time, the two projects are using more water than ever before, with the cultivated land area growing from 7,500 ha in 1958 to 174,000 ha in 2009 (Bury et al., 2013, pp. 371–372).

Latin America is heavily urbanised with 80% of the population living in cities (Leeson, 2018, p. 107). Growing urban population centres and tourism are among the most vocal stakeholders in the SRB. Ancash is experiencing around 0.6% population growth per year and, by 2050, Peru's population could increase from the current 30.8 to 40.1 million people. Of all urban and rural Ancash households, 9% and 16% respectively do not have access to permanent water supply (Drenkhan et al., 2015, p. 723). Rapid urbanisation in cities like Callejón de Huaylas, Chimbote and Trujillo have driven potable water use up without it being accompanied by adequate development of wastewater treatment facilities (Mark et al., 2017, p. 64).

The Peruvian Ombudsman reports allow in-depth structured analysis to take place. They

benefit from an inclusive definition of conflict along with detailed stakeholder categorisation. Social conflict is defined as 'a complex process in which sectors of society, the state, and firms perceive that their goals, interests, values or needs are contradictory and this contradiction can [but does not always] lead to violence' (Report 184, June 2019, p. 3).[1] This definition of social conflict is a necessarily inclusive term, as a solely violence-based definition would be limited in its ability to measure the various forms a protracted and complex disagreement can take. The Ombudsman reports consider a conflict to be violent if it is accompanied by casualties, instances of kidnapping, injury to people, violent invasion and/or damage to property (ibid., p. 4). The three parties named in the definition are 'sectors of society', 'the state' and 'firms', which might demonstrate that the Ombudsman's Office views the division of Peruvian society in terms of economic corporatism. Having 'firms' as a named party, along with the state and the ambiguous 'sectors of society', hints at the power of large companies in Peru.

The reports divide the stakeholders into three levels: primary, secondary and tertiary. Primary stakeholders are 'those who participate directly in the conflict'. Secondary stakeholders 'can be groups that support one of the parties: institutions, societal organisations or the people indirectly linked to the conflict'. Tertiary stakeholders '[are] people or organisations that, due to their characteristics, may have an impact on the course of the conflict' (Report 184, June 2019, p. 3). This division enables the examination of a wide group of stakeholders whose influence might have otherwise gone unnoticed if only primary stakeholders were recorded. For example, a mining conflict, which was resolved by governmental intervention but escalated by the national police, could not be fully analysed if the reports only recorded the local community and the name of the mining company. The reports are organised by departments and have grown to include various subcategories over the years.

The reports fulfil Scott's four-point quality criteria. Scott set four criteria in order to assess the quality of official state documents in qualitative social science research: authenticity, credibility, representativeness and meaning. The Ombudsman reports fulfil these and are, thus, an interesting and reliable source of data when analysing socio-environmental conflicts in the context of climate change and glacial peak water.

The documents are authentic, meaning they are genuine and of unquestionable origin, and are easily available online on the Ombudsman's official website at no cost.

Scott defines evidence as credible when it is free from error and distortion. An extensive study on the Peruvian Ombudsman's level of political independence concluded that the Office had not been subject to the dramatic, politically motivated budget cuts experienced elsewhere in South America (Pegram, 2011). The study also found that the Ombudsman's Office has maintained its autonomy and that it makes an important contribution towards facilitating human rights claims 'across an entrenched divide between state and society' (Pegram, 2011,

p. 245). Operating across societal divisions enhances the Ombudsman's credibility, as they can mediate between stakeholders with greater ease and without being seen as an organisation favouring the Peruvian government's political leanings, which has been prominently pro-mining for decades (Himley, 2014).

A source is considered representative when it is typical of its kind, and in cases when it is not, the extent of its atypicality is known. The reports cover all other departments of Peru, and it becomes evident that the Ancash region is typical of the rest of the country. As all other Andean states have an Ombudsman's Office of their own, a study with a larger scope could in the future analyse the effects of climate change on socio-environmental conflicts across the entire mountain region (Moreno, 2016).

Scott considered a source as having the required level of 'meaning' when it was clear and comprehensive. The Ombudsman has kept an unabridged record of social conflicts in Peru for almost 15 years. The reports retain consistent features across this period, such as organising stakeholders into different levels, main location and conflict type. Consistency makes the tailoring of an analytical process that fits the reports easier. This article used Direct Qualitative Content Analysis (DQCA) to build two databases.

DQCA coding and selecting the most typical conflict in the Santa River Basin

The following section describes in three parts how the 184 Spanish-language Ombudsman reports, from 2004 to 2019, were organised, coded and analysed.

The reports were available on the Ombudsman's website from which they were individually downloaded (https://www.defensoria.gob.pe/). Each monthly report, in portable document format (PDF), was attached to a corresponding year–month according to section–page in an OneNote notebook. The reports were then studied to identify the Ancash department sections, which were subsequently screenshot into the report's corresponding OneNote page. The social conflicts in Ancash were then analysed and coded by utilising DQCA. The notebooks also included annual summaries of the conflicts.

DQCA is based on 'existing theory or prior research about a phenomenon that is incomplete or would benefit from a further description' (Hsieh and Shannon, 2005, p. 1281). In this case study, prior climate conflict and Peruvian socio-environmental research guided the DQCA process. The existing interconnected dimensions with climate change helped to produce a coding system. As mentioned previously, the article utilised the Ombudsman Office's definition of social conflict, which brings together both violent and non-violent modes of analysis.

In the first stage of data analysis, the article identified the socio-environmental conflicts in the Santa River Basin (SRB). This meant categorising the conflicts from 2004 to 2019 into "in the

SRB" and "not in the SRB" codes. The following step examined the SRB-labelled codes and identified social conflicts which fell under the socio-environmental conflict category. With some of these, the article deviated from the Ombudsman's categorisations by re-labelling, for example, a 'conflict over matters of national government' as socio-environmental when the main friction point was irrigation projects across the region. The article utilised a system of labelling and re-labelling, which enabled the recognition of overlapping themes such as violence, resolution types and actor types.

This method is advantageous because the complex interaction between stakeholders is very difficult to quantify and measure statistically. A linear regression model would not fit the available data. Research conducted on mining conflicts and their prevalence in the mining projects' regional proximity does not capture the complex river- and glacier-specific conditions in the SRB or the department as a whole. If the country's hydrological systems were more systematically recorded and categorised, and then matched with the Ombudsman reports, a more reliable quantitative analysis would be possible. The article produced figures with descriptive statistics to demonstrate better how the conflicts have evolved over the period in question.

After each monthly report had been analysed, the 23 socio-environmental conflicts that were identified in the SRB were compiled into a database on Microsoft Excel. The entries were categorised according to 19 variables, which included basic information such as location, length of conflict, reactivation features, and primary/secondary/tertiary actors involved. More complex variables included the presence of violence, roadblocks, water authorities, resolutions, mining and water quality/quantity features.

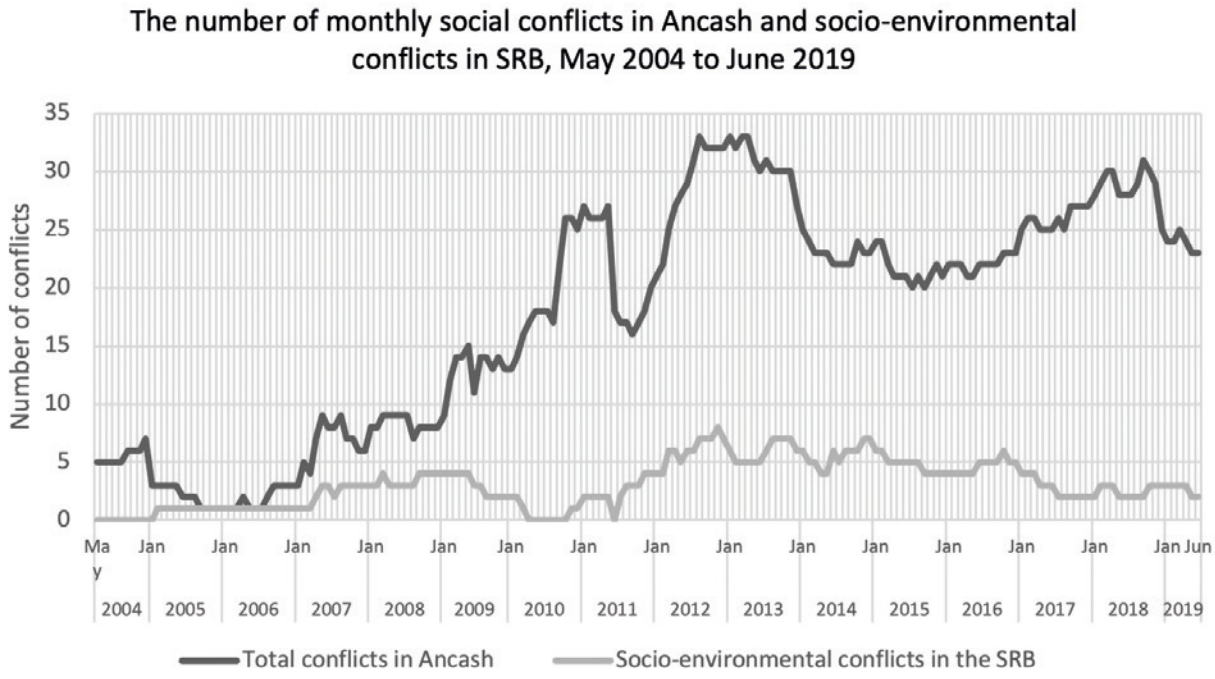
Data analysis suggested that the peak water of the SRB did not have a direct effect on the conflicts. Five major factors, which escalated the 23 conflicts, were identified: violence, upstream–downstream dynamics, multiple stakeholder cooperation, depleted water quality and quantity, and the weaponisation of roads.

As the article identified a relatively small number of socio-environmental conflicts within the SRB, the most typical conflict was selected for further analysis. As Gerring and Cojocaru (2016) have argued, '[a] typical case is intended to represent the central tendency of a distribution, which is of course not the same as the entire distribution. To say that a case is typical, therefore, does not mean that it is representative in the way that a larger sample might be representative of a population' (pp. 395–396). In other words, selecting the most typical case for intensive analysis enabled the article to reflect on the rest of the conflicts and their central elements, while exploring complex causal pathways in the small-N sample. The most typical conflict had to have all five factors and approximate other conflict attributes, such as length, location and stakeholders involved. Based on these required attributes, the article selected the Three Rivers conflict (November 2010 – November 2012) as the reflection point

for further analysis.

Peak water did not increase the number or length of socio-environmental conflicts

Reaching glacial peak water did not directly increase the number or length of the 23 socio-environmental conflicts near the SRB. These were not the dominant social conflicts in the Ancash region. This is surprising considering the vast amount of literature on the stakeholders of the SRB conflicts and the widely discussed decreasing water resources of the basin. Drenkhan et al. (2015, p. 724) theorised that there would be 'increased water stress and potentially more conflicts between different water users in the lower Santa [river] and adjacent river catchments, particularly in the dry season'. The number of conflicts did not increase in the SRB as the water resources were becoming scarcer each year. Furthermore, contrary to the expectations of Drenkhan's theory, the SRB notably reported zero socio-environmental conflicts between 2010 and 2011.



The moderate increase in SRB conflicts coincides with a regional rise in the number of conflicts, which starts in late 2011 and trails off at the beginning of 2014. This regional rise can be traced back to the Huari province, which lies outside the SRB, on the other side of the Cordillera Blanca's southern tip. The Huari province conflicts could have mobilised stakeholders in the SRB. This article discusses further the effect of Huari conflicts on SRB conflicts when referring to upstream–downstream dynamics.

Contrary to Drenkhan's theory, the conflicts do not display a seasonal pattern, with more conflicts active during the dry season compared with the wet season. In fact, the length of the 23 SRB conflicts decreases as the period in question unfolds. A full examination of the conflicts' length would require a regression analysis, which lies outside the scope of this article. Establishing how the length of the conflicts changed over time is impaired by the

"reactivation" of previously dormant conflicts. For example, three of them were reactivated, meaning that after an initial resolution or a period of latency, the conflict became active again, while two which began in March 2012 and October 2018 respectively are still unfolding. As a result, the length of a conflict should not be the sole factor analysed.

The first identified socio-environmental conflict started in February 2005 and, as of June 2019, there are two conflicts currently underway in the SRB. Excluding those two, the average conflict length was 20 months, with the shortest lasting three months and the longest 56 months. The small number of conflicts causes outliers such as the three-month- and 56-month-long conflicts to have a skewing effect on any trend line. November 2012 was the most active month in the SRB with eight overlapping conflicts. The clustering, with two-thirds of the conflicts unfolding between November 2010 and November 2014, might also have a skewing effect on future trend analyses. A full examination of the effects of the cluster would require the building of a linear regression model.

The recorded length of these conflicts can be deceiving as the reports keep marking some of them as active for a few months after each event that occurs within the conflict. This prolongs some relatively inactive conflicts and shows them as having deceptively long active periods. Keeping conflicts active and on the record is beneficial for the Ombudsman's Office from a bureaucratic standpoint, as this method skirts the confusion generated by an array of active and inactive conflicts. The relative decrease in SRB conflict duration during the period in question may be a sign of improved mediation efforts by the central government. For example, the National Water Authority (ANA) and its provincial and local branches (AAAs and ALAs) were created in March 2008 to help with mediation efforts in hydrological socio-environmental conflicts (The World Bank, 2017). Following their establishment, the national and local water agencies mediate nine out of 20 SRB-based socio-environmental conflicts in one form or another.

Instead of peak water, the conflicts were dominated by five other escalating factors: violence, upstream–downstream dynamics, multiple stakeholder cooperation, decreases in water quality and roadblocks. These five factors had a more pronounced effect on the conflicts, either in terms of their length and number or their complexity.

Although the number and length of the conflicts might have varied, their overall qualities changed little during the period in question. The most common form of conflict involved campesinos (small-holder farmers) or hamlets challenging a mining company (13 conflicts). All but one of these conflicts had a hydrological component, which was either quantitative or qualitative, or both. Five conflicts involved a region versus a mining company as primary actors, two conflicts concerned campesinos versus a hydropower plant, two involved regions versus farmers, and one included a region against a hydropower plant.

The primary, secondary and tertiary stakeholders were found to be interacting in a highly complex manner. For example, two different campesino communities stoned a mining company's cars and its workers because their water source had dried up. It was only after a strike that the mining company agreed to an Environmental Impact Assessment with a local water authority, which installed flow meters supervised by the Mining Ministry (Atupa and Antauran Hamlets vs Barrick Misquichilca, March 2012 – present). Analysing only primary actors simplifies the complex web of interactions among stakeholders.

The Three Rivers conflict, which was active for two years from November 2010 to November 2012, was identified as the most typical conflict. It consisted of a number of communities in the dominant Santa River and two minor rivers, Pativilca and Fortaleza, protesting the proposed mining operations of Centauro Corporation S.A.C. in the Conococha Lake from where the rivers originate. Due to well-organised strikes, the national government sent representatives from five different agencies to coordinate round-table discussions between the communities and CENTAURO S.A.C. The central government directed organisations and the technical committee, whose reports effectively stopped the proposed mining operation in February 2011.

The Three Rivers conflict is the only one of the 23 conflicts, which covers the entire Basin, from the Conococha Lake to the town of Santa on the Pacific coast. As such, it involves all relevant stakeholders within the SRB. It lasted 24 months, close to the average conflict length of 20 months, and also took place alongside the highest number of simultaneous conflicts in the SRB, with seven other conflicts being active in November 2012.

The five key factors identified by the coding process were present in the Three Rivers conflict and they contributed to its escalation, which means that they increased its intensity or severity.

Conflicts over the quality versus the quantity of water had a different impact on the prevalence of violence

An analysis of the role of water quality versus quantity and violence versus non-violence in Peruvian socio-environmental conflicts is a much-needed addition to the existing literature. Past studies have lacked clear distinctions between these two sets of elements when conducting large-scale statistical analyses (Salem, 2018). Measuring only the prevalence of violence in conflicts, instead of their content or length, deprives studies of much-needed complexity. As discussed previously, the streetlight effect of doing research based only on easily available data, is also visible here. The presence of water conflict, coupled with water-related fines or rainfall, as the key water-related variables in Peruvian conflict analysis, leaves the important question of glacial peak water out of the picture (Salem, 2018, pp. 6–8).

The article found that violence can act as a catalyst for the central government to become involved, but this does not guarantee a faster resolution. Violence tends to deepen grievances

and make them harder to solve. Previous Peruvian mining-related conflict research produced by socio-political scientists has addressed violence extensively (Bebbington and Williams, 2008). Interestingly, non-mining-related socio-environmental studies specific to the SRB do not address violence as a feature of the conflicts (Bury et al., 2013; Carey et al., 2014; Carey et al., 2012; Drenkhan et al., 2015). These studies are largely conducted by academics who specialise in the physical aspects of melting glaciers, the history of water sources or aspects of human–environment interaction, such as water consumption. This disconnect could be rectified by funding more interdisciplinary studies in the future.

In the Three Rivers conflict, the first escalating factor to appear was violence. It started with a mass protest, which resulted in the death of one protester and 12 wounded police officers. The passing of the protester and the fear of further escalation forced the central government to act rapidly. Nine different parties were sent to mediate between the communities and the mining company, including representatives from three ministries, the National Water Authority, the National Police, the National Congress, the Ombudsman's Office, the provincial government and a prestigious university. Flooding the province with experts and people working for a common solution arguably reduced the communities' anger, as this assured them that their concerns were being taken seriously.

Eight of the 23 conflicts involved elements of violence. As seen with the Three Rivers conflict, violence normally manifested itself in the form of serious injuries following clashes of protesters with the national police or private security personnel hired by mining or hydroelectric companies. The article counted at least two casualties in the protests.[2] The reports failed to record all associated acts of violence. Supplementary research into some of the more complicated conflicts, such as the Parón Lake conflict over the glacial lake's water levels, pointed to the kidnapping and beating of the secretary of the lake's defence league (Coordinadora Nacional de Derechos Humanos, 2012). Thus, the level of violence in the 23 conflicts could potentially be higher than that revealed by the Ombudsman's reports.

On average, violent conflicts lasted longer than non-violent ones (26 months compared with roughly 18 months respectively). The average length of violent conflicts is based on six of the identified conflicts, as the other two are still ongoing. The longer duration of a violent conflict may indicate that it is harder to solve, as violence tends to make grievances more complicated, leading to reparations, legal action or cycles of revenge (Barnett and Adger, 2010, p. 645).

The decreasing quantity of water is singled out as a strong precursor to violence, while the decreasing quality of water is not. The frequency of violent conflicts over the quantity of water did not increase during the period in question indicating that there is no direct link between peak water and violence. Eight out of the 23 conflicts were violent. Decreasing water levels were a dominant feature in six out of those eight violent conflicts (75%). Five out

of the remaining 15 non-violent conflicts were linked to decreased water levels (33%). The decreasing quality of water, however, was an unclear precursor to violence. Out of all the 23 conflicts, only one lacked a quality of water component to it (Vicos campesino community vs Toma la Mano mining company, July 2013 – March 2014). The more pronounced violence of water-quantity conflicts may be due to a number of issues. For example, in cases where water quality is compromised, it might still be fit for other purposes, such as agriculture and the industry, which in turn does not affect the economic security of local communities. There are also various levels of contamination, while some minor impurities can be treated with technological and infrastructural investments, such as water treatment plants. Conversely, when water quantity drops, competition among all stakeholders, including farmers and mining companies, intensifies. One could predict that socio-environmental conflicts will become more violent in the future as the SRB keeps losing more of its run-off water. At the moment, however, no clear evidence exists of conflicts intensifying and turning more violent over the period in question due to decreased peak water.

Contrary to theoretical expectations, upstream conflicts were more prominent than downstream ones

Contrary to Drenkhan et al.'s (2015, p. 724) speculation that increased water stress would be focused on the 'lower Santa [river] and adjacent river catchments', the data indicated that conflicts that were upstream tended to be more numerous. The downstream focus is based on the view that incidents of water contamination potentially affect more people downstream, thus, attracting more stakeholders; however, the number of stakeholders involved in a conflict is relative to the attention paid to possible contamination events and mining companies upstream, while the total number of conflicts in this case decreases as one follows the river downstream. The SRB starts from the Conococha Lake in the Recuay province (four conflicts) and runs north through the small Aija province (two conflicts), then the Ancash capital region of Huaraz (five conflicts), and flows into the Ocean via Carhuaz (two conflicts), Yungay (three conflicts), Huaylas (three conflicts) and the coastal Santa province (two conflicts). Of all conflicts, two were province-wide: the previously discussed Three Rivers conflict and the Ancash farmers' irrigation conflict, which ran from November 2010 to November 2012 and April–June 2007 respectively. The first three upstream provinces account for more than half of all SRB socio-environmental conflicts. The Aija province is noteworthy as, despite the fact that only a small portion of its territory lies within the SRB, it still hosted two conflicts during the period in question (January–May 2011 and July 2011 – April 2012). Additionally, one must point out that Huaraz's large number of conflicts is partly associated with the fact that the capital of Ancash, Huaraz City, lies within its borders. Huaraz City is undergoing rapid urbanisation, meaning its demand for available water is rising, while strain is placed for the same reason on nearby rural communities, which are struggling with maintaining access to clean drinking and irrigation water (Lynch, 2012, p. 368).

The presence of mining operations also attracts more conflicts, as locals can identify polluting

activities at their source. Most mining operations are located in the upstream areas of the SRB, which was also one of the main escalating factors in the case of the Three Rivers conflict. If the CENTAURO S.A.C. mining operation were to contaminate the Conococha Lake, all three rivers and their downstream industries and populations would be affected. The Three Rivers conflict is unique in the SRB, as it involves dozens of stakeholders all along the Santa River, acting in unison against the proposed operation. Large-scale initiatives taking place downstream do not attract the attention of upstream stakeholders. For example, the proposed decrease of water levels at the Parón glacial lake conflict attracted a large number of stakeholders from a wide range of industries, including tourism and local farming. Although the conflict reactivated twice, was classified as active for a total of 56 months and ran on and off for nearly nine years (2007–2016), there was a notable absence of representatives from the Yungay, Carhuaz, Huaraz and Aija provinces. One could argue that this was because there were a few regional groups present, such as the Agrarian Federation of Ancash (FADA), but this does not explain why so many smaller downstream organisations were involved and none from upstream.

The absence of support from upstream organisations in cases of downstream conflict displays lack of unity and cooperative spirit among the various organisations. The SRB provinces differ from, for example, the Huari province, which is served by the very effective Municipal Association of Huari Population Centres (AMUCEP). AMUCEP has helped smaller communities organise against mining companies in cases of suspected water contamination and decreased water quantities (November 2011 – present). The SRB provinces lack a unified organisation such as this, which could help syndicate upstream communities in solidarity to downstream ones if the case arose.

More attention should be paid to intra-state conflicts, both violent and non-violent, when it comes to upstream–downstream river dynamics, which are mostly viewed from the perspective of international tensions or cooperation efforts (Karreth and Tir, 2018; Lawson, 2016; Tian et al., 2018). This partially applies to the wider South-American region, where international rather than domestic river boundary disputes have been prioritised (Hensel et al., 2006).

Conflicting stakeholder interactions need an environmental peace perspective

Over the period in question, more actors became involved in the conflicts, often escalating them by adding new dimensions and contradicting priorities. As the overall length of conflicts decreased during this period, this could mean that the more parties were present, the more successful they were at resolving them. On average, violent conflicts had the highest number of stakeholders involved. Shorter conflicts and an increased number of stakeholders could indicate that environmental problems, under certain circumstances, act as catalysts for cooperation. This directly contradicts the previously discussed theories of water scarcity leading to more conflicts in glacial water basins (Drenkhan et al., 2015). Multiple stakeholder

interactions, along with ecological change, have been speculated to play vital roles in shaping the future of water resources and water governance in the SRB region (Bury et al., 2013). Although these speculations mention the future potential of governmental water management entities, such as the National Water Agency, they still exclude them from their analysis.

The article found that conflicts became increasingly complex as time went on in the period examined. This increase in complexity can be attributed to the National Water Agency's renewed efforts in resolving hydrological conflicts and multi-stakeholder cooperation. The initial conflicts concerned mostly primary stakeholders, meaning actors that were directly involved in the conflict itself (conflicts from 2005–2008). The mid-period conflicts (2010–2013) had mostly primary and secondary stakeholders, while the majority of conflicts towards the end of the period (2014–2018) engaged primary, secondary and tertiary stakeholders. A conflict comprised, on average, roughly seven stakeholders.

The increase in the number of tertiary stakeholders coincides with the National Water Authority's (ANA) implementation of the 'Protocol for the prevention and management of social conflicts related to water resources' (Protocolo para la prevención y gestión de conflictos sociales vinculados con los recursos hídricos) in 2014 (Autoridad Nacional del Agua, 2014b). This protocol helped the Ombudsman diversify its data sources, as the ANA uses a wider conflict categorisation system and acts independently from the Ombudsman's Office, with its own resources and investigative teams (ibid.). The ensuing diversification has contributed to the Ombudsman discovering more tertiary stakeholders involved in the conflicts.

Multi-stakeholder cooperation functions as an escalating factor in conflict. Three Rivers exemplifies this in practice. This conflict had the most stakeholders out of all conflicts, with 22 in total. Chronologically, it falls into the mid-period under examination, which mostly had primary and secondary actors, 14 and eight respectively. The conflict saw downstream macro-agricultural projects, small farmers and big urban centres, such as Catac and Huaraz, cooperating to stop mining activity. This is a rare occurrence, as ordinarily these three would be in competition over the same water resources. The large number of stakeholders could be tied to the fact that the conflict had features of violence, including one of the two deaths identified in the data (the other death being in the farming community of Mareniyoc vs Barrick Misquichilca conflict, March 2012 – October 2016). Violent conflicts had almost twice as many stakeholders compared with their non-violent counterparts. On average, a violent conflict had roughly 11 stakeholders, while a non-violent one had only six. The larger number of stakeholders involved in violent conflicts could indicate a collective desire to cooperate in order to solve high-stake conflicts.

The spirit of cooperation and conflict resolution as triggered by environmental problems has received limited attention in the field of climate conflict. Tobias Ide and Jurgen Scheffran

addressed this phenomenon under the term 'environmental peace perspective', where 'environmental problems are – under certain circumstances – not sources of conflict, but chances and even catalysts for cooperation between groups. The underlying assumption is that even hostile parties may work together if they face a common threat affecting the well-being of each party'. They go on to point out that environmental problems present some attributes that foster cooperation; for example, they are often long-term, cut across political borders and constitute a common threat to several groups (Ide and Scheffran, 2013, p. 14). This notion of environmental problems potentially triggering cooperation and conflict resolution attempts contradicts the previously discussed theories of SRB conflicts as exacerbated solely by water scarcity (Drenkhan et al., 2015).

Some of these features are also present in the SRB conflicts, with hostile parties, such as small farming communities and mining corporations, coming to the negotiating table due to drops in water quality. Additionally, the environmental factors in the SRB are also long-term, traverse political borders and threaten several stakeholders.

Ide and Scheffran's discussion does not expand on the role of the state and non-governmental organisations in facilitating cooperation efforts. In the case of SRB conflicts, the ANA and the Ombudsman's Office both became increasingly involved, throughout the examined period, in recording and facilitating discussions among conflicting parties. In their later work, the two scholars acknowledge the 'lack of integrative cumulation of knowledge' in the 'environmental peace' research at large (Ide and Scheffran, 2014). Further study would be required to map out fully the effects of growing resilience through accumulative institutional knowledge.

Ide and Scheffran's analysis can also be simplified into a dichotomy of cooperation or violence. In some SRB conflicts, violence was accompanied by an increased number of stakeholders, such as the ANA and the Ombudsman's Office, followed by a cooperative resolution. In other words, cooperation can follow violence or vice versa. Further investigation, including regression modelling, would be needed to determine and analyse these causal links further.

Increasing water governance did not acknowledge the glaciers or the ENSO

Although the slowly decreasing quantity of water in the SRB did not have a direct effect on the number of conflicts in the area, water did play a major role in most of the basin's socio-environmental conflicts. Nevertheless, there has been a distinct lack of mentions about glaciers and other factors related to climate change. Multiple hydrological components have moved the focus of socio-environmental conflicts from quality to quantity, and from stakeholders to pollutants. There has also been a noteworthy absence of the El Niño-Southern Oscillation (ENSO) phenomenon from discussions, which previous studies have identified as a key feature in some climate conflicts (Hsiang et al., 2011).

Although glaciers are the main water source of the SRB, especially during the dry season, the conflict reports mention them sparingly and in fact only twice, when referring to the Huascarán National Park and the glacial Parón Lake.[3] This lack of focus could be due to an organisational or educational deficit. The Ombudsman has a large mandate, which guarantees its independence but also renders it responsible for a multitude of social conflicts from labour disputes to human rights violations. As the glaciers are complex hydrological structures, the Ombudsman's Office could have purposefully focused on the social aspects of the conflicts and their immediate water sources, such as nearby streams. Alternatively, the lack of glacial connections could be attributed to the public and the Ombudsman's Office both being unaware that water sources are connected to glaciers via, for example, underwater aquifers. Carey (2010) notes that, historically, knowledge of complex water systems, which reach beyond the visible mountaintop glaciers, has been guarded by mining and hydropower companies, as they have a stake in keeping the public in the dark about the interconnectedness of water systems.

A simple guide targeting the public accompanied the already mentioned water-related social-conflict management protocol published by the National Water Authority (Autoridad Nacional del Agua, 2014a). Although the guide clearly addresses an adult audience, with extended text sections and statistics, it is filled with cartoon characters explaining how the water and consultation systems of the country work. The use of cartoons and other simple visualisations could be a sign of the public's relatively low level of understanding when it comes to Peru's highly complex freshwater systems.

The conflicts were divided based on their triggers: firstly, quality of water and, secondly, quality in addition to quantity of water. According to this classification, there were 13 and ten conflicts in each category respectively. Both types were constantly present during the examined period with no notable fluctuations. All conflicts in the first category involved a mining company as one of their primary stakeholders, while hydroelectricity plants and agricultural projects also featured in the second. The absence of agricultural projects as primary stakeholders facing accusations of water pollution is interesting, as agriculture can heavily damage water sources with fertilisers and livestock sewage. Their absence could be due to the fact that the largest agricultural initiatives, Chavimochic and Chinecas, are located at the edge of the SRB, near the Pacific coast. Alternatively, mining companies are easier to identify as culprits when previously absent metals appear in the water system, compared with the hundreds of campesino communities located along the SRB potentially using relatively similar fertilisers. Water sources have been reportedly compromised by a great variety of pollutants, from vague complaints about 'contaminating materials' to a specific highly dangerous case of lead poisoning (Macate community vs Fortaleza mining company, June 2012 – January 2013, Virgen del Rosario de Quillo community vs Copemina mining company, October 2018 – present).

The various water management authorities, from the National Water Authority (ANA) to the regional (AAAs) and local authorities (ALAs), are relatively small. These organisations are led vertically from the national to the local level. They were present in nine out of the total 23 conflicts and mostly in those featuring both water quantity and quality complaints, making up six out of the nine instances. They held technical and mediation roles to solve both violent and non-violent conflicts among various stakeholders. Considering that most of the conflicts had at least a water quality aspect in them and that the authorities were involved in only 40% of the cases, one could argue that they were relatively inactive in solving the SRB's socio-environmental conflicts. This could have been due to the Ombudsman's dominant role as a nationwide impartial mediator, while the water authorities were perceived as having a more pro-environment stance. Interestingly, the conflicts hardly touch upon other weather events, such as flooding and its wider climatic causes.

Although the Southern Oscillation has been extensively studied in the past, it did not feature in any of the socio-environmental conflicts of the SRB. The El Niño-Southern Oscillation (ENSO) phenomenon is the dominant driver behind inter-annual climate variability. ENSO is characterised by a fluctuation between unusually warm (El Niño), neutral, and unusually cold (La Niña) oceanic and atmospheric conditions in the tropical Pacific (Muis et al., 2018, p. 1311). The fifteen-year period under examination included multiple fluctuations among the three conditions, including five El Niño occurrences.

Most of the people affected by El Niño live in coastal communities and work as fishermen. The macro-agricultural projects of Chinecas and Chavimochic were not affected by the ENSO cycle during the 15-year period. As the irrigation systems are mostly based on the melting glaciers and their annual dry–wet season cycle, macro-agricultural projects do not have to rely on other cycles associated with the Southern Oscillation, such as the monsoons. Arguably, the coastal plains and the Cordillera Negra protect the glaciers of the Cordillera Blanca from the ENSO cycles. In other words, ENSO-based conflicts, which are prominent in other countries, are not present in the SRB, as its water system depends on the melting glaciers.

Protest utilisation of roads against mining companies

Road use and roadblocks were a common escalating factor in the socio-environmental conflicts of the SRB. Roadblocks are a cheap, non-violent method of protesting and an easy way of disrupting a mining company's day-to-day operations and, thus, their profit margins. Utilising roadblocks in anti-neoextractivist protests, and anti-neoliberal protests in general, has been common in the region for decades. This contrasts greatly with contemporary climate conflict literature, which views roads and "connectedness" as a simple proxy for resilience.

The wider climate conflict literature has not considered roads as a possible space for protests. For example, Kok et al. (2016) regard roads as a method for analysing socio-ecological patterns

of vulnerability. Roads are used as a proxy for the core dimension of "connectedness" more than a possible route for aid in the case of a climate-induced conflict. The idea of roads as a vulnerability variable is mostly rooted in Afrocentric scholarship (Detges, 2016; Carter and Veale, 2013). Afrocentrism and focus on humanitarian aid obscures regions and situations which are not reliant on imported food. As Peruvian towns do not fall into this category, the people are more willing to restrict their transportation options to gain leverage against corporations. Introducing Latin America into the climate conflict literature, thus, could modify current indicators for vulnerability and make them more global in outlook.

Roadblocks are frequent in the region, with the tactic transgressing traditional political boundaries. Anti-neoextractivist and anti-neoliberal protests, with roadblocks as their key leverage, have been common in the region for decades (Franklin, 2014). They have also been a feature in protests, where big corporations have joined with small farmers to fight government regulations. An example of this was the 2008 roadblocks targeting dairy production put up by Argentina's united agricultural sector going against government restrictions and price controls (Ferrero, 2017, p. 63).

The Three Rivers conflict, along with 12 other conflicts in the SRB, utilised roadblocks as a form of protest. The Ancash Farmers Union (FADA) organised a roadblock from the Conococha Lake to the coast. The blockade sped up the publishing of the Environmental Impact Assessment report, which ended up putting a halt to the proposed mining project (November 2011). The Ombudsman does not consider roadblocks as violent acts since they do not necessarily result in bodily harm or the destruction of property. Seven out of the 13 conflicts with roadblocks, however, did feature incidents of some level of violence, ranging from arson to murder, with roadblocks normally preceding the acts of violence. This could indicate that roadblocks help the primary stakeholders cross an escalation threshold within the conflict. Crossing the threshold makes the conflict turn from an illegal, but non-violent, action to one adopting violence (Dudouet, 2013, p. 404).

Conclusion

Contrary to existing theory, the river basin reaching glacial peak water did not directly increase the number of socio-environmental conflicts in the affected area (Drenkhan et al., 2015). Instead of a direct and clear relationship between the diminishing glacial resources and conflict, a pattern of complex variables emerged. Previously, Carey et al. (2014) had argued that in the Santa River Basin, from 1954 to 2014, shifts in water management have not been driven by the hydrological variations caused by climate change but by human variables. Similarly, during the examined period (2004–2019), the Ombudsman reports also emphasised human variables, although these differed greatly from the ones presented by Carey et al. in 2014.

Exploring violence as part of socio-economic conflicts, instead of mining conflicts alone,

provided a much-needed broadening of scope. The article found that violence can act as a catalyst for the involvement of the central government. This does not guarantee a faster resolution, however, as violence can deepen grievances and make them harder to solve. Expanding the scope of conflicts helped the article explore the different effects of decreased water quantity versus quality, with the former being more prominent in violent conflicts. No link between peak water, quantity of water conflicts and violence was identified.

Contrary to a previously theorised increase of downstream conflicts, the SRB conflicts were more numerous and included more stakeholders when located upstream (Drenkhan et al., 2015). The absence of support from upstream organisations in cases of downstream conflict displays lack of unity and cooperative spirit among the various organisations. These intra-state findings are a necessary addition to the climate conflict literature's often international discussions on river dynamics and conflicts. With the SRB conflicts growing shorter but with more stakeholders involved, the element of "environmental peace" was addressed. This concept flies directly against the climate conflict literature's notion of ever-growing and worsening conflicts. Further research, including regression modelling, would be needed to explore fully the causal links between environmental problems triggering cooperation among normally hostile parties. Water quality and quantity were relatively constant but formed key factors escalating conflicts during the examined period. The reports barely mention melting glaciers or other factors related to climate change, such as the ENSO cycle. This was surprising considering that the existing literature is heavily driven by theories related to climate change (Hsiang et al., 2011). Further qualitative exploration into why the Ombudsman reports fail to mention climatic factors should be conducted by analysing the Peruvian political and social considerations surrounding the Ombudsman's Office itself.

Roadblocks were proven a cheap, non-violent method of protesting and an easy way of disrupting a mining company's day-to-day operations and, thus, their profit margins. Roadblocks were a common escalating factor for 13 SRB conflicts. The wider climate conflict literature has not considered roads as a possible space for protests. Arguably, this oversight is caused by the existing literature's Afro- and humanitarian-centric views, which value roads as signifiers of resilience against climate change instead of a stage for protest. Considering the widely used available sources on African road access and conflict data, roadblock protests could be relatively easily identified on a broader scale. The examination of these protests could then be linked to climatic factors, such as drought patterns.

These findings are an important addition to the rapidly expanding climate conflict literature because they touch upon the largely unexplored factor of glaciers on a relatively under-researched region. As the literature on climate conflict expands, mostly with advanced regression models, it is important to assess potential complex variables of exposure to climate change. Glaciers and their peak water are such variables, as they act as key features in many water systems around the globe. Although the article did not find direct links between the

SRB conflicts and the river's peak water, it did discover other factors which escalated the conflicts.

If three conditions are met, future research could add these escalation factors to an advanced regression model exploring the effects of peak water on conflict. Firstly, more glacier-based rivers must be identified as being in various stages of melting. A diverse set of glacial river systems would enable the model to assess how the conflicts and stakeholder interactions evolve over time, taking into account the decreasing quantities of available water. Secondly, a systematic categorisation of social conflicts would have to take place in order to enable the model to identify various conflict types and reactivations. Features of this categorisation could include whether the conflicts are near rivers and who the stakeholders are. The database created for this article could act as a good starting point. Thirdly, a more substantial categorisation system for violence should be developed. This article's violence/non-violence binary does not cover the full breadth of escalating factors. A potential jumping-off point could be the four levels of protest developed by della Porta and Diani (2009), which comprise three levels of non-violent protests and one that is violent. Della Porta and Diani also address the thresholds which separate the four levels, and how they are reached. This would enable the model to capture how the conflicts evolve over time under different conditions of peak water.

Studying the effects of glacial peak water on adjacent populations is crucial for producing successful climate change mitigation strategies. Understanding how stakeholders interact and what makes conflicts escalate in terms of length, number, reactivation or violence, enables governments to navigate and mediate these conflicts. As millions of people will face reduced access to fresh water in the future, tensions are bound to rise. Future scholars must find ways to include both violent and non-violent conflicts into their research. Including both types of conflict will enable us to forecast when communities will reach the crucial breaking point between violence and non-violence. This could help us learn from thousands of positive examples of successful conflict management and move away from merely pointing out the links between violence and climate change. Coherent conflict management will have to lie at the heart of climate conflict research now, at a time when we are facing the consequences of melting glaciers.

Notes

[1] https://www.defensoria.gob.pe/wp-content/uploads/2019/07/Conflictos-Sociales-N%C2%B0-184-Junio-2019.pdf

[2] The deaths occurred in the following conflicts: Campesina community of Huambo, Recuay vs Centauro S.A.C., November 2010 – November 2012 (Report 81, November 2010); Farming community Mareniyoc, Huaraz vs Barrick Misquichilca, March 2012 – October 2016 (Report 103, September 2012).

[3] Buenos Aires community vs Greenex mining company, August 2013 – November 2013; Lake Parón downstream communities vs Duke Energy, 2007–2010, 2011–2014 and 2016.

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