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Between water abundance and scarcity: the cultural politics of biofuels in Piura, Northern Peru.

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ABSTRACT

In early 2000 the promotion of biofuels in Peru was set through the construction of discourses stressing their benefit to the country. Biofuels would not only respond to the increasing prices of fossil fuels in international markets, but it would also improve employment level by creating jobs in rural areas, contribute to change the energetic matrix and decrease carbon gases to slow down climatic changes. By 2006 several companies showed interest in producing ethanol from sugar cane in Piura, a semiarid area located in the northern coast of Peru. Investment included the acquisition of large extensions of land in addition to water rights adequate enough to irrigate large areas of monocrop production. From a political ecology framework, here I analyze how these companies discursively played with the ideas of water abundance and scarcity to secure their water rights to the detriment of peasant communities and smallholders who were traditional water rights holders. Finally, I argue that these discourses contributed to the production of a "waterscape" that not only reinforced water unsustainability but also social inequalities.

Introduction

Nowadays water is undoubtedly a disputed resource. Multiple interests, often in opposition, revolve around water governance on how water should be distributed and allocated. The controversies and conflicts that come up upon water allocation are generally preceded by a set of discourses about the amount of water existing in a particular basin. Discourses imagine not only the basin's water offer, but they also shape and decide which interests should prevail, and therefore, how water should be distributed. This paper deals precisely with such discursive struggles in Piura, a semiarid coastal region, where biofuels companies are planting sugar cane to produce ethanol since 2006. By that time several international and national companies got interested in Piura as a suitable region for sugar cane plantations. However, concerns upon the pressure these industries posed to the water balance in the Chira basin arose. In view of this, efforts focused on discursively demonstrating water abundance to allow sugar cane plantations in this area. In this paper, I analyze the cultural politics involved in the discursive struggles upon water offer in the Chira basin, Piura, Peru. In the first part, I delve on political ecology and anthropology to analyze imaginaries on water abundance and scarcity. I then turn to the

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description of the Chira basin in Piura. Next, I analyze how these discourses -the companies', the state's and local people's- competed and eventually imposed a particular waterscape in the region. A discussion follows on the importance of discourses in determining how power takes shape in struggles around water resources. Data for this article have been gathered from primary and secondary sources. In Piura I interviewed experts on water and agriculture, authorities of the regional government, members of peasant communities, small scale farmers, corporate workers and representatives, etc. I also visited the Chira river and some canals of the Poechos system[2]. In Lima I interviewed also agricultural authorities, experts from the academia and experts on biofuels and water.

Political Ecology and Anthropological perspectives on water

Generally, political ecologists have emphasized the material aspects of environmental conflicts to unveil power inequalities. A great deal of discussion has been devoted to elucidate whether these conflicts are determined by scarcity or abundance of resources. While Neo-Malthusians have focused on resource scarcity as the main cause of conflicts, Neo-Marxists have rather identified that abundance determines the occurrence of conflicts (Seeman 2011)[3]. The first are concerned by the imbalance between population growth and resource scarcity and its environmental consequences, while the second emphasize "the underlying processes […] that […] generate environmental and social injustices…, the unrelenting capital accumulation and the extraordinary asymmetries of money and political power that are embedded in that process (Harvey 2005: 352). They are specially concerned by the unequal terms of exchange in environmental conflicts, for which they delve on "who gains from and who pays for, who benefits from and who suffers […] from particular processes of metabolic circulatory change" in order to democratize the "distribution of social power and a more inclusive mode of producing natures" (Swyngedouw 2004: 30).

Despite the fact that neo-Marxist political ecologists include in their analysis not only natural and physical aspects, but also social, cultural, economic, technical and political aspects of ecological distribution[4], in their attempt to stress the material inequities involved in such conflicts some have underestimated the importance of the symbolic[5]. A critique from Social Anthropology have

[2] The Poechos system is a hydraulic infrastructure built in four phases, between 1970 to 2004.
[3] For a more complete account of the development of political ecology, see Peet and Watts (1993), Martinez Allier (2002), see also Bebbington (2009).
[4] Political ecologists, such as Swyngedouw (2009) and Gandy (2004) use metaphors such as cybors, circulation, hybridity, waterscapes to reflect this entangled socio-natural character of environment.
[5] See Martinez Allier, 2010: 107, see also Mung'ong'o, 2009.

emphasized Political Ecology's "overly deterministic vision of social structure [that] often eclipses the ways in which competing claims to resources are articulated through cultural idioms in the charged contexts of local politics" (Moore 1993: 381). More recently postmodern political ecologists have emphasized the imperative to look beyond materiality to include the social constructive aspects of ecological inequalities[6]. Latest works to understand environmental politics have addressed anthropologists' call to carefully examine "the myriad struggles over the cultural categories through which access to critical environmental resources are contested" (Moore 1993: 382)[7]. Since 2000, Political Ecology has taken a more symbolic turn. In his analysis of environmental conflicts, Swyngedouw (2006) for instance talks of the hybrid socio-nature of water, pointing to the intrinsic relationship "between the transformations of, and in, the hydrological cycle" and several kinds of power relationships (Swyngedouw 2004). In his detailed description of the development of political ecology, Escobar (2010) concludes that the postmodern generation of political ecologists[8] is concerned with social constructivism. In fact, "post-structural political ecologies attempt to understand how the unequal power relations amongst social groups, and the 'knowledge' that mediates human-environmental interactions, are reproduced as present-day ecological changes on all scales" (Baghel and Nusser 2010: 233).

For social anthropologists, the intersection of the symbolic and the material is consubstantial to its subject matter. For instance, Moore's idea of the 'politics of place' describes processes by which "particular territories are imbued with meanings, shaped by cultural practices, and reworked in the rough-and-tumble of rural politics" (1998: 349), thus highlighting "the simultaneity of symbolic and material struggles over territory" (1998: 347). In these spaces, power is inherent to social relations, and domination and resistance are linked to representations of land (and water) that entangle the symbolic and the material in a complex interplay.

As with land, water scarcity and abundance can be understood as produced by particular material-symbolic dynamics driven by local, national and international forces with political and economic power differentials that contend different representations, cultural practices and politics regarding water. In what follows, I deal with ideas of water scarcity and abundance to unveil how they are shaped by cultural practices, economic and political interests to determine specific ways in which water should be

[6] See Peet and Watts 1993.
[7] For a detailed anthropological critique to Political Ecology, see Moore 1993.
[8] They come from post-structuralism, post-marxism, post-colonial studies, etc. (Escobar 2010).

distributed in the specific area of the Chira valley in Piura. Next, I discuss how water scarcity has been conceptualized and politically used.

The cultural politics of discourses on water scarcity/abundance

From a hydrological perspective, the United Nations conceive water scarcity as "the point at which the aggregate impact of all users impinges on the supply or quality of water […] to the extent that the demand by all sectors, including the environment, cannot be satisfied fully" (FAO, 2007: 4). They calculate that "an area is experiencing water stress when annual water supplies drop below 1,700 m3 per person. When annual water supplies drop below 1,000 m3 per person, the population faces water scarcity, and below 500 cubic metres, "absolute scarcity"" (Ibid.). For the United Nations World Water Development Report # 3 "water scarcity occurs when so much water is withdrawn from lakes, rivers or groundwater that supplies can no longer adequately satisfy all human and ecosystem requirements, resulting in more competition among potential users" (Unesco, 2009: 128). Water stress "is also a question of water quality. Freshwater bodies have a limited capacity to process the pollutant charges of the effluents from expanding urban, industrial and agricultural uses" (FAO 2007: 10).

FAO (2007: 5) considers that "water scarcity…can occur at any level of supply or demand". Its inherent contingency depends not only on physical factors such as climate, soil, etc. but also on cultural, social and political factors. From Anthropology its importance lays on the fact that it "might reflect the economic ability to pay for water, or the customs, social conditions, and relationships that privilege access to some while withholding access from other" (Johnston 2005: 136). Thus, water scarcity is "a consequence of social relationships and historical and contemporary transformations within the struggle for water control" (Ahlers, 2008: 8). From Political Ecology "such inequitable hydro-social configurations" are "fundamentally socially produced" (Swyngedouw 2009: 57)[9]. Historically, water scarcity has been used to foster particular political and economic interests (i.e. market opportunities for investment, energy scarcity to develop hydroelectric power, water mismanagement to make necessary the development of new administration and policies that allow public subsidy on private sector) (Bakker 2000, Johnston 2005, Ahlers 2008). Johnston (2005) criticizes, thus, the alarming voices within the United Nations System and International Financial Institutions, such as the World Bank and the International Monetary Fund, that raise the issue of water scarcity to promote a particular recipe to overcome the urgency: "At times, the scarcity is created as a by-product of

[9] See also Swyngedouw 2006, 2007.

resource decision making that prioritizes one use over another. At other times, the perception of scarcity is manufactured to fuel and further various political agendas" (Johnston, 2005: 140, 144).

Based on case studies, Bakker (2000), Ahlers (2008), Mehta (2007), and Budds (2012) demonstrate how scarcity is socially constructed to benefit certain political and economic processes. Bakker (2000) describes how the 1995 drought in Yorkshire, England, was the perfect excuse to re-regulate and privatize water. Corporate mismanagement of potable water –she calls it "governance failure"- set the stage for a re-regulation that obliterated the state and empowered the market. Ahlers (2008) shows how in the north of Mexico drought was the result of an increase of water demand due to commercial agriculture, the extension of the garment industry (maquiladoras), and other water productive uses, while water supply showed normal trends. The drought was severely felt by peasants due to the withdrawal of a state subsidy which used to help them in times of crisis. Thus, peasants were left alone to deal with neoliberal forces. Mehta (2007) demonstrates how in the case of the peninsula of Kutch in the district of Gujarat, India, scarcity is usually attributed to low rainfall and frequent droughts, for which decision makers relied on the Sardar Sarovar Project, a large multi-dam project constructed on the Narmada river for irrigation and hydroelectric purposes. In order to further the construction of the dam, scarcity was discursively naturalized to serve the interests of powerful actors with stakes in the project. This not only obscured the anthropogenic nature of droughts due to increasing water consumption, but also concealed historical local responses to deal with temporal droughts. Similarly, Budds (2012) analyses La Ligua valley located in central northern Chile, to prove how scarcity is socially contested. While those living on the valley floor and in the downstream valley assert that scarcity is caused by users located in the upstream valley (who use extensively ground water to irrigate their lands for export agriculture), the later think that water scarcity is impossible in Chile. As usual, a reservoir is seen as the solution to scarcity. Here, the framing of scarcity as a result of hydrogeological conditions obscures the fact that is was caused first and foremost by increasing water consumption for agricultural export.

Likewise, In Ica, Peru, an overexploitation of groundwater for irrigation of agroindustry products was the main cause of water scarcity to the point of depleting the aquifer. The solution offered by both water users in Ica and the central government was a hydraulic project to divert water from the highlands through the construction of a canal. Little consideration was given to the actual water demand upstream and the fact that the construction of the canal could generate ecosystem changes,

and therefore, future water imbalances. Thus, the discursive construction of water abundance in the highlands was meant to cover up unsustainable irrigation practices in the lower basin that caused water scarcity (Urteaga 2013).

Water scarcity and development

The political manufacture of water scarcity in these cases recalls Ferguson's (1994: XIV) argument when analyzing the development industry in Lesotho:

> "Development" institutions generate their own form of discourse, and this discourse simultaneously *constructs Lesotho as a particular kind of objet of knowledge, and creates a structure of knowledge around that object*. *Interventions are then organized on the basis of this structure of knowledge*, which, while "failing" on their own terms, nonetheless have regular effects, which include the expansion and entrenchment of bureaucratic state power, side by side with the projection of a representation of economic and social life which denies "politics" and, to the extent that it is successful, suspends its effects.

Political ecology has explored the intermingling relationship between development and water (Martinez Allier 2002, Swyngedouw 2006). Baghel and Nusser (2010) mention that just after political independence postcolonial governments in South Asia envisioned the construction of dams as a requirement of modernity[10]. It was assumed that the domination of nature for progress legitimized modern governments. Nowadays, he states, "such gigantic technological hydroscapes continue to symbolise human dominance over nature, lauded as they are as icons of modernity and national prestige" (Ibid.: 231).

The structure of knowledge created around the idea of water scarcity or abundance may contribute to create perceptions of such physical phenomena which influence social practices and political decisions that aim to transform water in order to achieve "development". Historically, hydraulic infrastructure as a response to discursive water scarcity has been pretty much linked to development. The construction of discursive devices to socially legitimize the necessity of water infrastructure to achieve progress contributed to processes of state formation[11]. From the 1980s on, neoliberals associate development

[10] See also, Reisner 1993.
[11] Wittfogel 1957, see also Reisner 1993.

to the boost of the private sector and the market economy for which the state should provide the foundations (i.e. hydraulic infrastructures).

This does not mean that water scarcity is something unreal[12]. Undoubtedly, in some regions at specific times it can be an alarming fact with catastrophic consequences[13]. My interest here is to unveil the causes of scarcity and abundance; particularly, the way these phenomena are discursively and socially constructed[14]. I contend that water scarcity and abundance as discursive devices (Nader 1997) could have similar catastrophic consequences not only because it allows the transformation of nature for "progress", but also because it could severely endanger those excluded from the benefits of such deeds[15]. Representations deployed through discursive strategies may generate effects of truth[16] with political, social and economic consequences. In fact, "while physical hydrological conditions can produce water scarcity, the discourses of 'scarcity' and 'abundance' are used to mobilize different farmers' interests" (Budds 2012: 72), that are usually detrimental to others. In this regard, "Particular attention […] needs to be paid to social power relations (…) through which hydro-social transformations take place. This would also include *the analysis of the discourses and arguments* that are mobilized to defend or legitimate particular strategies" (Swyngedouw 2009: 57, my emphasis). Through the analysis of discourses we can unveil how "discursive strategies […] create 'effects of truth'" that transforms reality (Alonso, 1988: 35). In the case study, hydraulic infrastructure was not only the symbol of agricultural modernization but primarily the means through which land and water became gradually but steadily commoditized in Piura. In the next section, I describe the Piura region in the north coast of Peru.

Piura, a northern coastal semiarid region

The extent of Piura is about 3% of Peru's. A border region with eight provinces, Piura shares three basins with Ecuador: Catamayo-Chira, Puyango-Tumbes y Zarumilla. 62% of the Catamayo-Chira basin is located in Peru with approximately 9800 km2[17]. Geographically, Piura not only has coastal areas but also regions reaching 2,700 masl in the highlands. Productively, Piura is divided in three sectors. Paita

[12] See Baghel and Nusser 2010 for an analysis of the Bakhra command area where a new irrigation infrastructure was unnecessary due to the existence of canals.
[13] See Johnston 2005.
[14] See Swyngedouw 2009.
[15] See Wali 1989 and Johnston 2005.
[16] See Alonso 1988.
[17] See: http://hispagua.cedex.es/sites/default/files/especiales/Trasvases/monograficocuencas2012/Cuencas-compartidas-peru-ecuador.html

and Talara; Piura, Sullana, Sechura and the coastal Morropon valley; and Huancabamba, Ayabaca and the Morropón sierra[18]. Population in Piura reaches 1'700 thousand people[19], of which the majority is linked to the agricultural sector. The Chira valley is located in the provinces of Sullana and Paita, with agricultural areas and ecological systems such as dried forests. Land grabbing (cultivated and non-cultivated) and land fragmenting have gone together as this area transforms into an agro industrial region.

In 2004 the coastal areas in Piura had approximately 103,474 hectares of agricultural surface, of which 98.5% were irrigated and only 1,5% corresponded to rainfed agriculture[20]. The arrival of agroindustry corporations to Piura valleys, such as Chira, transformed not only land ownership but also water use. Between 2000 and 2009 cultivated hectares rose up to 76.13% reaching approximately 41,930.97 in 2009. A great percentage was destined to rice, following sugar cane, banana and lemon. Sugar cane is the first crop among the semi-permanent products[21].

The decision on cultivating sugar cane for producing ethanol in Piura was taken by the central government located in Lima which the regional government backed up.[22] Marginal lands regarded as common goods[23] by peasant communities, small farmers and small agricultural and livestock associations were suddenly transformed into restricted corporate goods. This fact soon highlighted social inequalities between local communities and the corporate newcomers especially with regard to land and water rights acquisition. The law, both regional and national, played a fundamental role in setting up biofuels governance in Piura. The normative framework allowing land grabbing was designed during Fujimori's political regime at the beginning of the 1990s [24] mostly to develop agroindustry in the coastal areas. In July 1991 a Legislative Decree N° 653 approved the Law for the Promotion of Investments in the Agrarian Sector, which opened up the agricultural sector to the market[25]. As a consequence big corporations concentrate 70% of the cultivated surface for sugar cane,

[18] Cabrejos, 2011; véase también Revesz y Oliden 2012..
[19] Cabrejos, 2011.
[20] Gobierno Regional de Piura, Dirección Regional de Agricultura. 2006.
[21] Source: DRA, GORE Piura (2012).
[22] See Silva (2008), Gallo (2009) and Deforge-Lagier (2009).
[23] For example, local herdsmen used marginal lands that were not legalized for their livestock or as forest.
[24] See Urteaga (2008).
[25] For example, subparagraph "d" of article 2° of the Legislative Decree 653 promotes investment in marginal lands for agricultural, livestock, forest or agroindustry; while article 9° indicates those agricultural producers who owned more than five hectares of land could mortgage their lands in favor of any natural or legal person.

while small farmers just retain 30%.[26] In Piura, the results of this policy became evident by mid 1990s, when land transferences popped up covering marginal lands, allotments, communal lands, among others.[27]

Water: a contested terrain.

The contingent confluence of forms of production and governance configured what Bakker (2010) calls "neoliberal natures", which includes not only the transformation of space through water and land private regimes but also symbolic representations that sustain those configurations. As regards to water, the concept of waterscape understood as a "sociospatial configuration that is constituted by social and ecological processes, which become manifest through the particular nature of flows, artefacts, institutions and imaginaries that characterise a particular context" (Budds, 2012: 125), can shed light to the discursive construction of water abundance in the Chira valley in Piura. As Swyngedouw (1999) shows in his analysis of Spain's large program for the construction of dams, a particular representation is crafted through and ingrained in these hydraulic works that allows capital to operate. Similarly, in Piura hydraulic infrastructure has been the symbol of progress and the means to transform previous sociospatial configurations into land and water private regimes.

Historically, Piura has gone through constant transformations driven particularly from the central state to widen the agricultural frontier by means of hydraulic infrastructure.

> "The reorganization of space and the extension of the cultivated area since the construction of the regional net of hydraulic infrastructure for irrigation have been developed in four consecutive phases that allowed the increasing intervention of the state: - At the beginning, private farmers would construct the first water Canals in the Bajo Piura and Chira (1895-1905). – By the end of the Leguía government the commission headed by Sutton would amplify the canals in these valleys (1930s). – Afterwards, with financial aid from the World Bank Odría would derive the Quiroz river, a tributary of the Chira river, and would allow the colonization of San Lorenzo valley (1951-1964). – Finally, with the construction of the Poechos water reservoiur and the Chira-Piura project […], two water basins were interconnected, thus allowing

[26] See: http://www.minag.gob.pe/portal/sector-agrario/agricola/cultivos-de-importancia-nacional/azúcar/producción25?start=1

[27] Eng. Carlos Cabrejos, personal communication, 26.08.12.

> the Bajo Piura valley to access water throughout the year and replacing pump irrigation for gravity irrigation." Revesz and Oliden (2011: 158-9).

It is not casual therefore that water has been a crucial concern not only for peasants and small farmers, but also for huge agro industrial corporations, as for the state itself. In fact, the National Agroenergy Plan (2009-2020) drawn up by the Ministry of Agriculture, mentions some potential caveats for biofuels production in the coast: lack of information on water offer in the basins, including blue, green and white water, etc., scarce knowledge on the existing normative framework for water use, lack of clarity on water rights and obligations, excessive informality of water rights, problems regarding salinity of soils due to inefficient irrigation and lack of drainage infrastructure in valleys such as Chira, lack of crops adequate to the soils and water deficit that characterize the Peruvian coast, hydraulic infrastructure which are deficient due to sedimentation (MINAG 2009: 13). In spite of this, most state authorities in charge of promoting biofuels did not consider water in the investment schemes. Isabel Quispe pointed out: "Water has not been an issue in the designing process of the Law for the Promotion of Biofuels. No environmental approach to integral sustainability exists."[28] Water was not an issue not only in the promotion of biofuels but also in the allocation of water and land rights to these new agricultural water users. Regional and national authorities gave prevalence to biofuels corporations in the allocation of water rights upon other local actors who had previously and unsuccessfully required water rights. Not only this, but they also underestimated warnings on the extreme vulnerability of the water balance in the Chira valley.

In order to respond to the critiques blaming them for the production of water scarcity in the Chira valley both corporations and the government devised arguments that not only assured there was enough water in the Chira water system, but also showed that they used water efficiently. Whereas corporations contend that their use of technology allows them to be efficient water users, through a water offer approach the national government emphasizes that ground water is still abundant in the region. "M" corporation, for instance, indicates that they have acceded to return flows, with which they do not affect superficial water offer for other users in the valley and that they are efficient in using water saving technologies. Nonetheless, experts calculate that a hectare of sugar cane irrigated with tech irrigation systems use between 17,000 m3 y 20,000 m3.[29] In addition, they sustain, sugar

[28] Professor at the Pontificia Universidad Católica del Perú. Personal communication (25.10.12).
[29] Eng. Ricardo Pineda, personal communication, August 2012. Torres Aguas (1995: 196) estimates that sugar cane's water

cane is a crop requiring irrigation water throughout the year, whereas rice is only seasonal. As for the state, in 2008 INRENA[30] responded: "There are still 1,371 MCM of unexploited groundwater, particularly in the north zone of the country. Currently [2008], merely 874 MCM are being exploited". [31] Under an exclusive water offer approach, INRENA sustained that it is also necessary to develop more infrastructural projects to save water, with which "we could reach 12.400 MCM."[32]

The Chira river and sugar cane for ethanol

Among the Piura rivers Chira is not one characterized by low water volumes. In 2007 water authorities considered that in average, in bad years, the river flow was approximately more than 3,000 MCM, of which water demand reached 1,600 MCM[33]. However, when one considers the temporal variable (water comes from January to April), and the fact that the Chira-Piura is an integrated system covering the demand from the Medio, Bajo Piura and the Chira, there is less reason to be optimistic. Experts consider that in the long run this pressure on water resources will surely boost water conflicts in the valley:

> "…This is more or less the dynamic of the Chira: there still are struggles for water, and there will be for sure because not all the projected areas are being cultivated and because all the valleys are in crisis. The valleys were never hundred per cent cultivated…the Chira has 80,000 hectares under irrigation but actually not even 50,000 hectares have been sown in the last agricultural campaigns. Therefore, [in theory] we would have water for 30,000 hectares…Now that more areas are being sown, in addition to the inefficient water use that characterizes this valley, the conflicts would surely arise. Water conflicts are starting to pop up and water is going to be a big issue…"[34].

A distinguished engineer told me: "Even before the sugar cane companies arrived in the Chira valley local population already had water problems."[35] In fact, together with the amount of water conceded

consumption "ranges between 1200 y 1500 mm per year, whereas in subtropical zones were dry seasons are longer and evaporation is higher than in tropical zones, it is a bit higher".

[30] INRENA is the national institution in charge managing natural resources.

[31] Ortiz, Marienella. Ibid.

[32] Ortiz, Marienella. Ibid.

[33] Silva 2008.

[34] Eng. Carlos Cabrejos, personal communication, 26.08.12.

[35] Eng. Ricardo Pineda, personal communication, August 2012.

to bioethanol companies, there are also agro industrial corporations cultivating organic crops for export, such as bananas, grapes, etc. Additionally, informal users pump water from the tale of the regulated Chira-Piura system. Peasant communities such as San Lucas de Colán and Tamarindo have unsuccessfully claimed access to more water for their cultivated lands, whereas the opposite happens to bioethanol corporations such as Agrícola del Chira whose water demand has been adequately met. In addition, sediments in the regulated Poechos system are clogging it thus reducing it storage capacity by half[36].

In 2011, Food and Agricultural Organization (FAO) organized a research Project to study the effects of bioenergy crops on the availability of water in the Chira-Piura basin. Using the WEAP modeling program, Ramos worked upon four probable scenarios in year 2030. The first maintained the water offer and demand excluding new bioenergy crops, except the ones already installed. The second increased the water demand on 24 000 hectares of sugar cane; while the rest of the variables remained constant. The third scenario supposed an increase of 24 000 hectares of sorgo. Finally, the fourth supposed an extension of the areas of sugar cane and other crops of small farmers, as well as a higher pressure on the level of operation of the dam. The study concluded that state institutions do not take in account water management in land use planning: "The results for scenarios 2, 3 and 4 indicate a reduction of the confidence (of the hydraulic system), which leads to decreasing the covered water demand from 90 per cent to …84, 89 and 85 per cent for farmers, and 80 per cent to 60, 74 and 52 per cent for bioenergy crops". Upon this, Ramos contends that "Scenario 1 is satisfactory with limitations and scenarios 2, 3, and 4 are unsatisfactory" (Ramos, 2011: 69). In short, augmenting cultivating areas with sugar can for Ethanol would affect water availability that covers the demand of the Chira-Piura regulated water system, thus impacting not only upon other water users but also on the same bioethanol corporations. This analysis coincides with a study published in 2010 by the National Academy of Sciences of the United States, which concluded that "expanded ethanol production could increasingly stress water resources by expanding biofuel crops into dryer regions requiring new irrigation" (Huffaker, 2010: 130).

Land and water grabbing in the Chira valley. The M's biofuels project

[36] Deforge-Lagier (2009), Gobierno Regional de Piura, Dirección Regional de Agricultura (2006).

Reports on biofuels assert that sugar cane production projects for bioethanol transform not only land but also water uses (HLPE 2011; FAO 2011; OXFAM Internacional 2011). Since year 2000 approximately 80 million hectares have been negotiated in developing countries. The development of agribusiness based on irrigation agriculture is one of the elements that increase water demands to levels unforeseen before[37], affecting ecosystems and the livelihoods of communities, farmers and vulnerable indigenous peoples.

The analysis of "M" corporate biofuels project requires that both land and water are examined as interlinked. The process of biofuels production in the Chira valley supposed several transformations, the first being the conversion of thousands hectares of marginal lands into agricultural land, and secondly, the discursive calculations of water offer in the Poechos regulated water system, which sustain different economic interests in the Chira valley. Those pro-biofuels contend there is enough water in the basin to irrigate more than 15,000 ha of sugar cane, while those who oppose argue that water scarcity is a reality in the Chira Piura System. In this section, I will touch on these issues.

In August 2003 the Law for the Promotion of Biofuels Market (N° 28054) was passed, the promoter being the right-wing legislator Fabiola Morales. Next year the central government issued the Regulations governing the law. Immediately after a year, in 2005, a Special Committee for the promotion of Private Investment in the Piura region was appointed. Same year, the Special Project Chira-Piura granted the Regional Government the reserve of marginal lands close to the left bank of the Chira river for developing a private investors' ethanol project. The arrival of bioethanol corporations in Piura accelerated the process of land acquisition, therefore triggering the land market. Land acquisition by agro industrial corporations started by mid-1990s when the cost of a hectare was very cheap. Currently, a hectare in the most productive valleys of Piura would be in the range of 1 500 and 2 000 dollars[38]. The valley's climatic conditions make it optimal for cultivating sugar cane for ethanol. In fact, while it produces approximately 132,5 tonnes per hectare, Brazil produces only half[39]. However, the same climatic conditions that favor the development of the crop also hamper it because water is often a disputed good in semi-arid areas where sugar cane is grown[40].

[37] See Huffaker (2010).
[38] Eng. Carlos Cabrejos, personal communication, 26.08.12.
[39] Ortiz, 2008.
[40] See McCornick, Awulachew, & Abebe, 2008, cited in Deforge-Lagier (2009: 26).

There is no exact data on the amount of land sold in Piura from mid-1990s on. Some assert that approximately 150,000 hectares have been sold, whereas in the Chira valley 37,000 ha.[41] Unofficially, it is widely known that these hectares sold to agro industry corporations included communal lands, state lands, livestock lands, among others, many of which were categorized as marginal lands (tierras eriazas),[42] even though communities and small groups of farmers, pastoralists and livestock owners possessed and/or used them differently for their economic activities[43]. Not only has this fact transformed land ownership in Chira, but also water management because several hectares of marginal lands have been incorporated to the regulated hydraulic system as economically productive and thus in need of water. In Piura most of the land that Biofuel corporations got was arid or marginal land, which meant that "lands that were not producing any crops [would] be modified to produce sugar cane" (Deforge-Lagier 2009: 49). These lands once transformed put another pressure to the water offer of the Chira-Piura basin. For this reason, it is acknowledged that "changes on land use intensify soil exploitation, increase water abstraction and increase water pollution" (Ibid.).

Nowadays, even four types of owners could be identified in the region, "in the first group, there are big corporations with more than 1,000 hectares; in the second group, middle and small companies with more than 100 hectares; in the third group we can find big and middle land owners with more than 5 to 99 hectares, and the last one is formed of small owners …"[44]

By 2006 the regional government of Piura, through the *Proyecto Especial Chira-Piura*, leased 10 000 hectares of marginal lands. "M" corporation participated as an automotive project finally winning the lease. In the first phase lands were acquired in the following way: 400, 5232, 1701, 1230, 196, and 877 hectares. "M" also required a reserve of water of about 186.6 MM3 that, according to "M", flowed from the Sullana dam to get lost in the sea. Generally, this water is named "return flow", and it is defined as superficial water that cannot be storage in the dams, superficial water that flows to the sea, and ground water storage in the aquifer located between the Sullana dam and the mouth of the Chira

[41] Eng. Carlos Cabrejos, personal communication, 26.08.12.
[42] Legally, marginal lands are those uncultivated plots due to water scarcity or excess which need investment to be transformed into cultivated lands. Section 24 of the Decreto Legislativo 653 defines marginal lands and mentions mounds, prairies with natural pastures, protected lands and those that constitute archeological patrimony as examples. See also Ley Nº 26505, o Ley de la inversión privada en el desarrollo de las actividades económicas en las tierras del territorio nacional y de las comunidades campesinas y nativas.
[43] Carlos Cabrejos, personal communication,26.08.12.
[44] Cabrejos 2011: 44.

river[45]. This remark is important as it has been the argument "M" used to contend that it would not compete with other agricultural water uses in the system.

Discursive struggles on water availability in the Chira basin

The conflict arose in 2006 when "M" showed its interest in investing in lands to cultivate sugar cane for ethanol in Piura. One of the most conflicting issues consisted on proving the existence of a water volume enough to cover the additional demand this investment meant for the regulated hydraulic system. This integrated system fed not only the water users organizations from the Chira river but also from the Medio and Bajo Piura and from Sechura.

A bureaucratic battle led by mostly state institutions followed around the measure to allocate the 186 MCM water reserve to "M". In the group opposing bioethanol cultivation were mostly water regional authorities, such as the president of the Board of the Autoridad Autónoma de la Cuenca Hidrográfica Chira Piura (AACH- CHP), the general manager of the AACH-CHP, and the Autoridad Técnica del Distrito de Riego (ATDR) Chira, as well as those farmers from the Medio and Bajo Piura and Sechura water users organizations, water users organizations from the right and left bank of the Chira river, and from El Arenal district, who were definitely against the water concession to "M". The second group in favor of bioethanol production was formed mostly by authorities from the regional government, national government, the water users from the Chira water organization, and "M" corporation.

In August 2005, the authorities from the AACH-CHP recommended that a hydrological study and water balance be elaborated by "M" to assess the water volume available for the ethanol project. Only one month later, "M" had the study done and sent it for approval to the Regional Government. Apparently, the "M"'s Environmental Impact Assessment contained enough data to conclude on water abundance:

> "The [2006] EIA [includes] hydrological and water balance studies in the Chira river basin. The scope extends from Sullana Dam to Chira river estuary. It concludes that hydro balance is sufficient to provide water to actual users, preserve the environmental flow and [carry out] the agrofuel project. Nevertheless, access to data is limited and only the report with main conclusions is available. It avoids any assessment

[45] Gallo 2009.

> of the reliability of the conclusion since no detailed data are available" (Deforge-Lagier 2009: 47).

After a thorough revision, both the AACH-CHP and the ATDR Chira recommended that the study was revised since it did not include the water volume available during the dry season when water levels are low. During this time, they indicated, "the volume of water lost into the sea is negative. The water offer is not enough to attend the constant water demand of the Special Project Chira Piura". Water authorities should -the 2006 AACH report[46] pointed out- revise the study before granting any water right to "M". Same year the general manager of the Special Project Chira-Piura supported the report sent by AACH-CHP and similarly recommended the revision of the hydrological study before granting the right to return flows. It also remarked that the kind of water right that should in any case be granted to "M" should be a "Permiso", not a "Licencia". The first one refers to return flows that get lost in the sea, whereas the second concerns superficial flows from the river. The general manager of the Special Project Chira Piura, contended: "The Chira Piura regulated system does not have any possibility to attend the marginal lands of the left bank of the Chira river downstream the Sullana dam, for which in case of water deficit the responsibility will merely be "M"'s."[47] Voices from civil society were also against the decision:

> "A representative from a governmental institution says "*in a normal year, there is no water scarcity. But …some years there is drought, and then farmers and pastoralists are impacted by lack of water availability*". [A] manager from another governmental organisation, PECHP, shares this concern. In a local newspaper (Republica, 2008) he points out a water depletion issue. He suggests a revision of a license granted for an extension of 500 ha for permanent crops, authorised by the [Autoridad] Autonoma del Chira. Those verbal statements are confirmed by a document submitted by INRENA, [which] describes a deficit of water from August to January in the measure point of Montero. Moreover, a professor confirms water availability is sufficient on year basis: Rio Chira presents an availability of 3000 MMC per year, when human needs for agriculture, industrial and domestic use is of 1800 MMC maximum. Although there is a high water level during 3 months, there is not enough water for all users from June to December." (Deforge-Lagier, 2009: 47).

[46] Informe N° 1-2006-AACH.
[47] Oficio N° 580-2006-GRP-PECHP.

Experts sustained that a reasonable doubt existed as to the basin's water availability to cover 14,000 ha of new land acquired for biofuels because the original water balance of the Chira-Piura basin did not consider an extension of the agricultural frontier, even with the water reservoir working up to its design capacity[48]. Unconvinced of these statements regional authorities of the Piura regional government decided to carry out another study to prove that there was enough water for all. Through the *Ordenanza Regional N°110-2006/GRP-CR*, regional government carried out a water balance study which indicated that:

> "the total volume of water offered by the [Chira river] and irrigation system is sufficient to provide water to all users. There is enough water available to supply actual users' demand of 290 MMC, considering a loss of 30% and ["M"] project, an additional demand 186 MMC. They indeed consider the supply from the Rio Chira in addition to Poechos reservoir supply. It is important to note that the study is based on an additional agro-industrial demand of 10672 ha. It seems the need for the second company [6,000 ha more] has not been taken into consideration in this study carried out in 2006" (Deforge-Lagier 2009: 47).

Participation of national water authorities finally put an end to the discursive struggle, thus favoring ethanol corporations. INRENA contended that after evaluating "M" water balance of the Sullana dam to the Chira river estuary, it was possible to reserve 186 MCM for "M" agrarian and industrial uses that come from the superficial return flows from the Chira river going downstream the Sullana dam and from the groundwater of the aquifer located between the Sullana dam and the Chira estuary[49]. INRENA also demanded that the regional water authority elaborate a water balance of the basin to determine the lower river ecological flow and ordered them to supervise this flow. In the meantime, "M" required the acquisition of 10,684.15 hectares, property of Special Project Chira Piura, for agrarian and industrial projects regarding the production of ethanol. In July 2006, 10,600 ha approx. were adjudicated to "M" for US$640.588 and an annual payment of US$500,000 for twenty years. The contract also compromised "M" to transform 1000 ha of local farmer's rice to sugar cane[50].

[48] Silva 2008; Ramos, personal communication, April 2013.
[49] See: Informe N° 036-2006-INRENA-IRH-DIRH-MAN/ACF.
[50] Acuerdo del Consejo Regional de Piura N° 352-2006/GRP-CR.

In September 2006, through a Supreme Decree N° 056-2006-AG, the national government reserved 186 MCM water from return flows and groundwater of the Chira basin downstream the Sullana dam to its estuary for two years. In spite of the opposition of the President of the Board of Directors of the AACH - CHP[51], who had already informed that its institution had not given its consent for the approval of the DS 056-2006-AG, the national government decided that by setting the minimum river flow or ecological flow of the Chira river in 0.3 m3/s there was nothing else to discuss[52]. The regional government similarly established that "M" should present a Development Plan for water reserve, and that it should enforce the legal requirements to ask for a "Licencia".[53] Here also, the regional government bypassed the regional water authorities, when they recommended that a "Permiso" (water right on return flows) and not a "Licencia" (water right on superficial flows from the river) should be granted to "M".

In January 2007, after the contract was signed between "M" and the regional government of Piura, the Water Users Organization of the Medio and Bajo Piura sent a document to the President of the Board of Directors of the AACH CHP to express concern on the decision to attend "M" water demand. They pointed to the irresponsibility of the regional authorities who granted this water volume to a corporation disregarding small farmers and the ecological flow. During the dry season when there is no return flow, they contended, this corporation would use water from the regulated system thus hindering their livelihoods[54]. Later in May 2007 Ministry of Agriculture issued a regulation[55] whereby it established that waters of the Piura river were exhausted and, therefore, no water rights could be granted anymore. This regulation affected all those water users that have been unsuccessfully asking to be granted water rights, but also those small farmers and local communities who wanted to plant new crops, and even corporations who wanted to invest in sugar cane for ethanol.

Once the study was approved by the National water authority, "M" started to carry out its hydraulic engineering which supposed not only the change of land use from marginal to agricultural lands, but also archeological studies, studies on the river ecological flow, etc. After this, the Resolución Directoral 1497-2006-IRH was issued by the National Water Authority, and therefore "M" presented a file to

[51] See: Oficio N° 518-2006-AACH CHP.
[52] See: Resolución Ministerial N° 01497-2007-AG.
[53] See: Acuerdo del Consejo Regional 368-2006/GR Piura-CR.
[54] Gallo, 2009.
[55] Resolución Ministerial 380-2007-AG.

sustain the construction plan for two water pumping stations named Macacará and El Arenal.[56] To the Macacará pumping station located in the district of La Huaca, "M" received a "Licencia" from the National Water Authority for about 2'452,800 m3 of superficial water from the Chira river for industrial use of the Ethanol Production Plant[57]. Water reservoirs (pumping stations) have 400 mts and 280 mts, that together amount for 650,000 m3, with 8 meters depth.

In May 2009 "M" required that "Licencias" water rights be assigned by the National Water Authority to irrigate hectares of sugar cane seeds. In the first phase, 7,800 ha are programmed but they finally sowed 7.500 ha. During the second phase, not the whole 2,300 ha could be sowed because of the land quality, but water authorities allowed them to take water to the adjacent terrains that were acquired from small farmers. "Licencias" not only were granted for industrial water uses. They were also granted for agricultural uses, thus confirming small farmers' and water users organizations' initial fears.

Figure 1: "Licencias" (water rights) granted to "M" in 2009 for agricultural water use.

Clase de Derecho	Resolucion	Fecha	Unid.Catastral	Ambito de Organizacion de Usuarios	Ambito Administrativo	Tipo de Uso	Clase de Fuente	Fuente de Agua	Volumen (m3)
LICENCIA	030-2009 ANA-ALA CHIRA	03/03/2009	04127	COMREG EL ARENAL	ALA CHIRA	AGRICOLA	SUPERFICIAL	CHIRA	2,628,540.00
LICENCIA	030-2009 ANA-ALA CHIRA	03/03/2009	11530	COMREG EL ARENAL	ALA CHIRA	AGRICOLA	SUPERFICIAL	CHIRA	3,742,380.00
LICENCIA	030-2009 ANA-ALA CHIRA	03/03/2009	11530	COMREG EL ARENAL	ALA CHIRA	AGRICOLA	SUPERFICIAL	CHIRA	129,080.00
LICENCIA	030-2009 ANA-ALA CHIRA	03/03/2009	04127	COMREG EL ARENAL	ALA CHIRA	AGRICOLA	SUPERFICIAL	CHIRA	2,628,540.00
LICENCIA	030-2009 ANA-ALA CHIRA	03/03/2009	11530	COMREG EL ARENAL	ALA CHIRA	AGRICOLA	SUPERFICIAL	CHIRA	3,742,380.00
LICENCIA	030-2009 ANA-ALA CHIRA	03/03/2009	11530	COMREG EL ARENAL	ALA CHIRA	AGRICOLA	SUPERFICIAL	CHIRA	129,080.00

[56] See: Resolución 565-2008-INRENA

[57] See: Resolución Directoral N° 0316-2012- ANA-AAA-JZ-V. This "Licencia" renewed a former one granted through Resolución Administrativa N° 0389-2011-ANA-AAA-JZ-V.

									13,000,000.00 m3

Fuente: Sistema de Información de Recursos Hídricos. En: http://www.ana.gob.pe:8080/rada/wfrmDetaDUA_xU.aspx. Consulta: 31/09/13.

When asked about the volume of water allocated to "M" for industrial and agrarian uses, the "M" corporate responsible admitted that the volume of return flow is enough for everything they have already planted and also for the projected areas. As for the economic cost of water, in January 2013 "M" had paid S/.0.02794/m3 as water rate to the water users organization of the left bank of the Chira river.

Discussion: Water in, water out. Discourses, power and biofuels

The arrival of new corporate actors in Piura had contributed to the transformation of both land and water uses. Before their arrival, water distribution was based upon the existing agricultural lands, which excluded marginal lands. The transformation of marginal lands into cultivated ones by "M" Biofuels Corporation changed the foundations of the initial scheme of the irrigation system and water management thus alarming small water users and organizations.

National and regional discourses raised to favor biofuels project were carefully designed to project the impression of water abundance in the Chira-Piura basin and enough water availability to cover new irrigation demand for 10,000 ha of sugar cane for ethanol production. However, the water balance study "M" elaborated did not consider different seasons but the total average of water offer per year. Regional water authorities and other agricultural users contended that the water balance should have considered not only the water offer average per year, but particularly the dry season (May to December), the actual water uses, the current clogging of the Poechos reservoir, and the agricultural necessities of old and new water users.

The case study here shows how discourses create the conditions of possibility for power to operate thus transforming socio-natures for the construction of waterscapes. In fact through discursive devices on water abundance in the Chira basin political and economic power, both regional and national, finally accumulated water to the detriment of other more vulnerable land and water users. The development of the biofuels project in the Chira valley meant not only dispossession of marginal lands considered common goods that were actually used by local communities, farmers and pastoralists. Locals have also been dispossessed of water as return flows allocated to "M" biofuels project were

also used by small farmers who are not legally considered water users, and because water scarcity during the dry season will most probably affect them, small farmers and local communities harder than new corporate water users. Moreover, local people deeply believe that "M" is actually using superficial water from the Chira river, not the return flows that it was authorized to use. In fact, large scale cultivation of sugar cane in Piura has posed manifold environmental impacts for small and middle land and water users, farmers and peasant communities. The discursive devices that allowed the production of this "waterscape" in Piura have reinforced not only water unsustainability but also social inequalities.

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