Urban metabolism, water scarcity and seawater desalination in Chile under a neoliberal paradigm with Maria Christina Fragkou

This is a written transcription of the podcast 'Urban metabolism, water scarcity and seawater desalination in Chile with Maria Christina Fragkou

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In this morning I will talk to you, a Chilean morning and Mancunian afternoon, I will talk about how water scarcity has been constructed in Chile. How desalination has been actually imposed as the main solution to water shortages along the country and what mine and others research results have to say about this, no. There are many things that we have talked with Armando that I should talk about today. So I will try to be both inclusive, you know like try to deal with all the issues we want to talk about, and on the other hand, I will try to also, you know, try to give enough detail for all the issues.

So okay, I think I have to start with the name of my presentation. It's "Mining, Urbanisation and Water Provision in Arid Contexts: a critical analysis of de-salination of the Antofagasta region in Chile". I have a political ecology approach to the water issues and my studies. So I always combine both physical and more social and political aspects. And for me, it's very important to start with the physical context, you know.

Chile, for those of you who don't know the country so well, is a very long country going from North to South, with very varied water availability. And you can see on the right hand of the slide, how water availability is increasing from North to South. We are in the Sorthern hemisphere so the world can be interpreted in a different way than us who were born in the northern hemisphere. So the north is very warm and is very arid. Antofagasta in Chile, actually is in its northern part, its close to the world's driest desert the Atacama desert, and this is where most copper extraction takes place, both in Chile, and it's one of the world's most important copper extraction sites. So we have a very dry North, with very intensive copper, and lately lithium mining, then we have a central Mediterranean valley where you have very intensive agricultural exports. And this is the place that is most affected by a ten year megadrought that has been torturing the country.. And then you have the southern part which has like a much more humid and temperate climate where, as you can see on the slide as well, where water availability greatly overcomes water demand. On the contrary, with the northern part of the country. In the sourthern part you have a lot of hydroelectric power dams, many hydroelectric power dams, that also cause conflicts with local people, such as the [00:06:05]Mapuche [0.0s] indigenous communities. And there are also many salmon farms. So all this type of aquaculture in the south, mining in the north, and very intensive agriculture exports in the centre of the country. Conditions, in a sense, its water scarcity you know. In combination with this geographically uneven water availability. On the other hand, as

being as a climate change hotspot, added to that we have a huge urban expansion, and urban expansion does not only mean that we have a more need for human consumption, but also of higher quality. Now this is like the physical context in Chile. Now, how about the political one?

Chile is a textbook, you know, for neoliberal water management. It is based on an absolutely free market where supposedly the state does not interfere at all with how water is managed. There is private property on water rights, which are rights that give you the right to extract a certain flow of water, usually measured in litres per second. The actual legal scheme that defines how water is distributed and the property rights on water is defined by the Water Code. The Water Code, I will say imposed because it was created during the dictatorship, it was created, it was an idea, that took place during the Pinochet dictatorship, and it has three main characteristics.

First of all, the Water Code separated water rights from the land. So in other places, a very typical strategy to have access to water is to buy land and then you have all the water of the aquifers that go below it, but in Chile this is not the case, no. So you have water rights are divided from land rights, they are separated. So a person who lives anywhere in the world can buy a water right, independent if they have land or not. And the reverse. There are many farmers who have land, but they do not have water, because they have to buy it separately.

Second characteristic of the Water Code is that those water rights you know, water is separated into water rights, superficial ones and underground ones and these water rights have been given to the people and companies freely, without any costs, and perpetually. So if I go to the General Directorate of Water in Chile and I know that there is water availability in a river, for example, I can ask for one litre per second; like a water right equal to one litre per second, and they can give me this right. This means that they can give this to me for free and I can, forever and ever, extract one litre per second from that river or aquifer etc...I can sell these water rights. even though they gave this to me for free. I can, how is it like not sell but 'arrendar'. Armando, can you help me? I'm sorry, I forgot the....like rent. You can rent the water right. So somebody can pay you so they can use this water right. And it's also transferable, I can pass it on to my children or give it away to somebody. So the water is mine, once the water directorate gives it to me. And me, I can be an actual person, I can be a mining company, etc..

The third characteristic of the Water Code is that there is no prioritisation between uses. Once the water directorate has given away all of the water rights, there is no rule that says, "Okay, but first we have to secure ecological health" or "We have to secure human consumption" or "we have to guarantee the human rights to water". This has been included in the water code very recently, like a couple of months ago, and I don't want to get very much into it because we have to wait and see how this is going to be implemented. But for 40 years, the Water Code has not prioritised either ecological nor human uses before industrial, mining, agricultural, etc.

So these three characteristics of the Water Code have ended up in having water transactions. People can sell and buy their water right. They can rent them, you know . And so the idea is like, you know, based on the tragedy of the commons, the idea that every person or community or company has their own water rights they will take care of them because in some cases they have paid for them. And based on private property, the system should naturally achieve the highest efficiency in use. And also this market that emerges from the private property of water will naturally allocate water between uses. So that the actors that most need water will pay more for it, and this means that they will take better care for it.

This was promoted like a very technocratic, efficient and supposedly apolitical distribution system of water resources. But many colleagues, including Jessica Budds from the University of East Anglia, who has very profoundly studied the Water Code, its sources and its impacts, including also Carl Bauer from Arizona. All of them, plus more and newer, let's say, research have demonstrated that the water code has resulted in socio-environmental conflicts and water rights accumulation by the powerful politically and economically actors, you know, like mining companies, agricultural companies, banks, financial institutions. All of these have a great accumulation of water rights because there is no, there's no limits, to how much water you can have or what do you do with that water. This causes scarcity and lack of access for the more disempowered, marginalised and poorer actors and groups. All of this causes water insecurity for human consumption and water resources depletion. Water resources depletion has to do with the water code and also a very bad water management scheme applied in Chile. But it's not the case right now to go into that.

What I really like is our colleague Jessica Budds says that "The commodification of water in Chile is not merely like an outcome of the neoliberal model which was imposed by the dictatorship of Pinochet. But it's more a condition for the neoliberal model to succeed because the water code succeeded in securing water for all the economic sectors in the neoliberal model and that dictatorship had as a priority". So you have the mining sector secured water rights in the north, in the world's driest desert. The same happens in the centre with the agricultural sector, the big agricultural sector for water exports. And in the south, as I told you, there are many hydroelectric projects which essentially are important for mining in the north. So water along the country is useful for sustaining, either directly or through energy production, mining and agriculture with the main economic sectors in Chile.

So I think I have delayed a bit in this first part. Armando, could you please let me know when I have like 5 minutes left. So, what has Chile done under the situation that I was telling you about. You know, the ten year megadrought, the climate change threat. So there have been many plans, here I have some plans, so you can see that it is very important for the country to defend lets say climate change and water shortages. And so you can see, like the national climate change adaptation plan, $26 million, $100 million on the National Drought Plan, $5,000 million for water use efficiency measures. And they all follow, like what we would call like a hydraulic paradigm. Solutions that are based on megaprojects, solutions that are based on projects that need a lot of capital investment. And they also need external and international capital for them to be materialised.

The solutions to water scarcity here is like a resume of this. Dams, desalination plants. There is a water, i'm sorry it's not a giveaway, it's a highway, it's a water highway. It's a plan to take water from the south ofg Chile and through submarine pipes to move it to central Chile for agriculture. It's a very, I don't have a word for these kind of projects, they don't make any sense economically, ecologically, socially. But there is a lot of money in creating them. Chile has no demand management. So there is very little management on the demand side, only augmentation of water supply. No public participation, people do not exist niether as clients or consumers, no. No integrated water management. There is no challenging the Water Code. Now with the new constitution, there is a new constitution being written in Chile, and there are many, people are really trying to change how water is not only managed, but also how it is seen. Not like a renewable resource whose economic use is prioritised, but also they're really trying to impose the guarantee for the human rights water and to have a different relationship with nature. But all this is under suspension, we could say, because it's still being elaborated. And there is also no reflections on the water-energy nexus, no. Now everybody's talking about desalination in Chile,

but nobody's talking about where this energy is going to come from. I don't know, sometimes when they consider renewable energies, they just want to, you know, like fill the desert with sun power-plants or energy energy farms, as if the desert was, you know, like just rocks or sun. As if it wasn't an ecosystem that needs to be, you know, like a conserve.

So there is a lot to wait from Chile. You know, in the sense of what kind of solutions are given to water scarcity. And very lately, what I was telling you about something different is happening; public discourses are starting to put the blame and the solutions to citizens. So we have to shower less, they king of threaten, it doesn't sound like a threat but it is, that they were going to rationalise water. I don't know if the verb is correct, but have water cut-offs every few days in the case of the metropolitan region of Santiago, which hosts some 7 million people. Nobody mentions that there is a great hydroelectric plant on the birth of the main river. Nobody talks about the [00:21:21]los bronsias mine [4.9s] that is also on the birth of the other important river that supplies Santiago with water. So there is a very closed vision on how water scarcity is constructed in Chile and the solutions point mostly to the citienship than extractive industries, water management etc.. This is a very tragic, comic-tragedy, I don't know, it makes you want to cry and laugh. And it's the news about how the ex-president of Chile announced $5million plan in collaboration with the Netherlands, Israel and China, in order to double water efficiency. By doubling water efficiency we will manage, if you read the latter part of the slide, "with this we will go from 1.2 to 2.4 million hectares irrigated". So he says that they're going to double water use efficiency in agriculture in order to double the surface that is cultivated. There is a mix of scarcity measures with economic measures, no. So when we hear about efficiency and when we are about measures on scarcity, especially in Chile, sometimes it's really a boost for economic activities rather than water conservation or guaranteeing the human rights of water.

So this is like a review of research has been done so far, a bit superficially. Desalination in this context in Chile, where there is really important bet on extractivism in Chile. There are very few voices that are critical to mining, to exports, tomassive export-agricultural activities. So desalination only comes, you know to say "Okay we don't have enough water, but we have all these coastlines". We remember the map of Chile, from one side you have the Andes mountain range and on the other hand, you have the Pacific Ocean. So the Chileans feel that they're actually looking for a solution to water scarcity by looking at the sea. Okay. And effectively, desalination can be a good solution in many cases. It's used in arid and coastal cities and water scarse areas. It can reduce pressure on freshwater resources. It has this imaginary of an infinte water source because, you know, you see the sea and its endless. So there you go. You have your infinite water resource, the sea. And also it is a technology that uses a lot of energy, and it's very expensive, but there have been many technological and economic advantages.

The direct impacts of desalination is the brine disposal because the desalination, I'm sorry, I'm talking about desalination but I have not explained the process. For those of you who do not know it, desalination is essentially extracting water from the sea, then you separate it through a very energy intensive process through membranes. So water passes through membranes and then you have two different products. You separate water from all of its components. So you have on one side a very clear water, which is actually distilled water like H2O, which is not the water we drink, but it's distilled water. And on the other hand, you have a very concentrated brine where you have all the components of salt-water like concentrated.So brine disposal is an issue. The high energy consumption is an issue. And the associated CO2 emissions. When we needs. Where you have a predomination of fossil fuels in the energy needs of the country. Then the mere function of the desalination plants implies that CO2 omissions. And this brings us to the drawbacks of

desalination, beyond the very low kind of impact of brine disposal, extracting water, where the plans are situated, etc.. Desalination is essentially a mal-adaptation strategy to climate change, no. If we generate CO2 that causes climate change and I'm sorry, this is a bit hard to explain this vicious circle. So we are trying to adapt to climate change, climate change and reducing water resources. We put a desalination plant, the plant needs a lot of energy. The thermoelectric plants that supplies with energy the desalination plant, it needs CO2 thus contributing to climate change, which is the same...I am sorry, which is like the same event or it contributes to the problem that it tries to adapt to. So I think the mal-adapation work is very interesting when we evaluate adaptation strategies to climate change.

Then we have social impacts related to the price of desalinated water. So it depends a lot for who do we desalinate water for? Is for the industry? Is it for the people? In Chile, there is a tendency to use desalinated water for human consumption and everything indicates that they do not want water for the productive sectors because the cost of water can make an industry non-profitable. So you cannot extract copper with desalinated water for example, because maybe the extracted copper is going to cost much more than than the desirable or the affordable. I'm sorry, like the agreed price. And since desalination depends on energy and this comes from fossil fuels, fossil fuel price fluctuation can effectively have an impact on the price of desalinated water. So it is very unfair and very dangerous to tresspass, these vulnerabilities of price, to the people.

So I think I will carry on to the case of Antofagasta. So what we did in this research, is the case of Antofagasta. Antofagasta is a city in the monomes region. It's a city and a region in Northen Chile. Antofagasta City is the capital of the Antofagasta region. and the region is the most important copper mining region both in Chile and we can say in the world. Antofagasta has more than a half of Chilean copper exports and it represents 16 to 20% of global copper production , so it's very important not only for Chile but also for the global production chains that depend on copper. So when we think about the conflicts in Antofagasta, it's much more complicated if we put like the global side of these problems.

Antofagasta is situated in the Atacama Desert. As I told you, it's the world's driest desert and where most mining activities take place in Chile. So this is like a lethal combination we could say. What's happening in Antofagasta is that water availability became critical. So in 2003, [00:31:35]Da La Cine Bar, [0.3s] the desalination plant, that was the name of the plant which was given to by the neighbourhood where it was constructed, in the northern part of the city. So in 2003 the public sanitary company, the public water company constructed, or ordered, the construction of this salination plant, and then it was privatised. So the new company, woh bought the sanitary company, also bought its water rights. So the water rights that they take advantage of. And also the desalination plant. So we ended up with this huge sanitary company that was in control of water rights, of giving and supplying with water, all the important urban centres in Antofagasta, and it was also in charge of a desalination plant. This water company had many contracts with mining companies in the region, and what happened is that previously water, I'm sorry the colour of these arrow is not the adequate one, but if you can see here previously water was coming from the Andes mountain range to the cities for human consumption. But with a desalination plant, this freshwater, or mountain water, stayed you know in the mountains, to be used by the mining companies. And in the sea side, where ordinary urban areas are, people have started using desalinated water. So what we have here is like, we could calkl this a metabolic waste of of the region's water metabolism. So water was coming from the mountain range to the sea, and suddenly, with the construction of one, more than one desalination plant, the cities started being supplied next to the sea with desalinated water and all the mining, all the mines,

were supplied with continental or mountain water. This was not, when I asked the sanitary company why this happens, and in general, the general discourse is that, the public discourse we could say, is that the desalination plant was built because the city was being expanded, because more people were coming to Antofagasta. Yet in 2003 in [00:34:53]Banco international, Banco de Americano, [0.0s] the American development bank, already stated, it is here with more at the end of the slide, and they were already in 2003, which is the year when the plant was constructed, they were saying that water from desalination will gradually replace the current supply is something the sanitary company doesn't matter. So people are going to drink desalinated water and mountain water will stay for mining purposes. Also through contracts with the sanitary companies. So if we see it as an engineer, I always say this example and I'm really sorry for the engineers is not that I don't like them but you know, there is usually like this a volumetric appreciation of things. But you have a lot of this water here, you have this water there, you kind of distribute water. And what is important is volume. When I see it from a hydro-social perspective, it is very important to see what kind of water each actor uses and who makes the decisions of who is going to drink, what kind of water and who's going to use what kind of water?

This is, I will go back to this idea, this is kind of a flow gram that we created. It doesn't really matter to see all the flows in their detail, but it is very interesting to see all these different water sources that there are in the region, how these are fragmented. And which is the logic behind separating these water flows, deciding who is going to use desalinated water and who is going to use mountain water, and how water vulnerabilities are constructed through these water distribution schemes where literally people are practically invisible. There is no public participation. Nobody told or asked people if they want to drink desalinated water etc.

So in order to understand what's happening now, with this breaking of all sorts of the region's working metabolism once desalinated water enters the hydro-social cycle, in a way, we make analysis in three different levels: the regional level, the urban level - the whole city, what has happened to the city, and then on the household level.

So in terms of regional implications, there have been quite a few studies. I was surprised to see Antofagasta has called the attention of several researchers, mostly from a political ecology perspective or legal geography, for example. They also agree that the use of desalinated water has not decreased freshwater consumption, but increased water resources for mining. So actually what desalination did for the region was to increase water for mining and give the desalinated water to the people. In an article that we wrote with Jessica Budds a few years ago, we critically analyse how desalinated water entered the hydro-scocial cycle of the Antofagasta region and we understood that desalination helps to stabilise the Water Codes. When you have a distribution and property system that does not work, that causes conflicts, that causes accumulation, that causes or produces scarcity for a few actors and communities who are already marginalised, socially and geographically in some cases, then if you just plug in a desalination plant that produces new fresh water, in a sense, then you kind of fill the homes off of the Water Code. The desalinated water does not permit us to see all the failures of the Water Code because there is a new source that comes in and does not let the scarcity be more visible in a sense.

So this is the idea with the regional implications, I think it has been made clear, and then we had a look on the urban scale. It was very interesting to see how the municipal green areas were increased in the city. If you see here, these blue lines 2003 when the desalination plant was installed. What we were interested in was not only to see how on the urban level you had more water, but we also wanted to see how this new water where was it consumed? Because the idea is

that if you have an already unjust system or unequal system of water distribution, bringing in a new source is not going to change things, its not going to bring justice. It's not going to bring water security. But it is going to maintain, the same structure of distribution is going to be maintained. And it was very interesting to see that in the, for a very small example, that the green municipal areas in the Antofagasta city, this is the city of Antofagasta, very similar to Chile, very thin and long. So if you can see it is the southern part of the city that is more green and it is like the most rich part of the city. So we can see an augmentation in water for irrigation, but only in the richest parts of the city. So we have more water, but we do not have more water for everybody, in a sense.

And another thing that we saw and was very interesting, but we cannot talk about this right now, it has to do with the water territories, the urban water territories, that were produced in Antofagasta. There was one part of the city that was distributed with desalinated water like this one, the darkest one, then you have one in the middle where you have both desalinated and mountain water, and then the clearest of the blues, it is only mountain water. So inserting desalinated water in the city's water week created three different territories with three different types of water. This triggered us a lot. So we made some 1000 surveys back in 2017. We wanted to ask the people if they like water. People do not know what kind of water, they do not know if they consume desalinated water or mountain water. They do not trust it. Nine out of ten households they buy bottled water, which duplicates the household expenses for potable water.

And these are maps to demonstrate the dissatisfaction of people with several organo-lectic characteristics. If you see the first one, it has to do with water quality and the red ones are badly evaluated. And overall desalinated water has been worst evaluated than mountain water. Maybe not statistically very important but in a very stable way. In know characteristics desalinated water has been worst evaluated.