CALCULATIVE IMAGINATIONS

Following the performative socio-technical construction of Costa Rica's carbon neutral actor-network

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von der Fakultät VI - Planen Bauen Umwelt
der Technischen Universität Berlin
zur Erlangung des akademischen Grades

Doktor der Philosophie
- Dr.phil. -
genehmigte Dissertation

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Tag der wissenschaftlichen Aussprache: 10. April 2019

Berlin 2019

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Abstract

This dissertation explores the current process of socio-technical reconstruction, negotiating, ordering and stabilization of 'nature' as it is performatively (re)assembled as 'carbon' through a series of contingent calculations performed by 'green technocracies'. Particularly, the research follows how Costa Rica's community of techno-scientific 'experts' enables the simultaneous emergence of 'carbon' and 'carbon offsets' as the 'problem' and the 'solution' –respectively– to the country's effort in reaching its self-imposed goal of becoming the world's first 'carbon neutral' nation by 2021.

Chiefly drawing on actor-network theory (ANT), this dissertation will show how the very objects of 'nature' with which the global campaign for facing 'climate change' (and hence also the country's 'carbon neutral' initiative) is concerned with, are not self-evident objects that pre-exist the different policies, devices and calculative practices developed to render them orderable. Instead, the study will show that 'carbon emissions' and 'carbon offsets' are things that come into existence through the mediation of a heterogeneous network of socio-technical devices, numbers and 'expert' knowledge; and are not simply things literally and figuratively floating 'out there' in the atmosphere. Therefore, rather than focusing on the *material* –i.e. chemical, physical or climatological– properties of Greenhouse gases (GHG), this dissertation focuses on how the abstract entity known as 'carbon' is 'socially' collected, measured, accounted, displaced and (re)circulated by Costa Rica's 'green technocracy'; and how these practices enable a process of *neoliberalism* (understood

as a socio-technical *governmentality*) which is performatively assembled and *black-boxed* as the 'logical solution' to a series of longstanding 'development' problems embedded in the requirements of capitalist value. The study will also show how the contingent, fragmentary and biased nature of carbon calculations requires high degrees of improvisation, selective blindsight, deliberate discrimination and guesswork from both 'expert' practitioners and their technological devices, and from final political decision-makers. Furthermore, this dissertation sheds new light on the socio-technical process through which the *inexistence* of an invisible 'gas' is transformed into a measurable, tradable, storable and circulatable currency. Rather than a particular material good (i.e. cubic tons of oxygen), or 'rights to pollute', the commodities exchanged in carbon markets (carbon offsets) are better understood as imagined *void*-like entities capable of 'erasing' the *materiality* of another gas in an 'equivalent proportion'.

Finally, drawing on governmentality studies, it will be discussed how the 'voluntary' character of Costa Rica's policies and programs aimed to *order* carbon and 'climate change', heavily relies on the creation of a myriad of *technologies of accounting* intended to extend *action at a distance*. Hence, Costa Rica's 'carbon neutral' actor-network performatively depicts climate change as a problem that is technically and technologically amenable through abstract calculative spaces. Furthermore, it will be shown how in moving from a 'protectionist', state-centered conservation model to a more market-oriented 'neoliberal' one, the Costa Rican state has found a viable mechanism to transfer what is perhaps the largest share of responsibility of

reducing the country's GHG emissions –and therefore of reaching the self-imposed goal of carbon neutrality in 2021– to the private sector.

To Christiane

Acknowledgments

I would like to thank Professor Jörg Stollmann for giving me the immense opportunity of pursuing these Doctoral studies; and for having always helped me to find my way through all those years. I am forever in debt!

Also, I would like to thank Professor Ignacio Farías for having shared his invaluable insights which allowed me to face the simplest and most complex challenges of this research.

Photo credit: Hector Santos.

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ANT: Actor-Network Theory
CDM: Clean Development Mechanisms (defined by the UNFCCC under the Kyoto Protocol)
CERs: 'Certified Emission Reduction' credits, also CER
CGR: General Comptroller of the Republic [State entity]
CO_2eq: Equivalent Carbon Dioxide units
COP: Conference of Parties
CTO: Certifiable Tradable Offset
DCC: Climate Change Directorate [State entity, dependency of MINAE]
ENCC: National Climate Change Strategy [State policy]
FONAFIFO: National Forestry Financing Fund [State entity]
GHG: Greenhouse gas
GWP: Global Warming Potentials [Established by the IPCC]
ICE: Costa Rican Institute of Electricity [State entity]
IPCC: Intergovernmental Panel on Climate

Change

IMN: National Meteorological Institute [State entity]

INDC: Intended Nationally Determined Contributions

INGEI: National Inventory of Green House Gas Emissions

INTECO: Institute of Technical Standards of Costa Rica

INTE-12-01-06:2011: See B5:2016

INTE B5:2016: National Voluntary Normative for Demonstrating Carbon Neutrality (formerly INTE-12-01-06:2011)

MDVCCR: Domestic Voluntary Carbon Market of Costa Rica [Proposed state policy]

MINAE: Ministry of Environment and Energies (Formerly MINAET)

MINAET: See MINAE

MIV: Motorized individual transports

MRV: Measuring Reporting Verification

MRP: Costa Rican Market Readiness Proposal [Document]

NAMA: Nationally Appropriate Mitigation Action [Projects]

NDC: Nationally Determined Contributions

ONF: National Forestry Office

PES: See PSA

PSA: Payments for Environmental Services [Program]

REDD+: Reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests, and enhancement of forest

	carbon stocks in developing countries [Program initiative]
STS:	Science and Technology Studies. Also known as science, technology and society
UCC:	See UNC
UNC:	[Costa Rican] National Compensation Units (formerly UCC)
UNFCCC:	United Nations Framework Convention on Climate Change
VERs:	'Voluntary Emission Reduction' credits, also VER

Shortened concepts:

Carbon Market: Domestic Voluntary Carbon Market
'C-Neutral'*: Carbon Neutral certification program
'Country Program': Carbon Neutral Country Program (Agreement 36-MINAET 2012)
'2021 goal': Carbon Neutral goal for the year 2021

(*) Official name.

INTRODUCTION.

Living anywhere in the western hemisphere, it seems impossible to not be familiar with slogans such as 'sustainable development', 'nature preservation', 'biodiversity conservation' or 'climate change mitigation', at least in some degree. What is more, it may also be safe to believe that a significantly large amount of those who are at least vaguely familiar with these concepts, will tend to deem them as 'good things'. Things to which, additionally, the mere idea of openly opposing to would seem right out wrong in a 'moral' and 'ethical' sense. Those ideas and ideals have sank in so deeply in our western 'modern societies' that even impoverished peasants in an underdeveloped or developing country will increasingly have a hard time defending themselves from moral or even judicial judgment for cutting down a tree for its wood, or shooting a wild animal for its meat, regardless of whether their very survival depends on these material goods. At the same time, those ideas and ideals have greatly contributed to the eruption of a wide variety of markets filled with 'greener' consumer goods, spaces and experiences just waiting to be consumed by a 'trending' population of 'environmentally aware' consumers.

I myself, for example, have been living in Berlin for the last four plus years while developing the present doctoral research. I have witnessed first-hand the explosion of 'green' products and 'greener' lifestyles that the urban middle and upper classes have adopted in order to keep 'current' with these trends. I have seen the proliferation of

'bio' and 'vegan' shops, restaurants and supermarkets particularly in the 'hip' neighborhoods of Berlin like Kreuzberg, Neukölln and Prenzlauer Berg where gentrification is strongest. In these businesses it is common, for instance, to see 'airplane' papayas flown all the way from a South American or South East Asian country straight to the shelfs of the 'bio' supermarkets where they are neatly stacked inside plastic boxes bearing stickers that state that they were produced in 'bio' farms. Nevertheless, no information is provided about the carbon emissions involved in flying these products from their origin countries so that they can be consumed as fresh as possible at the other side of the globe; or of the environmental footprint of producing the disposable plastic containers in which they are displayed.

Other numerous examples of the raise of 'green' products and lifestyles can be traced back to my home country of Costa Rica. In fact, I believe that nine out of ten times when I am asked where I come from, people instantly follow my answer by acknowledging the fact that it is well known for being a 'green' country, and also commonly, how they or a friend or relative of theirs flew all the way there to do some 'eco-tourism'. And I believe this is hardly surprising for any Costa Rican anymore. In this context, the country has historically been renowned as a world-class champion in defending, implementing and boosting nature's conservation since at least the 1970s when the country pioneered in establishing a series of state-centered implementations directed to protect its impressive biodiversity. These policy devices ultimately resulted in the creation of Costa Rica's now world-famous 'National Park' and 'Conservation Area' network system that today gathers

approximately one third of the country's surface under various forms of environmental protection. More recently, the nation's 'green' economic activities –such as eco-tourism, renewable energies, and more recently carbon exchange markets– not only positioned this small Central American country on the world map but have played a central role in the country's economic and political life in one way or another.

Costa Rica's pioneering program of 'Payment for Environmental Services', for example, was largely acknowledged as a groundbreaking implementation for its time that ultimately influenced many nations worldwide in their own re-thinking and re-writing of conservation policies and programs (Pagiola, 2008). Likewise, the country was part of the world's first international exchange of 'Certifiable Tradable Offset' (CTO) in 1997 when it sold 200,000 tons of carbon equivalent offsets to Norway in exchange for $2 million US dollars.

In spite of these few examples provided here, attention towards understanding how the nation has built –and continues to build– its remarkable 'green' status and, perhaps more interestingly, how it actually *performs* its 'greenness' in day-to-day practices of its 'green technocracy', has been rather superficial in international media, and arguably scarce in critical academia. Hence, this dissertation intends to precisely focus in understanding these performative 'expert' practices and show how Costa Rica's environmental discourse has shifted from a state-centered and centralized conservation model to a market-oriented and de-centralized one where the state has gradually transferred the burden of facing climate change

to the private sector. As I will argue throughout this dissertation, this process could be understood as a localized effect within a wider move towards a global neoliberal environmental governance (Swyngedouw, 2005). Here, neoliberalism is to be understood as a particular way of thinking and being capable of aligning these emergent 'green' lifestyles and 'common senses' with specific economic and political interests and rationalities without the need of direct state control. In short, a *governmentality*. Moreover, I argue that this tendency has coincided with a larger paradigmatic shift that has progressively replaced 'biodiversity conservation' for 'climate change' as the driving concept of global environmental discourses (Fletcher 2010a).

At first sight, it would seem tempting to 'match up' 'biodiversity conservation' with the state-centered conservation model, and climate change with the market-based one; however, a closer look to how this shift has taken place in Costa Rica reveals that both of these conservation models (discourses + practices) are anything but clear cut. In fact, in this dissertation I will show how in practice, neither one is being replaced by the other. For instance, I will show how the Costa Rica's carbon markets heavily rely on state funding and are under direct state control over the demand and supply sides of these markets. However, I will also argue that the 'impurity' of these markets should not be seen as evidence of 'market flaws'. Instead, I will show how this 'hybridity' allows these particular networks to operate through, rather that in spite of, heterogeneity and disorder; and to constantly adapt themselves in order to work their way around whatever obstacles they may encounter.

Despite the many differences one can easily find between activities like selling 'airplane' papayas in a 'bio' supermarket in Berlin, flying to Costa Rica to do Ecotourism, or buying 'carbon offsets' from Costa Rican forests, I believe that these three examples share one key similarity which I will explore in this dissertation: They all emerge from the *creative capacity* of neoliberalism that is characterized by a process of *intense abstraction* (Pellizzoni, 2011). Hence, what is being sold is neither just a 'papaya', a walk in a national park or 'clean air' from the rainforest, but the imaginary experience of buying something 'clean', 'green' and 'pure'.

The emergence of the above-mentioned examples of green actor networks –and other examples that could easily be found– are only conceivable in light of the cognitive-moral *agency* that is currently being assigned to 'nature', and that has in turn allowed a "spur [of] new 'green' markets, equipped with 'eco-products', 'eco-managing' firms and 'eco-conscious' consumers – all in keeping with the new *spirit of capitalism*" (Blok, 2013, p. 500. My emphasis). Hence, the search for 'greener' products, experiences and lifestyles could arguably be understood as a replacement of religion as the axis around which our fear of social disintegration becomes articulated (Cook & Swyngedouw, 2012, p. 1973). Thus, I tend to believe that buying 'green' or 'eco' products and experiences has developed into a sort of modernist 'eco-indulgences'.

The present dissertation aims to contribute to the existing body of studies which are addressing the key assumptions that fundament global and local contemporary discourses and practices of environmental governance. In particular,

the study at hand will try to shed new light on several modernist 'facts' that we have learned –and learned to learn– to take for granted in regards to the global campaign against climate change in general, and to the mitigation of carbon emissions, which has emerged as the champion of such campaign. I will argue –based on the present research– that the imagined modernist separation between 'nature' and 'society' is the origin of our contemporary understanding of the multitude of issues which we call the ecological crisis. Consequently, so is the equally imagined separation between the knowledge realms of 'science and technology' (capable of approaching and ordering 'nature') and 'politics' (capable of partially and temporarily controlling 'human' entities, and of imperfectly explaining human behavior).

In order to discuss these myths of contemporary environmental governance, this study closely analyzes the performative practices of (re)constructing, negotiating, ordering and stabilizing 'nature' in Costa Rica. More precisely, the research focuses on the way 'nature' is performatively reduced to 'carbon' through a series of socio-technical practices performed by the country's 'green technocracy'. Hence, the latter community of 'experts' simultaneously enables the emergence of both 'carbon' and 'carbon offsets' respectively understood as the 'problem' and the 'solution' to the country's effort in reaching its self-imposed goal of becoming the world's first 'carbon neutral' nation by 2021.

Therefore, the present dissertation seeks to answer the question of:

How is 'nature' performatively (re)assembled as 'carbon' through the socio-technical calculations of Costa Rica's 'green technocracy'?

By putting into question the very myth of the objective pureness and the robustness of the scientific method while chiefly drawing on actor-network theory (ANT), this dissertation questions the very core assumptions over which modern science has sought out to approach and interpret an imagined singular 'nature out there', and through which modern techno-sciences have sought out to *order* (Law, 1992) nature for the sake of 'human society'. Following these observations, this dissertation will show how the objects of 'nature' with which the campaign to face 'climate change' is concerned with, are not self-evident objects that pre-exist the different policies, devices and calculative practices developed to render them orderable.
Therefore, instead of focusing on the *material* –i.e. chemical, physical or climatological– properties of Greenhouse gases (GHG), this dissertation focuses on how the highly abstract entity simply known as 'carbon' is 'socially' collected, measured, accounted, displaced and (re)circulated by Costa Rica's 'green technocracy'; and how these practices enable a process of *neoliberalism* (understood as a socio-technical *governmentality*) which is performatively assembled and *black-boxed* as the 'logical solution' to a series of longstanding 'development' problems embedded in the requirements of capitalist value (Lansing, 2011).

This study will show how 'experts' actively *purify* their calculations in order to reduce 'unnecessary complications' for political decision-making agents, as well as for the community of specialized 'experts' itself. Therefore, for

emergent scientific statements to appear as indisputable 'facts', there is a need to actively produce *trust* in the 'objectivity' of numbers and the 'unbendable' character of mathematic calculations. However, this dissertation will show how the contingent, fragmentary and biased nature of carbon calculations requires high degrees of improvisation, selective blindsight, deliberate discrimination and guesswork from both 'expert' practitioners and their technological devices, and from final political decision-makers, particularly when dealing with highly abstract invisible entities such as carbon emissions and carbon offsets.

I will also show how different calculations will result in the emergence of different entities, and how both entities and calculations are co-emergent effects of specific socio-technical performances. Consequently, I will show how there is no such thing as one universal method to determine whenever a country is or is not 'carbon neutral', just like the idea of a singular conceptual definition of 'carbon neutrality' is an impossible one. As I will show, the determination of whether a country is or is not 'carbon neutral' is not a matter of unveiling the 'truth' through unquestionable scientific 'proof', but instead a matter of methodological and conceptual choice. A choice very much determined by subjective and political motivations. Therefore, I argue that the calculations to determine 'carbon neutrality', and the latter's exact conceptual definition are best understood as *fluid objects* which are performatively brought into existence as "something that *both changes and stays the same*" (Law & Singleton, 2005, p. 338. Original emphasis). In the following, I will show that in the process of assembling and calculating 'carbon', the

material properties of GHG emissions, carbon offsets, or carbon markets 'are not enough'. Instead, I will show that what counts are, on the one hand, the inscriptions that register, displace and tell the story about 'carbon neutrality'; and on the other hand, the contingent socio-technical practices that enable carbon to emerge into 'social', 'economic' and 'political' realities.

In spite of the name 'carbon markets', I will set forth that it is not 'carbon' that is exchanged in these markets, but rather the absence of 'carbon'. Therefore, this dissertation sheds new light on the socio-technical process through which the *inexistence* of an invisible 'gas' is transformed into a measurable, tradable, storable and circulatable currency. As a result I contend that following the performative processes in which 'nature' is reduced to 'carbon' will only allow us to arrive to half of the understanding of how carbon markets operate since the commodity exchanged in carbon markets is not any particular material good (i.e. cubic tons of oxygen), nor simply 'rights to pollute'; but instead the *absence* of another material entity (i.e. carbon). Therefore, I propose understanding carbon offsets as imagined *void*-like entities capable of 'erasing' the *materiality* (Law, 2007) of another gas in an 'equivalent proportion'.

In order for *offset-as-a-void* to exist, three key assumptions must be stabilized and put to work. First, that different gases can be 'made the same' (MacKenzie, 2009) through socio-technical practices of calculations. Second, that 'offsets' can be brought into existence through carbon-offsetting actions (i.e. forestry projects); and third that these *void*-like entities come into existence 'at the expense' of other material entities, particularly GHG emissions.

Therefore, I argue that an *offset-as-a-void* brings into being a patterned *order* of interwoven *absence* and *presence* which cannot conceivably exist if all of its (non)materiality is brought together in a single space and time.

Similarly, in the first chapter of this dissertation will also show how the carbon-equivalent emissions[1] –more commonly known only as 'carbon emissions'– that the imagined *offsets-as-voids* are supposed to 'erase' are themselves politically assembled entities that equally rely on performative heterogeneous processes of patterned *absence*-and-*presence* (or inclusions-and-exclusions) – processes that simultaneously lead to the establishment of an empirically contingent categorical *order* of *socially valuated* objects, which are themselves ontologically *multiple*, *precarious* and *fluid*.

Materially speaking, I argue that both 'carbon emissions' and carbon 'offsets' or 'credits' are in fact nothing more (or less) than numbers on computer screens or printed spreadsheets in carbon accounting devices and reports. In other words, neither 'carbon emissions' nor 'carbon offsets' are things literally and figuratively floating 'out there' in the atmosphere, nor things that occupy Euclidean space; instead they are things that come into existence through the mediation of a heterogeneous network of

[1] It should be noted that in this dissertation I draw a difference between carbon –equivalent– emissions and GHG. Briefly, while GHG are physical entities that absorb and reflect radiant thermal energy, 'carbon (equivalent) emissions' are the result of a series of socio-technical calculations intended to 'flatten' the former entities into an imagined, orderable and comparable *normalized* gas.

socio-technical devices, numbers and 'expert' knowledge. In spite of that, these numbers and calculations indeed have concrete impacts over the actual materiality of Costa Rican forests (such as the incentive to limit forest plantations to certain tree species capable of offsetting larger quantities of GHG emissions, etc.). Impacts that are arguably stronger than those that any of the material attributes of GHG may have.

Considering all the above, I will show how Costa Rica's carbon calculations must irremediably be understood as intrinsically political processes from which inherently political material entities emerge. Since such calculations start with the process of separating things or states of the world into qualitative categories, and by imagining courses of action associated with those newly classified things. As a result, carbon calculations can no longer be assumed as processes exclusively populated by 'neatly' arranged numbers and/or by an unbendable techno-scientific ethos, but instead, I argue that the emergent accounts of GHG emissions themselves result and temporarily 'hold together' through performative process of *qualculation*[2] and not simply 'calculations'.

The categories and classifications employed to separate things into qualitative taxonomies are neither limited to

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[2] According Callon and Muniesa (2005), *qualculations* are intermediate situations between judgements and calculations. They are material practices that are simultaneously qualitative and quantitative.

simply recording a reality 'out there', nor are they constructed in a political vacuum. Instead, I show how the process of assembling systems of classifications involves a series of politically biased negotiations where decisions over the enactment of delineations take place. Namely, deciding what will emerge as visible (and what will submerge into invisibility), the overall level of 'detail' of the newly emerged visible reality, and 'what things go where' are all subject to compromises, judgments and deliberations.

Drawing on governmentality studies, I discuss how the 'non-binding' or 'voluntary' character that characterizes Costa Rica's policies and programs mobilized to *order* carbon and 'climate change' heavily relies on the creation or improvement of accounting practices and devices. These technologies of accounting are intended to extend *action at a distance* (Latour, 1987) and allow for new spaces of control without the need for direct interventions from any authoritarian entity. Hence, I argue that Costa Rica's 'carbon neutral' actor-network performatively depicts climate change as a problem that is on the one hand technically and technologically amenable through abstract calculative spaces; while on the other hand, a problem that requires a change of behavior through *technologies of government* (Miller & Rose, 1990) capable of translating the subject's 'self-interests' into a certain domain of reality aligned with the *political rationalities* of the state in a way that subjects become self-regulating individuals capable of acting as agents of government. Moreover, the use of this particular body of theory will also allow me to discuss how several coexisting forms of environmental *governmentality* are performed simultaneously as Costa Rica's general

environmental governance, and as the nation's attempt to reach 'carbon neutrality' in particular. Here, I will argue that the different forms of *governmentality* target different socio-material actors, use different methods of *translation* and serve different, and sometimes competing, purposes.

I will argue that in moving from a protectionist and 'state-centered' top-down conservation model to a more self-regulating market-oriented 'neoliberal' one, the Costa Rican state has found a viable mechanism to transfer what is perhaps the largest share of responsibility –and at least a great share of the economic burden– of reducing the country's GHG emissions to the private sector. Henceforth, I contend that these new institutional forms of governance-beyond-the-state set in motion a process of *externalization of state functions* rooted in a neoliberal governmental rationality. This rationality, I argue, allows the Costa Rican state to not only justify its own inaction towards reducing its GHG emissions, but to also benefit from the provision of the demand and the supply sides of the national carbon market.

Moreover, in examining this transition from a 'state-centered' conservation model (focused on the conservation of biodiversity) to a 'neoliberal' one (advocated to face climate change), I will show how the preservation of flora and fauna has been downgraded from a worthy conservation goal on its own right, to a secondary one. Here I will also show how the state has also contributed to the current depiction of existing protected forests (mainly under the state-centered 'fortress conservation' model) as being 'useless' in the mitigation of global carbon emissions; and how this transition is not limited to a simple 'rhetoric'

shift, but instead means the performative reconstruction of 'nature' in a *material* sense.

In spite of the latter process of 'downplaying' non-anthropogenic forests, in the third chapter of this dissertation I will discuss how Costa Rica is currently investing a great deal of effort in supporting the development of market-based mechanisms that would allow it to 'cash-in' on its early environmental actions assembled precisely as command-and-control implementations during the country's earlier welfare-state era. In light of the refusal of the United Nations Framework Convention on Climate Change (UNFCCC) to accept non-anthropogenic forests as viable source of carbon offsets, and considering that the vast majority of the country's carbon credits are currently produced in such forests, this move is strategic for ensuring the future of Costa Rica's carbon neutral actor-network.

Furthermore, I will argue that the 'anthropogenic' introduced above is a fundamental component of the ontological construction of the 'problem' of climate change, and at the same time of its 'solution'. Here I argue that the latter widespread and largely *black-boxed* insistence on the 'man-made' component to 'climate change' has further accentuated the modernist belief that 'human' entities are ontologically *other* to 'nature'. Moreover, I argue that this ontological polarization has actively undermined the *agency* of 'non-human' entities by performatively reducing them to a passive, mute and 'helpless' community of 'natural recourses' waiting to be *ordered* by the modern science and technology of 'human kind'.

This dissertation will explore the role of the Intergovernmental Panel on Climate Change (IPCC) as a 'global' *parliament of specialists* capable of ordering the performative assemblage of 'local' carbon calculations through their taken-for-granted authority and their *black-boxed* calculative devices –which are in turn believed to be a matter of 'pure' techno-scientific practices 'uncontaminated' from any political or economic entanglements. In this discussion, I claim that the emergence of the IPCC as allegedly *autonomous expert communities* is part of a reorganization process of neoliberal governance, where national states increasingly delegate or *up-scale* their environmental governance tasks to such transnational entities. However, I also discuss how *up-scaling* environmental governance is not limited to transnational organizations controlling the local action performed by national states. Instead, I will show how the mobilization of 'standards' and *technologies of government* like the 'C-Neutral' certification program and the voluntary GHG emission inventories allow governmental agencies to exercise oversight over the private sector without the need to deploy any direct regulatory control.

I contend that the different policies and devices intended to govern Costa Rica's carbon emissions enact climate change as a reality that must be primarily ordered for the sake of the nation's 'economic' development. Depicting climate change this way is consequent with the overreaching paradigm of sustainable development in which 'nature' is reduced to 'natural resources' (such as timber, trees-as-carbon-sinks, etc.) so that the 'economic development' –and not 'society' or 'nature'– can be sustained. Hence, I on the one hand maintain that the *value*

of the emergent 'resources' is not found in the things themselves, but rather in a reductively understood notion of their *usefulness* (Lansing, 2010); while on the other that the value of things does not naturally pre-exist the economic practices of calculations mobilized to render them *orderable*.

In the second chapter of this dissertation I will take a look into the two different embodiments of Costa Rica's 'carbon markets' –a ongoing 'pre-operative' one, and an expected 'future' one– and show how neoliberal market-based and state-centered command-and-control implementations and mechanisms in environmental governance are performatively morphed and hybridized in practice. Hence, I contend that the fact that both embodiments of the country's carbon markets have developed into 'imperfect' exemplars of neoliberal markets should not be seen as a 'market flaw'. Instead, I argue that this 'hybridity' has in fact provided the 'pre-operative' market the ability to operate through apparently impenetrable dissidence, and to constantly adapt and transform itself however it may be fit; while the accumulated experience *in vivo* (Callon, 2009) of the latter market has provided the Costa Rican 'green technocracy' with an insight that embraces –rather than rejects– heterogeneity and multiplicity via a mutable, adaptable and permeable 'hybrid' configuration. In a more theoretical sense, I argue that carbon markets can be understood as *messy objects* (Law & Singleton, 2005) in that they refuse neatly delineated categorizations, and in that they cannot be ruled out by prior methodological commitments to particular and limited versions of clarity. Instead, Costa Rica's *messy* carbon markets are interpretatively complex

objects that mean different things to different people, and at the same time *multiple objects* enacted into reality in numerous –and often conflicting– simultaneous ways.

This dissertation contributes to the growing field of studies on carbon exchange markets by offering an additional concept to this field that has not previously been coined. More precisely, I offer the notion of ***Offset Leakages*** to refer to the units of carbon offsets (or carbon) *sold* or *bought* outside of the national boundaries of the country of interest. Hence, I argue that there are two types of such leakages: carbon offsets *bought* by local organizations to providers located outside of the national territory and carbon offsets *sold* by local organizations to buyers located outside of the national territory. Both types of *Offset Leakages* challenge national states in that they refuse to be enrolled in the latter's own GHG accounting systems. In this discussion I will argue that the country's intention to contain the proliferation of both types of *Offset Leakages* is directed to not only ensure the liquidity of the country's domestic carbon market –and consequently the survival of the forestry sector which supplies the market–; but will also avoid the outflow of offsets which could potentially undermine Costa Rica's chances of reaching its '2021 goal', and its post-COP21 commitments.

In the following two subsections of this introduction, I will attempt to outline some general theoretical and methodological considerations surrounding the analytical framework of the present dissertation. Although I believe that the following research chapters themselves can show these aspects at hand more clearly, it is perhaps prudent to

expose the main conceptual and empirical sensitivities conveyed in this study at the very outset of this document. In the third and last subsection of this introduction a chapter outline of the dissertation will be presented which intends to explain the splitting of the empirical work into three themes following the overall argumentative strategy. It should be noted, however, that this division does not attempt to distribute the content extension of the research into neatly balanced compartments.

1.1 Theoretical approach

As was introduced above, the study immerses in the use of ANT in order to introduce new analytical resources that would allow the reconceptualization of the largely *black-boxed* interrelation between the social, political, economic and material implications of the performative processes of construction of 'carbon'. This contribution involves rethinking the ontological and epistemological grounds over which climate change is believed to be a technically and technologically *orderable* issue by an imagined community of autonomous techno-scientific 'experts'. Hence, this implies placing the imagined relationship between 'nature' and 'society', and consequently between 'techno-sciences' and 'politics' under scrutiny.

Even though I could certainly elaborate an argument of why I have chosen to use ANT as the theoretical backbone of the present dissertation, I doubt I could elaborate one as 'spot on' as Yvonne Rydin's own argument about the potential of using ANT in understanding planning for low-carbon development. She contends:

> ANT seems ideally suited to understand a world in which technological systems and environmental change are major preoccupations. With its emphasis on the lack of any boundary between society and technology or between the social and the natural worlds, it has the potential to deliver a theory appropriate for contemporary planning practice for sustainability. It can offer an analytic edge over existing planning theories that only engage with the material and natural world through the values and communicative action of social actors.
>
> (Rydin, 2012, p. 24).

Although the precise matter that concerns this dissertation is different from the one Rydin engages with in this particular paper, I believe that the above statement fully applies to the potential of ANT in exploring the performative socio-technical processes of construction, negotiation and *black-boxing* of 'nature' derived from the politically contingent practices of carbon 'experts'. Consequently, all distinctions between ontological categories will not only be empirically ignored in this dissertation but will be open to close scrutiny. In this respect, John Law (2007) argued that ANT assumes that nothing has reality or form outside of the relations enacted in empirically grounded practices. Thus, this theory-method "[l]ike other material-semiotic approaches, the actor-network approach thus describes the enactment of materially and discursively heterogeneous relations that produce and reshuffle all kinds of actors including objects,

subjects, human beings, machines, animals, 'nature', ideas, organizations, inequalities, scale and sizes, and geographical arrangements" (p. 2).

On the other hand, what Bruno Latour identified as the difficulty of grasping ANT, is in my opinion actually one of its potentials. Latour (2017) argues that this approach has been made by the fusion of three hitherto unrelated strands of preoccupations: "a semiotic definition of entity building; a methodological framework to record the heterogeneity of such a building; [and] an ontological claim on the "networky" character of actants themselves" (p. 1463). Additionally, Latour continues arguing that the potential limits of these three previously unrelated features can only be solved when they are fused together into an integrated practice of study. This dissertation precisely intends to respond to such challenge.

All things considered, this research departs from the ontological conviction that there is no such thing as a singular 'natural' world 'out there' that stands opposed to another 'social' one. Instead, I depart from the belief that *multiple* 'eco-socio-technical' hybrids are simultaneously enacted into being and are literally confronted against one another day in and out. Moreover, since these multiple socio-natural hybrids are biased, performative constructions that depend on the specific practices of *calculations* enacted by any given actor-network, they are always *fluid* and necessarily *imagined*; yet with very real material effects on the ground.

Regardless of the many and diverse analytical opportunities found in ANT, the conceptual stands of this

theory/methodology will be complimented with some key conceptual and analytical devices of governmentality studies as a means to provide a more heterogeneous and thus richer landscape of critical perspectives towards the complex issues here examined. More precisely, the discussions developed throughout this dissertation will draw on a selection of previous academic works that understand 'neoliberalism' as Foucauldian *governmentality*. One of the main differences between this perspective and others instead embedded in structuralism –mainly based on Marxism– lays in the understanding of 'power' and 'knowledge'. To be more precise, Marxian structuralism is based on the understanding of "*power* as a resource a ruling class possesses and of *knowledge* as an ideological construct that needs to be unveiled" (Farías, 2011, pg. 365. My emphasis). These two understandings necessarily rely on theories and plots about hidden structures, intentions, repressions and oppressions. On the contrary, Foucauldian *governmentality* –just like ANT–, does not presume the existence of any overreaching structure capable of determining the action of any given actor or the emergence of any particular reality. On the contrary, this approach understands *power* as a complex, yet precarious ensemble of *knowledge* productions based on locally and performatively produced discourses, materials, technologies, and calculations. This ensemble then allows the enactment of a particular mentality of rule that constantly (re)assembles entities, socially constructed realities (or forms of *knowledge*) through a certain taken-for-granted 'commonsense'. According to Ignacio Farías (2011) then, Foucauldian work "proceeds by means of positive descriptions of the enunciates and assemblages mobilized to sustain historical power/ knowledge regimes" (p. 367); hence does not offer

'ready-made' explanations to locally emergent controversies.

The purpose behind using the selected critical perspectives of this alternative theory is to provide but one possible reading of the political agencies behind the environmental discourses and practices that constitute Costa Rica's carbon-neutral actor-network. Put differently, the researcher believes that using selected concepts of governmentality studies would allow to discuss (at least) a part of the findings derived from the more *material-semiotic* analysis through different critical lenses which instead focus on the distribution and stabilization of 'power' within the formation, association and active performances of the studied actor-network; particularly by looking into the *technologies* and *rationalities* that allow the de-centering of government through the active role of self-regulated individuals facilitating a *government at a distance*.

Moreover, the introduction of this second theoretical apparatus provides a particular reading of the issues introduced with ANT which is ultimately intended to reduce the risk of producing an analysis that uni-directionally applies pre-established categories –from a single theory– on empirical data. This theoretical and methodological heterogeneity has been implemented to counterbalance the particular 'weaknesses' found in each analytical device, while adding overall depth to the analysis. Likewise, it may ultimately lead to a rich discussion on not only the specific topics and controversies examined, but likewise on the overall theoretical and methodological framework of the study itself.

This dissertation will be framed as a *Multi Perspective Triangulation* research (Flick, 1992) as it will engage in the active use of multiple theoretical devices –ANT, governmentality studies and others–; multiple methodologies –again ANT, (anthropological) document analysis, and reconstructive methods (interviews)–; and finally, multiple sorts of data –interviews, official policy documents, existing academic research, available online material, etc.–.

The purpose of using triangulation here is not to increase the 'validity' of the research nor to ensure the project with a sort of 'uncontaminated objective purity' that would result from the use of different methodological devices as a way to make up for each other's 'weaknesses'. Hence, triangulation must not be understood here in its positivistic sense as a method that "assumes a single fixed reality that can be known objectively through the use of multiple methods of social research" (Seale, 1999, p. 473). Instead, the use of triangulation in this project is to enrich the scope of perspectives in which the issues are to be addressed in a theoretical sense and to add depth to the analysis of those issues in a methodological sense. As Nigel and Jane Fielding (1986) put it: "Theoretical triangulation does not necessarily reduce bias, nor does methodological triangulation necessarily increase validity. Theories are generally the product of quite different traditions so when they are combined, one might get a fuller picture, but not a more 'objective' one" (p. 33). Hence, these authors argue that because different methods derive from different theoretical traditions, combining them can add range and depth to the research, and not the much pursued 'accuracy' of positivism. In sum, the purpose of triangulation in the

present dissertation is not to seek congruent research results, but on the contrary to welcome the complementarity of distinct perspectives.

It should be noted however that the use of triangulation does not mean just throwing together any theoretical or methodological devices for the sake of complementarity. Instead, the power of triangulation lies on a more 'strategic' assemblage between two or more devices which add their own 'strengths' to the analysis, and through which each device complements in a way the 'shortcomings' or 'limits' of the other. Here, Field and Field (1986) recommend choosing at least one method specifically suited to explore the structural aspects of the research problem, and at least one other method capable of capturing the essential elements of meaning to those involved (p. 34). Therefore, Uwe Flick (1992) suggests that the 'strengths' mentioned above should ensure the research with at least one method to provide for *description and interpretation of the contexts* in which the interaction between actors occur within and throughout networks, and at least another to *illuminate the process of interaction* itself.

Thus, and in spite of not doing full justice to either of the theoretical and methodological devices used in this dissertation, I will use ANT as the analytical device to *illuminate the process of interaction* between the heterogeneous actors that assemble Costa Rica's carbon-neutral actor-network; and governmentality studies as the device to *describe and interpret* the multiple contexts in which these performative 'socio-technical' interactions take place.

1.2. Methodological approach

The present dissertation largely engages in the analysis of a wide variety of documents ranging from official policy documents, officially issued procedure manuals, legal documents, official communications and reports, to websites of state entities and other relevant actors. However, and because this research primarily draws on the analytical sensitivities of ANT, the particular approach to document analysis followed in this dissertation differs from the positivistic approach commonly associated with such type of analysis. Henceforth, in this subsection I will briefly introduce a more *material-semiotic* approach to document analysis by drawing primarily on the works of Chris Shore and Susan Wright (2011), and Mathew Hull (2012) which concur in recognizing documents as active agents in the construction of new emergent realities, and not simply passive 'representations' of technocratic discourses and practices.

Shore & Wright (2011) argue that the field of anthropology opens up new perspectives on the study of policy. To sustain this, these authors review how in its typical version, anthropology has historically failed to study policies due to several types of shortsightedness of the field itself, such as being human centered; being eminently positivistic by presuming the existence of a structural order to reality; and by treating policy analysis as a quasi-scientific activity. These authors argue that the interpretative paradigm to anthropology may offer several advantages to the analysis of policy documents such as the ability to observe policies as actants with agency rather than simply manipulable tools or objects. Hence, they argue that documents may instead

be seen as productive, performative and continuously contested entities. The authors argue that policies are productive, performative, precarious and incomplete entities that *create* new (emergent) social realities and entities. Moreover, they argue that **"**[a] policy finds expression through sequences of events; it creates new social and semantic spaces, new sets of relations, new political subjects and new webs of meaning" (p. 1). Similarly, Hull contends that documents are not simply instruments of bureaucratic organizations, but rather are constitutive of bureaucratic rules, knowledge, practices, objects, outcomes, and even the very organizations that mobilize them. What is more, Hull (2012) argues that the "[a] methodological focus on documents (rather than sociologically defined organizations) helps us ethnographically address a classic problem in social theory, how to characterize the boundaries of organizations" (p. 258). In other words, focusing on the policy documents rather than on the bureaucracies that produce them may help us see through and beyond formal institutional boundaries.

Shore and Wright argue that focusing on policies may allow us to understand how systems of governance come into existence simultaneously with the construction of subjects as objects of power (2011, p. 20). As this dissertation will show, carbon emissions and carbon offsets do not preexist the processes of calculation and ordering prescribed in the various policy devices analyzed in this study. Instead, these gases are part of the wide variety of effects derived from a series of heterogeneous socio-technical performances from which policies, 'experts' and 'scientific facts' also (co)emerge.

However, as this research will also show, the enacting of a certain reality into being is only possible at the expense of enacting 'other' alternative realities. In this respect, Shore and Wright argue that the establishment of a policy "[…] is one moment in a process of appropriation and contestation when a political coalition succeeds in silencing others, making their version authoritative and embedding it in the precepts and procedures of the state" (2011, p. 13). Hence, bureaucratic documents should no longer be understood either as abstract 'semiotic constructions' detached from emergent material realities; nor simply as 'texts' abstracted or abstractable from their own material vehicles (Hull, 2012, p. 253). What is more, this author argues against what he considers a prevailing 'invisibility' of documents that entails that researchers continue to look *through* documents rather than *at* them. In this respect, the present dissertation directs its attention towards the very documents that actively participate in the process of construction of new emergent realities in all their intermingled material, semantic and pragmatic dimensions. Scrutinizing the material qualities and the socio-technical processes of production and circulation of documents therefore allows researchers to explore the role and agency of documents without misrecognizing them as inherently powerful 'fetishes' or objects (Hull, 2012, p. 254).

Shore and Wright (2011) contend that the challenge for researchers is to find a small site that opens a 'window' through which larger, and more complex processes of political transformation can be observed. Doing so, they argue, would allow the observer to follow the connections, associations, and putative relationships between the networking actants involved in a particular controversy (p.

12). This analytical vantage point is possible in light of the role of policies as a fundamental 'organizational principal' of society which "provides a way of conceptualising and symbolising social relations, and around which people live their lives and structure their realities" (p. 2).

Hull (2012) identifies two broad capacities of documents which he calls the 'coordination and control' and the 'constructive' capacities. The first capacity establishes that bureaucratic administrations are capable of controlling subjects through technocratic knowledge which is materialized in bureaucratic documents which act as instruments of control and coordination. Here "[w]riting establishes the stable relation between words and things necessary for bureaucracies effectively to implement regimes of control" (p. 256). The second capacity of documents is their ability to make things come into being; or to *construct* subjects, objects and socialities. Here the author argues that documents act as mediators between schemes of classification and the emergent things being controlled (p. 259). Much like uniforms, cars, official buildings etc., documents are a form of 'material culture' which is central to how the state comes to be enacted by the population (p. 260); thereby documents actively determine how political power is imagined, negotiated, stabilized and *black-boxed*.

Sebastian Ureta (2014) synthesized 5 conceptual and methodological contributions that a *policy assemblage* perspective could provide to the analysis of public policies which I essentially paraphrase as follows:

-Policies as emergent: They are not fully formed things 'out there'; there are no guiding principles that remain stable all the time.

-Policies as multiple: They exist in multiple versions at the same time.

-**Policies are highly distributed and nonlinear:** They move all the time, passing from government offices or from focus groups to the streets of the city. Their temporal development is not linear but constantly looping. Meaning that as new issues appear, the whole process of negotiation, construction and stabilization starts all over again.

-**Policies do not end with the ribbon-cutting:** They are continually reenacted, changing their outcome in accordance with the presence/absence of certain devices in the assemblage. Hence, they are never absent from the controversies and overflows in which the assemblage is continually reenacted with ever-changing results, resulting in ever new loopings.

-A methodological focus on concrete practices: It is in these very concrete practices, and not in the discourses of powerful actors or the official guidelines set by public offices, that the different configurations of a policy assemblage emerge.

(Ureta, 2014, pp. 13-14)

Finally, Shore and Wright state that "[p]olicies are not simply 'transferred', they are reinterpreted as they travel

across cultural boundaries. This is rarely a neatly rational or coherent process and the effects are unpredictable, as policies tend to have 'social lives' that outlive their authors" (2011, p. 20). While this means that documents cannot be understood as the *immutable mobiles* described in classic ANT because they are constantly *transformed* as they circulate and are interpreted time and again; I would add that documents should be considered for their ontological *multiplicity* which well transcends their epistemological *fluidity*. More precisely, while documents can indeed be seen as *boundary objects* –as they are interpreted differently by say different technocrat 'experts' time and again–, documents can be thought about as multiple objects enacted into being in the practices of getting to know such emergent new realities (Law & Singleton, 2005, p. 334). Therefore, the present dissertation will combine the analysis of documents with on-site interviews with the very actors who, alongside the analyzed policy documents, manuals, legal documents, etc., construct new socio-technical realities into being.

During March through April 2016, and again in February 2017, a total of 24 in-depth semi-structured qualitative interviews were carried out by myself with a mixed group of strategic actors involved one way or another with what I identified in that time to be Costa Rica's two leading 'green' actor networks. These where what I called the 'carbon-neutral' –on which this dissertation focuses on– and the 'eco-tourism' actor-network –which, after a long and complex process of analytical contemplation was 'dropped' from further analysis for several reasons which escape the interest of what turned out to become the present research–.

These interviews with an average duration of one hour, where all recorded on digital audio files and later transcribed into digital text documents by myself. All the interviews –and consequently their verbatim transcriptions– where originally produced in Spanish; while only the extracts shown in this dissertation where carefully translated into English by myself and proofread by a professional translator. Finally, it is worthwhile mentioning that the interviews were carried out in a semi-structured matter where the interviewer (myself) identified a series of 'topics of interest' rather than strict direct questions to address in the interviews. These topics where allowed to flow somewhat freely as the subject discussed and interconnected ideas and topics at will. This does not mean that direct questions were not posed, but rather that they were only sporadically posed in order to guide the subjects back to the topics of interest whenever necessary.

In sum, the empirical material on which I am drawing in this dissertation consists of well over 20 different policy documents (official reports, manuals, norms, legal documents etc.), plus a set of 15 interviews conducted with people involved with either Costa Rica's 'C-Neutral' certification program, its carbon exchange markets or on the country's carbon accountability systems and inventories. Finally, this material is supplemented by analysis of dozens of relevant academic papers, chapters and essays on the different issues mentioned above.

1.3. Chapter scheme.

In this introduction, I have linked all the different arguments I have coined throughout this research which all fall under a common problematic, and which combined construct the hermeneutic argumentative thread of this dissertation. As can be seen, I have used different theoretical concepts to analyze the performative process of re-construction of 'nature' as 'carbon' through a series of contingent socio-technical practices of calculation as performed by a wide range of heterogeneous materials and entities including Costa Rica's 'green technocracy', forests, policies, imaginations etc.

In spite of having split the 'argumentative thread' of this dissertation from the comments on the theoretical' and 'methodological' approaches of the study that followed, the remaining chapters of this dissertation iteratively combine theory-data-method in order to avoid a disjoint appreciation of not only the issues at hand, but of the very analytical tools mobilized in this study. This is particularly true for ANT which Law (2007) describes as a "disparate family of material-semiotic *tools, sensibilities* and *methods of analysis* that treat everything in the social and natural worlds as a continuously generated effect of the webs of relations within which they are located" (p. 2. My emphasis). In other words, ANT is not so much an 'abstract theory', but an empirically grounded case-study *method* which facilitates conceptual theoretical stands to simultaneously co-emerge *a posteriori*.

This dissertation will close with a **conclusion** which, rather than summarizing the findings of the study or

condensing a grand argumentative statement –which instead can be found in the opening paragraphs of this introduction–, intends to provide the study with a closing speculative reflection where specific questions and challenges are raised over three different aspects:

a) The dissertation's contribution to the field of urban design and planning
b) The study's contribution to the development of environmental governance policies
c) Some potential aspects worthwhile exploring further in follow-up research, perhaps even at a post-doctoral level.

Additional to this conclusion, this dissertation will be organized around three main chapters as visualized in the following figure:

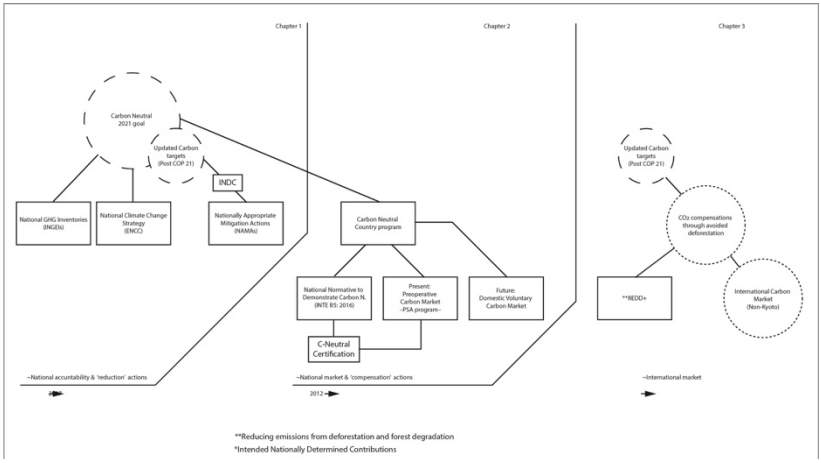

Figure 1: Dissertation's chapter scheme

As 'Figure 1' shows, each of these three chapters focuses on analyzing different *moments* of Costa Rica's carbon neutral actor-network, which are each embodied in a series of policy devices and documents –represented in rectangles– which each specific chapter sets out to analytically review.

Although in reality these three *moments* are inseparable, intertwined, fluid and perhaps most importantly imagined –by the researcher–, they have been separated by three somewhat coinciding chronological/thematic borders that have allowed me to define three reasonably recognizable chapters:

Chapter 1. Starts by laying out the basic foundations over which the entire 'carbon neutral actor-network' has been assembled. This general framework introduces the general vision behind Costa Rica's initiative to impose itself the target of becoming the world's first carbon-neutral country by 2021 as well as several other closely related targets that largely emerged from the COP21 conference in Paris 2015. Besides introducing that framework, this chapter focuses on reviewing a series of 'state-led' actions directed to so to speak 'set the house in order' in terms of establishing actions to both 'account' national GHG emissions, and to 'reduce' these emissions in the different productive sectors of the country. Hence, this first chapter analyzes a series of policy devices coined in the first decade of the 2000s which favored direct state control over the country's population via a series of *technologies of government* intended to *align* the latter's 'self-interests' with the *political rationalities* of the state. Additionally, this first chapter introduces the process of

construction of 'carbon' through a series of calculation practices performed by Costa Rica's 'green technocracy' through which some gases emerge as 'environmentally hazardous' –and hence become relevant *issues* to contain–, while others emerge either as 'harmless' or 'irreprehensible' emissions which are eventually withdrawn from any further techno-scientific calculation and thus political consideration.

Chapter 2. Unlike the straighter forward, state-centered implementations reviewed in the opening chapter of this dissertation, the second chapter focuses on a series of market-centered implementations devised as the very core of the country's carbon neutral actor-network. Likewise, while the first chapter introduces the different actions directed to 'reduce' the country's carbon emissions, the second chapter concentrates on analyzing a series of mechanisms devised to 'compensate' the surplus carbon emissions that the former reduction actions could not govern. The market-centered 'compensation' actions analyzed in this second chapter where developed in the second decade of the 2000s after the proclamation of Costa Rica's 'Carbon Neutral Country Program' that defined the legal procedures by which private organizations may be granted the 'C-Neutral' voluntary certification after submitting to an emissions assessment based a national standard stipulated for such purpose. The second chapter will also review two different embodiments of Costa Rica's 'carbon markets' where the first –and currently only operational one– has been supplying 'carbon credits' to the organizations enrolled in the 'C-Neutral' program since that certification was launched; while the second has been envisioned as a 'refined' version of the

current market –incorporating market safeguards, new specialized institutional frameworks, etc.– which is expected to take its place in a nearby future.

This chapter will show how through the 'C-Neutral' certification program, and through the two embodiments of the country's carbon markets, the Costa Rican state has found a viable mechanism to transfer what is perhaps the largest share of responsibility of reaching its self-appointed goal to become a 'carbon neutral' nation in 2021 to the country's private sector.

Finally, this chapter deepens further in the ontological process of construction of 'carbon' introduced in the previous chapter by focusing on how 'carbon offsets' emerge as imagined *void-like* entities capable of 'erasing' the materiality of 'carbon emissions' in equivalent proportions by bringing into being a patterned *order* of interwoven *absence* and *presence.*

Chapter 3. The third, last and by far shortest chapter of this dissertation will focus on discussing Costa Rica's interest in the further development and formalization of the REDD+ initiative which would allow 'forest preservation' to qualify as a viable source of carbon offsets under the UNFCCC authority, and hence as an eligible activity for CDM project status.

This chapter will discuss how Costa Rica's current market-based environmental governance mechanisms in general, and the REDD+ initiative in particular, are presently being oriented towards 'cashing-in' on the country's early environmental actions assembled during the country's

earlier interventionist-state era, and through command-and-control implementations. Additionally, it will be discussed how the REDD+ initiative is seen as an opportunity for the Costa Rican state to enroll the country's large extensions of 'non-anthropogenic' forests in formal international carbon-markets while simultaneously still supplying the domestic carbon-market –reviewed in chapter 2– with non-Kyoto carbon offsets. As the discussions will show however, this new prospective market is not exempted from controversy. Instead, in light of the country's self-appointed goal to become the world's 'carbon neutral' nation by 2021, the chapter identifies a dilemma that Costa Rica must soon face in regard to whether to 'keep' its offsets and make that deadline, or 'sell' its offsets internationally and make a profit. This discussion will simultaneously provide a final layer in the ongoing discussion pertaining the ontological process of re-construction of 'nature' as 'carbon' –and 'carbon offsets'– which will consequently allow me to introduce a new ontological category that I have named *offset leakages*, which have been enacted in Costa Rica's 'carbon-neutral' *actor-network* in two different ways.

1.4. Reading code

In order to ensure a more fluid and comprehensible flow in the following discussions and reviews, I will use 'single quotation marks' to mark complex ideas that are often taken-for-granted in our modernist understanding of the world. Since attempting to leave out such modernist roots would probably lead to having to use a different code of communication altogether, the present paper will make use

of the mentioned resource simply in attempts to enrich the discussion. Similarly, the use of *italics* is employed much in the same way, yet this time to mark complex concepts derived from the different theoretical and methodological devices used in the present work such as those drawn from ANT and governmentality studies.

Furthermore, the dissertation will implement a color code intended to assist the reader's 'navigation' through the different sections of the study. Text in **black** fonts is used to **describe** the data set –policy devices, references to existing local research, empirical work, etc.– consulted in each section in a more straightforward or glaring manner. Text in **blue** fonts is used to **discuss** the data set from a more theoretical-analytical position. These discussions are in no way 'detached' from the more descriptive reviews mentioned above. On the contrary, they are to be understood as a continuous reflective dialog with the more empirical and descriptive work. Text in **green** fonts and inside dashed-lined boxes is used in a series of **simplified summaries** at the end of each of the larger theoretical discussions where the different theoretical arguments and findings are described in the most simplified language and fashion as possible. Finally, text inside solid-line boxes contain selected extractions of particular on-site interviews carried out during the empirical phases of the study.

The use of this overall reading system intends to break an unwanted compartmentation of sections which would typically split raw empirical descriptions and observations from a rigid 'theoretical' or 'conceptual framework'. Instead, this three-color code intends to engage the reader in a non-linear iterative exploration of this dissertation.

–Chapter 1–

Neutralizing Carbon in Costa Rica

Introduction

In 2007, Costa Rica announced its intention to become the world's first 'carbon neutral' country. This goal was to be achieved by the year 2021, through reaching its own reported emission levels for the year 2005 again in 2021. In order to do so, the Costa Rican state decided that the country should gradually reduce its emission levels through a series of 'mitigation' and 'adaptation' mechanisms consolidated in a group of strategical policies for such end.

Briefly, the policies developed to meet the carbon neutral goal for the year 2021 (which I will from here on forward refer to simply as the '2021 goal') pivoted around a central one –the **National Climate Change Strategy**– which was meant to coordinate all other specific efforts that would together constitute the country's grand action plan for facing climate change and for becoming a 'carbon neutral' nation.

The first part of this opening chapter will focus on reviewing that pivotal strategy in order to show how the Costa Rican 'carbon neutral actor-network' depicts the 'climate change' it sets out to confront as a problem that is technically and technologically remediable though 'proper' accountability systems that would enable the state to 'see' where environmental problems lay, and with that to locate where and how to intervene (Lovell & MacKenzie, 2011).

At the same time, I will show how these accountability systems provide a new space for citizens, entrepreneurs, politicians and others to recognize how much they themselves contribute to climate change; and that way promoting the self-regulation of their –consumption, productive, domestic, etc.– behavior without the need for any form of direct top-down enforcement from the state.

As I will show, Costa Rica's 'carbon neutral' goal, and its strategy to reach it, largely relies on the development of 'technologies of accountability' intended to frame Green House Gases (GHG) as 'carbon equivalent emissions' (or simply 'carbon'). It should be noted that in this dissertation I will draw a difference between 'carbon' (or carbon-equivalent) and GHG emissions in that while the latter are physical entities that absorb and reflect radiant thermal energy, 'carbon (equivalent) emissions' are the result of a series of socio-technical calculations intended to 'flatten' the former entities into an imagined, orderable and comparable *normalized* gas. Under this understanding, 'carbon' is then an emergent abstract entity rendered governable through the mobilization of numbers and techno-scientific calculations trusted to 'technocrat experts'. Therefore, the second policy reviewed in this chapter is precisely the **National Inventories of Green House Emissions** developed to quantify the emission and absorption of 'carbon' emitted to the atmosphere in a given period of time. In reviewing these systems of accountability, I will show how the emergence of 'scientific facts' is the production of *trust* in the 'objectivity' of numbers and the 'unbendable' character of mathematic calculations; and how numbers take an active role in reducing the 'unnecessary complications' of carbon

calculations so that the decision-making process carried out by politicians and by techno-scientific 'experts' alike can be shortened.

The last two policies reviewed in this chapter pertain to a group of policies developed by the Costa Rican government to 'update' its 'carbon neutrality' goal in light of the international compromises that emerged around the time of the UNFCCC's Conference of the Parties or –COP21– held in Paris in December 2015. As I will show, these compromises have led to a process of gradual re-sematization of the '2021 goal' as an 'early action' that can be grouped among a number of other goals to mitigate climate change. Additionally, I argue that the policies developed in the second decade of the 2000s clearly denote Costa Rica's interest in joining the 'green' inflection of the new spirit of capitalism (Blok, 2013) which performatively reshuffles the demand and supply side of a series of emergent markets filled with 'greener' experiences and 'greener' goods.

In this opening chapter, I follow how Costa Rica's current environmental discourse is progressively replacing 'biodiversity conservation' for 'climate change' as its driving concept. I show how this paradigmatic shift can be seen in the way the country's 'National Park' system (the flagship of the former concept) is losing its overall appeal and relevance to the 'carbon neutrality' effort (milestone of the country's 'climate change' concept); which is now being enacted as the nation's most urgent environmental challenge. Moreover, by exploring this shift I also show how the assigned economic and symbolic value of 'nature' depends on its conceived 'usefulness', which is currently

understood as its potential to face 'climate change' (i.e. generate renewable energies, absorb carbon emissions) and not –anymore– to preserve biodiversity.

Prompted by a wide variety of authors from STS an ANT concerned with the active role that techno-scientific 'experts' and their calculations play in the emergence of new material realities (Lippert, 2013; Asdal, 2008, 2011; Lovell & MacKenzie, 2011; Kalthoff, 2005; Lansing, 2010; and others), I argue that the *materiality* of 'nature' –enacted as 'carbon'– does not pre-exit the processes of calculations intended to render it governable. Subsequently, I contend that such calculative devices are not limited to simply record a positively given natural reality. Hence, rather than understanding 'carbon' emissions as positively given natural objects that are literally and figuratively floating around 'out there', I show how such abstract gases are politically assembled entities whose material and discursive *presence* necessarily relies on the *absence* of that of other *disrupted* –alternative or hypothetical– entities. While building the above argument, I examine how the performative practices of Costa Rica's green technocracy are, on the one hand, embedded in a series of political subjectivities; while on the other hand, how these practices of *qualculation* really occur through a series of performative negotiations between human –i.e. technocrat 'experts'– and non-human entities –i.e. numbers– holding equal *agency*. Thus, while exploring the contingent and precarious processes in which 'scientific facts' are assembled, I show how the 'natural' entities that we assume as a given, and the techno-scientific calculative practices that *order* them, are far from being performed in a political vacuum.

This chapter will also discuss how the authority of the Panel on Climate Change (IPCC) relies on projecting itself as a *parliament of specialists* (Callon, 2009) which operates on 'pure' techno-scientific knowledge and robust scientific consensuses 'free' from any socio-political entanglements. In practice however, scientific 'facts' really emerge from socio-political negotiations between a limited circle of 'experts' who each try to impose their own scientific 'arguments' over the rest. Thus, these 'experts' eventually end up bargaining their 'arguments' among each other instead of 'simply' demonstrating an undisputable 'proof' of any given scientific 'fact'. Once consensus is reached in those 'quasi-scientific' processes of negotiation, the resulting 'scientific statements' are depicted to the larger public as a monolithic, timeless and unquestionable 'natural reality' which is nevertheless 'measurable' and 'calculable' through mathematical numbers. Finally, I argue that the community of imagined 'autonomous experts' of the IPCC extends an *action at a distance* that is capable of ordering the performative assemblage of 'local' carbon calculations via their taken-for-granted authority and their *black-boxed* calculative devices.

A. 'Carbon Neutrality' goal for 2021.

Former president Oscar Arias –a hardline advocate of economical neoliberalism– announced in 2007 Costa Rica's intention to become the world's first 'carbon neutral'

country by 2021[3]; this way coinciding with the nation's 200-year celebration of independence from the Spanish empire. Since then, the three consecutive governments have ratified the goal.[4]

The selection of the specific 2021 deadline for reaching 'carbon neutrality' in Costa Rica is perhaps the first evidence of the actual *heterogeneity* (Law, 1992; 2007) behind the constituencies of the 'nature' constructed in the carbon neutralization network; and of the *agency* (Callon, 2004) that an 'abstract' entity can hold in a network regardless of how 'technical' it may appear. What appears to 'only' be an abstract symbolic entity (a commemorative date), in reality plays an unquestionable role within this network to the point that it replaces any other techno-scientific entity in the selection of 'the' deadline in which Costa Rica will 'neutralize' its carbon emissions. The following extract of an interview made by the author with a high-ranking representative of one of the two auditing agencies authorized in the 'C-Neutral' certification program (discussed later in the second chapter) illustrates this tension:

> ***Subject:*** *The original idea hmmm in 2008 was… "Let's make Costa Rica carbon neutral"*

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[3] Although other nations such as the Maldives and New Zealand had also pledged to become carbon neutral nations, Costa Rica remains the only one to still maintain its self-appointed goal (see Araya, 2015).

[4] Including the 2014-2018 Luis Guillermo Solis administration, Costa Rica's first social democratic government since 1978.

Interviewer: *Hmmm.*

Subject: *Ok… by when? ...:2021. Why? They never asked themselves.*
And why in such short time? They also never asked themselves

Interviewer: *Hmmm.*

Subject: *Additionally, the answer is very political… "because we celebrate our bicentenary" [of the independence from the Spanish empire]*

Interviewer: *Right.*

Subject: *There is nothing technical about it [giggles].*

(Source: M. Gonzales, personal communication, April 7, 2016. My translation.)

This extract shows how in spite of the common assumption that 'scientific controversies' are the 'stuff' of scientific control, non-scientific entities (such as a political one in this case) can override any constituent techno-scientific calculations and 'expert' knowledge of a network, and establish themselves as an *obligatory passage point* (Callon, 1986).

Additionally, it may be pertinent to briefly –but significantly– point out at the beginning of this chapter that the concept of 'carbon neutrality' itself is not free of controversy. Stefan Gössling (2009) holds that not only does the concept of 'carbon neutral' only comprise CO_2 emissions (as opposed to, for example, climate change that

would include all Greenhouse gases) but that the 'neutral' part of the concept is an oxymoron because emissions are not 'neutralized'; instead they are really *compensated for* (Gössling, 2009, p. 19).

Following the self-proclamation of the '2021 goal', in 2010 the national government founded the Climate Change Directorate (DCC, for its acronyms in Spanish)[5] which has been appointed the function of coordinating the action plan of the **National Climate Change Strategy (ENCC**, for its acronyms in Spanish), in which Costa Rica's compromise to become a carbon neutral country in 2021 is acquired. However, the ENCC was officially issued in 2009, and the state created the DCC to provide MINAE with a specific dependency with the task of overseeing the implementation of the ENCC, which was finally provided with an 'action plan' in 2012. Besides these mentioned policies, the carbon neutral initiative was initially provided with three additional, and closely linked, instruments designed to reach the 2021 goal. These were the '**Carbon Neutral Country Program**' (*Programa País Carbono Neutralidad*) articulated in Agreement 36-MINAET 2012; the **National Voluntary Normative for Demonstrating Carbon Neutrality**[6] articulated as INTE-12-01-06:2011, later updated as **INTE B5:2016**; and the creation of a **domestic carbon market** (Dirección de Cambio Climático [DCC], 2012a, p. 19). The ENCC will be

[5] The DDC is a dependency of the MINAE, established by executive decree MINAE No. 35669. Note here that the ENCC was issued before the creation of the DCC.

[6] Often referred to in relevant official documentation as 'Norm to Demonstrate Carbon Neutrality', 'National Norm for Carbon Neutrality', or simply as 'National Voluntary Norm'.

discussed further in this first chapter, while the 'Carbon Neutral Country Program', the INTE B5:2016 normative, the domestic carbon market and other relevant initiatives will be discussed in following chapters. However, it may be relevant to stress that these policies are in fact difficult to separate both in discourse and in practice. In fact, a review of the existing literature on the subject, as well as the policy documents themselves reveals that elements of one policy instrument are constantly inserted into the next in a rather straightforward and uncomplicated way; making it at times rather difficult to trace back the original sources from which a certain statement or device first appeared on.

The general idea behind the '2021 goal' is that the nation's GHG total net emissions should be systematically reduced until that year in order to match the emission levels of 2005. The latter levels have been determined and registered in the fourth **National Inventory of Green House Gas Emissions**[7] elaborated in that year –published in 2009– by the National Meteorological Institute (IMN, for its acronyms in Spanish).

Furthermore, the DCC (2012a) argues that Costa Rica's strategy to reach carbon neutrality in 2021 is based on the application of the same calculation that the Institute of Technical Standards of Costa Rica (INTECO, for its acronyms in Spanish) formulated for private businesses to

[7] According to the MINAE (2015, p. 6), six of such inventories have been elaborated to date since 1990.

voluntarily aspire to become certified 'C-Neutral'[8]:

$$E_{(i-1)} - R_{(i)} - C_{(i)} = 0$$

Where:
i: Stands for the reference year. In the case of the '2021 goal' for Costa Rica, 2005 has been chosen as such baseline.
E: Corresponds to the **emissions** of the entity being measured* using internationally recognized standards (ISO 14064-1 or the GHG Protocol of the World Resources Institute).
R: Corresponds to the emission **reduction plans** that the entity being measured* should carry out to document its emission reduction efforts for the period being measured. According to MINAE "the reduction process is instrumental to the carbon neutrality certification, such that the organization's main efforts in terms of reduction of tons of CO_2 equivalent should be reflected in R" (Ministerio de Ambiente y Energía [MINAE], 2013, p. 29).
C: Corresponds to the accepted options of **compensation** of GHG emissions that the entity being measured* must enroll.
(*) These are either a particular private organization (in the case of the 'C-Neutral' certification program) or Costa Rica as a whole (in the case of the '2021 goal').

In short: In order for Costa Rica (and the private organizations that seek the 'C-Neutral' certification) to

[8] See Chapter 2 for a full analysis and discussion regarding this particular formula or calculation, as well as the entire 'C-Neutral' certification program.

become 'carbon neutral', it must calculate its net emissions for a specific period (E), minus their reductions or internal emission removals (R), minus their compensated emissions (C) and equal zero (0).

The reasons for establishing the emissions of 2005 as the baseline of comparison for targeting future reductions in GHG has not been officially stated neither in the ENCC, nor in its action plan, nor in the 'Carbon Neutral Country Program', nor in the INTE B5:2016 Normative. Kowollik (2014) believes that this is because the 2005 national GHG inventory is the earliest and most trustworthy inventory of all available ones. However, Soto (2014) states that because of important methodological changes made in the fifth national inventory of 2010 −published in 2014− all previous results to this particular GHG inventory are now considered to be incomparable; and therefore, comparisons to the 2005 inventory are now to be understood as merely informal and referential. Additionally, this press release refers to the subdirector of the IMN who stated that all previous inventories to the 2010 version are currently pending to be recalculated using the methodological criteria employed in the 2010 version, which is now based on the guidelines of the Intergovernmental Panel on Climate Change (IPCC).
Hence, regardless of the particular methodological changes that the IMN implemented from the fifth national GHG inventory onwards, which intended to correct an apparent lack of methodological reliability found in all earlier GHG inventories (including the 2005 version), the relegation of the 2005 reference year to an 'untrustworthy', 'unreliable' and 'incomparable' baseline did not lead to the rethinking or refining of the carbon neutrality venture in any degree.

Likewise, it can be argued that 2021 goal is based on what the IMN itself now considers a lack of 'scientific robustness' that is not properly *aligned* with the IPCC's methodological *black box* (Callon & Latour, 1981). This issue then opens up several questions regarding what is (and what is not) understood as 'scientific robustness', how it is coined, how it travels, and the role that authorized 'experts' play in assembling, maintaining and circulating scientific legitimacy.
According to Donald MacKenzie, the authority of the IPCC rests on the *black boxing* of its own authority as a decisive social factor (MacKenzie 2009, p. 447). This authority, he adds, is rendered as a *subpolitical* matter in that it "[preserves] the boundary between 'science' and 'politics', since the boundary is precisely what is needed to facilitate political action, because it matters that action can be based upon 'sound science'" (MacKenzie, 2009, p. 453. Original emphasis). Hence, the authority of the IPCC as a *parliament of specialists* (Callon, 2009) is not only taken-for-granted in the endorsement of what can (and cannot) be considered 'scientific enough'; but its criteria, judgment, devices and actions are also readily 'trusted' to be *other* to socio-political biases and dodgy pseudo-science.

In his STS informed study on 'soil pollution' in former mineral mining sites in Chile, Ureta (2018) coins the term *baselining* to refer to a bundle of messy complex socio-technical practices through which human and non-human entities actively negotiate the emergence of both 'baselines' and 'pollution'. Ureta shows that rather than being 'objective', a baseline functions as a norm that both 'scientifically' describes and 'politically' prescribes what a pristine state of 'naturalness' is, and what it ought to be.

Thereby, he argues that "[e]ntities such as baselines do not exist naturally in the form of pristine entities and/or landscapes. They have to be produced through very site-specific baselining processes, usually in parallel with the (potentially) polluted entities" (p. 352). Additionally, he points attention towards existing criticism on the use of historical records to attempt to reconstruct a state of 'naturalness', which a baseline is supposed to *enact* (such as Costa Rica's 2005 baseline derived from the data that had been previously gathered by the IMN). Particularly, how the actors involved too often interact with the available data uncritically, without cautiously examining the specific contexts and approaches in which such accounts where coined, circulated and recorded (Alagona, Sandlos, & Wiersma, 2012). The latter authors believe that the fragmentary, selective and ambiguous nature of historical records, that necessarily requires high degrees of 'guesswork' and 'extrapolation' from 'expert' practitioners, should challenge these to incorporate more sophisticated analytical methods which are capable of coping better with the complexity and variation of a world in continuous flux (p. 65).

Regardless of all the imbued complexities mentioned above, Maarten Hajer (1995) argues "[h]ard decision-making on global environmental problems requires an almost unprecedented degree of *trust* in *experts* and in our political élites at the same time as this trust is continually undermined by scientific controversies and political indecision" (p. 11. My emphasis). With that, he suggests that however indispensable the authority of 'scientific experts' may be considered, in practice, it is always contested and frail.

Additionally, Reiner Keller (2012) argues that the *agency* of practitioners is irremediably embedded in the particular techno-scientific field in which they participate, and from which particular 'problems' and their proposed 'solutions' emerge. This field represents a particular universe of scientific contemplation that has been handed down to her or him by the historical tradition of science. As a result, he argues that the leeway for the discretion of the 'expert' in stating problems and in exploring possible solutions is a limited one (Keller 2012, p. 48). In other words, the *agency* of techno-scientific practitioners is one constrained by a network of *black boxes* and biases, which she or he draws upon and re-circulates time and again. In the case of Costa Rica's 2005 baseline for the carbon neutral initiative, 'trust' placed in the original *calculations*[9] performed by 'experts' was eventually questioned, yet not enough to challenge the entire carbon neutral 2021 goal to be 'overhauled'. Instead, the IMN 'corrected' its inventories by employing a renewed methodological criterion based on the *black-boxed* guidelines provided by the IPCC.

All these issues raise questions regarding what is considered scientific robustness and objectivity, expert authority and *agency*, and the legitimacy of techno-scientific *black boxes,* just to mention a few.

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[9] In the present dissertation, I borrow the particular definition of this term as was coined by Ingmar Lippert in his 2013 Doctoral dissertation which refers to *calculation* as the practical and material activity performed by humans; and not the calculation as a disembodied mathematical logic (Lippert, 2013, p. 88).

Briefly: The Carbon Neutral initiative was built over a known lack of scientific robustness and of any actual consensus between technocrat experts. Consequently, the reliability of the 2005 INGEI (over which the '2021 goal' is based on) was eventually put into question. In spite of this, the '2021 goal' was never modified or adjusted accordingly. Additionally, current INGEIs employ a methodology that is based on the largely unchallenged and taken-for-granted authority of IPCC which is still widely assumed to be purely scientific knowledge, hence free from any socio-political entanglements.

A general description of the latest available National Inventory of Green House Gas Emissions will follow after the next review of the ENCC in the following subsection.

1. National Climate Change Strategy (ENCC)

The main objective of the ENCC is "to reduce the social, environmental and economic impacts of climate change and promote sustainable development through economic growth, social welfare and environmental protection using *mitigation* initiatives and *adaptation* actions so that Costa Rica improves the quality of life for its people and eco-systems by moving toward a carbon-neutral competitive economy by 2021" (MINAE, 2013, p. 22. My Emphasis). Hence, the ENCC's defines 'mitigation' and 'adaptation' interventions as the two types of actions that will lead the country to a series of transformations that will reduce the impacts of climate change while simultaneously paving its way towards an ideal 'sustainable development'. As will be discussed throughout this dissertation, the latter concept of

'sustainability' has been so successfully *black-boxed* in contemporary environmental governance discourses, and so systematically mobilized, that in rare occasions one is able to find voices resisting or disagreeing with it – not only amongst circles of technocratic 'experts' and policy makers, but even amongst mobilized environmental activists (Escobar, 1996). Moreover, it has become such an unchallenged and taken-for-granted notion that it is now morally 'difficult to resist' (Blok, 2013; Fletcher, 2010a).

All of the different analysis and strategic implementations provided in the ENCC are based on the data gathered in the above-mentioned National GHG Inventories elaborated by the IMN. However, the sectors recognized in both documents are not identical. The IMN merges Agriculture and Forestry (and other land uses) as a single sector, while the ENCC categorizes them as two separate ones. Briefly, this non-correspondence of categories what is at stake in calculatory processes, from an epistemic point of view, is not (only) whether the operations of calculations work or not, but where categories have to be separated (Kalthoff, 2005, p. 77). In other words, categories do not pre-exist calculations, just like neither of the former are limited to simply record a reality 'out there'. Instead, in the political practice of separating entities into categories, new realities emerge as things that were once 'invisible' are made 'visible' in very specific and ways (Murdoch and Ward, 1997, p. 308).

DCC (2012a) defined the ENCC action plan as:

> A Road map that contributes to the process of *mainstreaming* the climate change agenda in the prioritized sectors (transport, energy, agriculture,

> water resources) from a human development perspective. It is intended to become a *catalyzing instrument* for guiding public and private budget allocations in a more strategic and articulated way, so the country advances towards its transformation to a development model low on carbon emissions (including the landmark of carbon neutrality in 2021), and resilient to the effects of climate change. (DCC, 2012a, p. 39. My translation and emphasis)

With this definition, the DCC intends to make considerations related to climate change a common priority in all of the nation's highlighted sectors. It does so by providing them with a series of recommendations and voluntary guidelines instead of binding 'top-down' directives ordered through 'command-and-control' regulations.

It is designed around six 'axes', which link four general actions or implementations to the two general target goals of the plan. These can be better illustrated in the following 'Figure 2' –based on 'Figura 3: Ejes ENCC' presented in the mentioned document (p. 16)–. Here, the lower 4 axes are to be understood as the instrumental axes to reach the defined goals in 'mitigation' and 'adaptation', which are in turn represented as the higher axes of the strategy.

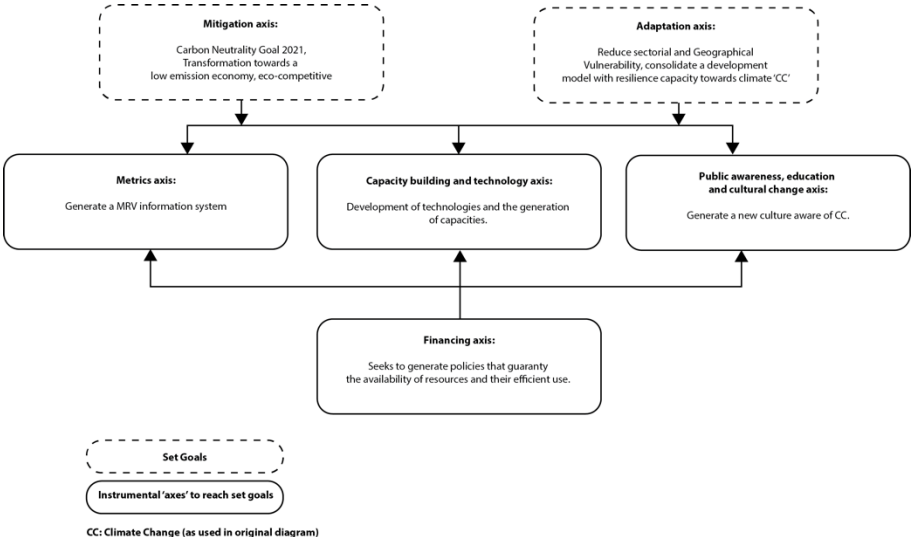

Figure 2: Axes of the ENCC

As stated earlier, the ENCC action plan defines 'mitigation' and 'adaptation' as the two main axes or types of actions that will lead the country to reduce its vulnerability to climate change while simultaneously paving the country's way towards a 'sustainable development'. The action plan provides each of these axes with their own general and specific objectives linked to each of the key sectors identified as crucial to be intervened in each type of action. Hence, in the 'mitigation' axis, the prioritized sectors are energies, transports and agriculture; while in the 'adaptation' axis, the water resources and, once again, the agriculture sectors are highlighted. As will be discussed in greater depth later on, through these axes, climate change is mainly enacted as a problem that is technically and technologically amenable, and as a problem that requires a change of behavior through technologies of government

capable of translating the subject's 'self-interests' into a certain domain of reality aligned with the state's *political rationalities* (Miller & Rose, 1990).

In the next pages, I will briefly review each of the strategy axes, while mainly concentrating on the 'mitigation' and the 'adaptation' axes from which the entire ENCC is framed.

'Mitigation'

The ENCC defines mitigation actions as those that will "make the country avoid carbon net emissions, while adopting a vision that combines environmental, sanitation, economic, human, social, ethic, moral, cultural, education and political actions with the nation's competitive strategy." (Ministerio de Ambiente, Energía y Telecomunicaciones [MINAET], 2009, p. 48. Author's translation). The ENCC stipulates that the country's overall 'mitigation' strategy will implement three strategic sub-axes, from which the ENCC action plan will focuses only on the first (highlighted):

> -**Reduction of gas emissions by source**
> -Capture and storage of carbon dioxide
> -Development of an effective national carbon market with an active participation in international markets.

Hence, the ENCC's 'mitigation' axis exclusively focuses on promoting efforts for the reduction of GHG emissions in the different highlighted sectors, whereas the remaining two 'mitigation' actions will be implemented under the

scope of other 'mitigation' policies and programs. Moreover, since the DCC (2012a) contends that Costa Rica's strategy to reach carbon neutrality in 2021 is based on the application of the same calculation that the INTECO formulated for private businesses seeking the 'C-Neutral' certification: ***E-R-C*=0** (see page 194); the ENCC can then be understood as a policy that exclusively focuses on the 'R' (reductions) variable; while the latter two remaining sub-axes of the country's 'mitigation' strategy – enlisted above–focus on the 'C' (Compensations) instead.

All in all, the ENCC prioritizes 5 different sectors in Costa Rica over which its different analysis and strategic implementations are to be applied to: energies, agriculture, change of land use [forestry sector], industrial processes, and waste management. From these sectors, the energy and the agriculture sectors –in that order– are identified as being the greatest producers of GHG emissions in the country. Furthermore, the plan highlights the importance of the 'transport' sub-sector[10] –belonging to the energy sector– as responsible for 64% of the latter's total emissions. Therefore, the plan urges the need for mitigation interventions in 'transports' separately from those in 'energies' (DCC, 2012a, p. 15).

The 'mitigation' axis of the ENCC action plan is defined by three specific objectives, each one respectively linked to one of the highlighted sectors:

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[10] However, I will continue to refer to transports simply as a 'sector' in order to avoid what I find to be unnecessary confusion in the discussions.

1) Reduce the GHG emissions from the land **transportation sector** by implementing a series of complementary measures focused on the improvement of accessibility, mobility and the use of low carbon-emission technologies.
2) Support the consolidation of a low carbon-emission **energetic model**.
3) Reduce GHG emissions while maintaining or incrementing the productivity of the **agricultural sector** in key products: Coffee, banana, sugar, cattle, pineapple and flooded rice parcels.

(DCC, 2012a, p. 39. Author's translation)

Mitigation: Transport Sector

The ENCC action plan recognizes the transport sector as the principal focus of GHG emissions in Costa Rica, and hence the reduction of this sector's emission levels should represent the foremost effort of the ENCC. More precisely, the ultimate challenge for this sector is to reduce the circulation of private vehicles in the country, which are responsible for 52% of the sector's GHG emissions. The ENCC states that the current (2012) amount of private automobiles in circulation in Costa Rica surpassed 600 000 vehicles –with a ratio of 1 vehicle for every 7.5 inhabitants– and with a tendency to steadily increase at a yearly rate of 3.8%. This vehicle fleet, which is mainly in circulation within the GAM, is said to have an intermediate level of fuel 'efficiency' and an average age of 12.3 years (DDC 2012, p. 12).

The action plan proposes the establishment of several specific 'products' for the transport sector, some of these are:

-An 'Integrated Public Transport System': a plan for the integration and coordination of the various types of transport systems in the GAM. This initiative is based on the assumption that the transfer of users from private vehicles to public transports will 'immediately' produce an effect in lowering emissions (DCC, 2012a, p. 41).

-A series of 'Congestion Control Measures': Expand the amount of dissuasive measures intended to render private vehicles unpractical while simultaneously promoting alternative and public transport systems. The DCC targets to reduce the private vehicle fleet by 20% (p. 42).

-The 'Technological Renovation and Modernization of the National Vehicle Fleet' through a series of financial and non-financial incentives. The program targets the conversion of the entire taxi and bus fleet to liquefied petroleum gas (LPG) by 2021; and to amount up to 15% of privately owned hybrid vehicles (p. 42).

The **'Capacity building and technology'** axis for the transport sector focuses on two issues. Firstly, the legal strengthening of the Public Transport Council (a branch of MOPT) so that it adapts its management and development model to one that mainstreams 'climate change' as a key subject in all future policies and practices. Secondly, the integration of transport planning with local planning practices and policies with the overall aspiration of planning 'denser' human settlements with lower dependence on commuting (p. 45).

Mitigation: Energy Sector

The DDC contends that in spite of Costa Rica's installed capacity for producing electricity, from which 77% are said to be based on 'clean sources' such as hydropower and wind power (DCC, 2012a, p. 29), the country still has a strong dependency on the use of fossil fuels. This is partly related to the fact that 9% of nation's electricity comes from thermal plants that run on fossil fuels such as bunker and diesel, which are an important source of the nation's total GHG emissions. Finally, the DDC holds that legal constraints make the development of potential sources of 'renewable' electricity difficult in areas which are under some type of protection (namely National Parks and indigenous reserves). The action plan proposes the establishment of specific actions for the energy sector:

-The creation of a cluster of renewable and transition energies in Costa Rica. The ENCC considers that the country already has the conditions to become a center of production of technologies that produce renewable and transition energies for Latin America –such as solar panels, wind turbines, etc. This is to be pursued by attracting firms of such technologies to establish manufacturing facilities in the country; by financially supporting local entrepreneurs in this area; and by training future professionals and technicians in this field (DCC, 2012a, p. 49).

-The 'efficient use of energy in strategic sectors': This action focuses on the user/consumer side of the energy market by introducing more energetically efficient technologies in different sectors identified as strategic - such as better refrigeration equipment in households,

better air conditioning systems in tourism accommodations, etc.- (DCC, 2012b, p. 6). Additionally, this action promotes the creation of 'Environmental Management Programs' to be implemented by Ministries, Municipalities and quasi-state institutions so that these improve their energetic efficiency and reduce their carbon footprints (DCC, 2012a, p. 49).

-The substitution of bunker and diesel in the generation of electricity (thermal plants) and vapor (boilers) with the gradual introduction of less pollutant 'transition fuels' like natural gas, LPG and biofuels; and in a more distant future, replace these with hydrogen or plasma (p. 48).

-The consolidation of the 'distributed generation program' which is intended to stimulate the generation and storage of electricity by a variety of 'small' technological devices directly connected to a grid available nearby consumption focuses. These devices are to generate electricity from renewable sources including solar, wind and hydropower (p. 47). 'Adjustments' in the country's legal framework are said to be needed to allow the implementation of this program. However, some suspect that the incorporation of solar power in particular has historically been downplayed due to political concerns that home-generated power would cut into state electricity's profits (Fendt, 2017).

-The 'Improvement and expansion of the electricity offer based on renewables': This action focuses in the "[…] *adjustment* of the necessary legal framework that would guarantee the offer of energy from *clean* sources [including] the *elimination of barriers* to the production of renewable energy […] within spaces that currently have some type of

restriction" (DCC, 2012a, p. 46. My translation and emphasis). In other words, lift existing bans that forbid the exploitation of 'natural recourses' –mainly hydro and geothermal power generation– in National Parks, natural conservation areas and indigenous reserves.

This last 'mitigation action' for the energy sector provides a valuable space to introduce a discussion on a key aspect related to the construction of nature in Costa Rica, as it mirrors a process identified by Robert Fletcher (2010a) in which 'nature' is being performatively reconstructed in the country's current environmental discourse where the previous driving concept of '*biodiversity conservation*' is progressively being replaced *to* '*climate change*'. An extraction of an interview conducted by the author with an engineer from the department of research and development of renewable energies of the Costa Rican Institute of Electricity (ICE, for its acronyms in Spanish) echoes this process:

> ***Subject:*** *So what other type of energy can be characterized as basic? Geothermic energy.*
> *But the problem, at a national level, is that all volcanoes are National Parks [Giggles ironically]*
>
> ***Interviewer:*** *Right.*
>
> ***Subject:*** *So someone had the genius idea that… well, it is a very good idea, 'let's turn all volcanoes into parks' …lets protect them.*
>
> ***Subject:*** *Hmm… I am very environmentalist, hence*

I have always said 'no, National Parks must be National Parks'. But what if there is an area that is very eroded inside a park? You know, that there are emissions from this park because there is no flora nor fauna; it's almost as if it was a desert.
So you might say 'No, here I will put some geothermal'. So you substitute this [eroded] part for geothermal while you buy these other thousands of hectares at the other side of the park where there is [still] biodiversity, where you could make a biological corridor. So 'park is park', while '[power] plant is [power] plant'; that way resource are simply taken advantage of.

Interviewer: *So let's say it's a simple relocation of limits?*

Subject: *The limits could be relocated so that Costa Rica has a 'win-win [situation]'.*

(Source: C. Hernandez Chanto, personal communication, April 13, 2016. My translation.)

As the extract shows, the subject starts up by characterizing the fact that National Parks where erected around all of the country's active volcanoes as 'a problem', and in a slightly sarcastic tone saying it was not a very smart one. This is because Costa Rican law bans any sort form of extractive exploitation, including the production of geothermal energy. Immediately after this characterization, the subject changes her statement by succumbing to the unquestionable ideological and moral goodness –or *black boxes*– over which National Parks emerged since the mid-1950s –precisely around two active

volcanoes– and explicitly reassures her conviction that parks should remain parks.

However, the subject explores the possibility of a 'third way'. One in which the materiality of nature, depicted as a standing reserve of material objects waiting to be ordered (Lansing, 2010) can be 'traded' for others elsewhere. The key for this exchange would heavily relay on the socio-performative practice of gauging and rating things, and to assign *value* to those things (Helgesson & Muniesa, 2013). Hence, values are not a thing that is naturally impregnated on objects and materials, but instead the emergent result of a performative and heterogeneous process of negotiations that is closely tied to conditions of desire and desirability (Helgesson & Muniesa, 2013, p. 7). The subject holds that exchanging a 'desert like' area for another that has a stock of flora and fauna elsewhere would represent a win-win situation for the country as a whole. In this plot, desirability is enacted in two ways:

Firstly, it is through the desire for 'renewable energy' –and not for preserving biodiversity– that the idea of the exchange, the designation of values and the conditions of the deal are conceived. The value of 'nature' is constructed first in terms of its potential to produce geothermic energy (and therefore to face 'climate change'), and second in terms of its potential to cluster a relevant stock flora and fauna (or preserve biodiversity). On this issue, Helgesson and Muniesa (2013) argue that "what things are worth can be manifold and change—and these values can be conflicting or not, overlapping or not, combine with each other, contradict each other. All, or almost all, depends on the situation of valuation, its purpose, its means" (p. 7).

Hence, the *multiple* value(s) of a thing are empirically manifold, *performative*, *fluid*, and variable.

And secondly, by depicting Costa Rica as a monolithic entity that wants such an exchange which is depicted as nothing less than a 'win-win' deal in which things can only go right. This second enactment can only work if things – in this case hectares of land– are gauged in terms of their 'goodness', and then rated from 'good' to 'bad'. The definition of which nature is 'good' vs. which one is 'bad' is not based on scientific facts; instead it is a culturally specific valuation resulted from a heterogeneous process of negotiation (Rice, 2014). In this particular evaluation, the hectares of land that have potential to accommodate geothermal power plants are deemed as 'good' nature; while those that do not, are portrayed as 'bad' nature. Likewise, their potential to gather a relevant stock of wildlife, or to house complex ecosystems is, in this particular valuation, irrelevant.

Briefly: Costa Rica's current environmental discourse is progressively replacing 'biodiversity conservation' for 'climate change' as its driving concept. This can be seen in the way the country's 'National Park' system (the flag ship of the former concept) is losing its overall appeal and relevance to the 'carbon neutrality' effort (milestone of the country's 'climate change' concept); which is seen as today's most urgent environmental challenge. The discussion also shows how 'nature' is still conceived as a commodity which can be easily traded and disposed of. Moreover, the assigned economic and symbolic value of 'nature' depends on its conceived 'usefulness', which is currently understood as its potential to face 'climate

change' (i.e. generate renewable energies, absorb carbon emissions) and not –anymore– to preserve biodiversity.

Mitigation: Agriculture Sector

According to the DCC, the agriculture sector is responsible for 35% of all GHG emissions in Costa Rica. 90% of the sector's emissions is Methane (CH_4) which is mainly produced in the digestive processes of livestock, while other GHG such as Nitrous Oxide (N_2O) and Carbon Dioxide are commonly related to the use of synthetic fertilizers and deforestation respectively (DCC, 2012a, p. 33). These figures make the agricultural sector the second largest source of emissions after the transport sector. However, the DCC states that unlike the latter, this sector already shows a positive tendency in that it presents an increase of productivity and a reduction of GHG per unit of the Agricultural Internal Gross Product (DCC, 2012b, p. 11).

The DCC argues that this sector's productivity is particularly vulnerable to the negative effects of climate change in that drastic variations of temperature and precipitations often lead to droughts and excessive rains which commonly mean losses in production (DCC, 2012a, p. 35). For these reasons, the action plan of the ENCC proposes to face two general challenges for this sector, that coincide with the two main interventions coined in the strategy: one in 'mitigation' –incorporate the use of 'climatically smart technologies' for the consolidation of an 'eco-competitive' [productive] model (p. 35) –; and the other in 'adaptation' –reduce the sector's vulnerability to the effects of climate change by improving the capacity of producers to adapt to these (DCC, 2012b, p. 12).

Continuing in the 'mitigation' axis of the ENCC, the strategy aims to reduce GHG emissions in the sector while maintaining or incrementing its productivity. The DCC argues that this can be accomplished by means of developing, spreading and adopting the use of 'win-win technologies' (or 'climatically smart technologies') in the sector (DCC, 2012a, p. 51). The **'Capacity building and technology'** axis for the agriculture sector proposes to link academic research with the new market demands for these technologies; and to adjust the necessary legal and institutional framework to financially promote their use (p. 52).

'Metrics' axis for all 'mitigation' actions and sectors

The action plan of the ENCC proposes to establish 'base lines' –intended to set a comparative ground for the estimation of GHG emissions within each sector– and 'Monitoring, Report and Verification' systems (MRV)[11] for all three prioritizes sectors. These instruments should at the same time be functional for both the development of NAMA[12] projects and the development of national carbon-market (p. 55).

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[11] The notion of 'Measure, Report, Verify' and accounting of data on emissions was introduced in the 'Bali Action Plan' that followed the 2007 COP13. Its overall purpose was to create transparency and enhance confidence among the different parties of the UNFCCC (Boos et al. 2015, p. 8).

[12] NAMAs: Nationally Appropriate Mitigation Actions. These will be discussed at length in page 159.

'Adaptation'

The ENCC adopts the IPPC definition of 'adaptation actions' as "the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities." (Parry, Canziani, Palutikof, Van der Linden, and Hanson, 2007, p. 869). The ENCC's action plan highlights water resources and the agriculture 'sectors' as priority sectors to be intervened with adaptation implementations because of three reasons. Firstly, because the former resources are said to be particularly vulnerable to the effects of climate change which can generate chain reactions that may result in intense droughts and floods which affects ecosystems, populations and the generation of hydroelectric power which provides over 70% of the country's electricity (DCC, 2012a, P. 15). Secondly, because, the agriculture sector is said to be particularly sensible to variations in temperature and precipitation patterns that could negatively affect the country's productivity, competitiveness and eventually even its future food safety. And thirdly, because it considers these two sectors as 'cornerstones' of the country's competitiveness (DCC, 2012b, p. 2). Hence, the ENCC action plan urges for the establishment of strategic interventions to reduce the vulnerability of water resources and the agriculture sector to climate change, while improving their 'resilience' capacities (DCC, 2012a, p. 15).

Just like the DCC did for the 'mitigation' axis (see page 70), two specific objectives define the 'adaptation' axis; each one linked to a particular highlighted sector respectively:

1) Increase the adaptation capacity of the populations and ecosystems most vulnerable to the impacts of climate change on water resources.
2) Decrease the vulnerability of agricultural producers to the impacts of climate change.

(DCC, 2012a, p. 39. Author's translation)

Adaptation: Agriculture Sector

As was mentioned earlier, the agriculture sector is targeted both by the 'mitigation' and 'adaptation' axes of the ENCC as the sector was defined as being particularly susceptible to the impacts of climate change (DCC, 2012b, p. 11). While the objective of the 'mitigation' axis is to consolidate a more efficient agricultural production through the 'generation, diffusion and adoption' of 'climatically smart technologies'; the objective of the 'adaptation' axis is to reduce this sector's vulnerability to climate change, which the DCC portrays as being diminishable by means of using 'technologies with tolerance', and appropriate production and crop management techniques for dealing with these effects (p. 12).

Additionally, the above 'adaptation' objective is to be pursued by incrementing the 'capital stocks' (physical, human, financial, and social) available for the most vulnerable producers by providing these with larger access to information regarding the consequences and the ways to face climate change, and to financial credits (DCC, 2012a, p. 62); which is precisely what the ENCC proposes doing in the **'Public awareness, education and cultural change'** axis for this sector. Moreover, the ENCC states that the effects of climate change will be felt more

intensively by the poorest segment of the nation's rural population, which is generally found in the most vulnerable areas of the country, and that tend to have less access to physical and financial 'capitals'. Therefore, the general attention of the adaptation policies of this sector is directed to supporting 'smaller' agricultural producers in ensuring a greater degree of 'adaptability' to their productive systems which will in turn result in the reduction of eventual productive losses (DCC, 2012a, p. 63).

The '**Capacity building and technology'** axis for the agriculture sector recommends to improve the capacity of 'data' producing entities (relevant state ministers, the IMN, etc.) to provide public decision makers and private producers with 'better' information. For this reason, the action plan proposes the creation of an information system for the adaptation and the management of risk for the agriculture sector.

Although brief and apparently straightforward, the above axis provides a clear example of how the ENCC's action plan depicts the solutions to climate changed as technically and technologically attainable through the development of *technologies of government* (Miller & Rose, 1990) mediated by an *imagined community* of technical 'experts' and in the performativity of numbers (Asdal, 2011) capable of providing decision makers with scientifically legitimized information. This in return could be seen as a process in which political decision makers effectively become subordinated to expert rule through the displacement of political decisions to knowledge realms that are still largely celebrated as non-political (Hajer, 1995, p. 39).

Adaptation: Water Resources Sector

The DCC starts off the description of the proposed 'adaptation' actions for water resources by stressing the sector's importance from an economic perspective. The report states that the impacts of extreme hydrometeorological phenomenon in Costa Rica "oscillate between 0.5% and 1.5% of the annual GDP" (DCC, 2012a, p. 60); and that variations in precipitation levels condition and potentially impact all economic activities related to, or dependent on, the generation of electricity because of the country's heavy reliance on hydroelectricity (DCC, 2012b, p. 2). Therefore, the DCC literally highlights that "the integrated management of water resources is the main adaptation measure [of the ENCC's action plan]" (DCC, 2012a, p. 60. Author's translation).

This paragraph shows that already at the introduction of the 'adaptation' strategy for this sector, 'climate change' is once again enacted as a reality that must be ordered for the sake of the nation's 'economic' development. Here, the impacts of climate change are measured not in terms of their effects over the *materiality* of 'nature', but in terms of how 'environmental' issues –such as extreme hydrometeorological phenomena– can affect Costa Rica's annual Gross Domestic Product by distressing the nation's capacity to generate hydroelectricity. This assertion is consequent with the overreaching paradigm of sustainable development in which "[…] nature is reinvented as environment so that capital, not nature and culture, may be sustained" (Escobar, 1996, p. 328). Hence, the *value* of things –water recourses, and more generally 'nature'– is not found in the things themselves, but rather in a reductively understood notion of their *usefulness* (Lansing,

2010). Kristin Asdal (2008) further argues that making 'nature' real is not for the sake of 'nature', but for the protection of specific material assets linked to economic productivity.

The **'Capacity building and technology'** axis for this sector recommends to implement –and strengthen existent– public policies and legal frameworks for the governance of water resources in the country. The plan suggests the creation of a 'water agenda' for such purpose; and the inclusion of climate change 'axes' in the ongoing revision and update of the nation's 'National Plan for Water Resources'. Moreover, the action plan suggests promoting the use of water-efficient technologies for industrial, agricultural, and residential applications.

'Metrics' axis for all 'Adaptation' actions and sectors

The ENCC action plan recommends the creation of a 'National Information System for Water Resources Integrated Management' and a 'National Information System for Disasters' both intended to produce the necessary information for decision makers to increase local and national resilience of the agriculture and water resources sectors in the face of climate change (DCC, 2012a, p. 65).

'Financing' axis for all actions (Mitigation and Adaptation)

The DCC recognizes that the country's currently available budget to finance climate change is well below the estimated requirements of the ENCC; and that these could

jointly represent a cost between 1.5% and 2.5% of the GDP (p. 65). Hence, the DCC argues that the ENCC action plan provides a series of "*enabling* and/or *catalyzing* actions for the implementation of sectorial emblematic actions" (DCC, 2012a, p. 65. My translation and emphasis). To finance all those emblematic actions, the DCC considers fundamental a list of activities for such end. From that list I consider relevant to highlight:

> -To conclude the design of ongoing proposals for NAMA projects in the agriculture, transports and energy sectors.
>
> -To continue the process of consolidation of the national carbon market and the 'C-Neutral' program, which could potentially enroll a wider range of actors from the private sector and private funds.
>
> (DCC, 2012a, p.69)

Hence, the ENCC makes explicit the reliance on the implementation of NAMA projects, so that when these are eventually up and running, they can provide a needed financial support for the rest of the programs suggested throughout this policy. A similar thing can be said about the ENCCs reliance on the strengthening of the existent 'C-Neutral certification program' (discussed on page 184) through its further promotion among private sector entrepreneurs.

Finally, the **'Public awareness, education and cultural change' axis for all actions (Mitigation and Adaptation):** Throughout the ENCC action plan, this axis concentrates on different actions aimed at changing specific behavioral aspects of the targeted groups of human actors enrolled one way or another with each

specific highlighted sector. The different aims of this axis are either to improve the perception of people towards something (like public transportation systems); to change of consumer choices (like 'carbon-friendly' agriculture products); to change consumer habits (such as the adoption of more 'carbon-friendly' habits by energy consumers, or more 'efficient' use of water by industrial or agricultural producers). In general, the proposed method for such change of habits relies on the development of public 'awareness rising campaigns' and 'education plans' including the curricular adequacy of primary and secondary formal education, as well as in engineering, agronomy and education study programs. Another relevant aspect worth mentioning here is the intention to design these campaigns in a 'friendly' way towards the specific target groups which in many cases are housekeepers in urban and rural areas alike (DCC, 2012a, p. 50), and women in particular, which the ENCC action plan systematically refer to as 'agents of change' because of their traditional role of administrating households, their role in the education of children, and their huge participation in micro-businesses (p. 54). Hence, in light of the Costa Rican state's inability to coerce behavior through mechanisms of direct authoritative order; the ENCC relies on self-regulating individuals who, through the use of *Technologies of government* (such as charts, indicators, study programs, systems of accountability, standards and certifications) are directly empowered in participatory processes in which notions of 'sustainability' are objectified, measured and standardized and thus rendered governable (Holden, 2011). In this respect, Bulkeley and Schroeder (2011) suggest that "in order to understand the processes and outcomes of governing climate change, analysis should focus on the *hegemonic*

projects or programmes through which the objects and subjects of governing are constituted and contested, and through which the form and nature of the state and authority are accomplished" (Bulkeley and Schroeder, 2011, p. 751. My emphasis) Furthermore they argue that attention should also be placed in the understanding of the ways in which projects selectively assemble –or better, *translate* (Callon, 1986)– relevant entities into achieving their own aims either through direct order or through *self-government* (Bulkeley & Kern, 2006).

Punctual Observations 1

Before continuing reviewing the next constitutive policy of Costa Rica's 'carbon neutral *actor-network'*, I consider relevant to point the reader's attention towards certain criticisms made from different sources concerning the applicability, viability and reliability of the ENCC and its action plan.

First, Monica Araya[13] argues that despite the international compromises that the country has assumed in regards to climate change, and in relation to its self-proclaimed 'carbon neutral' goal in particular, it continues to fail to provide MINAE or the DCC with a formal mechanism to publicly inform about either the steps taken –and the ones still to be taken– in order to comply with that objective, or about the available funds that the country has received from international cooperations in order to implement projects for addressing climate change. (Araya, 2015, p.

[13] Araya is an author and advisor that has specialized in politics of climate change in Costa Rica, among other Latin American countries.

18). Araya's critique has been made in line with an audit elaborated by the General Comptroller of the Republic (CGR)[14] in 2014 that addressed the state of advance in the implementation of the ENCC that concluded that "the [DCC] utilizes a rather inefficient mechanism to oversee the execution of the action plan of the [ENCC], and that it lacks the instruments that allow the measurement of its results which limits the quality of the control [the DCC may have] over its development" (Contraloría General de la Republica [CGR], 2014, paragraph 5. My translation).

The CGR determined that this lack of efficiency originated from the DCC's application of an implementation model that is incapable of reasonably estimating the degree of compliance and development –reflected for example in the fulfillment of deadlines, percentages of advance, etc. – of the specific goals for each of the prioritized sectors of the ENCC. This situation suggested by the CGR, prevents the DCC from having traceability over the different products and actions proposed in the ENCC, and to alert the respective actors about possible deviations during their implementation (CGR, 2014, paragraph 5. My translation).

Secondly, the CGR found that the ENCC was never officially issued through an administrative act that would provide its content with a legally binding character, and hence legally bind all the state institutions it is set to be involved with. The report states that this failure is

[14] The CGR is a constitutionally appointed state organism charged with auditing and reporting on the government's operations in order to improve its accountability.

particularly problematic because of the complex, inter-sectorial and long-term character that the strategy proposes, which is moreover based on the fulfillment of a series of objectives, actions, goals and specific products assigned to not only several autonomous public institutions, but several strategic private partners (for instance, agriculture producers, public transportation companies, etc.).

The CGR states that the President of the Republic in conjunction with the relevant Ministries are entitled to order guidelines of mandatory compliance to all state institutions that each consist of the targeted sectors of the ENCC; and to order these to comply with all policies, goals and objectives assigned to each of their respective sectors (CGR, 2014, paragraph 4) short, the CGR's audit concluded that providing the ENCC with a legally compulsory character is essential for its effective implementation.

Finally, Kowollik (2014) whom coincided with the former critique, added that neither the ENCC nor its action plan can be considered as 'roadmaps' exclusively advocated to the country's climatic effort as they are both conceived around the notion of 'fighting against climate change' as a 'global concept'. With that the author refers to how these interrelated policies fail to point out which are the general recommendations for actions, and the urgent measures required to attain the '2021 goal' (Kowollik, 2014, p. 2). What all these criticisms have in common is that they all render the ENCC and its action plan as policies that are somewhat 'vague' and based on mere 'suggestions' rather than 'concrete' implementations with a binding character. I believe that both of these criticisms can be discussed both

epistemologically and *ontologically* with some of the analytical sensibilities provided in governmentality studies, and Science and Technology Studies (STS) –respectively–.

First, the suggestive and 'non-binding' character of the ENCC, which can be seen throughout the various 'axes' of its action plan, depict the solutions to climate changed as technically (and technologically) attainable. As has been shown, the strategy suggests that the key to enhanced governance over climate change issues heavily lays on the creation or improvement of accounting practices and devices. These *technologies of accounting* are intended to extend *action at a distance* (Latour, 1987; Miller & Rose 1990) and allow for new spaces of control without the need for direct interventions from any authoritarian entity. Moreover, the ENCC suggests that the development of neat systems of accounting itself relies on a great deal of 'trust' on techno-scientific 'experts' and technological devices. In this perspective, it is only through such sociotechnical mediators that we may finally be able to 'see' environmental problems unfold (Hajer, 1995; Murdoch & Ward, 1997). To this Asdal (2011) adds that abstract calculative spaces –such as systems of accounting– not only require 'trust' in the mediation of an *imagined community* of technical 'experts', and in the performativity of numbers, but in fact *(re)produce* 'trust' in return. In this process, accountants 'experts' not only situate themselves as the *managers of carbon* but position themselves as pivotal in delivering solutions to the problem of climate change (Lovell & MacKenzie, 2011, p. 717). Lastly, it is precisely through the role of 'autonomous expert communities' that government priorities are provided with a legitimacy that is apparently exempted from political entanglements, which

at the same time allows these priorities to be translated into a wide variety of locales (Timmermans and Epstein, 2010, p. 80).

In short, the DCC depicts climate change as a problem that is on the one hand technically amenable through abstract calculative spaces both 'narrowed down' and mediated by –assumedly– autonomous and scientifically objective 'expert' knowledge and action; while on the other hand, a problem that requires a change of behavior through *technologies of government* capable of translating the subject's 'self-interests' into a certain domain of reality aligned with the state's *political rationalities* in a way that subjects become a type of self-regulating individuals capable of acting as agents of government (Rutland & Aylett, 2008).

Secondly, criticisms on the vague or 'non-concrete' character of the ENCC can be theoretically discussed in a more *ontological* sense by following how STS scholars have focused on exploring the *fluidity* and *multiplicity* (Law & Singleton, 2005) of not only 'nature', but of the environmental policies intended to render 'nature' governable. Under this perspective, the material form of any given entity will always inadequately enact the symbolically charged construction it is supposed to embody, and vice versa. This intrinsic incompatibility also means that there will continuously exist an irremediable gap between the *materiality* (Law, 2007) and the *inscription* (Cook & Swyngedouw, 2012) of any object since these assemblages are always held together *precariously* through the constant negotiation between of 'concrete' and 'abstract' entities. Furthermore, and as will be discussed

throughout this dissertation, the objects of 'nature' with which environmental issues –like facing climate change– are concerned with are not self-evident objects that somehow pre-exist the different policies that where developed to order them. Instead, both the materiality and the inscriptions of the objects of 'nature' come into existence within particular sociotechnical processes of policy development (Rutland & Aylett, 2008).

Fletcher (2013) argues that the country's self-proclaimed intent to reach carbon-neutrality in 2021 consists of little more than a branding mechanism to boost the Costa Rica's 'green' credentials while at the same time ensuring itself with a competitive edge by supplying 'C-Neutral' products in specific markets of interest. Both he and Kowollik (2014) suggest that the carbon neutral campaign is almost exclusively assembled by *non-material* 'rhetoric' or 'abstract discourses' with hardly any actual on-the-ground *material* 'practices', or 'concrete implementation'. This also means that the enduring abilities of the network are put at risked precisely because of its own failure to enroll a wider range of *durable* (Callon & Latour, 1981) heterogeneous materials embodied as concrete implementation practices and strategical actions.

Briefly: Costa Rica's 'climate change' strategy depicts the solutions to climate change as being technically amenable though sound accountability systems. These systems rely on the mediation of 'experts' who are trusted to act on allegedly pure scientific grounds, free of any political interests and biases. The point of these accountability systems is to allow us to 'see' where environmental problems lay, and with that to locate where and how to

intervene. However, these accountability systems also provide a new space for citizens, entrepreneurs, politicians, etc. to recognize how much they themselves contribute to climate change; and that way promoting the self-regulation of their –consumption, productive, domestic, etc.– behavior without the need for any form of direct top-down enforcement from the state.

Additionally, the discussion addresses how the materiality of 'nature' does not pre-exist the policies that seek to render it governable. On the contrary, both the materiality and the discursive depiction of 'nature' emerge from those policies. However, both of these dimensions of 'nature' are necessarily flawed and mismatched.

Similarly, some voiced criticisms have held that Costa Rica's strategy to face 'climate change' suffers from a non-correspondence between its constitutive –rhetoric– 'discourses' and its –on the ground– 'practices'.

Following up on the above issue, and in spite of the ENCC's particular emphasis on the urgency to engage in 'mitigation' actions for the transport sector (identified as being by far the largest producer of GHG emissions in the country); the last inform published by the Program State of the Nation (PEN, for its acronyms in Spanish) [15] revealed that while the national population has grown only 23.4% during the course of the last 15 years, the nation's fleet of motor vehicles has duplicated (PEN, 2015, p. 173)[16]. Now,

[15] PEN is a research program that belongs to the National Rectors Council (or CONARE), which itself includes the country's four state universities. The program is advocated to addresses 'sustainable human development' in Costa Rica.

[16] This same source shows that this tendency shows signs of further increasing as the nation's MIV fleet grew an additional 5% between

although the growth of that fleet is not synonymous with the growth in GHG emissions by itself, it surely seems to be the case in Costa Rica where 66% of the nation's total gross emissions are produced by transportation motored vehicles (p. 178). The same report reveals that by far the largest amount of the vehicles responsible for those emissions (62.7%) are MIV –automobiles, vans, SUVs, motorcycles, etc.–, followed by freight line trucks (21.1%), and lastly –and very revealingly–, public transport (15.2%) –which is precisely the mode of transportation that the ENCC intended to favor instead of MIVs. Additionally, in spite of the ENCC's 'Technological renovation and modernization of the national vehicle fleet', MINAE holds that the vehicles in the country continue to be 15 years old on average. MINAE states that this is the result of –still– inexistent state controls regarding the importation of new and used vehicles, and the prevalence of weak policies to incentive the incorporation of new –and thus more 'environmentally efficient'– technologies for both private and public transport sectors (Ministerio de Ambiente y Energía [MINAE], 2015b, p. 99).

In sum, not only does the Costa Rican state continue to fail to mobilize the different regulatory frameworks and programs proposed in the ENCC –which intended to reduce the amount and antiquity of MIV–; but on the contrary has permitted that the amount of such polluting agents not only grew, but duplicated precisely during the years following the nation's self-imposed challenge to reach carbon neutral nation in 2021. Moreover, despite the comparatively low amount of emissions produced by

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2013 and 2014 alone (PEN, 2015, p. 171).

public transportation systems in Costa Rica, the sharp growth of private vehicles in combination with a significantly slower growing population appear to indicate that the tendency is to favor the use MIV instead of public transportation. To add evidence to this claim, the PEN report condensed the following chart showing how the public transportation subsector has not shown any signs of growth within the last 3 decades, while on the contrary privately owned motorized individual transports (MIV) have swiftly grown.

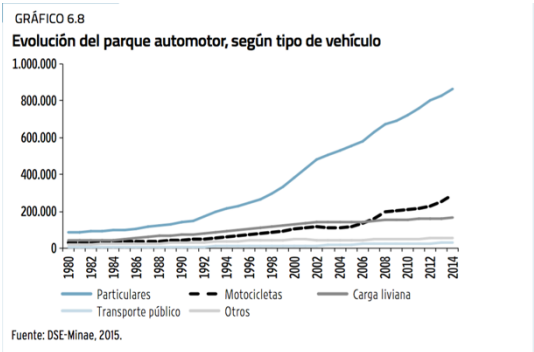

Figure 3: Motorized fleet evolution, according to type of vehicle. Retrieved from PEN (2015, pg. 306)

Finally, the 2015 PEN report also concludes "the intensive use of hydrocarbons is associated with a scarce use of renewable sources based on technologies and investments that would allow resolving, above all, consumption in the transport sector" (PEN, 2015, p. 177. Author's translation). This means that in spite of the country's significant installed capacity to generate power from so-called 'renewable sources'[17], and albeit the ENCC's explicit

[17] See Fletcher (2013) for a critical discussion on how hydropower in

intention to further "improve and expand the offer of electricity based on renewable sources" (DCC, 2012a, p. 46), 72.1% of all energies consumed in the country are imported hydrocarbons (PEN, 2015, p. 177), and 66% of those fossil fuels are consumed in the transport sector (MINAE, 2015b, p. 93).

As part of this study's interviews I asked my informants *"What would you identify as the most urgent environmental issue to solve in Costa Rica?"* To this question all –but one– of my informants identified different issues related to the nation's urban transport sector as the most urgent to address. While some of the subjects focused on the lack of comprehensive infrastructural planning, others focused on the lack of regulations to control the growth of MIV and its consequent GHG emissions, or on the lack of environmentally efficient transport technologies, particularly for public transport alternatives. All of them coincided that the national government had simply not taken the goal of reaching carbon neutrality in 2021 seriously. Below is an extraction of an interview with a board member of the National Chamber of Eco-Tourism when asked the above-mentioned question:

The following extract shows a particular response to the above question by a board member of the National Chamber of Eco-Tourism:

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particular has been 'greenwashed' and *black-boxed* as a flagship example of 'clean' and 'renewable' energies in Costa Rica –and globally– despite being associated with several 'social' and even 'environmental' trade-offs. Moreover, see Graef (2013) for a recount of how this process took place in a specific historical controversy in Costa Rica.

> ***Subject:*** *Hmm... but… I mean [urban transport planning] is a real challenge, and one that I believe the government has not taken seriously. If we had a more efficient public transport, one of better quality, then people would maybe dare to leave their cars at home and use public transport, and obviously more so if these would hopefully be* [ironic giggle] *electric transport systems and more efficient and so forth.*
>
> *But no, they have not taken it… I mean, they have not given the issue the urgency that it deserves in spite of the challenge that we have with the goal [of reaching carbon neutrality] and that its* [ironic giggle] *on 2021.*

(Source: N. Carballo, personal communication, March 18, 2016. My translation.)

As the extract shows, the subject explicitly contends that the Costa Rican state has not been 'serious' about addressing issues related to the transport sector. Additionally, the subject suggests a disbelief in the state's intention to promote the incorporation of environmentally 'efficient' technologies of public transportation.
Finally, the subject argues that the state's reluctance to provide the issue with a sense of urgency does not reflect the country's resolve to become carbon neutral by 2021; a goal which the subject also dismisses with a clear tone of irony.

In the last few pages, I have showed that Costa Rica's ENCC may very well provide a traceable example of how

many of the constituent *discourses* and *practices* that constitute the country's 'carbon neutrality' *actor-network* are so incompatible with one another that the gap between its conflicting *materialities* and *inscriptions* threatens to cause a network breakdown; and that this gap in return may be the result of a failure to conceive the latter entities as integral *actants* of the same *actor-network*.

Nonetheless, the point here is not to say that 'discourses' and 'practices' are irremediably confronted within and/or among every *actor-network*; and nor is it to assert that 'discourses' always equal no more than *non-material*, abstract or even empty rhetoric. On the contrary, the boundaries between 'discourses' and 'practices' are always permeable, mutable and in constant process of transformation and co-construction (Haraway, 1991). And even if the boundaries between the two could be drawn, Deleuzian and Foucauldian post-structuralist perspectives often content that materialist analysis can simply not be separated from discursive analysis in the first place, because language is in fact a constitutive actor in the construction of reality, and not just a reflection of it (see Escobar, 1996).

2. Carbon Accounting: National Inventory of Green House Gas Emissions

According to the IMN, the 'National Inventory of Green House Gas Emissions' (INGEI, for its acronyms in Spanish) is a document intended to "*quantify* the emission and absorption of GHG emitted to the atmosphere in a given period of time" ("Inventario nacional de gases," n.d.

My translation and emphasis). Hence, this document is understood as one delimited by a constrained temporality that is itself determined by a periodical revision and re-evaluation of its contents in a 'strictly' quantitative –hence not qualitative– sense. However, these are not limited to the expected variations in the numeric data values of each newer version of the inventory; but extend to the employed methodologies, mobilized descriptions and analysis. According to the IMN, the sixth and most current version of the INGEI for 2012 (Published in 2015) was elaborated according to articles 4 and 12 of the United Nations Framework Convention on Climate Change (UNFCCC), and the guidelines provided from the latter for National Communications of Non-Annex I parties, as adopted in decision 17/CP.8 (Chacón, Jiménez, Montenegro, Sasa & Blanco, 2015a, p. 11). The methodology mobilized in these INGEI focuses on inventorying all anthropogenic Green House Gases not controlled by the Montreal Protocol, and their respective sources. Additionally, the INGEI also intends to inventory all sources of 'absorption' of such gases in anthropogenic carbon sinks. More specifically, the methodology employed in the latest two versions of the INGEI is based on the IPCC's 2006 guidelines for GHG inventories, and on the 1996 version of such guidelines for inventorying GHG precursors –also known as Ozone precursors–. According to these guidelines, the INGEI is divided in four particular sectors:

-Energy
-Industrial processes and product use
-Agriculture, forestry and other uses of land (AFOLU)
-Waste management

Likewise, the evaluated gases are:

-Carbon Dioxide (CO_2)
-Methane (CH_4)
-Nitrous Oxide (N_2O)
-Halocarbons (HFCs)
-Perfluorocarbons (PFCs)
-Sulfur hexafluoride (SF_6)
-Carbon Monoxide (CO)*
-Nitrogen Oxides (NO_x)*
-Volatile hydrocarbons different from Methane (NMVOC)*
-Sulfur Dioxide (SO_2)*
(*GHG Precursors)

Emissions are accounted for each specific gas, and at the same time as equivalent Carbon Dioxide units (CO_2eq) with the purpose of being able to draw comparisons between them, and to measure the contribution of each 'key source' to the nation's total emissions (Chacón, Jiménez, Montenegro, Sasa & Blanco, 2014, p. 15). The latest two INGEI report have registered 95% of all GHG found in Costa Rica as a result of an assessment of the 'level' and 'trend' of these gases (Chacón et al., 2015a, p. 11). These two evaluations, as well as the notion of 'key sources' are based on the IPCC's (2000) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (Chapter 7: Methodological choice and recalculation) and on a 'software'[18] facilitated by the United States Environmental Protection Agency (Chacón et al., 2015a, p. 19).

[18] Unfortunately no further reference to this software has been found anywhere either in academic, official or news sources; nor was it ever mentioned during the applied field interviews with the relevant 'experts' during 2016 and 2017.

As was introduced in the beginning of this chapter, since the fifth INGEI, all of IMN's inventories have been based on the methodological and conceptual guidelines provided by the IPCC which have been effectively *black-boxed* and remain largely unchallenged. The latter process at the same time relies on how the authority of the IPCC itself, enacted as a *parliament of specialists* responsible for assembling, maintaining and circulating the scientific legitimacy of these seldom challenged calculatory devices remains equally undisputed (MacKenzie, 2009). The overall *agency* of the IPCC and its calculatory devices, as well as the mechanism by which both their authorities remain largely unchallenged, will be discussed in greater depth later on. For now, the following pages will summarize the sixth INGEI for 2012. This summary will review the contribution 'level' of each analyzed sector to the totality of GHG emissions in Costa Rica; as well as the identified trends of the totality of all generated GHG emissions throughout time (Chacón et al., 2015a, p. 18).

Finally, and before further continuing this particular review, I feel convenient to state that much in the same line with Ingmar Lippert's 2013 PhD dissertation, with which the present study shares numerous of theoretical, conceptual and paradigmatic similarities; I am taking all numbers in the different inventory reports, documents and interviews that sustain the present at *face values*. In other words, in the present dissertation, I will not attempt to engage with the formulas by which the derived values recorded, displaced and mobilized in each source where arrived at.

Energy Sector.

This category covers all GHG emissions generated in the combustion and volatilization of gases. The main focus of the analysis is placed on activities in which emissions are generated in the use of fossil fuels in stationary and mobile applications (Chacón et al., 2015a, p. 21). Stationary applications gather: energy generation industries, manufacturing and construction industries, and others (residential, commerce, agriculture and fishing industries). Mobile applications on the other hand gather: ground transportation, civil aviation, railways, maritime and river navigation and other transports (all terrain).
Data regarding the consumption of fossil fuels was taken from the annual energetic balance elaborated by the Energy Sector Directorate (DSE) and the emission factors from IPCC's 2006 guidelines for elaborating GHG emission inventories with the exception of the CO_2 emission factor which was instead obtained through an analysis of the carbon content of fuels used in Costa Rica (although there is no mention of the entity that carried out this particular analysis, or where it is available).

Energy Production Industry:

According to the IMN, Costa Rica has an energetic network largely based on 'clean' energies distributed in 71.8% of hydroelectricity; 13.9% geothermic; 5.2% wind; 0.8 Biomass; 0.003% solar and 8.2% thermic. The latter source is the only one considered a non-renewable and non-clean source of energy as it is powered by two fossil fuels: diesel and bunker (though to a lesser degree). Consequently, the majority of GHG emissions accounted

in the energy production sub-sector belong to thermic power generation.

The IMN excludes the emissions generated in the hydropower production in this section of the inventory, and instead includes them under the 'Humedales' category of the AFOLU sector which literally translates to 'wetlands', but which for the sake of accuracy, I will continue translating as 'flooded lands'[19].

This, they argue, is because they correspond to emissions generated in reservoirs (Chacón et al., 2015a, p. 22). In so doing, the IMN favors an understanding of these emissions as *other* to the generation of electricity.

Although I will discuss this with greater depth on page 146, the present can be seen as an example that shows how classifications do not pre-exist 'natural' entities; just like neither are the calculations that *order* these simply limited to record a positively given reality 'out there'. Instead the development of classifications is a critical step in the enactment of new emergent realities in which entities are *locked* into specific roles assigned for them by other actors in a process of *translation* (Callon, 1986). In this particular case, gases liberated in reservoirs through the diffusion of the water-air interface are locked into position (or classified) as GHG emissions belonging to the AFOLU sector by the IMN. In other words, the IMN imposed its 'flooded lands' category over certain entities (gases) which

[19] As I will argue later on page 146, the inaccuracy of the translation of this term is neither innocent nor the result of sloppiness, but a carefully orchestrated socio-technical arrangement.

in turn came to be define as 'GHG emissions'. These then emerged as a new 'natural' reality made visible and calculable (Murdoch and Ward, 1997) not by themselves, but as entry numbers strictly recorded under the 'flooded lands' –and not the 'energy production industry'– category of the INGEIs.

The IMN renders the emissions from geothermic power as 'fugitive', and calculates them by using an 'emission factor' taken from a local study of CO_2 emissions directly from the geothermic plants. This was done so in light of the inexistence of any methodology to account for these emissions in the IPCC guidelines (Chacón et al., 2015a, p. 25). Solar and wind power are considered to not have any directly related emissions.

Manufacturing and construction industry:

Includes the emissions produced in all equipment used in different industrial processes to produce vapor, heating, cooling, illumination and movement (driving force). Emissions produced in the transportation of raw materials and products are excluded in this section, and are instead included in the 'transport' sub-sector (the same is true for all other subsectors analyzed in the INGEI's that require any kind of transportation of goods or raw materials).

Food industry is the primary consumer of energy in this sub-sector using up to 37% of the energy, followed by the chemical industry with 15%, and all other industries (such as construction and the production of leather, paper, wood products, etc.) with a combined total of 38%.

Transports:

This sub-sector includes emissions produced in terrestrial, aerial and maritime transportation vehicles. A national CO_2 emission factor was used in the analysis of this subsector alongside IPCC's emission factors for all other GHG emissions.
According to IMN, the vehicle fleet in Costa Rica consisted of approximately 1.400.000 vehicles in 2012; while both the proportion of vehicles with diesel and gasoline powered engines, and the amount of CO_2 emissions these respectively produce were very similar.

Although emissions produced in international air transport and in international maritime transport are accounted in this sub-sector, these are only accounted in order to "guarantee worldwide completeness; but they are [ultimately] not added to the country's emissions" (Chacón et al., 2015a, p. 23. My translation). The IMN states that these emissions[20] are presented for 'informative' purposes only, but that they 'belong' to an 'international deposit' (Chacón et al., 2015a, p. 25).
As will be further discussed later on, the growing GHG emissions produced by the equally growing international air travel and air fright industries remain on a virtual 'no man's land' as these emissions have so far escaped all international regulations intended to allocate them. These

[20] Which according to the 2012 INGEI, adds up to 609.89 Gg of net CO_2e (Chacón, et al., 2015a, p. 25) whereas the same inventory estimates the emissions of the entire energy production to a total of 590.44 Gg of net CO_2e (p. 22).

failed international attempts have included the Davos Declaration (2007) by the United Nations World Tourism Organization, the first period of the Kyoto Protocol (2008–2012), the Copenhagen Climate Conference (2009), and more recently the International Civil Aviation Organization Conference (2016); none of which has, for instance, conclusively held any actor or part[21] responsible for these emissions, nor secured an international tax on aviation fuel.

Other [sub]sectors:

Under this category, the INGEI includes the 'public, service and commercial [sub]sector', the 'residential [sub]sector' and the 'agriculture [sub]sector'. These gather the emissions produced in refrigeration, illumination, cooking, heat generation, office equipment and other non-mobile machinery.

Before reviewing the next sector of the INGEI, it may be relevant to mention that Costa Rica is an importer of petroleum (not a producer). Hence the 'fugitive' emissions found in this sector correspond only to the transportation, refinement and storage of such imported oil, and the distribution of its derivate products (Chacón et al., 2015a, p. 25). Moreover, it is stated on the 2012 INGEI that the country did not import raw oil in that year and hence no emissions exist for this specific entry.

[21] For instance, destination countries, countries of departure, airline companies, aircraft manufacturers, travelers, etc.

Industrial processes and product use.

The emissions considered in this sector correspond to those produced in the "transformation of raw materials through physical and chemical means" (Chacón et al., 2015a, p. 27). This includes the manufacturing of cement (by far the largest source of GHG emissions of the sub-sector); the production of lime; the production of glass; the use of hydrofluorocarbons –as a replacement to Chlorofluorocarbons (CFCs) – in refrigeration, air conditioning and other applications; the use of Sulfur hexafluoride (SF_6) as an insulating agent in the transmission and distribution of electricity.
This sector does not include the respective emissions produced in the country's electronic industry as the IMN states that there are no such emissions in the production of semiconductors (the only electronic product manufactured in Costa Rica). Additionally, the emissions produced in the use of non-energetic combustion products –such as lubricants and paraffin waxes– are not accounted in this INGEI as the data concerning these is only currently being produced for its inclusion in future inventories (Chacón et al., 2015a, p. 28). Finally, there is no entry for the emissions produced in steel or chemical industries because these are inexistent in the country.

Agriculture, forestry and other uses of land (AFOLU).

According to the IMN, agriculture and forestry activities either generate GHG emissions or absorb CO_2 through several processes that take place in the different eco-systems condensed under this sector. These processes include photosynthesis, respiration, decomposition,

nitrification, denitrification, energetic fermentation and combustion (Chacón et al., 2015a, p. 31). More precisely, the INGEI reviews the following processes in relation to their respective emissions:

-CH_4 emissions produced in the energetic fermentation of cattle.
-CH_4 and N_2O emissions produced in the processing of manure.
-Emissions and absorptions of CO_2 resulted from changes in the existence of carbon in biomass, dead organic matter and mineral soil*.
-CO_2 and non- CO_2 emissions produced in fires*.
-N_20 emissions*.
-CO_2 emissions related to the application of lime and urea*.
-CH_4 emissions produced in rice cultivation.
-CH_4 emissions in flooded lands (This includes all reservoirs used in hydroelectric power generation).

*On all managed lands categorized as part of the AFOLU sector.

In the summary of this chapter, I consider relevant to briefly review two particular subsections of the AFOLU sector because of their direct relation to the topic of this study; and because I believe they both reveal interesting information regarding the way GHG emissions are framed in the latest two INGEI reports.

Forestry land.

The information sources used for this subsection mainly derive from governmental forestry statistics and censuses;

land coverage maps; and stored and fixed biomass data by type of forest (Chacón et al., 2015a, p. 33). The proportion of carbon stores in tree biomass used in the latest two INGEIs (used to estimate CO_2 absorptions) equals 47%. This factor corresponds to the one recommended in IPCC's 2006 methodology. However, there has been voiced criticisms from Costa Rican academics in regard to the extent the *black-boxed* notion that forests are in fact capable of offsetting carbon emissions at all (Baltodano, 2008), and the *precariousness* behind local calculations to estimate actual carbon absorptions in relation to biomass expansion in forest stocks (Alice, Fonseca & Herrera, 2014, p. 28).

Flooded lands.

This sub-section of the INGEI includes the methane (CH_4) emissions produced in reservoirs used in hydroelectric power generation. The methodology defined by the IPCC in 2006 only considers methane emissions liberated in reservoirs through the diffusion of the water-air interface[22] in light of "existing discussions regarding the amount of actual emissions from reservoirs, especially those with low energy or power densities" (Chacón et al. 2014, p. 35). Therefore the guidelines designed by the UNFCCC for Clean Development Mechanism projects (CDMs) were used to determine the power/density ranges (estimated in Watts/m^2).

In absence of a 'scientifically valid' national emission factor to determine the corresponding emissions of this sub-

[22]Although three other mechanisms are recognized and enlisted in the INGEIs.

sector, the employed emission factor derives from the IPCC (Chacón et al. 2015a, p. 36).

It is stated on the 2010 INGEI that Costa Rican reservoirs are not expected to produce large emissions rates because they belong to the higher power-density category (Chacón et al. 2014, p. 36). Instead, the document states that these emissions could be expected to become minimized in the long term because the country's reservoirs produce much more energy-per-unit than those high-emission cases typically used as reference in existing literature. Moreover, on page 36 of the 2010 INGEI, table 4.9 titled 'CO_2 emission criteria in reservoirs' is provided:

Power density (W/m^2)	Recommendation
Less than 4	Not to consider standard methodology for CDM projects.
4-10	90 ton CO_2 eq/ GWh
More than 10	Emissions can be neglected.

Table A: Threshold values and criteria for hydroelectric power pants with reservoirs

'Table A' (which is at the same time based on UNFCCC's CDM EB23 Annex 5)[23], designates the threshold values and criteria for hydroelectric power pants with reservoirs for CDM projects as accepted by the mentioned multilateral entity. Thresholds are calculated in the result of the division of the assigned value of installed power generation capacity by the flooded surface area. In the 2010 INGEI it is argued that there is no reservoir in Costa

[23] Available at: https://cdm.unfccc.int/EB/023/eb23_repan5.pdf

Rica with a lower power density than 4 W/m^2. Moreover, that aside from a single reservoir that has a higher power density than the previous figure, all other reservoirs in the country have higher or much higher power densities than 10 W/m^2 (Chacón et al. 2014, p. 36). Consequently, their CO_2e emissions may be neglected from GHG emission inventories. Similarly, a member of the Costa Rican Institute for Electricity (ICE) stated that methane emissions form reservoirs have a generation curve that dramatically decreases after 10 years because the submerged organic matter should be completely disintegrated by that time (C. Hernandez, personal communication, April 13, 2016). These issues surrounding the processes of calculation and accounting mobilized in Costa Rica's INGEIs for the 'flooded lands' subsector can be seen in light of two specific theoretical arguments found in STS work. First, the role that numbers have in making things governable through a process of *simplification* (Law, 1992) with which decision-making processes are effectively 'shortened' by actively transforming the *objects* that calculations and modern technologies together reveal into uniformed, materialized *things* that afford being measured, compared, displaced and circulated (Kalthoff, 2005, p. 73); and second, that for an object –like methane emissions from reservoirs, as calculated in the INGEIs– to be sustained, stabilized and capable of moving between locations, not all of its constituent 'parts' can be brought into presence; hence any given thing made *present* will always depend on another being made *absent* (Law & Singleton, 2005).

Waste management

The last sector of the INGEIs estimates the carbon, methane and nitrogen oxides from the following sources:
-Solid waste disposal
-Biological treatment of solid wastes (Composting)
-Incineration and open incineration of waste
-Treatment and elimination of sewage water

A revealing issue addressed throughout the review of this sector is the less than ideal situation of wastewater treatment in Costa Rica. The INGEI states that despite the fact that the country's sanitation covers 99.4% of total population; only 2.4% of the latter has access to a sanitary sewer network connected to some sort of water treatment system. Additionally, the INGEI reveals that despite the fact that 70.54% of the total population makes use of septic tanks, there are little to no controls regarding the design, construction, operation and maintenance of these. Moreover, the authors state that in the majority of cases, these tanks are only connected to black water (from flush toilets) and not greywater (sinks, showers, wash machines, etc.). What is more, in the majority of cases, the latter are directly connected to storm sewers and drains which eventually unload untreated directly on rivers and creeks (Chacón et al., 2014, p. 44).
It is stated on the last two INGEIs that the lack of available information, and the lack of regulatory controls on sewage infrastructure, is evident in the construction of new residential condominiums; while on the contrary, "all

productive activities[24] that generate residual waters must comply with the regulations on spill and re-use of residual waters" (Chacón et al., 2014, p. 47. My emphasis and translation). This means, in other words, that regulations on this matter are enforced over the private sector, yet with the exception of the housing industry.

Total results

The final chapter of the 2012 INGEI provides a short summary of all sectors analyzed put together. This summary contains several tables that simplify (and hence, reduce) the information found in the previous chapter with the intention of allowing a quick-and-easy comparison between the emissions produced in each of the four sectors (expressed both as specific GH gases, and as their respectively assigned 'carbon equivalence' value), and between the emissions accounted in latest three INGEIs (2005, 2010 and 2012). Likewise, the 2012 INGEI presents an 8-page annex where all tables are summarized with more detail.

The following diagram is based on '*Figura 6.1: Distribución de las emisiones de gases de efecto invernadero expresadas como CO_2 equivalentes para el 2012'* provided at the end of the 2012 INGEI[25]. It visually summarizes the distribution of GHG emissions expressed in CO_2 equivalent units.

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[24] The 2012 INGEI enlists the production of coffee, sugar, starch, vegetable oil, meat, fruits and vegetables as such productive activities.

[25] The shown 'Figure 4' is virtually identical to figure 6.1 except for the translation of all wordings from Spanish to English.

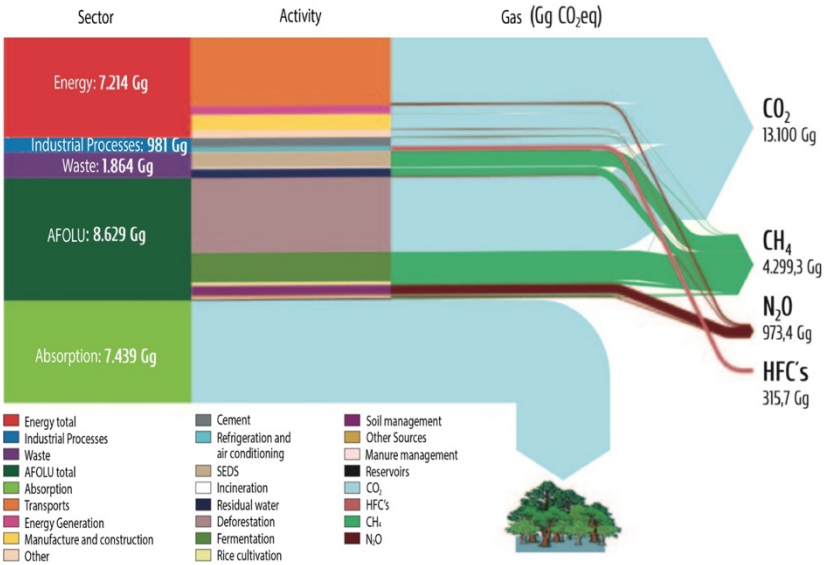

Figure 4: Distribution of GHG emissions for 2012 expressed in $C0_2$ equivalents

Punctual Observations 2

Several mentions are made throughout the different sectors and sub-sections of the INGEIs indicating that certain emissions (mainly CO_2) are not 'added' to the country's total GHG emissions for one reason or another. Although these reasons are specific to the source of each particular emission, these emissions are generally withdrawn from the overall calculations because they are said to emerge either from organic matter –such as plant

residues, biomass, timber, charcoal, etc.[26]; or biogenic processes –such as CO_2 emissions from landfills and the treatment of wastewaters.

Following Michel Callon's now classic ANT study on the scallops and fishermen of Saint-Brieuc Bay in Brittany, France; I argue that the IMN sought to become indispensable to a wide range of gases by defining these as 'GHG' emissions. The 'nature' of some of these gases where further defined as being 'environmentally hazardous' due to their contribution to the problem of 'climate change', which itself emerged as the 'new' main environmental threat to target through Costa Rica's 'carbon neutral' *actor-network*. Later, this emergent network –which includes the IMN as a key actor– suggested that the problem of 'climate change' could be resolved if GHG emissions where negotiated and accounted in the *obligatory passage point* of the IMN; namely the National GHG inventories. However, while some gases where defined by the INGEIs as 'evil' GHG emissions, others (like the emissions from organic matters introduced above) were 'withdrawn' from the overall calculations, discarded because of their somewhat independent nature to human activity (such as water vapor), or simply remain 'invisible' to modern science and technology.

All in all, earth's global emissions are neither things simply

[26] For instance, carbon emissions produced in cooking in the residential sector are not included in the final inventory because the most common types of fuels used for this purpose are timber or charcoal (Chacón et al., 2015a, p. 24).

'out there' in the atmosphere, nor things that occupy Euclidean space; instead they are things that come into existence through socio-technical devices (such as computer screens) and performances (such as conferences, scientific articles) mediated by communities of 'experts' (Lippert, 2013, p. 21). "Researchers, irrespective of their discipline, work on inscriptions produced by instruments, which they have to decipher and put into statements. […]" (Callon, 2006, p. 13). Callon further argues that the scientist's work is to 'help nature to write' hence making 'experts' the mediators between the *inscriptions* 'written' by nature, and the interpretations put into words which will eventually constitute the propositions and discourses about the new emergent 'natural' reality. It takes further *effort* to sustain and stabilize the networks of relations over which those emergent statements were assembled upon; otherwise things start to lose their shape and stop being the objects they were (Callon & Singleton, 2005, p. 337). In our case, accounting is key in making carbon emissions visible –or invisible– (MacKenzie, 2009), particularly because 'non-visible theoretical entities' like gases, are simultaneously brought into existence *and* made calculable by an *operative writing* which determines the correspondence between those emergent 'invisible' entities and their formal mathematical expression; and not the nexus between those expressions and naturally given objects 'out there' waiting to be measured, calculated and recorded (Kalthoff, 2005, p. 82).

Just like emissions are not simply just 'there' waiting to be *ordered*, the motivations and interests of the enrolling actors to participate in the performative construction of emissions should not simply be taken for granted either.

Emissions only become relevant once they have been constructed as an *issue*, an "unwanted consequence of an action or omission that affects a certain group of human beings" (Ureta, 2014b, p. 306). Moreover, carbon emissions become a 'public' *issue* once certain human actors feel affected by them in a certain way, and decide to gather forces to 'fix' them, to do something about them. But as we have seen, not all *inscriptions* become gases; not all gases become 'emissions'; and finally, not all 'emissions' become *issues*. It becomes apparent then that the two relevant things to look at here are: Firstly, how it came to be determined what things will be made visible (and subsequently, what others invisible) within the emergent networked reality; and secondly whose voice will determine this outcome (Bowker and Star, 1996). These questions loop back to Callon's four moments of *translation* in that:

1) *[Problematization]* The IMN sought to become indispensable in the fight against hazardous GHG emissions which affect Costa Rica's 'economy', 'environment' and 'society'. For facing such challenge, the IMN suggested that these emissions could be governed if they were calculated and accounted for in its INGEIs (the IMN's *Obligatory Passage Point*);
2) *[Interessement]* The IMN locked a range of gases into fulfilling the role of what became to be known as 'GHG emissions';
3) *[Enrolment]* The IMN mobilized a set of strategies in which the emergent 'GHG emissions' where defined and calculated –through inscriptions, technological devices, mathematic expressions and social interactions among 'experts'–;
4) *[Mobilization]* Finally, the IMN mobilized a series of

techno-scientific calculations, propositions and discourses about the accounted GHG emissions in an effort to provide robust 'scientific proof' that would allow to sustain these inventories (and these emissions) as a stable network of relations. The emergent propositions where assembled not only as credible and indisputable 'proof' about carbon emissions; but also, as *mobile* gases capable of circulating through their *displaced* embodiment as numbers in inventory reports.

However, did all GHG gases make it into these reports? Whatever happened to those gases that despite being made *visible* in instruments, inscriptions and statements; and despite being defined as 'GHG emissions' either ended up slipping through the INGEIs by avoiding their calculation, or ended up being calculated but *not* added to Costa Rica's final grand emission total?

As was mentioned in the first paragraph of this subsection, GHG gas emissions liberated from the combustion of 'organic matter' (such as timber or biomass) and from 'biogenic processes' (like organic decompositions in landfills) are in fact withdrawn from the overall calculations without the provision of any explanation or reason whatsoever[27]. Similarly, emissions from international aviation and maritime transportation, or 'international bunker fuels' are also expected to be accounted but not summed to the country's total emissions (United Nations Framework Convention on Climate Change [UNFCCC], 2017). In this case, the IMN states that these emissions are only accounted in order to

[27] See pages 25 and 43 from the 2012 INGEI.

guarantee 'worldwide completeness' (Chacón et al., 2015a, p. 23) and presented only for 'informative purposes' but that they ultimately 'belong' to an 'international deposit' (p. 25). Emissions from international flight industries in particular are in fact a delicate issue to consider since these increased proportionally to the growing demand for international air travel and transports in general. On this matter, Fletcher argued that "[t]he Kyoto Protocol, for example, does not require any specific parties to assume responsibility for emissions from international air transport" (Fletcher, 2016, p. 144); while Gössling (2009) discussed how the international aviation has been left 'off the hook' from any reasonability on the matter, despite the intricate symbiosis between air travel and global tourism (particularly 'eco-tourism', where Costa Rica is renowned to be hugely important). Gössling's study showed how the growing GHG emissions from the air travel industry remain on a virtual 'no man's land'; as these emissions have so far escaped international regulation (such as the not-so-binding 'Davos Declaration' in 2007 by the United Nations World Tourism Organization) which do not hold any actor conclusively responsible for these emissions. In short, while emissions from 'biogenic processes' and 'organic matter' simply 'disappear' from the final overall calculation of the INGEIs, international flight and maritime emissions are enacted as being 'stored' in an abstract void-like space known simply as the 'international deposit'. Hence all these emissions have been effectively *disrupted* (Galis and Lee, 2014); they have been rendered as 'powerless' in that their power to influence negotiations within the INGEIs network has been downplayed as being either 'harmless' (emissions from 'biogenic processes' and 'organic matter'), or 'irreprehensible' (emissions from

international air and maritime travel). Rather than constructing *chains of translation* (like Callon's *moments of translation* suggest), the IMN has constructed *chains of differences* that deconstruct the *agency* of those gases by destabilizing their organization, and ultimately portraying them as *invisible others* (Galis and Lee, 2014, p. 168) to those other gases who succeed in mobilizing their own *agencies,* and in making themselves dominant and representative – hence effectively being added to the grand emission total of the INGEIs.

Galis and Lee then speak of a process in which the *presence* of some 'successful' actors necessarily depends on the *absence* of other defeated and excluded ones. Although not nearly the same claim, Law and Singleton (2005) argued that the constant, juxtaposed and patterned interactions between entities (bodies, numbers, discourses, etc.) *included* and *excluded* from a network make it possible for an object to be temporarily sustained over different and discontinuous locations (Law & Singleton, 2005). In short, they argued that an object made *present* necessarily depends on another made *absent*. When these emergent objects are further translated into policies, a process of *problem closure* takes place which provides "socially acceptable solutions for well-defined problems" (Hajer, 1995, p. 22). These solutions are once again obtained by sorting out which aspects of the emergent problem will be included, and which will be excluded; giving way for a 'proper target' for policy-making instead of the contradictory, fluid and precarious *mess* (Law & Singleton, 2005) from which objects actually emerge. Finally, Lippert (2013) argues that since the calculation of carbon emissions are full of judgements like the ones reviewed so far, it is apt to

conceptualize the process of accounting carbon emissions not simply as a calculation, but as *qualculation* (Callon & Muniesa, 2005) that implies both qualitative and quantitative manipulations over the mobilized data and its relations, and over the materiality of the emergent reality. The emergent numbers and 'results' from these *qualculations* are signifiers of loss of accounts of –*other*– realities (Lippert, 2013, p. 107). In other words, the *presence* of emergent accounts of GHG emissions that result and temporarily 'hold together' from a performative process of *qualculation* rely on the *absence* of other alternative accounts of such emissions and of other *disrupted* material entities. In conclusion, GHG emissions are politically assembled entities that rely on performative heterogeneous processes of patterned absence-and-presence (or inclusions-and-exclusions) that lead to the establishment of a categorical *order* between *socially valuated* (Helgesson & Muniesa, 2013) objects that is nevertheless empirically *contingent*, and ontologically *multiple*, *precarious* and *fluid*.

Briefly: Costa Rica's GHG did not pre-exist policies. Instead, they are politically assembled entities that were defined within the policies intended to render them governable –the INGEIs–. Yet not all gases 'made it' to the inventories. Unlike GHG, not all gases emerged as 'bad'. Some gases where rendered as 'harmless', others as 'irreproachable' to any particular actor, while others simply remained 'invisible' to 'modern' science. Hence all of these 'other' gases where consequently either ignored or withdrawn from the INGEIs.

Put differently, GHG emissions are not positively given natural objects literally and figuratively floating around 'out there'; instead they are politically assembled entities whose

material and discursive *presence* necessarily relies on the *absence* of that of other –alternative or hypothetical– entities.

Continuing with another observation on Costa Rica's INGEIs, numerous mentions are made to indicate the origin of each 'emission factor' or specific 'calculation' used to determine the different values assigned to each sub-sector analyzed throughout the INGEIs. As far as emission factors go, the document essentially alternates between the use of emission factors provided in the 2006 IPCC guidelines for elaborating GHG emission inventories and locally produced emission factors derived from specific studies elaborated in Costa Rica. Here, the authors state that ongoing work is continuously being invested to improve the quality of the data used in the inventories as well as the emission factors (Chacón et al., 2015a, p. 17). This suggests then, that the ideal scenario is to consolidate as much context specific-emission factors as possible, leading to measuring systems with greater certainty than those generic default emission factors provided in the IPCC guidelines. In fact, Chacón acknowledged this concerned in a personal interview and stated that the IMN currently has all of its estimations of GHG and removals for each source in at least 'level 1'; yet that the goal is to have them all in 'level 3' (A. Chacón, personal communication, February 27, 2017). By this, Chacón makes reference to the three 'Tier levels' coined by the IPCC in its 2003 *Manual for Good Practices for Land Use, Land Use Change and Forestry*. According to this manual, 'Tier levels' are three progressive methodological ranks for estimating GHG and their removals for each source that go from the use of simple equations with default data to

country-specific data to more complex national systems. According to the IPCC, the progression from the 'lowest' to the 'highest' level correspond to an implicit progression in the degree of 'certainty' of estimations because of the increase of methodological complexity, regional specificity and the extent of activity data (Intergovernmental Panel on Climate Change [IPCC], 2003, p. 3.17). Likewise, the IPCC states that moving from lower to higher tiers typically requires an increase in institutional and technical capacity, and in resource investment.

Put briefly and schematically, the following table condenses how the IPCC defines these three 'Tier levels':

Tier Level 1	Employs basic methodologies that commonly uses spatially rough data, such as nationally or globally available estimates of deforestation rates, agricultural production statistics, and global land cover maps.
Tier Level 2	This tier level can use the same methodological approach as Tier 1 but applies country-defined emission factors, emission coefficients for specific regions and specialized land-use categories per activity. The IPCC considers the use of this set of country-defined data as a more appropriate basis for estimating GHG emissions and removals in each specific reporting country. Additionally, Tier 2 level can also apply stock change methodologies based on country-specific data.
Tier Level 3	Employs models and inventory measurement systems designed specifically for each national circumstance, repeated over time and driven by

	high-resolution activity data that is compartmented into a finer sub-national grid. According to the IPCC, the more complex methodologies employed in this tier level provide estimates of greater certainty than those of lower tiers and have a closer link between biomass and soil dynamics. Additionally, this level employs land-use data that can track land changes over time. Finally, the models coined in this level are to periodically undergo quality checks, audits, and validations to ensure their accuracy.

Table B: Framework of tier structure
(Based on IPCC, 2003, p. 3.17. Box 3.1.1).

Throughout the INGEI, quantitative values assigned to specific gas emissions appear on the different tables of the document. However, the ways in which these gases were 'actually' measured is often left unsaid. On those occasions in which these mechanisms are made explicit, we find references of measurements directly made on a selected population of sources –such as emission measurements made on automobiles without inbuilt emission control systems (Chacón et al., 2014, p. 22). On other occasions, measurements are 'estimated' on the basis of available 'related' information connecting a process or a product to an emission calculation –such as the estimation of CO_2 emissions from the cement industry based on available knowledge on the carbon emissions produced in the processing of clinker (a component of cement) instead of cement itself (Chacón et al., 2015a, p. 27). Finally, some estimations are arrived at based on measurements of arguably distant and indirect variables in space, time and

matter –such as the assessment of N_2O emission from domestic residual waters based on estimates of the consumed kilograms of protein per capita at a national level. In this case, emissions are arrived to by calculating the amount of nitrous oxide typically liberated in the synthesis of urea linked to the degradation of protein by the human body (p. 45).[28]

Despite the rather obvious differences between the methods of calculation employed in the three examples above; and despite the differences in the degree of local accuracy and methodological complexity between the different (tier) 'levels' of calculations enlisted earlier, the IMN makes no explicit distinctions between the qualitative differences of these calculations. Instead, the INGEI is reported in a way in which it would appear as if all of its different calculations and measurements share the same degree of robustness, precision and accuracy.

Alice, Fonseca and Herrera (2014) however published a critique on several issues behind Costa Rica's GHG inventories from a methodological point of view, which in part relates to all the issues discussed above. The authors argue that the absence of several technical specifications to estimate emissions in Costa Rica's INGEI reports generate elevated risks that reduce the applicability, comparability and reliability of their results (Alice et al., 2014, p. 28).

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[28] The three examples of measurements described in this paragraph correspond to what Alice, Herrera and Fonseca (2014) term 'source sampling', 'material balance' and 'extrapolation' measuring techniques respectively.

Now, before I continue reviewing the particular criticism these authors make to Costa Rica's INGEIs, I would like to make a relevant philosophical statement related to why –or more precisely how– I have included the particular work of these authors in the first place. As I will continue showing throughout this dissertation, I do not believe that it is possible or even relevant to discuss whether the different methodological procedures, devices and calculations mobilized in the process of accounting GHG emissions in Costa Rica –or in fact, in any other techno-scientific controversy– can be considered technically or scientifically 'flawed' or not. Or for that matter, to state that there exist alternative devices that would allow techno-scientific 'experts' to measure, calculate and record carbon emissions more accurately. Such an endeavor would precisely contradict the purpose of this entire dissertation in that it would imply subscribing it into a positivistic paradigm that understands that a positively given 'nature' out there can be approached by sound scientific methods populated by strictly objective inquiry and properly calibrated instruments. On the contrary, I believe that GHG gases cannot 'simply' be measured to begin with, precisely because such entities only come into existence through particular and contingent sociotechnical practices. Or as Lippert puts it: "Different apparatuses produce different carbon. A reconfiguration of any carbon measurement apparatus will not get closer to an independently existing reality. Rather, the material reality of carbon is configured by the means by which it is produced" (Lippert, 2013, p. 471). Hence, a collage of different –and often competing– practices will result in *multiple* realities of carbon(s). What is more, I believe that these simultaneous practices are not only embedded in –

political– subjectivities, but also occur through a series of performative negotiations between human and non-human entities holding equal *agency*.

Returning to Alice and colleagues' (2014) paper, the authors identify several issues or challenges related to the country's methods and metrics mobilized to estimate its GHG emissions. First, they argue that Costa Rica's carbon neutral model makes no distinction between 'real' and 'potential' emission measurements (p. 19). Here 'real' measurement of emissions are understood as the calculation that better reflects the actual mass of gases liberated in the atmosphere in a certain period of time; while the 'potential' measurement is the estimation of the maximum rate of liberated gases that a source can reach during a certain time frame. These two types of measurements are based on two assumptions: 1) that all measuring equipment used to determine these emissions work at their full capacity; and 2) that these instruments are capable of measuring the full load of the measured gases. The authors argue that the country's 'carbon neutral' policy not only makes no distinction between the nature of these two approaches –which is commonly distinguished explicitly in each country's carbon regulation policies–; but that this leads to the potential risk of mixing these two methods which would lead to inconsistences that affect the overall capacity to compare the obtained data.

Second, they argue that despite the fact that the development of GHG inventories necessarily requires the combination of approaches to estimate emissions, the selection of these methods should on the one hand be made explicit from the starting point of any inventory;

while on the other hand consider the associated costs of elaborating an inventory in relation to the quality and degree of uncertainty that comes with each of the different methods (p. 20). In that respect, the authors establish a cost/benefit relation between the associated costs of six different technics to determine GHG emissions, and their degree of trustworthiness where the most costly method – source sampling– is also the most reliable; and the most inexpensive one –extrapolation– is at the same time the most inaccurate. The following 'Figure 5' –based on *'Figura 1: Relación entre el costo, el grado de confianza y las diversas técnicas existentes para el cálculo de emisiones en los inventarios de GEI'*[29] (Alice et al., 2014, p. 20)– illustrates the relation between costs and degree of confidence implicit in each of the existing technics to determine GHG emissions:

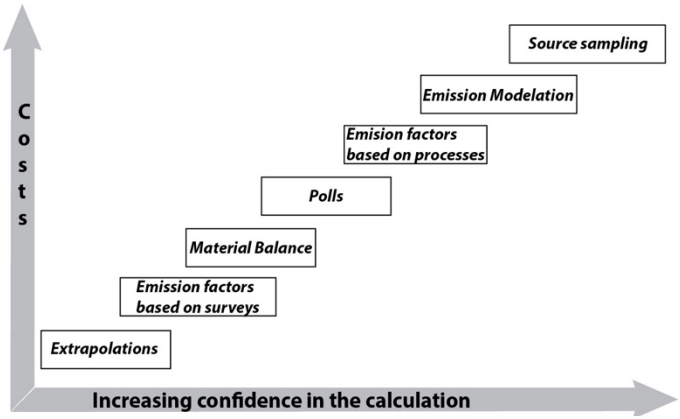

Figure 5: Relation between costs, benefits and degree of confidence in each technic for determining GHG emissions

[29] The shown 'Figure 5' is essentially the same as Alice and colleagues' 'Figura 1.' Found in page 20 of the reviewed article; except for the translation of all wordings from Spanish to English.

Although I will not attempt to review the six different techniques that the authors identify, I would like to focus on briefly reviewing the measuring technique that is based on the use of 'emission factors', which was acknowledged as the selected method in Costa Rica's INGEIs. 'Emission factors', which are placed somewhere in the middle of the cost/benefit scale-chart, represent the relation between an amount of GHG liberated in the atmosphere and a corresponding 'activity unit' (activities are the sources of emissions; for instance, generation of thermic electricity, cattle ranching, etc.). Emission factors can be classified in two types: those based on processes, and those based on census; the former are considered to be more accurate/expensive while the latter more inaccurate/inexpensive (see figure 5). Additionally, emission factors can either be nationally determined, or derived from IPCC's database and guidelines. Just like the former types of emission factors, the freely available emission factors derived from the IPCC are considered more inaccurate because of their generic nature; while nationally determined emission factors are considered to be much more precise, yet (more) expensive to produce. Costa Rica's INGEIs combine all of these types of emission factors, yet the IMN acknowledges the need to improve INGEIs by "considering more accurate methodologies, by elaborating emission factors specific to the country and by collecting more detailed activity data" (Chacón et al., 2015a, p. 19. My translation). However, the IMN also admits that doing this will require additional resources than those currently available; and that it is not possible to make improvements to each and all categories of emission source.

On this subject, the following extract of an interview made to a high-ranking member of FONAFIFO's development and marketing department addresses how in face of the elevated costs and the complexity behind the elaboration of nationally determined data, calculations are often deliberately simplified to reduce such costs and complications:

> ***Subject:*** *I believe that [the calculation of] carbon is one of the easiest ones. Because what you quantify is the growth of trees. There are other variables there that are rather complicated right; that we have tried to 'purify' so that… so that the costs do not elevate right? For example, those that have to do with nitrogen-sequestrating species.*
>
> *If you get into that… you have to quantify how many emissions of nitrous oxide are filling up the atmosphere; so hmmm, you also have to quantify how many [emissions] are staying [sequestered in the ground], and you would also have to quantify how many [emissions] are being generated in that exchange of nitrogen.*
>
> *So in the end of the day, these are small things that we are leaving out at the moment because we believe that they are way too complicated right? Hmmm these would mean being in the field with devices and instruments that tell you how the flow of nitrogen from the ground to the atmosphere really is. Right?*
>
> ***Interviewer:*** *Sure.*

Subject: *So, these are small things that… are more complicated to quantify, but… let's say you can obviate these in the general quantification, by saying: "ok, I will not consider these"… you can define certain limits. So to say: "ok, I will quantify until 'this' limit, and from there on, if it gets better or not, well… it could end up improving but I better not quantify it because it's way too costly".*

Interviewer: *Hmmm.*

Subject: *Right? For example measuring the organic carbon from the soil that 'happens' in an ecosystem. One would have to constantly be doing soil analysis; and although these are possible to quantify, they are very costly. They imply having to be going over to all the sites and taking soil samples every certain amount of time so that you can assess the growth of the organic carbon in a certain site, and in a certain ecosystem.*

So these are things that make you say no; I will not complicate my life. I know that organic carbon will improve but I will not quantify it because it's way too complicated. So instead, one focuses only in [the quantification of] the growth of trees.

(Source: R. Bedoya, personal communication, March 28, 2016. My translation.)

In this extract, the subject holds that the FONAFIFO has worked on 'purifying' the calculations necessary to determine the amount of GHG offset by tree biomass. In this process of methodological 'purification', certain

variables that typically bring along several –simultaneous– technical, monetary and practical 'complications', are the *excluded* from further calculatory consideration.

The subject also suggests that a great deal of the inherent complications from measuring certain variables in relation to carbon accounting derives from the need for 'experts' to be physically present at different sites –time and again– taking samples directly from the sources. As an alternative to such hassle, the subject readily assumes that 'expert knowledge' can authorize the establishment of 'limits' as to what is –and what is not– to be measured and calculated; and that way cutting corners in terms of complexity and costs. This belief consists just one of the two *black boxes* sustained in this statement; where the second –and perhaps more obvious one– is embedded in the assumption that trees and forests are essentially and necessarily 'good' at offsetting GHG. Hence measuring how much they offset is enacted more as a *matter of fact* than of *matter of concern* (Latour, 2004).

Before continuing with this discussion any further, I would like to direct the reader's attention to a central issue that can be observed not only in the above extract, but that has been mentioned several times throughout this chapter. That is on how the last two versions of the INGEIs have been based on the methodological and conceptual *black boxes* of the IPCC. Particularly on the parameters derived from IPCC's 2006 and 1996 guidelines for GHG inventories and for inventorying GHG precursors (respectively); as well as on the generic 'emission factors' found in the later version. These guidelines, as was briefly argued earlier, have been effectively *black-boxed* in a process

that was made possible in light of how the authority of IPCC itself has remained largely undisputed as a *parliament of specialists* whose a-political 'experts' assemble, maintain *and* circulate scientific legitimacy over 'climate change' issues. Moreover, MacKenzie (2009) holds that on those occasions in which IPCC's authority has been challenged, it has been over the bases of the 'reality' of anthropogenic climate change, and not on matters of 'details' over the IPCC's calculatory devices which tend to occur in more limited circles. He argues "[t]he IPCC's authority in such detailed matters is thus an essential part of 'making things the same' in carbon markets, by keeping the 'exchange rates' between gases inside the black box and separate from political and economic disputes" (p. 447. Original emphasis). Two ideas can be deduced from this assertion: Firstly, that an essential part of IPCCs task is to keep rendering its own authority as a *subpolitical* matter so that techno-scientific knowledge on which political decision-making about climate change issues is almost unproblematically based on, continues to give the appearance of being objective and indifferent to socio-political biases. And secondly, MacKenzie's assertion addresses how the IPCC actively seeks to clear out any potential space for controversies to emerge from in regards to its calculatory *black boxes*. As part of this effort, the IPCC relies on continuously projecting itself as a network assembled from strong techno-scientific consensuses, which ultimately authorizes its devices as scientifically pertinent. However, Callon (2009) holds that "in its organization, with the constitution of a world *parliament of specialists* (the IPCC) […], like any political assembly, negotiate the content of their reports among themselves and vote on scientific facts before making them public and

passing them on to policy-makers" (p. 545). Hence, scientific 'facts' emerge from *performative* negotiations between 'experts' who mobilize competing constructions of scientific 'realities' embodied in different calculations and different numbers; and not simply through the demonstration of undisputable 'proof' of an underlying reality 'out there'.

A parallelism may be drawn here with Kjaer and Muritsen's (2007) work on following the process of construction and negotiations of numbers involved in budget-variances controversies. Much like in the negotiation of competing scientific reports on 'climate change', the authors argue that there is a limit to the calculability of things and therefore negotiations are preferred. They concluded in their study that "[t]he goal of negotiation was to reach a state where participants were satisfied that it was not too far from their own calculation even if the result could not be proven" (p. 13). Thus, calculative or numeric 'facts' are not only the emergent effect of processes of negotiations, but the result of 'compromises' which involve a certain degree of 'unprovable' assumptions.

Once 'scientific facts' emerge from those processes of negotiations among limited circles of 'experts' (MacKenzie, 2009), they are not enacted either as frail nor contingent but instead as monolithic, timeless and unquestionable; or even better, as 'natural'. Here, a key condition for the emergence of 'reality' is that negotiations over "which numbers to feed into the calculating machine" are kept out reach for the larger public (Asdal, 2008, p. 129).

Another key condition for the emergence of 'scientific facts' and 'natural reality' is the production of *trust* in the performativity of numbers; and their role in establishing the technical possibilities of cleansing GHG emissions (Asdal, 2011, p. 3). Much like language is not limited to being a mere reflection of reality (Escobar, 1996; Miller & Rose, 1990), the production of *trust* relies on the *agency* of numbers themselves as active agents in the bringing 'natural facts' and 'realities' into existence and not simply in 'inscribing' scientific objects and facts into a supposedly pre-existing reality. Simultaneously, numbers are active agents in reducing complexity so that the decision-making process can be shortened (Kalthoff, 2005). The latter assertion can be identified in the extraction of the interview above where the subject literally refers to the processes in which calculations are *purified* in order to reduce 'unnecessary complications', not only for final decision-making agents, but for the community of specialized 'experts' themselves.

According to Rose (1991), in this process of construction, 'facts' –such as GHG emissions, the 'national economy', 'the population', and so forth– are assembled as a visible 'plane of reality', marked out by a grid of norms which render them governable. In his own words "the collection and aggregation of numbers participates in the fabrication of a 'clearing' within which thought and action can occur. Numbers delineate 'fictive spaces'" (Rose, 1991, p. 676. Original emphasis). In our case after all, "what are 'emissions' if not the *quantification* of pollutants?" asked Asdal (2011) who also argued that the pollution issue has been framed through numbers and calculating practices more than any other area of public administration (p. 2).

Hence, in the same process in which 'facts' are assembled, the emergent circulating objects –such as GHG emissions– are fixed into existence as uniformed, materialized things that can be measured and compared through computing, balancing and calculating (Kalthoff, 2005, p. 73).

Briefly: The authority of the IPCC relies on projecting itself as a network assembled from 'pure' techno-scientific knowledge and robust scientific consensuses which are all free from any socio-political entanglements. In practice however, scientific 'facts' really emerge from socio-political negotiations between a limited circle of 'experts' who each try to impose her or his own scientific 'arguments' over the rest. Thus, these 'experts' eventually end up compromising and conceding their 'arguments' among each other instead of 'simply' demonstrating an undisputable 'proof' of any given scientific 'fact'. Once 'scientific consensus' is reached in those processes of negotiations, the resulting 'scientific statements' are depicted to the larger public as a monolithic, timeless and unquestionable 'natural reality' which is nevertheless 'measurable' and 'calculable' through mathematical numbers. Hence, another key condition for the emergence of 'scientific facts' is the production of *trust* in the 'objectivity' of numbers and the 'unbendable' character of mathematic calculations. Moreover, numbers are seen as active agents in reducing complexity so that decision-making process can be shortened by reducing 'unnecessary complications' for decision-making agents, and for techno-scientific 'experts' alike.

Aside from all these issues discussed until now, Alice and colleagues also argue that the existing legal framework for reporting GHG in Costa Rica under the 'Carbon Neutral

Country Program' (reviewed later in this chapter) does not establish any guidelines oriented to determine the maximum degree of 'uncertainty' accepted either for the GHG inventories presented under that program, nor for the INGEIs themselves. What is more, the authors argue that nearly none of the inventories elaborated in the country to this date have included a 'calculation memory' that supports the value of uncertainty they are required to declare. This leads to a situation in which nearly any technique for calculating emissions is currently being admitted in Costa Rica, which in turn directly affects the quality of the [resulting] data, and the inter-comparability between inventories (Alice et al., 2014, p. 22).

Finally, Alice et al. (2014) state that 'extrapolations' –which they grade as the least accurate method to calculate GHG emissions– commonly take place in Costa Rica because of the prevalent lack of local studies (in terms of specific geographical areas, local tree species, ecosystems, etc.). These extrapolations along with the lack of domestic information ultimately contribute to further levels of uncertainty in the estimation the nation's emissions (p. 24). Moreover, by referring to some examples of locally produced estimates, these authors show how the use of the IPCC's 2006 'generic' reference values to estimate carbon absorption through the measurement of tree biomass expansion will tend to either overestimate or underestimate the actual valuations of carbon absorptions by local tropical forests (p. 28). All these issues addressed by Alice and colleagues carry a significance worth taking into consideration in the extent that, as they argue, decision-making within Costa Rica's 'carbon neutral' initiative continues to be made over outdated, incomplete,

imprecise, and generic data. At the same time, this situation puts into question the very purpose of the country's general 'carbon neutral' effort and all of its derivate embodiments.

Another issue worthwhile highlighting is the way in which categories are 'arranged' in the INGEIs. Particularly the placement of GHG emissions produced in hydroelectric power generation under the 'energy production industry' category in the 'energy' sector, while the emissions produced in water reservoirs appear under the category 'flooded lands' in the 'Agriculture, forestry and other uses of land (AFOLU)' sector. This is particularly relevant to highlight because not only are the majority –if not the totality– of all constructed dams and reservoirs in Costa Rica directly related to the generation of hydropower, but the INGEI explicitly links reservoirs to no other activity than the former. Yet, no reason is given to justify the separation of these two entities into two completely separate sectors. After all "the practical performance of enframing entities to be accounted for is everything but innocent" (Lippert, 2013, p. 451), and this particular separation is by no means the exception. On the contrary, I believe it is carefully orchestrated to result in a significant reduction on the total accounted methane emissions for the energy sector. By separating them as the INGEI does, the 'energy production industry' sub-sector comes out 'cleaner' in terms of accounted GHG emissions, which is very much in line with the country's discourse on being

powered by what is essentially a sustainable power matrix based on 'clean energies'[30].

But what is at stake? Kalthoff (2005) argues that calculative devices, such as the INGEIs "are not conceived of as neutral devices but as theory-loaded instruments of (scientific or economic) representations" (p. 71). Hence, neither the technical nor the human entities that assemble the socio-technical network of carbon calculations perform their task on a neutral basis, but instead on the basis of standardized forms of knowledge. The same thing then goes for the political practice of separating the calculated entities into categories or classifications. Bowker and Star recommend that "we should always understand classification systems according to the *work* that they are doing –the network within which they are embedded" (Bowker & Star, 1996, p. 7. My emphasis). In the case of Costa Rica's INGEIs, this *work* is certainly not limited to simply calculating the amount of gases being liberated to the atmosphere for the sake of the gases themselves; but for assuring the 'economic development' and 'growth' of Costa Rica, as was promised so insistently in the reviewed ENCC. But how exactly could cleaning up Costa Rica's 'energy production industry' benefit its economic growth? I can think of two reasons:

First, and based on the observations of two of my key

[30]For an example of this narrative in a recent press release, see: https://www.independent.co.uk/news/world/americas/costa-rica-electricity-renewable-energy-300-days-2017-record-wind-hydro-solar-water-a8069111.html

informants, the original idea behind the carbon neutral initiative was to attract international firms to 'move in' to Costa Rica which offered them, amongst other things, "practically the worlds cleanest energy network" (M. Gonzales, personal communication, April 7, 2016. My translation). According to these informants, this meant that international firms placing their operations in Costa Rica would 'automatically' transform them into low-emission ones.

The following extraction of an interview made to another of my key informants further illustrates this argument, while also introducing the second way in which cleaning up the country's 'energy production industry' may benefit its economic growth:

> ***Subject:*** *What should be promoted in tourism, and that Costa Rica has not done so thoroughly is… if you come to Costa Rica, how many tons of carbon dioxide do you emit? Versus when you travel to Panama, or I don't know… Colombia. These [other] countries have high… emissions of carbon dioxide in their energy production so to speak. So, if you come to Costa Rica, and turn on a light bulb in your room, or put on the air condition, how much carbon dioxide do you generate?*
>
> ***Subject:*** *In 'so' many days your generation of carbon dioxide will be 'so' much; and if you go to 'this' other country, you generate 'so' much.*
>
> ***Subject:*** *These are tools that they could be using in tourism, which I would say they are currently not taking advantage of.* […] *this could be a decision-making point*

for travelers.

Interviewer: *Sure.*

Subject: *If I go to Costa Rica I don't pollute so much, and I will see all this biodiversity; if I go to Panama, I will see the same biodiversity but I will pollute 'this much'* [more].

Interviewer: *Hmmm.*

Subject: *What is my impact in* [terms of] *'carbon footprint'? The only thing that we have different from the rest of the world is the generation of clean energy.*

Subject: *Let's say Amazon* [for example]… *Amazon, come and install your business and your offices here. If you install them in India or even in Panama, your tons* [of CO_2] *will be 'so' much; but just by coming to Costa Rica instead, you will have an emission reduction of 'so' much per year.*

Subject: *But they are not exploiting this; this is not being divulged* […] *And this is right now like the big 'boom' everywhere*

Subject: […] *What is Costa Rica's market plan? It's a 'green country'.*
Ok perfect, but everyone wants to be 'green' […] *But none of them can, or at least it's going to be tough for them to reach us.*

(Source: C. Hernandez Chanto, personal communication, April 13, 2016. My translation.)

At the end of this extract, the subject also refers to how offering a network of 'clean energies' may potentially be mobilized as a device of *interessement* (Callon, 1986) for attracting international firms to invest in the country by 'moving in' part of their operations into Costa Rica. The subject argues that the benefit for these foreign firms would be the 'certain' and/or 'automatic' reduction of their corporate emissions; as opposed to moving into countries 'like' India or Panama. These latter countries instead are *distorted* (Galis & Lee, 2014) by the subject by making their offerings seem unsound and illogical for any international firm seeking to boost their competitiveness under the new 'boom' of carbon neutral economies.

The second benefit from 'cleaning up' (or *greenwashing*) Costa Rica's 'energy production industry', introduced by the subject in the first half of this extract, relates to the potential benefits the country might obtain from promoting itself as a 'carbon neutral destination' (Gössling, 2009). The overreaching intention of this move is the development of the nation's tourism industry by further enhancing its 'image' as being 'environmentally pristine' and 'sustainable' through the reduction of its GHG emissions (Gössling, 2009, p. 17). Just like the subject built her argument on the potential of attracting international firms to invest in Costa Rica, the subject's statement destabilizes 'other' countries (this time Panama and Colombia as examples) by *distorting* them as places that may offer the 'same' *commodity* –biodiversity–, but at a higher 'ecological' cost –emitted tons of carbon dioxide[31].

[31] Although it is not the intention of this discussion, or more generally of this dissertation, several scholars have pointed their criticisms

It is important to notice the subject's insistence on stressing how Costa Rican authorities have failed to thoroughly exploit the country's 'clean energy' industry as a key 'branding' agent. A strategy with the potential opportunity of attracting both foreign investors and international tourists interested in jumping on the 'booming' bandwagon of 'low-emission' economies, products and experiences. An opportunity that according to the subject, has nevertheless been ignored in spite of Costa Rica's head start over its potential competitors on both tourism and 'clean energies'.

So far, I have presented two perceived reasons why 'cleaning up' Costa Rica's 'energy production industry' may be mobilized as a strategy to potentially benefit the country's economic growth. But how exactly does 'cleaning up' actually happen? I believe that by counting the GHG emissions produced in all dammed reservoirs linked to hydroelectric power plants under the category of 'flooded lands' in the AFOLU sector –instead of the 'energy production industry' category in the 'energy' sector–, not only do these emissions suddenly become *invisible*, but so do the man-made reservoirs that produce them.

I argue that any reader interested in knowing the total carbon emissions of Costa Rica hydroelectric power

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towards a certain paradox related to the flight lengths that generally connect origin (demand side) and destination (supply side) countries involved in global eco-tourism. These criticisms point towards the inherent incompatibility between the use of fuel-intensive air travel systems and the 'ecological sentiments' of the consumers of eco-tourism (See Hunter & Shaw, 2007; and Gössling, 2009)

industry (which is said to represent over 70% of the country's electricity) will not only *not* find these emissions 'directly' in the different sums, estimations or charts presented in 'energy sector' subchapter; but will likely also dismiss these emissions all together for they have arguably been *displaced* in a way that makes them appear as if they are being caused by 'naturally' occurring phenomena. This, I argue, is because the Spanish word that originally appears in all available versions of the INGEIs, *humedales* –which I have chosen so far to translate as 'flooded lands'–, literally translates to 'wetlands'. The latter word is defined by the online Merriam Webster dictionary as: "land or areas (such as marshes or swamps) that are covered often intermittently with shallow water or have soil saturated with moisture" (Wetland, 2018). Hence classifying man-made dammed reservoirs as 'wetlands' is in fact highly inaccurate and considerably misguiding.

It is also worthwhile noting here that all of Costa Rica's INGEI reports are written in Spanish language exclusively; and that my decision to translate *humedales* as 'flooded lands' instead of 'wetlands' was a deliberate choice to avoid this precise confusion and misguiding[32].

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[32] It should be noted here that the IPCC includes 'flooded lands' in the 'wetland' chapter of the 2006 Guidelines for National Greenhouse Gas Inventories. However, in such guidelines the word 'wetland' is not used in substitution or omission of the word 'flood lands' as is the case of Costa Rica's INGEIs. For more see: https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/4_Volume4/V4_07_Ch7_Wetlands.pdf

The process of 'cleaning up' Costa Rica's energy production industry through making the GHG emissions produced in man-made dammed reservoirs *invisible,* shows how categories and classifications are neither limited to simply record a reality 'out there', nor are themselves constructed in a political vacuum. This echoes the two key aspects of what Bowker and Star's (1996) called the practical politics of classifying and standardizing: "arriving at categories and standards, and, in the process, deciding what will be visible within the system (and of course what will thus then be invisible)" (p. 4). Moreover, the authors hold that those visibility issues arise as the leading actor who performatively constructs the final outcome of a formal classification decides where to 'make the cuts in the system'. Hence the assembling of systems of classifications (like the INGEIs) involve a series of performative negotiations where decisions over the enactment of delineations take place. Namely, deciding what will emerge as visible; what will submerge into invisibility; and the overall level of 'detail' or 'depth' of the newly emerged visible reality.

Finally, Lippert argues that "the credibility of the concepts and categories are inextricably linked with *trust* in the reliability of measurements" (Lippert, 2013, p. 174. My emphasis). He adds that these measurement approaches can only become *black-boxed* once they have been assumed to work on the basis of clearly defined and standardized techno-scientific measures and methods. All of the so far reviewed *invisible work* necessary to assemble and maintain systems of classification precisely relies on being *black-boxed*, and on being taken-for-granted as a thing of strict science and technology. Hence, classifications "can best be understood as doing the ever-local, ever-partial work of

making it appear that science describes nature (and nature alone) and that politics is about social power (and social power alone)" (Bowker & Star, 1996, p. 8).

In summary, there is nothing innocent about accountability nor about the regimes of making things (in)visible or the process of construction of categories it requires and loops back.

Briefly: This discussion addresses how the Costa Rican 'clean energy' network can potentially be used as a 'branding' asset to attract international firms to invest in the country, and in the eco-tourism industry. The former by offering international firms to 'clean up' their corporate emissions by 'simply' moving their operations in the country; while the latter by promoting the country as a 'carbon neutral destination'. In order for any of these things to happen, the country has to start by 'cleaning up' its energy production sector so that it can become a 'low carbon' destination. Hence the discussion addresses *how* exactly this 'cleaning up' happens. This process entails making certain emissions 'invisible' by re-arranging, mistranslating and 'resemantizing' them. Thus, the processes of making 'scientific' categories and classifications as well as 'natural' entities calculable are not performed in a political vacuum.

It may also be relevant to highlight the way that the information from the 2012 INGEI was synthesized, mobilized and reconfigured in comparison to the previous 2010 version. Despite a large proportion of text and information from the earlier version reutilized and directly reinserted in the later, much of the crucial information

regarding employed methodologies, sources and analytical processes was stripped away from the later version leaving the reader with what I believe to be 'information gaps' and *black-boxes*. As an example of this we find, that while the 2010 INGEI explains to a moderate degree of detail some key considerations that were taken into account when methane emissions where measured on reservoirs; makes reference to international scientific debates on the matter; enlists some reasons to justify why some sources of emissions where not taken into consideration while other were; and provides a short description of some relevant characteristics of Costa Rica's hydroelectric power industry network –related to its capacity to produce GHG emissions– these where all removed from the 2012 INGEI.[33]

Furthermore, this omission of information makes it impossible for the reader to understand how some emissions values reported on one INGEI suddenly change drastically on the next. For instance, and without moving away from the example of emissions from reservoirs, methane emissions were reported to be 5.54 Gg in 2010 (Chacón et al., 2014, p. 36), yet these dropped to 2.19 Gg in 2012 (Chacón et al., 2015a, p. 36). This sudden drop to less than half of the original value –which if one considers how values shift from one inventory to the next is quite drastic– is not in the least either explained or acknowledged in the more recent document. Another example of these value 'jumps' can be seen in the way in which the accounted emissions of the AFOLU sector have

[33] For instance, table 4.9 'CO_2 emission criteria in reservoirs' referred to on page 113 was removed from the 2012 INGEI.

not only drastically changed from one inventory to the next, but how the IMN re-calculated the emissions of the 2010 inventory in the following inventory without providing any insight on the reasons or the methods behind such recalculations, other than that these were 're-calculated' using the IPCC guidelines of 2006 (Chacón et al., 2015a, p. 51) –which, needless to say, where precisely the supposed methodological guidelines followed in the 2010 INGEI in the first place[34]. More specifically, the 2010 INGEI reported that the total of CO_2 equivalent emissions of the AFOLU sector equaled -473.29 Gg (Chacón et al., 2014, p. 51); yet, the 2012 re-estimated these to a total of 224.7 Gg –which is approximately four times higher than the former figure. Furthermore, the same INGEI estimated that the AFOLU sector then produced 1,119.36 Gg of CO_2e in 2012, which is almost five times higher than the value re-calculated for 2010. The following 'Table C' is based on the information provided in both INGEIs illustrates these particular 'value jumps' for the AFOLU sector:

AFOLU's total CO_2e emissions for the year **2010** as *originally calculated* in the 2010 inventory	AFOLU's total CO_2e emissions for the year **2010** as ***re-calculated*** in the 2012 inventory	AFOLU's total CO_2e emissions for the year **2012** as calculated in the 2012 inventory
-473.29 Gg	224.7 Gg	1,199.36 Gg

Table C: 'Value jumps' for the AFOLU sector for different INGEIs

[34] See page 13 of the 2010 INGEI.

Related to these omissions of information and lack of methodological transparency, Araya (2015) argues that the available information on the country's net GHG emission "[…] does not reflect Costa Rica's actual gross CO_2e (nor per-capita) emissions since the [employed] system of accounting subtracts the total amount of carbon absorbed by forests from the gross amount. And although this is methodologically allowed, […] little disclosure exists in the country regarding the *real data* of national emissions" (Araya, 2015, p. 30. My translation; my emphasis). In other words, total carbon emissions appear with the total emissions considered to have been offset already reduced from the sum; hence the 'real' total remains hidden. Moreover, the author argues that despite Costa Rica being up-to-date in its compromises with the UNFCCC, it is internally characterized by suffering a 'chronic' lack of information regarding its 'real emissions'. Regardless of what the author understands as 'real data' and 'real emissions', this critique highlights the existence of a series of methodological *black boxes* that may play a role in some of the information 'jumps' found throughout the INGEIs as mentioned above.

Additionally, Araya holds that the country has done a poor job in keeping GHG accounting and inventory reports –as well as their public communication– up to date (a conclusion also shared by Alice et al., 2014). She reminds the reader that as of June 2015 –when her referenced paper was published–, the available information on the country's GHG emissions was outdated by 5 years. Although the IMN published the 6th INGEI inventory after the mentioned paper was published later that year, the emissions reported in that last inventory corresponded to

those of 2012. Moreover, at the moment of writing this dissertation, the IMN has not published any INGEI since the latter, which means the latest available information regarding the country's GHG emissions is outdated by nearly 6 years.
Besides the reviewed National GHG inventories, the IMN has also been assigned by the government of the Republic to produce the 'National Communications to the UNFCCC (CN)' and the 'Biennial Update Reports (BUR)' as the required instruments to keep all other member countries of the UNFCCC informed about the nation's advance on the subject. These communications represent a compromise that all member countries of this convention assumed.

Since I believe those communication informs overlap the reviewed INGEIs and the ENCC –and its action plan–, I will not go into detail about the punctual information provided in these. However, these documents will be used to help sustain and inform the following analyses and reviews found on the following sections and chapters of this study.

B. 'Carbon Neutrality' goal updated.

The DCC (2013a) had already stated in the action plan of the ENCC that in light of the international compromises that emerged around the time of its publication, a point of departure must be drawn from the original plans conceived in the 2009 ENCC, and those that faced its action plan because, while the ENCC originally focused only on reaching the '2021 goal', its action plan pursued several

other goals for 2020, 2030 and 2050. Hence, a clear distinction must be made between the 'pre-2020 voluntary actions' and the 'post-2020 climate policies' that have a more 'binding' character (DDC, 2013a, p. 10).

More precisely, while the 'pre-2020' instruments and policies reviewed above were being designed, the UNFCCC requested all signing countries to publish their own 'Intended Nationally Determined Contributions (INDCs)' in the lead-up to the Conference of the Parties or COP21 held in Paris, in December 2015. Once the conference's resulted agreement is ratified, the INDCs pledged during the COP21 will serve as the initial Nationally Determined Contributions (NDCs) that represent the first GHG targets for both 'developed and developing' countries under the UNFCCC. The Paris agreement promises a turning point from ongoing negotiations on global climate change policies in that developing countries will assume legally binding compromises on the matter for the first time in history (Araya, 2015, p. 28).

In this context, the government of Costa Rica now holds that "the date of 2021 will become the turning point [of] Costa Rica's emissions, as a continuation of its voluntary action and a landmark in the path towards de-carbonizing the economy" (Ministerio de Ambiente y Energía [MINAE], 2015a, p. 3). Hence the 2021 goal to reach carbon neutrality has now been resemantized as an 'early action' that essentially focused on compensating the country's GHG emissions through the removal or offsetting of these through its forest sector (p. 2). This retelling of the story finally admits what some voiced

criticisms had suspected already shortly after the 2007 announcement was made: That Costa Rica was attempting to "plant its way out of the carbon-emissions problem […] rather than attack[ing] emissions more aggressively at its industrial and automotive sources" (Rogers, 2010).

MINAE argues that since 2007, mitigation goals have 'evolved' leading to a point in which the COP21 agreement states that international mitigation efforts must together aspire to maintain a 2°C limit on mean global temperature or global warming above pre-industrial levels[35] (MINAE, 2015a, p. 3). In this new context, MINAE argues, Costa Rica is now committed to a maximum of 9,374,000 tons of CO_2 eq. net emissions by 2030, with proposed emissions per capita of 1.73 net tons by 2030, 1.19 net tons per capita by 2050 and 0 net tons per capita by 2085 (p. 11). Although, as the following short extract shows, some believe these goals are absurdly ambitious and over the top:

> ***Subject:*** *Costa Rica has an annual per capita rate of 2 tons of emission per person; this is one of the world's lowest emissions. And according to the last [INGEI] report it's even lower, we are below the 2 tons now.*
>
> *We pretend to get to 2050 with half of that, and to 2100 with zero… Hmmm net emissions, which and that is a huge challenge.*

[35] See: "Summary of the Paris Agreement" (n.d.)

> *I don't know how we will be living in 2100… probably in super modern domes on tree canopies so that we can accomplish that [goal]; I still cannot imagine it.*

(Source: M. Gonzales, personal communication, April 7, 2016. My translation.)

Despite that the exact dates and goals expressed by my informant do not exactly match those established in MINAE's 2015 document here being reviewed, a clear tone of mockery denotes a rooted skepticism surrounding the country's current 'carbon neutral' discourse as devised in the nation's INDC even among key members of this *actor-network*.

Methodologically speaking nevertheless, MINAE sustains that Costa Rica's INDC targets are based on two complementary methodological approaches: a deductive one, based on future emissions scenarios modeling (forecasting); and an inductive one, which based on the emission goal for 2050, which sets out to determine a lineal reduction of GHG emissions necessary to accomplish it (backcasting) (MINAE, 2015a, p. 4). Moreover, MINAE states that Costa Rica's GHG reduction goals will be driven by national scientific consensus and validated by the criteria of the IPCC. And that the country's reduction goals may be modified as needed as new 'scientific information' becomes available.

Here MINAE once again reaffirms the authority of the IPCC as a *parliament of specialists* capable of providing trustworthy scientific criteria and guidelines rendered as *subpolitical*. Nevertheless, the 'deductive' and 'inductive'

methodological approaches over which Costa Rica's INDC has been based on have in fact been assembled following both quantitative and qualitative considerations which are, in practice, inseparable and indistinguishable. Insisting on viewing these practices as pure calculations in the sense of being all about number manipulations would fail to recognize the different qualifications or judgements necessary for those numbers to be sustained and to make sense on the one hand, and for new entities to emerge on the other. Hence, what actually takes place in the assemblage of Costa Rica's INDC targets –as well as on its carbon accounting practices in general– is a process of *qualculation*. More generally, "Quantitative methods, qualitative procedures, professional judgements, or the tinkering of daily practice – all of these are qualculative" (Callon & Law, 2003, p. 13). Henceforth, the emergence of numbers from these processes of *qualculations* cannot be seen as mere reflections of an objectively given world 'out there'; instead "numbers represent the relations and materials which have been arranged to fit together and perform a result" (Lippert, 2013, p. 106). Hence, when we find numbers and 'results' that make sense to us Lippert argues, it is because they relate to some forms of qualifiers which we often take for granted in that particular context.

Furthermore, both the 'deductive' and the 'inductive' methodological approaches mobilized by MINAE to assemble Costa Rica's INDC involve a great deal of *guess-work*. They both perform realities, betray and *disrupt* actants and can only be imagined, not controlled. "Any knowledge of carbon emissions is an effect of the particular distinctions enacted within the apparatus" (Lippert, 2013, p. 451). Thus, regardless of the chosen method, Costa

Rica's carbon qualculations must irremediably be understood as intrinsically political processes from which inherently political material entities emerge.

Costa Rica's INDC report reveals two further issues related to the particular discourses and strategies being mobilized within the country's current climate change policy worthwhile accentuating. First, MINAE states that the different sectors in the country "[…] all agree that climate change, more than just an environmental problem, is a development matter which requires effective climate actions through activities in the transportation, energy, forestry, agricultural, livestock and waste management sectors" (MINAE, 2015a, p. 8). With that statement, MINAE explicitly manifests its understanding of mitigation and adaptation to climate change as not 'just' issues that exclusively affect ecosystems, animals, trees, or even carbon; but instead that these consist of greater problems that affect the country's ability to economically grow or 'develop'. Or as Asdal (2008) argues the notion of 'cost-efficiency', which is pivotal in economics has been so effectively *black-boxed* in the governance of nature that it has become widely accepted that "[n]ot using nature's capacity to use resources efficiently equals waste of resources" (p. 129). Hence, the nation's discourse of 'climate change' is rooted in questions of 'economy' and not (just) 'nature'.

Second, it is stated three times in the country's INDC report[36] that "Costa Rica reserves its sovereign right to use

[36] Find the three non-literal reproductions of the same statement in pages 5, 6 and 8.

international compensation units to accomplish its goals within the National Contribution or, as well, within its Domestic Compensation Market. Any compensation units traded abroad will be registered in the National Emissions Inventory to avoid double accounting." (MINAE, 2015a, p. 5). This means that Costa Rica is emphatically insisting that, in spite of carbon offset credits being sold to national or international –private– clients, those sold offsets are still going to be included as part of the country's own carbon reductions in its national GHG inventory. By doing so, the Domestic Carbon Market will act as an instrument to accomplish the nation's mitigation goals regardless of who actually pays for those offsets, and where.

In a review of Costa Rica's international agenda on climate change, Monica Araya (2015) voiced several important and closely related criticisms on the country's performance in the process of designing its INDC and its GHG inventories. Among these, the author holds that despite of the agreement to submit the INDCs to the IPCC by September 30th, 2015, Costa Rica still did not have either a draft of its INDC nor a 'road map' of how to elaborate it by June that same year. Hence, Araya argues that "the tendency appears to be that the government will approach donor agencies to finance *technical workshops* (which should not be confused with public consultation) which does not guarantee any feedback processes from business, productive or academic sectors nor from the general public" (Araya, 2015, p. 31. My translation and emphasis). In sum, just months before the above mentioned deadline, Araya argued that Costa Rica's INDC was likely to be designed, drafted and reviewed in a rush. And that by doing so, the participatory mechanisms that the Paris

agreement favored where essentially cut out in the process; instead, the document was negotiated among a closed circle of 'experts', 'delegates' and their superiors (p. 32) behind 'close doors'. Contrary to this criticism however, MINAE stated that a number of sector-wide dialogues were organized during 2015 by Costa Rica's government to bring together key stakeholders in pursuit of defining sectorial plans and programs needed to accomplish the country's GHG reduction goals, within the INDCs context (MINAE, 2015a, p. 8).

3. Nationally Appropriate Mitigation Actions (NAMAs)

In 2011, Costa Rica submitted the world's first –of the still few– 'Nationally Appropriate Mitigation Action (NAMA)' in the agriculture sector, which targeted its coffee production network. A 'NAMA' is a set of policies and actions that the signing countries of the COP13 in Bali (December, 2007) undertook as part of a commitment to reduce GHG emissions. NAMAs are framed under the recognition that different countries may take different nationally appropriate actions in accordance with their own differentiated capabilities, but nevertheless within a common global responsibility. This notion –which had been formalized by the UNFCCC as early as 1992 during the Earth Summit in Rio de Janeiro– became known as the principle of 'Common but differentiated responsibility'.

The underlying aim of the Bali Conference was to increase 'mitigation activities' in developing (non-Annex I) countries through the implementation of NAMAs. Hence,

it was agreed that "NAMAs in developing countries should have an impact that can be measured, reported and verified (MRV), to ensure that the implemented measures make a genuine and effective contribution to the global climate response and that industrialized nations support the developing countries' mitigation efforts" (NAMA Café de Costa Rica, n.d). In order for an activity to be acknowledged as a NAMA, it must be capable of demonstrating its contribution to reduce GHG emissions 'relative to business-as-usual emissions in 2020' while being in line with the host country's development priorities. Here, the notion of 'Common but differentiated responsibility' which justified the emergence of NAMAs is an example of how specific *political rationalities* found in global environmental governance are mobilized to render reality 'thinkable' in very specific ways, through *translation* processes mediated by *technologies of government* capable of shaping thought, action and behavior regardless of any 'economic', 'political' or 'environmental' barriers. To this McCarthy and Prudham (2004) add that 'environmentalists' have often invoked scarcity, or in this case mitigation of climate change, without regard to equity. The resulting 'universalist pretensions' of these constructions they argue "are problematic if they fail to address the fact that exposure to even pervasive scarcities and environmental risks in fact varies widely across social strata, while responses are mobilized in ways that reproduce spatially uneven social geographies" (McCarthy & Prudham, 2004, p. 279). Hence, policies such as NAMAs insinuate specific ways of agency tied to a globally widespread –and *black-boxed*– 'common sense' that, at least in terms of climate change, knows no distinction between what is often referred to as the 'developed' and the

'developing' economies. These *technologies of government* are therefore only effective "to the extent that they tie various actors together and furnish them with common goals, forms of calculation, representation and so on" (Murdoch and Ward, 1997, p. 311).

Costa Rica's 'Low Carbon Coffee NAMA', which entered its implementation phase in 2015, is a sector-specific approach that aims "for a climate-friendly transformation of the entire value chain of one of the most important economic sectors in the country […] which is the source of nine percent of the country's greenhouse gas emissions" (Nama Facility (n.d.)). This project –which was implemented in conjunction with public, private and international partners[37]– intends to support the capacity of coffee farmers and millers to develop more 'efficient' production practices. Concretely, this means that the project is meant to guarantee coffee producers with the provision of technical and policy advice through grants, loans and guarantees to support them in acquiring more GHG-efficient fertilizer and milling technologies (Araya, 2015, p. 13). Moreover, the project promotes the adoption of techniques for reducing methane emissions from residual waters and coffee-pulp waste (Chacón, Jiménez, Rojas & Ramírez, 2015b, p. 89). An important goal of Costa Rica's Coffee NAMA is the creation the world's first certified 'low emission coffee' that would open new

[37] These include the Ministry of Agriculture and Livestock, the NAMA Facility, the Inter-American Development Bank, the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ), and Coopedota R.L.

markets for the country and its coffee producers (p. 88). This could be seen as a vivid illustration of how Costa Rica is interested in joining what Anders Blok calls the 'green' inflection of the new spirit of capitalism. An inflection which performatively reshuffles the demand and supply side of a renovated green market filled with goods and experiences assembled as "green attractors". These emergent 'green' commodities actively usurp the surplus of authenticity of 'nature' by casting it in the attractive grammar of projective green worth (Blok, 2013, p. 503).

According to Costa Rica's 2015 'Biennial Update Report (BUR)', this NAMA's 'quantitative goal' is to reduce the aggregate emission potential to 1.850.000 tons of CO_2e by 2024 (Chacón et al., 2015b). This would mean that the total emissions of the entire agriculture sector would be reduced by up to 15% solely by the implementation of GHG mitigation technologies in the production and processing of coffee ("NAMAs in Costa Rican coffee," 2016).

Additionally, Araya argues that this project was presented as a 'NAMA Laboratory' from which other Latin American coffee producers could learn from (Araya, 2015, p. 13). Likewise, its promoters hold that once it has been 'successfully implemented', "the initiative also seeks to lay the foundations for extending NAMAs to other agriculture systems" ("Costa Rican Coffee NAMA," n.d.). Therefore, the government of the republic through its Ministry of Agriculture and Livestock (MAG) in conjunction with the DCC and the United Nations Development Program (PNUD) followed the former project with the proposal of an 'Eco-competitive livestock NAMA' in 2013. Much in

the same line with the coffee NAMA, the Livestock NAMA intends to guide this specific productive sector towards more 'eco-competitive' and 'efficient' productive systems through reducing GHG emissions and transforming production practices of the beef, milk and double purpose subsectors of livestock (Chacón et al., 2015b, p. 89).

This NAMA is visualized to include several stages of implementation. The first one –the pilot phase– has been drawn in line with the carbon neutrality goal for Costa Rica and seeks to cover 10% of all cattle farms in the country by 2021; while the second stage targets to enroll 80% of all farms by 2028 (Chacón et al., 2015b, p. 89), and to promote the adoption of Measuring Reporting Verification (MRV) systems ("Eco-competitive Livestock," 2015) The projects targets to improve fertilization plans; to promote rotational grazing (rotation of livestock between pastures) and live fences; to improve pastures (by introducing improved pasture species capable of capturing more carbon emissions, while providing a food source to livestock that produces less energetic fermentation); and to introduce silvopastoral systems (such as planting of trees within the pasture areas to provide shadow for the herds while at the same time capturing carbon emissions) (Chacón et al., 2015b, p. 91). According to the 2015 BUR, this NAMA's 'quantitative goal' is to reduce 833.966 tons of CO_2e by 2021; and 12.923.718 tons of CO_2e by the time this NAMA has been completely implemented in 2028 (p. 90), although the estimates of the UNFCCC are much more modest placing the grand total of expected emission reductions to 6.000.000 tons of CO_2e (United Nations

Framework Convention on Climate Change [UNFCCC], 2015).

Aside from these two NAMAs, MINAE mentions three other projects at an 'implementation' stage, that will possibly be submitted as three additional NAMA projects all related to a single overreaching 'low emission development strategy' for the urban sector (MINAE, 2015a, p. 15). These are: a 'Low Carbon Urban and Housing NAMA'; an 'Ordinary Solid Waste NAMA'; and a 'Public Transport NAMA' (NAMA Database, 2012). However, by March 2018, none of these three have been submitted to the UNFCCC registry, and all three present varying degrees of development in terms of content and definition.[38]

According to Araya (2015), with the two submitted NAMAs, Costa Rica has shown to have successfully transitioned from Clean Development Mechanisms (CDM) to NAMAs; however that a second transition from NAMAs to INDCs has not been as effective due to an 'impasse' reached in the country's urban transport sector (Araya, 2015, p. 28). As will be discussed below, these transitions coincide with the instrumental changes between the Kyoto Protocol of 1997 (CDM), to the COP13 Bali in 2007 (NAMA) and finally to the COP21 Paris in 2015 (INDC).

[38] For more information on the current state of these three NAMAs see: http://www.nama-database.org/index.php/Costa_Rica

Punctual Observations 3.

As will be further discussed later, the Costa Rican government has carefully and emphatically insisted in seeing to that all the carbon offset credits 'produced' within the country are to be 'reserved' for their inclusion in its own GHG accountings (including INDCs and INGEIs), regardless of whether these credits are sold to nationally or internationally located buyers. This effort denotes Costa Rica's clear determination to use all means necessary to accomplish the several 'carbon reduction' goals it has assumed; and its understanding of 'carbon' (and the 'nature' involved in its offsetting process) as a thing that can be reduced to a tradable commodity that can ultimately be 'owned'.

Furthermore, this stand may also hint a certain confidence from the Costa Rican government in rendering the interests of its 'carbon-offset' clients as strictly corporate and private. With that I mean that clients are seen as private entities primarily interested in 'greening up' their businesses by compensating their corporate GHG emissions through the purchase of UNCs (Before UCCs); and not as particular –national or international– entities interested in such corporate compensations on the one hand, and on the reduction of their origin country's GHG emission accounting on the other hand. If the latter was not the case, then perhaps international offset buyers would instead favor either domestic options to compensate their GHG, or mechanisms that would ensure that whatever carbon offsets they purchase would be added to the GHG accountings of the buyer's own origin country.

Considering this, Costa Rica then seems to be pursuing its different carbon-reduction goals through at least two mechanisms that act inversely, but both on its own favor. On the one hand, it reserves itself the right to 'include' all carbon-offsets sold to international clients in its own national GHG accounting; and on the other hand, –as will later be discussed in Chapter 3– it discourages national clients from buying carbon-offsets in foreign markets so that 'offset-leaks' are avoided. Likewise, it is possible to conclude that despite the 'free-market' discourse that surrounds both of these mechanisms, Costa Rica's carbon-market clients are understood as neither 'full owners' of their offsets; nor entirely 'free' to buy such offsets wherever or to whomever they want.

Aside from the former discussion, I consider worthwhile highlighting an issue related to the country's current 'carbon neutral' discourses and policies coined in the second decade of the century, which respond to current shifts in global climate change discourses that conceptually fundament these international networks. Particularly, I would like to briefly concentrate on the 'shifts' between global 'climate change' policies (such as INDCs, NAMAs, CDMs); and the interrelations between the various mechanisms, policies and programs (such as MRVs, NAMAs, REDD+[39], etc.) that result from –and simultaneously constitute– the former.

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[39] REDD+ or 'Reducing Emissions from Deforestation and Forest Degradation' is a voluntary climate change mitigation approach that has been developed by Costa Rica, and other parties to the UNFCCC for the acknowledgment of the role of conservation, sustainable management of forests in the enhancement of forest carbon stocks in developing countries.

On her assessment on Costa Rica's international climate change agenda, Araya (2015) spoke of such a shift that was still taking place in Costa Rica since 2010 between the design of Clean Development Mechanisms (CDMs) to the design of NAMAs; while the author also referred to a second shift taking place at the moment of the article's publication between NAMAs to INDCs (Araya, 2015, p. 28). In order to engage in this discussion, I will refer to a discussion paper on the transitions and links between INDCs, NAMAs, REDD+, and other policies and programs published by Boos, Broecker, Dorr, and Sharma (2015) through the German Corporation for International Cooperation GmbH (GIZ) with UNEP DTU Partnership.

Boos and colleagues argue that prior to the Bali Action Plan (BAP) that resulted from the COP13, "developing countries were only encouraged to submit measures to mitigate GHG emissions in order to receive support from the convention's financial mechanism" (Boos et al., 2015, p. 3). Perhaps the most important of such mechanisms was the Clean Development Mechanisms (CDMs) in which developing countries voluntarily sold GHG offsets to first world buyers, and that way simultaneously fulfilling their own mitigation targets. However, according to a key informant enrolled in the IMN "[CDMs] where made to 'clean up' countries; not to [economically] compensate those that were doing things right already" (A. Chacón, personal communication, February 27, 2017). Hence, it is a commonly shared belief that countries –such as Costa Rica– that had already engaged in 'early efforts' of conservation before the emergence of CDMs, were not able to fully benefit from these mechanisms, as could other developing countries that had until then relied on

environmentally 'unhealthy' practices and development models.

The Kyoto Protocol (and its derived CDM) henceforth did not 'obligate' developing countries to mitigate their emissions prior to BAP; but this would change with the agreements resulted from the COP13 and the subsequent conventions (particularly the COP17 in Durban). Boos and colleagues (2015) argue that unlike the Kyoto Protocol which required 'Annex I' (or developed) countries to take on economy-wide emission reduction targets with reference to a base year (p. 3); the Ad hoc Durban Platform that resulted from the COP17 determined that mitigation actions are now expected from all countries regardless of their development status. Likewise, it could be argued that CDMs where gradually replaced by NAMAs which emerged from the BAP in 2007.

However, these same authors argue that NAMAs where not completely defined in the BAP, but instead that in the pre-2020 context, NAMAs 'evolved' from national mitigation 'pledges' towards nationally and voluntarily determined policies, programs and actions. This 'evolution' responds to the fact that NAMAs were originally conceived as instruments with a broad definition that is to be defined more by experience and practice rather than by rules and definitions set up by the UNFCCC (Boos et al., 20015, p. 5).
The following 'Table D' –based on *'Table 1: Development of mitigation action per group of UNFCCC member state over time'* (Boos et al. 2015, p. 4)– outlines the different 'mitigation commitments' of Annex I, and non-Annex I countries over time, and throughout the different UN Conferences

and summits, as well as several different historically relevant agreements on climate change.

Timeline	1992-1997	1997-2010	2010-2020	Post 2020
UN Conferences, summits and protocols	Rio Conference Kyoto Protocol	COP 13 (Bali)	COP17 (Durban)	COP21 (Paris)
Developed countries	Limit GHG Emissions.	Economy wide GHG reduction targets		INDC/ NDC
Developing countries	Take voluntary measures to mitigate emissions through CDMs.		NAMAs /REDD+	INDC/ NDC

Table D: Different 'mitigation commitments' of Annex I, and non-Annex I countries over time.

According to the authors, a more recent shift took place after the Durban convention, and especially after the COP21 in Paris, this time from NAMAs to INDCs to be implemented post-2020. INDCs consist of comprehensive devices that include and align together the different mitigation actions, plans and strategies to reach the medium- to long-term country-specific pledges that each of the signing nations of the UNFCCC will submit as their traceable commitments to "achieving a collective and progressive ambition level sufficient to limit global warming to below 2°C relative to pre-industrial levels" (Boos et al., 2015, p. 8). Hence, according to Boos and colleagues INDCs form an 'umbrella' for NAMAs –and other efforts such as REDD+, LEDs[40] and market

[40] LEDs or 'Low-Emission Development Strategies'. According to Boos and colleagues these can be defined as "forward- looking

mechanisms– when they are used as policy instruments and implementation tools to achieve the mitigation targets that each country will take to address climate change domestically (p. 11). Put differently, "INDCs provide the opportunity to follow a more integrated approach by aligning past commitments and actions through LEDS, NAMAs and REDD+ activities" (p. 12). Hence, unlike the aforementioned shift from CDMs to NAMAs, INDCs do not replace NAMAs, REDD+, LEDs, etc. Instead, the shift consists more of a way in which the later sets off efforts that are no longer conceived as separated sectorial sets of programs and activities with a potential for GHG mitigation; but are aggregated together and leveraged towards each country's post-2020 mitigation targets (p. 13).

Although it is not the purpose of this dissertation to either try to 'unmask' who is 'behind' the design, promotion and enforcement of the different global policies and programs on climate change reviewed in this study; nor to 'unveil' the reasons why these policies and programs shift from one to the next; what this section has so far revealed is that the transitions between global climate change policies and mechanisms have certainly had a role in shaping Costa Rica's national and international discourses and policies in the matter. In fact, Costa Rica has actively participated in the design of some of these global initiatives (such as REDD+, as will be discussed later in Chapter 3). Moreover, according to Araya (2015), the country has never opposed to the 'universalization' of responsibilities

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national development plans that encompass low- emission and/or climate-resilient economic growth" (Boos et al., 2015, p. 8)

and compromises for all nations to assume concrete mitigation efforts in order to reach the post-2020 set targets to reduce global GHG emissions (Araya, 2015, p.28). In short, Costa Rica has not only historically been 'onboard' with the different global policies on climate change and their shifting; but has been an active party in the design, promotion and advocacy of these. As this dissertation has shown so far, and will perhaps more obviously continue to show in the following two chapters of this thesis, Costa Rica has proven to be an advocate of the implementation of market-based mechanism to face challenges imposed by climate change, and to reach its self-appointed goal of achieve carbon neutrality by 2021.

Whereas this first chapter has focused on reviewing a series of state programs and accountability devices directed to 'politically' put Costa Rica's 'house in order' as a step towards reaching 'carbon neutrality' by 2021; the following chapter will instead review a series of market tools and devices directed to 'economically' activate and sustain the country's 'carbon neutrality' actor-network. Unlike the policies and programs reviewed in this chapter, which had a more heterogeneous mix of 'target groups' –like economic sectors, state and quasi-state institutions, policy makers, and general citizenship among others–; this second set of tools and devices is exclusively aimed at the country's private sector. Particularly at a segment of this sector that may potentially show an interest in joining the 'carbon neutral' bandwagon which this assemblage of policies and devices has set out to consolidate. On this matter, several scholars have pointed out that 'market' mechanisms, like the ones I seek to review on the following second chapter, reflect a spur of new 'green'

markets where the demand, the supply, and the management sides of these markets are together nurturing what Blok (2013) calls a renewed spirit of capitalism (Blok, 2013). Additionally, Erik Swyngedouw (2005) argues that in today's market economy, the 'political' does not operate independently from the 'social' and 'economic' spheres. This is especially true for governance over economic processes and modes of environmental use, where any operation of the political sphere is, de facto, a political-economic intervention. He argues that "political-economic intervention as governance inevitably impinges on decisions over economic processes and modes of environmental use and transformation [where] key decisions over resource allocation, use and transformation, are taken by private actors who operate within the constraining or enabling regulatory framework of systems of government" (p. 2002). Hence, under the 'market economy', the taken-for-granted divisions between the 'political', the 'social', the 'economic' and the 'environmental' on the one hand; and the divisions between 'state' and 'private' on the other –all to which I allude to above– are in fact *imagined*; and in practice necessarily *permeable*, *contingent* and *negotiated*. Again, these and many other related issues will be developed as followed in the next chapter.

–Chapter 2–

Recognizing 'Carbon Neutrality'

Introduction

In January 2010, Costa Rica delivered a 'verbal note' to the UNFCCC requesting the formal inscription of the 'C-Neutral' certification program into its NAMA initiatives (Araya, 2015, p. 11). Later in 2012, Costa Rica made the '**Carbon Neutral Country Program'** (hereinafter 'Country Program') official, which establishes the legal procedures for private organizations to elaborate GHG inventories, while it also legally fundaments the application of the **National Normative for Demonstrating Carbon Neutrality**. In other words, the Country Program establishes the parameters by which private organizations may be granted the **'C-Neutral' Certification** after submitting to an emissions assessment based on the agreed standards stipulated in INTE B5:2016, and after undergoing a process of reduction and compensation of their GHG emissions.

The latter process implies the any given organization applying for the 'C-Neutral' Certification may purchase the necessary 'carbon credits' needed to 'offset' the residual emissions they were not able to reduce for the established timeframe of the certification process. Therefore, this second chapter will first review Costa Rica's **'preoperative' carbon market** which has been supplying 'carbon credits' to the organizations enrolled in the 'C-Neutral' program ever since this certification was

launched; and secondly, I will be review a **'projected' domestic carbon market** prototype that is expected to replace the former market in the nearby future.

The review of these two embodiments of Costa Rica's domestic carbon markets will show how they have both have developed into 'imperfect' or 'incomplete' exemplars of neoliberal markets because they deliberately and fundamentally intertwine command-and-control mechanisms with market-oriented incentives. However, I argue that in light of practical inexistence of a 'pure' or 'perfect' neoliberal market, this heterogeneity should not be seen as a 'market flaw' or a fundamental weakness. Instead, I show how this 'hybridity' has in fact provided Costa Rica's 'preoperative' market with the ability to operate through an apparently impenetrable dissidence, and to constantly adapt and transform itself however it may be fit. What is more, I argue that the experience accumulated on the ground with the country's 'preoperative' carbon market, has prompted Costa Rica's 'green technocracy' to design its 'future' carbon market with a fundamental hybridity which is intended to be tested 'on the ground' rather than followed 'by the book'. The discussions derived in these reviews will show how rather than 'naturally' emergent things, the country's carbon-offset markets must deliberately, pragmatically and continuously be enacted into being. Both of these resulting markets offer 'laboratory-like' spaces to test the organization and functioning of actual carbon markets which are still largely rendered as highly experimental things.

In this chapter I will show how in spite of the country's 'carbon-neutral actor network' being apparently assembled over a fundamental principle of 'free market' that would, in principle, stand in a sharp contrast to anything that would resemble any sort of 'monopoly'; the Costa Rican government single-handedly controls both the demand and supply sides of the market, as well as the legal framework that regulates its functioning. In light of this, I show how the Costa Rican 'carbon neutral actor-network' actively restricts the sales of 'foreign' carbon credits –for the 'C-Neutral' certification program– as a means to ensure the liquidity of the country's own domestic carbon markets, while also ensuring the survival of the forestry sector that supplies these markets with nationally 'produced' carbon offsets.

Following the works of several academics, all following Foucault's ideas about *governmentality* (Miller & Rose, 1990; McCarthy & Prudham, 2004; Peck and Tickell, 2002; Fletcher, 2010b; Springer 2012), I explore the several coexisting –and often competing– ways in which environmental governance is being enacted in Costa Rica. These different socio-technical enactments –or governmentalities– differ from one another in the way they each reproduce a particular 'will to govern' as well as in the means they each use to accomplish their particular objectives and in the specific human and non-human entities they each target. For instance, I show that while the 'C-Neutral' program intends to seduce private businesses into adopting 'greener' practices by offering them promises of increased economic revenues, Costa Rica's 'national park' system enforces environmental conservation through top-down 'policing' and command-

and-control regulations. Correspondingly, I follow the ongoing process in which concerns about the protection of biodiversity –historically portrayed in the 'national park' system– have been gradually downplayed in favor of concerns about 'climate change' –currently being enacted as Costa Rica's 'carbon neutral actor-network'–. This move coincides with the country's shift from a 'protectionist' state-centered conservation model to a more market-oriented 'neoliberal' one in which the responsibility of environmental conservation –understood now as mitigating 'climate change' and reaching 'carbon neutrality'– are gradually being *transferred* from the state to the private sector. Moreover, I argue that the latter process of socio-political reorganization can be understood as a gradual progression towards the decentralization and externalization of state functions. A process that is congruent with a broader turn towards an environmental governance imbedded in a *neoliberalism* which ultimately intendeds to extend *action at a distance* (Latour, 1987) by translating 'private self-interests' into a certain domain of reality aligned with the state's *political rationalities* (Miller & Rose, 1990).

Hence, whereas the first chapter of this dissertation focused on reviewing a series of state programs and accountability devices directed to 'politically' put Costa Rica's 'house in order' as a step towards reaching 'carbon neutrality' by 2021; this second chapter will instead review a series of market tools and devices directed to activate the country's 'private sector' and that way to 'economically' sustain the country's 'carbon neutrality actor-network'. Put differently, while the policies and programs reviewed in the first chapter had a more heterogeneous mix of 'target

groups' –i.e. productive sectors, state and quasi-state institutions, and general citizenship among others–; the policy devices reviewed in this second chapter exclusively aim at a particular segment of the country's private sector that has –or is expected to have– an interest in joining the 'carbon neutral' bandwagon.

Besides these discussions, and once again drawing on ANT and STS literature, this second chapter will engage in a series of more *ontological* discussions pertaining some key aspects surrounding the country's 'carbon neutral' strategy in general and its carbon markets in particular. For instance, in these discussions I will show how in spite of the idea that carbon markets essentially embody the privatization of carbon emissions; what is sold in these spaces of exchange is not 'carbon' but –on the contrary– its *absence*. Furthermore, I will show how 'nature' is reduced to 'carbon offsets' (which in turn are framed as the circulating currency of carbon markets) through performative socio-technical calculations embedded in neoliberalism.

1. 'Carbon Neutral Country Program' (Agreement 36-012-MINAET)

The Country Program is a governmental legal agreement that establishes the voluntary procedures by which a productive process may become 'carbon neutral' (Ministerio de Ambiente y Energía [MINAE], 2013, p. 28). The program did not only make the 'National Norm for Carbon Neutrality' official, but also laid the legal foundations for its application.

This agreement establishes the legal procedures for both the granting of the 'C-Neutral' brand (discussed later from page 184), and for reporting particular carbon footprints from private organizations. Furthermore, the program officially creates the 'Costa Rican Compensation Unit (UCCs)' –re-conceptualized as National Compensation Units (UNCs) in 2016– as a new tradable carbon offset unit or a credit alternative to other existing compensation options such as the 'Certified Emission Reduction (CER)' and the 'Voluntary Emission Reduction (VER)' credits. In spite of the document stating that CERs, VERs and UCCs (or UNCs) are all acceptable 'compensation options', the document states that "[any given] organization that has realized actions for the reduction of its greenhouse gases, can compensate the emissions that they have not been able to reduce [by] acquiring *UCC*[s]." (Ministerio de Ambiente, Energía y Telecomunicaciones [MINAET], 2012, Article 5. My emphasis and translation). Hence, by not explicitly mentioning either of the other two options in the description of the mechanisms for compensating corporate GHG emissions, the program implicitly favors the exclusive commercialization of UNCs (before UCCs). As will be seen throughout this study, this is not an isolated statement found in the Country Program alone, but is one repeated in other crucial documents that fundament Costa Rica's carbon neutrality efforts –such as the ENCC's action plan, which was reviewed in Chapter 1– and echoed in statements of several of the interviewed experts of this actor-network.

The Country Program establishes two voluntary report levels available for participant organizations:

1) GHG emission inventory report
2) Carbon Neutrality declaration.

'Level 2' requires the interested organization to first elaborate a GHG emission inventory report –also referred to as 'carbon footprint'– whereas 'level 1' can be pursued without necessarily opting for the former.

GHG emission inventory reports must comply with the following standards –organized by priority level as stipulated in Article 2 of the Country Program:

-Greenhouse Gas Protocol (GHGP): Corporate Accounting and Reporting Standard from the World Resource Institute (WRI).
-ISO 14064-1:2006: Greenhouse gases -- Part 1: Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.

Additionally, INTECO instructs that all GHG emission inventory reports must be made with a focus on the organization's operational control.

Article 2 establishes that the period of validity of a carbon footprint declaratory is 'one calendar year'; and that the specific gases to be reported are:
-Carbon Dioxide (CO_2)
-Methane (CH_4)
-Nitrous Oxide (N_2O)
-Perfluorocarbons (PFCs)
-Hydrofluorocarbons (HFCs)
-Sulfur hexafluoride (SF_6)

The document states that only credited verification organisms are authorized to verify GHG emission inventory reports; and that it is the task of the Costa Rican Accreditation Entity (ECA) to credit these verification organisms. As of October 2018, the only two credited 'verification organisms' authorized to verify GHG emission inventories are the INTECO and the Carbon Neutral Unit of the EARTH University.

As mentioned earlier, the document establishes the legal procedures for organizations to participate in the Country Program at 'Level 2' by effectively declaring themselves 'carbon neutral' entities, and by doing so allowing them to apply for the 'C-Neutral' brand. In order to obtain this brand, applicant organizations must:

-Elaborate a GHG emission inventory report
-Obtain the verification of this GHG emission inventory report
-Obtain a declaration of 'carbon neutrality' under the National Normative for Demonstrating Carbon Neutrality INTE-12-01-06:2011 (later updated to INTE B5:2016)
-Compensate its residual GHG emissions
-Register its emissions, reductions and compensations.

The organizations that comply with these requirements may aspire to obtain the 'C-Neutral' brand once one of the two existing credited verification organisms verifies that they possess a management plan in line with the INTE B5:2016 norm, and once a maintenance audit is realized by those verification organisms once a year.

Punctual Observations 1.

In spite of the Country Program being apparently assembled over a fundamental principle of 'free market' that would, in principle, stand in a sharp contrast to anything that would resemble any sort of 'monopoly' (which limits the buyer's freedom to freely consume), one of my key informants argued that the Costa Rican government not only controls the market's entire legal framework –through the Country Program–, but also both the demand and the supply side of the market. The following extract of another interview made to a high-ranking representative of one of the two 'verification organisms' authorized in the 'C-Neutral' certification program shows this contrasting argument:

> ***Subject:*** *I would say that the country has to develop a structure of incentives; It* [also] *has to thoroughly analyze how FONAFIFO is handling the carbon market.*
> *I would say that to me, that is not a market; that is a monopoly in disguise.*
> *And that [the Costa Rican state] has not given the opportunity for others to get in.*
>
> ***Interviewer:*** *Excuse me, are you referring to the National Carbon Units? If yes, how so?*
>
> ***Subject:*** *Yes, because the Ministry of Environment, the Climate Change Directorate and FONAFIFO they… they are the same thing. Hmmm so there is […] a terrible management of impartiality, right?*

> *When instead that could be pushed forward with private alternatives.*

(E. Castro, personal communication, February 10, 2017. My translation.)

Aside from the subject's explicit argument that Costa Rica's Carbon market is really a state-controlled monopoly, this informant introduces two further, and interrelated, concerns. The first pertains to what he believes is a serious degree of bias surrounding the demand (DCC), supply (FONAFIFO) and regulation (MINAE) of the market which are all under the control of the Costa Rican state.

The second concern regards a perceived refusal of the state to allow non-state actors to participate in either side of the market. Here, the subject shows his explicit disbelief in what he depicts as a state-centered model; and instead suggests that the market would 'push forward' if actors from the private sector would take over at least some of the roles of the carbon market. Swyngedouw (2005) identifies this process of decentralization as the *externalization of state functions* and considers it as part of a wider three-fold process of reorganization between state, civil society and market under neoliberal governmental rationality. He argues that in this process new institutional forms of governance-beyond-the-state are set in motion and take part in organizing the conduct of conduct. In other words, such reorganization processes of governance in which "non-state, civil society or market-based configurations become increasingly involved in regulating, governing and organizing a series of social, economic and cultural activities" (p. 1998) are ultimately intended to extend *action at a distance* (Latour, 1987) by translating

'private self-interests' into a certain domain of reality aligned with the state's *political rationalities* (Miller & Rose, 1990). By 'private' I am referring to anything from individual subjects to private organizations and businesses.

Although these issues will be further developed in the remainder of this and the next chapter, I believe that it is already possible to conclude that the Costa Rican government is hardly indifferent to the choice of 'carbon credits' that the clients of the Country Program purchase in order to compensate their residual GHG emissions as part of the process of pursuing the 'C-Neutral' certification.

Normative for Demonstrating Carbon Neutrality (INTE B5:2016) and the 'C-Neutral' certification program

In 2011, MINAE requested INTECO to elaborate a voluntary normative that would allow private organizations to officially report their GHG emissions and that way aspire to obtain the newly designed 'C-Neutral' certification brand. The original Normative for Demonstrating Carbon Neutrality, which was originally articulated as INTE-12-01-06:2011, established the principles and requirements for private organizations to declare their GHG emissions; and provided the accredited verification organisms with the general criteria to evaluate these inventories. Later in 2016, the original normative INTE-12-01-06:2011, was updated and replaced by a

revised version (normative **INTE B5:2016**[41]) by INTECO's Normalizing National Commission. In spite of this however, to this date the vast majority of official and non-official documents that address the normative refer to its older version. While this dissertation will focus on the newer version of the normative, it may however be appropriate to point the reader towards this consideration.

Right from the start of the introduction of the INTE B5: 2016 document, INTECO states that this normative is in line with UNFCCC's philosophy of ensuring that the fight against 'climate change' must ensure a sustained and sustainable development at the same time. Hence, Costa Rica's Normative for Demonstrating Carbon Neutrality (from now on referred to simply as 'the normative') is considered an effort to increment the country's competitiveness in the different markets, while simultaneously reducing its GHG emissions (Instituto de Normas Técnicas de Costa Rica [INTECO], 2016b, p. 4). Thus, once again, Costa Rica prioritizes a market-oriented concern such as boosting 'competitiveness' as a driving interest for the development of this key environmental governance policy device.

INTECO holds that to be 'carbon neutral' commonly means that the net emissions associated with the organization's activities equal zero. Hence for an organization to become 'carbon neutral', the following actions –in order of relevance– are accepted as 'best

[41] In between both versions of this normative, version INTE-12-01-06-2016 was briefly issued by INTECO sometime between 2012 and 2017.

practices':

a) Measure the net carbon equivalent emissions and removals (GHG inventory)
b) Reduce emissions; and
c) Compensate any residual emissions.

These 'best practices', INTECO continues, require that the applicant organizations follow transparent MRV mechanisms so that these practices can be nationally and internationally recognized. However, INTECO states that due to the lack of a common definition, and of a lack of a recognized verification method, inconsistencies exist in regard to how to recognize the term 'carbon neutrality' (INTECO 2016b, p. 4). Therefore, the development of an instrument such as this national normative constitutes an effort dedicated to 'correct' this limitation. In this case, INTECO refers to how the concept of 'carbon neutrality' is fuzzy in a more 'methodological' sense which goes beyond Gössling's criticism introduced in the first chapter that argued that the concept of 'carbon neutral' is in itself imprecise, misleading and oxymoron.
The following extract of an interview with a member of INTECO explains this rather methodological fuzziness:

> ***Subject:*** *Costa Rica, depending on which definition of 'carbon neutrality' you use, is already 'carbon neutral'.*
>
> ***Interviewer:*** *Ok?*
>
> ***Subject:*** *Let's see… I will explain two definitions to*

you.
The national norm defines that 'carbon neutrality' is the totality of emissions from the year of the report, minus the reductions, minus the compensations right? They should sum up to zero.

Interviewer: *Hmmm that's right.*

Subject: *The British in their PAS 2050 define 'carbon neutrality' as the inexistence of an increment in net emissions respective to a base-line.*

So what does that mean? Costa Rica in the last national inventory had emissions in the order of 9 million tons [of CO_2e]. In comparison with the 2010 inventory… Costa Rica has practically no significant increase. Aside from the fact that it increased its forest cover to 52%.

Interviewer: *Hmmm.*

Subject: *If I want to declare myself [Costa Rica] 'carbon neutral' using the British definition, then I am already am 'carbon neutral'.*

(M. Gonzales, personal communication, April 7, 2016. My translation.)

As this extract shows, there is no such thing as a universal method to determine whenever a country is or is not 'carbon neutral'. Consequently, neither is it possible to image that a singular monolithic conceptual definition of 'carbon neutrality' can ever exist. Likewise, the extract suggests that determining whether a country can declare

itself 'carbon neutral' is pretty much a matter of choosing the most appropriate definition for each particular case; and not a matter of submitting to a ubiquitous scientific method capable of determining 'truths' based on unquestionable 'proof' and judged by some objective laws of a 'nature out there'. As Andrew Barry (2001) argued, differences between methods or practices exist less in relation to well-defined regions and borders (in this case say Costa Rica and England) then in terms of continuous – epistemological and ontological– variations and in terms of their *fluidity*. Hence he argues, techno-scientific standardization, methods and 'precision' are not universal, but culturally and historically specific values (p. 57). In other words, the 'calculations' to determine whenever or not a country is 'carbon neutral', and the conceptual definition of what is exactly meant by 'carbon neutrality' are best to be understood as *mutable mobiles* (Law, 2007) or *fluid objects* (Law & Singleton, 2005) which are performatively brought into existence as "something that *both changes and stays the same*" (Law & Singleton, 2005, p. 338. Original emphasis).

According to INTECO, the following can be considered the 'changes' and overall 'benefits' that can be obtained through the adoption of the INTE B5: 2016 normative:

1) Greater opportunity for the 'general public', consumers, current and potential buyers to take [consumption] decisions based on the best information available.
2) Increase of opportunities for competitiveness in the market of goods and environmentally friendly products.

3) Greater consumer protection.
4) Increase of actions to reduce or mitigate the effects of climate change in the different sectors of society.
5) [Emergence of] Verifiable 'C-Neutrality' declarations that guarantee transparency.
6) Increase in the probability for corporate entities to make improvements in their production management practices and in their derivative products, as a response to consumers or to market pressure.
7) Reduction of erroneous interpretations among the different actors at national, regional and international levels.

(INTECO 2016b, p. 5. My translation).

Although voluntary, the normative is based on a series of 'International Organization for Standardization (ISO)' norms that submit it to a nationally recognized level of rigor which is also transparent and traceable (Chacón et al., 2015b, p. 77). Moreover, INTECO states that all these ISO norms contain dispositions that, by being cited within the INTE B5:2016 norm document, constitute the basic requirements for that norm. The referenced ISO norms are:

> INTE/ISO 14064-1: Greenhouse gases. Part 1. Specification with guidance at the organization level for quantification and reporting of greenhouse gas emissions and removals.

INTE/ISO 14064-2: Greenhouse gases. Part 2: Specification with guidance at the project level for quantification, monitoring and reporting of greenhouse gas emission reductions or removal enhancements.

INTE/ISO 14064-3: Greenhouse gases. Part 3: Specification with guidance for the validation and verification of greenhouse gas assertions.

INTE/ISO 14065: Greenhouse gases. Requirements for greenhouse gas validation and verification bodies for use in accreditation or other forms of recognition.

INTE/ISO/TR 14069: Greenhouse gases. Quantification and reporting of greenhouse gas emissions for organizations - Guidance for the application of ISO 14064-1.

(Source: www.iso.org)

-Principles and Definitions

Aside from the INTE/ISO 14064 international norms, INTE B5:2016 is also based on the **'principles'** stated on the *Greenhouse Gas Protocol* of the World Resources Institute (WRI). These principles constitute a series of concepts intended to guide the application of the normative (INTECO 2016b, p. 12). These are:

*Relevance: Select the GHG sources, GHG sinks, GHG reservoirs, data and methodologies appropriate to the needs of the intended user.

*Completeness: Include all relevant GHG emissions and removals. Include all relevant information to support criteria and procedures.

*Consistency: Enable meaningful comparisons in GHG-related information.

*Accuracy: Reduce bias and uncertainties as far as is practical.

*Transparency: Disclose sufficient and appropriate GHG-related information to allow intended users to make decisions with reasonable confidence.

**Respect for the principle of legality: Meet the respective legal requirements related to the elaboration of GHG emission/removal inventories; and whenever preventive, corrective and improvement actions are implemented.

**Efficiency: Demonstrate improvements through the establishment of management plans to demonstrate carbon neutrality.

(*Taken directly from ISO 14064-2:2006; ** taken and translated from INTE B5:2016)

Besides these 'principles', the normative includes a six page long conceptual and technical **'definitions'** glossary that enlists each of the concepts used in the INTE B5:2016. Many of the concepts enlisted in this section correspond to

direct quotes from the ISO 14064-1 (indicated in 'Table E' in *Italics* followed by the original reference source in parenthesis). Finally, it may be relevant to point out that this section constitutes the largest chapter of the INTE B5:2016 due to the relevance that I believe it possesses within the normative. Consequently, this section will also constitute the most extensive section of this particular review.

The concepts enlisted in the 'Definition' section –and their original list numbers– are presented as follows:

3.1. Directed Action.	*3.21. GHG Source (ISO 14064-1. Section: 2.2)*
3.2. Accreditation	***3.22. Greenhouse Gas (GHG)*** *(ISO 14064-1. Section: 2.1)*
3.3. Additionality	3.23. GHG Report.
3.4. Base-year (ISO 14064-1. Section: 2.20)	3.24. Installation
3.5. Carbon Neutrality	*3.25. GHG inventory (ISO 14064-1. Section 2.14)*
3.6. Productivity/Efficiency Ratios	3.26. Organization
3.7. Emission Compensation	*3.27. Other Indirect GHG emissions (ISO 14064-1. Section 2.10)*
3.8. GHG Declaration (ISO 14064-1. Section: 2.12)	3.28. Permanence
3.9. Carbon Dioxide Equivalent (ISO 14064-1. Section: 2.19)	3.29. Reductions Management Plan for Carbon Neutrality
3.10. Double Accounting	***3.30. Global Warming Potential (ISO 14064-1. Section 2.18)***
3.11. GHG Emissions	3.31. GHG Project
3.12. Direct GHG Emissions (ISO 14064-1. Section: 2.8)	**3.32. Emission Reduction**
3.13. Indirect GHG Emissions	***3.33. GHG Removal (ISO 14064-1. Section 2.6)***
3.14. Energy Indirect GHG Emissions (ISO 14064-1. Section: 2.9)	*3.34. GHG Reservoir (ISO 14064-1. Section 2.4)*
3.15. Corresponding Participation Approach (ISO TS14069. Section 5.1.2.2.)	*3.35. GHG sinks (ISO 14064-1.*
3.16. Operational Control Approach (ISO TS14069)	
3.17. Financial Control Approach (ISO	

TS14069)	*Section 2.3)*
3.18. Competent Entity	**3.36. National Compensation Unit (UNC)**
3.19. GHG Emission or Removal Factor (ISO 14064- 1. Section: 2.7)	3.37. Provided User
3.20. Leaks	3.38. Project and/or Methodology Validation
	3.39. Project and/or Methodology Validator
	3.40. Verification
	3.41. Verification organism

Table E: Enlistment of 'definitions' in the INTE B5:2016 normative

Although it is not the intention of this dissertation to go through each and every single one of these 41 'definitions', I consider relevant visiting at least 11 of these (indicated with bold fonts in the above 'Table E') because of their straight-forward relation to the general issue of this dissertation; namely the current performative process of construction of 'nature' in Costa Rica through the 'carbon-neutral' actor-network. Since INTECO explicitly prohibits the publication or partial reproduction of any segment of the actual INTE B5:2016 document (which the researcher acquired privately though a direct purchase to INTECO), all direct quotations made in this dissertation will be extracted from **PN INTE 12-01-06:2016 CP**, an earlier draft version of the actual normative available for public consultation[42].

[42] Available for download at:
http://www.ciqpacr.org/sites/default/files/PN%20INTE%2012-01-06%20NORMA%20PARA%20DEMOSTRAR%20LA%20CARBONO%20NEUTRALIDAD%20CP(1).pdf

Carbon Neutrality:

"Is what is achieved through a transparent process of measurement, where the result of the net calculation of emissions and/or removals (E), minus reductions (R), minus compensations (C) equals zero" (INTECO 2016b, p. 6. My translation). This is expressed through the formula:

$$\sum E - \sum R - \sum C = 0$$

Definitions:
E: "Measurement or verifiable estimation of the total emissions and/or removals for a year, or the period to which the inventory corresponds, within the operative limit established by the [applicant] organization" (INTECO 2016b, p. 6. My translation). Here INTECO recommends the applicants to consult the INTE/ISO 14064-1 norm as a guide to develop a GHG inventory and thus for determining 'E' (see 'Base Year' on page 201 for a relevant consideration regarding the definition of 'E').

R: "Achieved decrease of GHG emissions by the [applicant] organization through the implementation of actions throughout time, within the reporting period" (p. 6. My translation).

C: "Leveling mechanisms for an entire or partial GHG inventory, or for an organization. These can occur *directly* by preventing the liberation [of], by reducing, or by removing a part of the GHG [emitted in] a process outside of the operative limits of an organization; and *indirectly*

through the acquisition of gas reductions (in the form of carbon credits) generated by a third party" (p. 7. My translation and emphasis).

Furthermore, INTECO explains that a 'carbon credit' is "a generic term that designates any certification or negotiable permit that represents *the right to emit* a ton of carbon dioxide, or the mass of any other GHG as a carbon dioxide equivalent (tCO_2e) which equals a ton of carbon dioxide" (p. 7. My translation and emphasis). Put differently, according to the normative, a 'carbon credit' constitutes a tradable permit that allows its buyer to gain the right to pollute the atmosphere within a pre-determined range (measured in tons) of emissions of carbon dioxide, or its also pre-established equivalence.

Additionally, both versions of the reviewed normative[43] include a note that clarifies the differences between 'E' vs. 'R' and 'C'. It reads: "While 'E' represents the net inventory of GHG emissions of the [applicant] organization for an annual period, 'R-C' represent the additional planned effort of the organization to reduce/remove and/or compensate what is required to achieve the C-neutrality condition" (INTECO 2016b, p. 7. My translation and emphasis). In other words, Costa Rica's 'Carbon-Neutral' calculation is based on a zero-sum formula where an organization can only become certified as 'C-Neutral' if its 'R' and 'C' values together equal 'E'.

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[43] By that I am referring –and I will continue to refer to– the PN INTE 12-01-06:2016 CP and the INTE B5:2016 versions of the normative.

Emission Compensation:

Following the definition of the 'Compensation' variable as found in the formula above, the normative further defines 'compensation of emissions' as a procedure through which the removal of CO_2 emissions –or the prevention of these emissions– can be "voluntarily acquired through the recognized compensation mechanism of *carbon credits* intended to counteract those GHG emissions that have not been reduced" (p. 8. My translation and emphasis). Both versions of the reviewed normative indicate that "the mechanisms of compensation recognized by this norm are the CER, VER and UNC" (INTECO 2016b, p. 7). Related to this, the normative includes '*Tabla 1: Esquemas aceptados para la compensación*' which details the three recognized carbon compensation schemes that meet the requirements of the normative. Except for the translation of all words from Spanish to English, the following 'Table F' is essentially the same as INTECO's 'Tabla 1' found on both of the referred versions of the norm under analysis:

Compensation Schemes	**Third Party verification organism**	
	National	**International**
1. CERs, Certified Emission Reduction		
Clean Development Mechanisms (CDMs)		X
2. VERs, Voluntary Emission Reduction		
2.1. Gold Standard[1] 2.2. Verified Carbon Standard 2.3. Other[2]		X
3. UNCs, National Compensation Units[3]	X	

[1]Gold Standard is a foundation that registers projects that reduce GHG emissions, and certifies [actions that attain] effective reductions. [2]Other compensation schemes may eventually be recognized by the competent authority. [3]UNC refers to a ton of [sequestrated, offset or avoided] CO_2e in a project developed with the criteria of the INTE/ISO 14064-2 norm.

Table F: Compensation schemes accepted in the INTE B5:2016 normative

Although at this point of the dissertation, this 'Table F' may appear to only show information that has been already introduced in previous sections of the present study, two particular issues can be deducted from it. First, footnote '2' suggests that the normative is not 'fixed' on exclusively including these two types of VERs; but instead is opened to other compensation options as long as the 'competent authority' approves their inclusion. Despite there being an entry intended to define such figure (entry 3.18 in both versions of the reviewed normative; see 'Table E') INTECO defines 'competent authority' only as: "the organization defined in the corresponding legal framework" (INTECO 2016b, p. 9. My translation). Hence, it is not explicitly stated anywhere in the normative who or what exactly constitutes this authority, and even less which criteria and mechanisms will such party employ to determine its decision. Although this question may seem superfluous, the users of (or in our case, those studying) the INTE B5: 2016 normative are left with no information to establish who makes this decision, and where, when, and how it is reached.

Second and perhaps more interestingly, 'Table F' reveals that CERs are in fact the only compensation mechanism of the three recognized that is issued under the CDM framework. In other words, CERs are the only of the three compensation units recognized in Costa Rica's 'carbon neutral' *actor-network* that are covered under the rules defined in the Kyoto Protocol. The difference between Kyoto and non-Kyoto recognized 'carbon-credits' will be explained in greater detail on page 256.

National Compensation Unit (UNC):

INTECO defines UNCs as "CO_2e units from avoided, reduced, removed, and/or stored emissions that can be monitored, verified and reported" (INTECO 2016b, p. 11. My translation). The definition includes two further footnote entries worth mentioning here. The first one states "this unit should be verified by an accredited body, and nationally recognized by the 'competent authority'" (p.11. Original emphasis. My translation).

The second entry note argues that "UNC[s] are national units registered before the competent authority, with which the [applicant] organizations can compensate those emissions that, after a sustained effort, where not possible to be reduced; and that could eventually be used in any country in which this normative is applied and recognized" (p. 11. My translation).

From this definition several important issues can be pointed out. First, in the very definition of UNCs, INTECO holds that one of the methods to 'produce' these units is by 'avoiding' emissions. In other words, a certain

mass of GHG emissions that is avoided from ever existing, is transformed or *translated* into its 'equivalent' mass of compensation, and hence it's equivalent tradable right to pollute. Although the ontological implications of such assemblage of absence/presence will be discussed later, what I wish to emphasize here is the mere possibility of including 'avoided' emissions as a recognized modality for UNCs, considering the negativity of the Kyoto Protocol to accept offsets from 'avoided deforestation' as a valid and feasible option in the first place. An option that is nevertheless, as I will discuss later, the largest source of CO_2e compensation in Costa Rica.

Second, the provided definition of UNCs concludes making a direct reference to the MRV system derived from the Bali Action Plan (COP 13), which is a concept, coined for accounting data on GHG emissions, and which is intended to "create transparency and enhance confidence among UNFCCC's parties (Boos et al. 2015, p. 8). INTECO's reference to UNFCCC's MRV system is revealing in at least two respects. On the one hand, it speaks of the way in which global environmental devices can be found even within locally produced policies that are nevertheless 'out' of the cover of global policies such as, in this case, the Kyoto protocol. Hence, one could argue that UNCs are simultaneously 'in-and-out' of authorized global environmental actor-networks. On the other hand, the reference to UNFCCC's MRV system is also based on the clearly *modernistic* belief that there is a 'nature' out there that can be scientifically measured, reduced, ordered and displaced through scientific calculations and protocols. Both of these issues are furthermore consolidated over the assumption that the MRV system (or any other global

environmental device such as NAMA, INDC, etc.) are rendered as stable and scientifically robust devices capable of ordering 'nature' in a 'precise', 'standardized' and 'objective' way.

Reductions, Removals and Base Year:

The normative defines the concepts of 'Emission Reduction' and 'GHG Removal' which both appear on very definition of the normative of 'Carbon Neutrality' and on the 'formula' over which the INTE B5:2016 is based on. However, defining these two concepts together may be prudent as the similarity between 'reduction' and 'removal' may cause some confusion and might somewhat obscure the overall comprehension of the normative.

According to the normative, **Emission Reductions** represent the "decrease in an organization's GHG emissions through the implementation of actions during the period of the report" (INTECO 2016b, p. 11. My translation). The definition also includes two footnote entries. The first enlists examples of 'reduction mechanisms' including technological changes in productive processes, forestry projects and sustainable agricultural production projects. The second footnote states the INTE/ISO 14064-2 norm can be consulted as the guide to develop reduction and removal projects offering UNCs (p.11).

Likewise, the normative forwards the definition of **GHG Removal** from the ISO 14064-1 norm (Section 2.6) which defines these as the "total mass of a GHG removed from the atmosphere over a specified period of time"

(International Organization for Standardization [ISO], 2006).

As was introduced earlier in page 194, in the 'carbon neutrality' formula (E – R – C = 0), emission **'removals'** are included in the variable (E); while emission '**reductions**' in variable (R). This means that while the INTECO's 'carbon neutrality' formula considers 'reductions' (R) as a subtraction made to the total of emissions (E) within the exact year in which the formula is being applied by the applicant organization, 'removals' are subtractions that where already made to the total of emissions (E) in a period prior to the application of the formula; or in other words, to the '**base year**'.

Once again, the normative forwards the definition of '**base year**' from the ISO 14064-1 norm (Section 2.20) as the "historical period specified for the purpose of comparing GHG emissions or removals or other GHG-related information over time" (ISO, 2006). Moreover, this definition includes a footnote entry that states that "[b]ase-year *emissions* or *removals* may be quantified based on a specific period (e.g. a year) or averaged from several periods (e.g. several years)" (ISO, 2006. My emphasis). Additionally, the INTE B5:2016 normative in fact states that the calculation of GHG 'reductions' must be realized with respect to the 'base year' established by the applicant organization (Instituto de Normas Técnicas de Costa Rica [INTECO] 2016a, p. 19). Hence, 'Base Year' really equals the (E) variable of the carbon neutral formula; whereas 'emissions' is only one of the two constituents of the former variable. The reduction of 'removals' inside the variable for emissions, and the equivalence of emissions to

'Base Year' could be said to mirror the same sort of lack of transparency found in Costa Rica's INGEIs (reviewed in Chapter 1) as was pointed out by Araya (2015) who argued that the 'automatic' reduction of offsets to the total sum of emissions in the INGEIs prevents the reader from knowing the actual value of carbon emissions at hand.

Verification and *Verification Organism:*

Finally, the normative defines **verification** as a "systematic, independent and documented process for the evaluation [GHG inventories, or for the demonstration of carbon-neutrality] within the agreed criteria for such verification" (INTE 2016b, p. 12. My translation).

Accordingly, INTECO (2016b) defines **verification organism** as "the competent and independent organization with the responsibility of carrying out the 'verification' and of informing about the 'verification' process" (p.12). According to the normative, 'verification organisms', must comply with the accreditation requirements established in the INTE/ISO 14065 standard.

Besides this disposition, the Country Program establishes in article 3 that the Costa Rican Accreditation Entity (ECA) is the authority in charge of accrediting these verification organisms. For this process of endorsement, the ECA determined the standards for accreditation of organizations for validation and verification (ECA-MC-P09- F13), for the verification procedure (ECA-MC-P13-F13), for the criteria to evaluate (ECA-MC-C10) and for the witnessing procedure (ECA-MC-P25) (MINAE, 2013,

p. 10). Moreover, MINAE holds that besides the ECA's commitment to grant the accreditation for domestic organizations, it will eventually recognize international accredited organizations, once Costa Rica has agreed to multilateral arrangements established for the purpose of consolidating an international carbon market (p. 10). As of 2018, the Carbon Neutral Unit of the EARTH University, and INTECO itself are the only two credited 'verification organism' authorized to carry out the verification processes established in the INTE B5: 2016 normative. As will be discussed later, the lack of available options for verification organisms, and the costs involved in hiring these organisms, have been identified as a source of concern by several of the key informants of the present study.

Other relevant conceptual premises:

The normative uses the definition of **Carbon Dioxide Equivalent** (CO_2e) as provided in the ISO 1464-1: 2006 standard, section 2.19 where it is defined as a "unit for comparing the radiative forcing of a GHG to carbon dioxide" (ISO, 2006). Both the original source and the INTE B5:2016 normative add a footnote that states that the CO_2e is calculated using the mass of a given GHG multiplied by its **Global Warming Potential** (GWP), which at the same time is defined as a factor that describes the "radiative forcing impact of one mass-based unit of a given GHG relative to an equivalent unit of carbon dioxide over a given period of time" (ISO, 2006). Additionally, INTECO further defines GWP as "an index-based on the radiative properties of *well-mixed* GHG, [and that it is] determined by measuring the radiative force of one mass-unit of a GHG well-mixed in the *current*

atmosphere over a given period of time, relative to carbon dioxide" (INTECO 2016b, p. 23. My emphasis. My translation)[44]. The normative later establishes that all GHG emission and removals may only be reported in terms of tons of carbon dioxide equivalent (tCO_2e) –which INTECO also calls tons of 'normalized gas'–; and that these are to be calculated by using the GWP values produced by the IPCC (INTECO 2016b, p. 16).

I would like to briefly mention two key aspects introduced in the above paragraph. First, by referring to tCO_2e as 'normalized gas', the normative is reinforcing the legal limits imposed by the IPCC which established that the GWPs –which were inscribed in the Kyoto protocol– are to be used to *translate* emissions of other greenhouse gases into their equivalents in CO_2 (MacKenzie, 2009 p. 446). Borrowing Pierre Belanger's (2015) call for an ecological turn towards understanding landscape as infrastructure, the implementation of this type of legal limits, and categories of accountability –institutionalized through standardization and systematization– remove more and more agency from regional resources and dynamic biophysical processes (Bélanger, 2015, p. 199). What is more, Bélanger holds that such 'normalization' processes are heightened by the security found in quantitative logic and numerical precision.

The second key aspect that takes place in the process of 'normalizing' gases as prescribed in the 'carbon neutral' normative is the 'bracketing out' of carbon-market politics

[44] Despite the explanatory purpose and tone of this description, the exact meaning of a 'well-mixed' GHG' and of 'current atmosphere' are not provided in the normative.

from IPCC's GWP estimations in the socio-technical process of 'making gases the same' (MacKenzie, 2009). In other words, keeping the 'normalization' of gases as a *sub-political* matter.

INTECO's normative advances the definition of two key concepts that conceptually fundament INTE B5: 2016, and that are once again subtracted from the ISO 1464-1: 2006 standard. These are the definition of **Greenhouse Gas** (GHG) and of **GHG Emission or Removal Factor**. The first is defined as a "gaseous constituent of the atmosphere, both natural and anthropogenic, that absorbs and emits radiation at specific wavelengths within the spectrum of infrared radiation emitted by the Earth's surface, the atmosphere, and clouds" (ISO, 2006. Section 2.1). This definition of **GHG** as well as the formerly introduced definitions of **CO_2e** and **GWP** all explicitly refer to a table produced by the IPCC in which the 'global warming potentials' of each GHG are defined. Although such table is not provided either in freely available version of the standard online nor on the INTE B5: 2006 normative, INTECO does provide a table based on it. More precisely, INTECO's table defines the GWP relative to each CO_2 over a 100-year time horizon. Although I will not provide neither an in-depth description of this table, nor a reference to the full version of this table –which covers three pages of the INTE B5: 2016 document– the following 'Table G' shows a short extract of such table:

Industrial denomination or common name	Chemical Formula	GWP over a 100-year time horizon (to the date of publication)
Carbon Dioxide	CO_2	1
Methane	CH_4	25
Nitrous Oxide	N_20	298
Substances controlled by the Montreal Protocol		
CFC-11	CCI_3F	4 750
CFC-12	CCI_2F_2	10 900
…	…	…

Table G: GWP relative to each CO_2 over a 100-year time horizon. Based on *Tabla A.1 Potenciales de Calentamiento Global (PCG) relativos a CO_2 por el horizonte temporal de 100 años* (INTECO, 2016b, p. 23).

Finally, the normative incorporates the definition of **GHG Emission or Removal Factor "**as the factor relating 'activity data' to GHG emissions or removals" (ISO, 2006, section 2.7). At the same time, the ISO 14064-1:2006 defines **GHG activity data** as the "quantitative measure of activity that results in a GHG emission or removal" (ISO, 2006, section 2.11). The ISO standard enlists the amount of energy, fuels or electricity consumed; the amount of materials produced; the services provided; and the area of land affected by any given activity as examples of 'GHG activity data'.

What is interesting about these concepts, which I have chosen to group as 'relevant conceptual premises', is perhaps not so much each of their individual definitions, but how they have been taken-for-granted both within (and beyond) the 'Carbon Neutrality' normative, and within the particular enactments of the normative in discourses and practices. Another interesting issue that can be derived from this section of the normative, is the

'influence' that 'global' environmental actors and their *black boxes* –such as the IPCC, the ISO and their respective standards, concepts and calculations– play in the performative assemblage of 'local' environmental enactments.

-Requirements for GHG emission and removal inventories.

After the conceptual and technical 'definitions' glossary reviewed above, the second largest section of the INTE B5:2016 normative corresponds to the 'Requirements for GHG emission and removal inventories'. This section includes the three further subsections:

A. Scope to demonstrate Carbon Neutrality
B. Resources, functions, responsibility and authority
C. Requirements for the evaluation of the GHG inventory

Subsection (A), or the 'Scope to demonstrate Carbon Neutrality' establishes that applicant organizations are required to determine and document their performance in relation to the normative. This determination must include:

-The 'limits of the organization': An analysis of the objective that the applicant organizations have for pursuing 'carbon neutrality'; as well as of their operations and facilities to determine their particular GHG sources and sinks.

-And the 'limits of its operation': A report on the organization's GHG emissions and removals related to its

productive processes. This report must also include all 'direct' and 'indirect' emissions related to their use of energy.

Subsection (B), or the 'Resources, functions, responsibility and authority', establishes that the applicant organization must have enough (economic, human, technological, infrastructural, etc.) resources to implement and follow through the process of 'carbon neutrality'.

Finally, this section concludes with subsection (C), or the 'Requirements for the evaluation of the GHG inventory', which includes –but is not limited to– the following three subsections[45]:
C.1. Selection of quantification methodology:

The normative establishes that the methodology used for applicant parties to quantify their GHG emissions and removals should be selected either from the available international norms, or from –nationally or internationally– recognized methodologies capable of reasonably reducing uncertainty. Additionally, the chosen

[45] I have chosen to limit the review of the 'Requirements for the evaluation of the GHG inventory' section of the normative to these three selected entries because of two main considerations: First, for the sake of overall readability, and second, and perhaps more importantly, because of their relevance to the interest of the dissertation, namely the process of construction of the Costa Rican 'carbon-neutrality' *actor-network* through the enactment of particular calculations. Please note that the enumerations assigned to each of this three subsection have been assigned by myself, and hence do not correspond to the original normative.

methodologies should be able to produce exact, coherent and reproducible results that at the same time allow the compatibility of data and information (INTECO, 2016b, p. 15). Moreover, the normative suggests the INTE/ISO 14064-1, INTE/ISO 14064-2 standards, and the WBSD/WRI GHG Protocol as recommended references of methods to quantify and reduce GHG emissions. This sub-section of the normative enlists three possible methods for the calculation of GHG emissions and removals:

> Method-1. "Calculations based on GHG activity data multiplied by the available *GHG emission or removal factors* which are made official by the *competent authority*, or [based on the] use of *scientifically supported models*" (INTECO 2016b, p. 15. My translation and emphasis).
>
> Method-2: Direct measurement using continuous or periodic GHG monitoring.
>
> Method-3: Calculations based on mass –or material– balances.

These three methodologies match those described in the discussions surrounding the INGEIs in the Punctual Observations 2 in Chapter 1, where Method-1 matches the favored method in the INGEIs in which the estimations are derived with the use of (nationally or internationally determined) 'emission or removal factors'. Method-2 consists of the more costly-yet-more-accurate 'end of the pipe' measurements known as 'source sampling' (Alice et al., 2014); while Method-3 corresponds to the 'less

accurate' technique of calculations based on 'material balance'. Once again, it may be relevant to consider the role that the 'generic' emission factors provided in the IPCC guidelines often play a role in the process of calculation of GHG emissions and removals (see Chapter 1); put plainly: the role of a 'global' *parliament of specialists* is that of an imagined community of 'autonomous experts' which order the performative assemblage of 'local' carbon calculations through their taken-for-granted authority and their *black-boxed* calculative devices. This particular interrelation of power is key to understanding Costa Rica's current market-centered environmental governance as a model rooted in a neoliberalism that largely depends on "autonomous expert communities that translate government priorities into a wide variety of locales and that provide legitimacy" (Timmermans and Epstein, 2010, p. 80). Although I will discuss the particular features and pragmatic implication of such neoliberal turn in Costa Rica's environmental governance later on, I would like to state here that I use the term 'neoliberalism' as a particular way of thinking and being, in other words as a Foucauldian *governmentality*. Such an understanding –which emphasizes on the proliferation and diffusion of state power through multiple institutional forms– offers an appealing capacity to overcome false dichotomies between state and market that too often have been accepted even by critics of neoliberalism; while apprehending neoliberalism as a discourse-productive assemblage of a particular kind of society and particular kinds of political subjects (McCarthy & Prudham, 2004, p. 280).

C.2. Calculation of GHG emissions and removals:

This subsection is directly related to the above mentioned one in that it establishes several considerations that the applicant organizations must comply with depending on the specific method for the calculation of GHG emissions and removals it selects. This subsection concludes by stating that the applicant organization is authorized to exclude the quantification of sinks, or direct or indirect GHG sources that when summed either do not exceed 3% of the inventory's total, or the specific value established on the program assigned for the applicant organization. However, the applicant organization is required to explain the reasons behind the prospective exclusion of any GHG source or sink from the quantification. Moreover, the normative states that those GHG emissions or removals that are neither technically nor financially feasible must be included as an estimation, which at the same time shall consider its degree of 'uncertainty' (INTECO, 2016b, p. 16). In short, Costa Rica's 'carbon neutral' normative allows the exclusion of certain GHG emissions and removals, depending on the estimated qualitative values of certain of its material qualities, as well as on certain technical and financial considerations relative to the estimation of the former values.

This section of the normative shows how, under certain socio-political conditions and through particular socio-technical arrangements, gases can be 'omitted' from the overall quantifications of an organization's GHG inventory. This particular process of *qualculation* resembles the one discussed in the Punctual Observations 2 in Chapter 1 in which GHG emissions from international air

and maritime travel, and from 'organic matter' and 'biogenic processes' are withdrawn from the overall calculations of the INGEIs. However, unlike the former, this particular calculation appears to focus more on 'quantitative' considerations –such as allowing the omission of gases representing less than 3% of the total of the inventory– than on 'qualitative' ones –like the 'nature' of the emission source–. However, as Callon and Law (2003) argued, "[calculation] has nothing to do with quantification" (p. 13). Instead, what we commonly understand as 'calculations' are better understood as processes in which entities are detached from other contexts –like inscriptions in a measuring device–, manipulated –through numbers, judgments, compromises, computer algorithms, etc.–, transformed, and summed in a single space –like a spreadsheet in an GHG emission inventory– (Callon & Law, 2003, p. 13). Hence, carbon is really *qualculated*, and not simply calculated (Lippert, 2013, p. 104) since *qualculations* are intermediate performative situations between judgements and calculations (Callon & Muniesa, 2005, p. 1232). Additionally, drawing some entities into a single judgement-calculative space also implies *excluding* other entities from being recognized in the process. A process that ultimately leads to the emergence of a new material called *result* (Lippert, 2013, p. 103). Put briefly, since calculations start with the process of separating things or states of the world into qualitative categories, and by imagining courses of action associated with those newly classified things, then calculations in general –and certainly carbon calculations in particular– can no longer be understood as processes exclusively populated by 'neatly' arranged numbers and/or by an unbendable techno-scientific ethos.

C.3. The '*Evaluation of uncertainty*'.

The second section of the 'Requirements for the evaluation of the GHG inventory' focuses on the assessment of uncertainty for GHG emissions and removals, which considers the 'uncertainty' of both the GHG activity data, and the GHG Emission or Removal Factor used (INTECO, 2016b, p. 17).

The normative provides the following formula to determine the 'uncertainty' of each of the sources and sinks identified by the applicant organization:

$$U_i = \sqrt{\left(EFu^2 + ADu^2\right)}$$

Definitions:
U_i: Represents the 'aggregated uncertainty' or the uncertainty associated to the source of emission or removal (i)
EFu: Corresponds to the uncertainty of the 'GHG emission or removal factor'; while
ADu: Is the uncertainty of the 'GHG activity data'.

Besides the former formula, the INTE B5:2016 provides an additional equation[46] to calculate the 'combined uncertainty' which is the resulting percentage of uncertainty from the sum of amounts (that correspond to half of the 95% confidence interval, divided by the total).

[46] Due to copyright reasons I am unable to include this second formula in the present dissertation.

This calculation is intended to determine the 'total' value of uncertainty from an entire GHG inventory.

The normative recommends that the applicant organizations consult the principles and methods to estimate 'uncertainty' provided in the IPCC's 2006 guidelines for National GHG inventories[47] (Volume 1; chapter 3), on the Climate registry website (http://www.theclimateregistry.org/), and on the WRI's 'Quantitative Inventory Uncertainty' guidelines available on the GHG Protocol website (https://ghgprotocol.org/sites/default/files/Quantitative %20Uncertainty%20Guidance.pdf).

-Requirements for the reduction of emissions.

This chapter of the normative enlists the requirements that must be met by any applicant organization in order to fulfill two further steps necessary for the declaration of 'carbon neutrality':

a) Elaboration of a 'reduction management plan'
b) Elaboration of 'documentation for the reduction of GHG emissions'

The 'Reductions management plan' is a document intended to gather all the reductions that the applicant organization must implement to demonstrate 'carbon neutrality'. This plan must include several declarations of

[47] The same reference over which Costa Rica's National GHG inventories is largely based on.

commitment, timetables, inventories of available resources, and estimations of specific targets.

The 'Documentation for the reduction of GHG emissions' on the other hand consists of a series of documents that justify and back up the reduction of GHG emissions that the applicant organization has set out to do. Once again, these documents include several specific declarations that justify the specific methodological choices of the applicant organization, as well as several other timetables and target estimations.

Three additional chapters follow this 'Requirements for the reduction of emissions' chapter, which enlist several formal requirements necessary for the declaration of carbon neutrality:

> -Requirements that an organization must meet when 'compensating' its residual emissions with the purchase of 'carbon credits'.
>
> -Requirements and steps that the applicant organization must fulfill in order to maintain and renew its GHG inventories, and its 'carbon neutral' status.
>
> -Guidelines on how to elaborate a report that effectively communicates an organization's 'carbon neutral' performance and results.

Due the more formal or 'administrative' character of these chapters, their repetitive content and their somewhat distant relation to the specific aim and topics of this

dissertation, I have decided to abstain from reviewing these three chapters in the same depth like was done with the others. However, I would like to point out three key issues that can be derived from these three final chapters of the normative.

First, INTECO states that the "acquired compensations must occur in a process outside of the operative limits of [the applicant] organization, and indirectly through the acquisition of GHG reductions (in the form of carbon credits) generated by a third party" (INTECO 2016b, p. 19). In other words, the Costa Rican normative to demonstrate 'carbon neutrality' only recognizes a 'compensation' of those 'carbon credits' that have been purchased by the applicant organization from an external supplier or producer of 'carbon offsets'. In other words, the normative dismisses any other form of compensation which could be produced by the applicant organization on its own; or any other form of exchange between the 'demand' and the 'supply' part that is not based on a monetary transaction. The later can be deduced because neither of the recognized 'carbon credits' (CER, VER or UNC) is legally available outside of the limits of national or international 'carbon markets'. This shows how in spite of neoliberalism insistence on the "pervasive naturalization of market logics, [justified] on the grounds of efficiency and even 'fairness' [of] their installation as the dominant metrics of policy evaluation" (Peck and Tickell, 2002, p. 394. Original emphasis); there is nothing 'natural' about a marketplace or about the agents of rational economic calculations that are expected to inhabit one. Instead the latter actors alongside their instruments, sites and techniques with which economic calculations are made

possible have to be made (Barry, 2001, p. 82). In other words, and just like any other market, Costa Rica's carbon-offset market is not a 'naturally' emergent thing; it has to be deliberately, pragmatically and continuously enacted as such. The opportunity to follow the performative emergence of Costa Rica's carbon market represents a laboratory type of space to test the organization and the actual functioning of an experimental market *in vivo* (Callon, 2009). Moreover, studying carbon markets offers an excellent field of inquiry in that they are "built up from scratch based on economic theories, but in an experimental way through the 'constitution of collectives comprising large numbers of different actors from diverse temporal and spatial horizons'" (Pellizzoni, 2011, p. 800). Hence, and following Ureta (2014a), Costa Rica's carbon offset market, as will be discussed in greater depth on page 239, performs at least three kinds of *work* as an emission trading scheme: it performs a *textbook* market –in which 'goods', 'buyers/sellers' and multiple 'market spaces' are performatively assembled and *framed* 'by the book'–, as a *civilized* enactment of market –in which competing differences in the way the market is *framed* are recognized and welcomed, and eventually negotiated– and it performs an *exemplar* of the validity of certain economic knowledge/practice mobilized to strengthen the general work of economics.

Second, the applicant organization must maintain management procedures to ensure that the information on its GHG results and performance are available for routine revisions. The normative states that this information must be coherent and precise, and at the same time reflect the total coverage of the inventory (INTECO, 2016b, p. 20). To this end, INTECO suggests that the organization must

ensure that its data collection systems are robust; that its measurement equipment is kept well maintained and calibrated; and that its data remains current and precise for its use in periodical internal audits and technical revisions. This assertion goes well in hand with Hajer's description of how 'modern' environmental problems lacking a material reality (such as the greenhouse effect, or the ozone depletion) require what he calls an almost unprecedented degree of 'trust' in 'experts' and in high-tech devices to help us understand these global threats. He argues:

> [U]nderstanding has ceased to be a matter of direct experience, but is a matter of complex scientific extrapolations, of mathematical calculations that require extremely expensive supercomputers, and, consequently, it is a limited group of experts who define the key problems, who asses the urgency of one problem *vis-á-vis* other possible problems, and who implicitly often conceptualize the solution to the problems that they put forward (Hajer, 1995, p. 10).

By emphasizing on the importance that 'properly calibrated' equipment, and on the robustness of data collection systems, INTECO enacts 'climate change' as a problem that is technically and technologically amenable through such *technologies of government*, and through the mediation of autonomous techno-scientific 'experts' who allow political rationalities and political action to be prescribed *at a distance*. However, Callon and Law argue that *qualculations* do not sit well with 'trust'. On the contrary, *qualculative* effects, they argue, replace 'trust' as to

talk about the latter is already to render it discussable, accountable and thus once again, *qualculable* (Callon & Law, 2003, p. 8).

Finally, INTECO argues that the normative does not correspond to any existing international norm because at the time of its development, no reference was available (INTECO 2016b, p. 22). In other words, INTECO argues that Costa Rica's INTE B5: 2016 normative is the world's first standard to demonstrate 'carbon neutrality'.

Briefly: Costa Rica's carbon-offset market did not 'naturally' emerge into being; instead it is the result of careful planning, and of particular political agendas. The resulting market offers a 'laboratory-like' space to test the organization and functioning of actual carbon markets which are still rendered as highly experimental.
Finally, the discussion addresses the process in which 'trust' in technological devices, accountability systems, calculations and 'expert' knowledge are constructed in Costa Rica as necessary way to maintain 'nature' governed. In short, how 'climate change' is constructed as a problem that is technically and technologically controllable.

Punctual Observations 2.

In the introductory section of the of the normative, INTECO states:

> This instrument is intended to support the efforts being individually or collectively carried out from the *private*, or the *public* sector to

> achieve Carbon Neutrality, and to advance towards a low Greenhouse gas emission model. This implies a strong transformation in the productive systems, the financial mechanisms and the country's structure (INTECO 2016b, p. 5. My emphasis and translation).

However, in spite of the suggestion that this normative is intended to be an instrument for the use of both 'private' and 'public' sectors; a closer look at the normative shows that such instrument is exclusively based on –voluntary– market mechanisms, and not on any kind of 'command-and-control' implementation. This assertion is perhaps already made evident when considering that the normative is built on the ISO 14000 family of standards related to environmental management; which is based on a voluntary approach to environmental regulations intended to minimize the environmental impacts of the operations and processes of private companies and organizations[48]. The voluntary character of the 'C-Neutral' program is intended to break away from Costa Rica's earlier state-centered command-and-control conservation model which was largely based on the 'National Park' system. A system that relied on the formal designation of strictly defined borders to 'fortress-like' protected areas, and imposed sanctions to anyone who violated these (Fletcher, 2016). According to Fletcher, this protectionist 'fortress conservation' approach could be considered a *sovereign environmentality* which facilitates "governance through top-down creation and enforcement of regulations" (Fletcher 2010b, p. 178). In

[48] See more on the nature of the ISO 14000 family of standards in https://www.iso.org/iso-14001-environmental-management.html

contrast, a voluntary market mechanism can instead be considered a *neoliberal environmentality* in that it seeks to "create external incentive structures within which individuals, understood as self-interested rational actors, can be motivated to exhibit appropriate behaviors through manipulation of incentives" (p. 173). Hence, this type of *environmentality* constitutes an alternative type of intervention to both the direct subjugation of individuals, and to the internalization of norms and values of what he calls the *disciplinary environmentality*[49].

So, if mechanisms of environmental governance such as the 'C-Neutral' certification –and for that matter, the ISO norms over which it is based on– are just voluntary, then why do private organizations and businesses bother? Timmermans and Epstein (2010) argue that in practice voluntary standards become 'de jure' mandatory producing a neoliberal government-industry hybrid of governance (p. 80). Additionally, the 'voluntary' nature of emission trading schemes –such as the 'C-Neutral' and the country's 'voluntary carbon market' that supports it– in practice work very similar to a 'carbon tax'[50], yet that they are less prone to negative lobbying and political opposition (MacKenzie 2009, p. 453).

Right at the beginning of the same normative, INTECO states that "[t]his normative applies to any type of

[49] Which, as was suggested on page 88, could be argued to correspond more to the ENCC through its 'Public awareness, education and cultural change' axis.

[50] That would typically require polluters to pay either by having to buy permits, as a liability, or as penalty fees for exceeding agreed upon pollution limits.

organization, regardless of its size, geographical location or activity, that seeks to improve its *competitiveness* through its compromise with [its] environmental performance, reducing its GHG emissions" (INTECO 2016b, p. 6). My translation and emphasis). Hence, INTECO assures that a key objective of this normative is to ensure a greater level of 'competitiveness' to those organizations that fulfill its requirements. Similarly, INTECO enlists the seven different benefits that an applicant organization is able to obtain through the application of the normative (see Table H from page 246) where four of them make direct allusion to either the consumption, production or supply of products or services within increasingly competitive markets; two focus on improving the transparency or comprehensiveness of the normative, and only one (number 4) on the collective need for reducing the effects of climate change regardless of the 'sector of society' (INTECO 2016b, p. 6). Finally, according to Fletcher, following the nation's former Minister of Environment, "the national carbon neutrality initiative is intended as a branding mechanism to leverage *C-Neutral* products and services through 'the sustained creation of value for target customers in the market or segment of interests, which proves to be superior to the value offered by the competition'" (Dobles in Fletcher 2017, p. 143. Original emphasis).

To further sustain this argument, I include the following extract of an interview made to one of my informants enrolled in FONAFIFO (the organization in charge of the supply side of the national carbon market through the sales of UNCs) who explains a common reason why the private sector has shown interest in the certification:

Interviewer: *The CST* is clearly for eco-tourism; yet 'Carbon Neutrality', you could say, is much broader. Or is* [C-Neutrality] *meant to be more industrial?*

Subject: *It's mainly for industry. However, even financial businesses have enrolled themselves in this* [C-Neutral program]. *It's something that has caught their attention that has allowed them to also join the country's reduction efforts.*
[Businesses] that have nothing to do with tourism and all of that; those that previously had no access to any other certification. So [the C-Neutral] *has already meant something attractive for many.*

They have seen this as an opportunity because it allows them to brand themselves.

*CST: Certification for Sustainable Tourism[51]

(R. Bedoya, personal communication, March 28, 2016. My translation.)

In this extract, the subject considers the fact that the 'C-Neutral' certification is not limited to one specific productive sector (as opposed to the CST certification that focuses exclusively in sustainable tourism) is an element that has by itself attracted businesses from a wide range of

[51] Up until a relatively late stage of the study that lead to the present doctoral dissertation, the idea to establish an analytical comparison between 'C-Neutral' and the 'CST' certifications as embodiments of political socio-technical constructions of 'nature' was explored. Hence many of the gathered data and interviews also collected information regarding the Costa Rican Tourism Board's CST certification program.

markets. The subject additionally adds that the 'C-Neutral' represents the only source of recognized environmental branding (or certification) available for any business organization outside of tourism sector.

Similarly, another of my informants, this time one enrolled in the DDC (the state institution in charge of the C-Neutral program) referred to the 'benefits' of the program as follows:

> ***Interviewer:*** *Do you believe that the Carbon Neutral certification, or the reduction of carbon in general, is important for our country? And if so, why?*
>
> ***Subject:*** *Well, I believe that there is already like… like a lot of all the effects of climate change. Not only droughts, floodings … but also at the level of costs that it represents.*
>
> ***Subject:*** *So I think that if you speak to people about the benefits that are obtainable through the Country Program which range from… energetic efficiency, improvement in accounting, reduction of costs, access to state bids and that sort of incentives mainly for private sector businesses well… that's why these have looked into obtaining the 'C-Neutral' brand.*

(K. Aguilar, personal communication, March 29, 2016. My translation.)

This extract shows how when asked about the 'benefits' from the reduction of carbon emissions in general, and

from the 'C-Neutral' program in particular, the subject began acknowledging what she believes is a widespread awareness about the (strictly) 'environmental' consequences of climate change. Immediately after that, however, the subject focused on enlisting the more 'business-like' benefits from obtaining the brand.

Hence, according to the two extracts above, the 'C-Neutral' offers its participants three main benefits from participating in the program:

> -A marketing tool through environmental branding
> -Cost savings in their operations through improved efficiency
> -Access to business incentives reserved for organizations certified 'C-Neutral'.

However, several other of my informants (some even directly involved in the process of certifying applicant organizations in the program) have expressed serious doubts about those three general benefits of the program enlisted above. The following extract of an interview made to a client enrolled in the 'C-Neutral' certification speaks of a certain skepticism felt towards the brand:

> ***Subject:*** *There are no incentive plans. There is no commercialization part, there is no focus part; there is no vision so that* [the C-Neutral brand] *gains followers, and the way to gain them is making them see the positive part that this has, what you gain, all the benefit.*

> *Despite of all the costs and all there is, we also have to talk about the benefits that achieved.*
>
> *Right? This is not being done, so it's really difficult. If you ask me, if the investment put down on this has generated something to my business? I am going to have to answer no(!).*

(J. Lopez, personal communication, April 15, 2016. My translation.)

The subject continued the interview mentioning examples of what she would consider plausible incentives that could ideally be gained by those organizations that obtain the 'C-Neutral' certification. She mentions for instance the option to be included as a 'service provider' for the government, and to have the option of having certain taxes reduced or cut out. All of these being hypothetical incentives that are currently unavailable for 'C-Neutral' businesses.

Continuing with the competitive advantages that the 'C-Neutral' program is supposed to provide, all of the interviewed subjects of the study –who had in fact obtained the 'C-Neutral' brand– reported not having perceived any particular boost in sales, or in the demand for their products or services since obtaining the certification. Moreover, several of my informants coincided that as of today, the 'C-Neutral' is not a product differentiator because the Costa Rican market, and the clients of this market, know nothing –or simply care too little– about 'carbon neutrality'. In fact, several of my informants –one of them being a high-ranking member of

INTECO itself– concurred that the 'C-Neutral' has become more a matter of 'image', or prestige among business entrepreneurs rather than an actual competitive edge. On this particular matter, Timmerman and Epstein (2010) warn "that voluntary nature of many standards makes it difficult to develop momentum unless built-in incentives promote compliance" (p. 80). Hence all of these concerns could be pointing towards a particular issue that is widely believed to deserve more attention than it currently does.

Back again to the extract above, the subject also referred to the costs that applicant organizations must cover to opt for the 'C-Neutral' certification. This leads to another criticism that was constantly made throughout the study's different interviews. Particularly, how the elevated expenses required to cover the costs of inscription, verification and finally for the compensation of residual emissions –not to mention the particular investment that the applicant must dedicate to improving its emission performance, either through technological, architectural, organizational, or other means– are unaffordable for many small- to medium-sized businesses. For instance, one of the study's informants stated that their organization (a financial entity seated in a rather large office building in San Jose) invests over $4,000 US Dollars per year only in compensating its approximately 500 tons of residual CO_2e emissions. That figure however does not reflect the initial investment of improving the organization's emission or energetic 'efficiencies', which commonly surpasses $15,000 US Dollars for any ISO certification in Costa Rica (Quirós, 2013); nor does it cover the costs of the verification part, which represents an additional cost of around $7,000 US

Dollars[52] per year. On the later issue, one of my key informants enrolled in one of the credited verification entities for the 'C-Neutral' program argued that the elevated costs required for hiring an auditing party are themselves a consequence of the large amount of requirements that these are expected to fulfill in a verification process (E. Castro, Personal communication, February 10, 2017). Interestingly enough, a somewhat similar asymmetry is said to be taking place in the 'supply' side of Costa Rica's 'carbon market', specifically in the forestry sector. This sector supplies the only source of Kyoto-recognized carbon credits to the national market, and has been 'decentralized' and 'privatized' under the country's current market-centered conservation model. This has gradually led to a system of competitive contracting among professional forestry engineers whose goal it is to offer the lowest possible rates for their services. Matulis (2013) argues that this competitive contracting has disproportionately benefited the wealthier, bigger landowners as the potential for savings are correlated with the contract size. Thus, the liberalization of the forestry sector may very well be harming the most vulnerable participants of the supply side of the market.

Another complaint found throughout the interviews with clients enrolled in the 'C-Neutral' program suggests a second asymmetry between the potential clients of the program based on the economic viability for these to pursue the certification; only this time related to the 'nature' of their operations, and not necessarily to their

[52]Estimate provided by personal communications with both J. Lopez, Mapache rent-a-car; and V. Espinoza, ICT in May and April 2016.

'scale'. The following extract of an interview with an actor enrolled in an organization certified 'C-Neutral' can better illustrate this point:

> ***Subject:*** *Certifying yourself is not cheap. Its more or less, in theory, $2,500.00 Dollars; $7.5 Dollars per ton* [of offset CO_2e].
>
> *For an organization like this*; but for a PYME**, or a* [automotive/ manufacturing/ etc.] *workshop, or a company dedicated to public transports that generates more than 1,000 tons; by $7.5 Dollars? Getting certified will be no* [good] *deal. Plus the measures that they would have to take to reduce their footprint? Otherwise they would generate more and more* [emissions]… *and for what?*
>
> *A financial entity seated in an office block building designed to current emission and energetic efficiency standards.
> **PYME: Small and medium size companies.

(M. Alvez, personal communication, April 5, 2016. My translation.)

Another of my informants –enrolled in FONAFIFO's marketing department– for instance, explained how some cement-producing firms showed particular interest in the certification; but that eventually dismissed the possibility of participating in light of the huge investment it would mean for them in terms of technological improvements, and in terms of compensating their residual emissions.

Considering all the above mentioned issues, it now becomes clear that from the start, the target group of the 'C-Neutral' has been the private sector and particularly those organizations and businesses that are 'large' or 'profitable' enough to afford all the different expenses required to apply for, obtain, and maintain the certification. Nevertheless, the target group of the certification are organizations that are additionally *not* enrolled in certain types of economic activities based on particular productive processes that yield large amounts of emissions. These two reasons practically rule out any realistic possibility for public entities to take part in the program all together. This, as follows, was pointed out by one of my informants whose organization is certified 'C-neutral':

> ***Subject:*** *What is going to happen now that the country has that* [2021] *goal; now that everything that comprises the government, and its public companies, has to become a part of these programs and be its guarantors? When* [Government and state entities] *have that amount of human recourses; when they have to apply the normative to all of them; that's going to mean an additional cost for them.*
>
> ***Interviewer:*** *Hmmm.*
>
> ***Subject:*** *Precisely today I heard about MINAE considering the costs of verification entities… because if they try to enter* [the C-Neutral program] *they already know they will not be able* [to afford it].

(J. Lopez, personal communication, April 15, 2016. My translation.)

According to the subject, because of the government's large amount of human recourses –yet I would also add because of its material recourses in general, and its intensive energetic needs–, in relation to its limited budget; and in combination with the elevated costs of the certification process, it is unlikely to consider the 'C-Neutral' certification as a feasible alternative for the state itself. That is, for reducing its GHG emissions in light of the country's 'carbon neutral' goal. What is more, this assertion does not even question whether the 'benefits' promised from obtaining the 'C-Neutral' brand (such as market positioning and business benchmarking) are attractive for public institutions at all.

All things considered, I argue that the 'C-Neutral' certification program represents a space in which the Costa Rican state transfers a great deal of the burden to reach its self-appointed goal to become a 'carbon neutral' nation in 2021 to the country's private sector. By doing so, not only is the state justifying itself in its arguable inaction towards reducing its GHG emissions but is also benefiting through the provision of the demand and the supply sides of the national carbon market.

However, the interviews made for this study show that, in spite of some informants claiming that 'the government does not show by its own example'; many appear to accept quite easily the 'leading role' of the private sector in Costa Rica's path towards 'carbon neutrality'. Moreover, many of them consider the private sector to be "the entity of

change in achieving the carbon neutral goal"[53]. Still, this does not mean that those subjects that placed their hopes on the private sector consider that public entities should be left 'off the hook'. On the contrary, several of them alluded to the need to literally 'force' state institutions into taking measures in order to reduce their carbon emissions; hence reserving any 'voluntary' mechanisms, such as the discussed certification program, to private entities.

Consequently, I believe that several coexisting forms of environmental *governmentality* are performed simultaneously as Costa Rica's general environmental governance, and as the nation's attempt to reach 'carbon neutrality' in particular. These different forms of *governmentality* target different socio-material actors, use different methods of *translation* and serve different, and sometimes competing purposes.

I would argue that the 'C-Neutral' program represents a *technology of government* inscribed in what Fletcher (2010b) calls a *neoliberal environmentality*[54]. More precisely, and

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[53] K. Aguilar, personal communication, March 29, 2016. My translation.

[54] Although Fletcher (2010b), like Agrawal (2005) and Luke (1999) mobilize the concept of *environmentality* as an extension of Foucault's original concept of *governmentality*; I will refrain from using the former extended concept in my own formulations as I believe it is mainly focused on the process by which socially situated subjects acquire an environmental consciousness and reassemble their identity as *environmental subjects* (Agrawal, 2005); whereas the original concept of –environmental– *governmentality* works in a broader sense to explain the socio-technical processes by which certain political rationalities emerge

following this author's definition of the latter concept, the 'C-Neutral' is assembled as an effort to 'combat climate' through the promise of an incentive structure intended to influence the enrolled organization's use of natural resources while reducing their 'carbon footprint'. This reduction is intended to be accomplished by altering the cost-benefit ratio of resource extraction, and energy expenditures respectively so as to encourage *in situ* preservation (p. 176). Furthermore, the 'C-Neutral' program is intended to motivate the enrolled organizations to align their 'self-interests', and to exhibit a 'more appropriate' environmental behavior in line with the state's *political rationality* (Miller & Rose, 1990). This is possible, once again, through the prescription of *technologies of government* –such as eco-certifications, emission accountability systems and the tradable 'carbon-credits'– assembled over the promise of delivering greater 'eco-efficiency' and 'eco-competitiveness'[55], and greater access to a renovated 'green' market filled with goods and experiences assembled as "green attractors" (Block, 2013).

At the same time, I believe that the ENCC (reviewed in Chapter 1), particularly in its 'Public awareness, education and cultural change' axis, constitutes what Fletcher calls a *disciplinary environmentality* in that is intended to persuade individuals –through formal education, 'awareness rising' campaigns, social media, etc.– to internalize the social

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as the 'logical solution' to situated narratives of particular ecological 'crisis' or 'threats' (in our case, 'climate change').

[55] As defined, and as promised by Costa Rica's former Minister of Environment and Energy Rene Castro (2015).

values and norms by means of which they will self-regulate their behavior in ways consistent with the state's goals vis-à-vis reaching carbon neutrality in 2021. An explicit example of how this second form of *environmentality* is being mobilized in Costa Rican environmental governance discourses can be found in the country's 'Third National Communication' for the UNFCC that states: "the need to build a national education and communication strategy on the matter of climate change is imperative […this strategy should] generate a reflexive and transformative social cycle that requires changes in people's daily practices, and in their *interpretation of reality*" (Ministerio de Ambiente y Energía [MINAE] & Instituto Meteorológico Nacional [IMN] 2014, p. 98. My translation and emphasis). As this shows, this form of *environmentality* then operates "through the internalization of social norms and ethical standards to which individuals conform due to fears of deviance and immorality, and which they thus exercise both over themselves and one another" (Fletcher 2010b, p. 173).

Unlike Fletcher's *neoliberal environmentality*, or the *disciplinary environmentality*, Costa Rica's oldest, and arguably most consolidated form environmental governance corresponds to a third type of environmental *governmentality* which this author names *sovereign environmentality*. This third type of *environmentality* is bound to state-centered protectionism, and just as Foucault's concept of *biopolitics* or *biopower,* it is justified as the defense of non-human life (Fletcher 2010b, p. 177). In practice, *sovereign* –environmental– *governmentality* is enacted as the direct exercise of sovereign power through the construction and enforcement of codified rules determined to protect biodiversity, and typically materialized in the state-centered command-and-control

practice of erecting 'national parks' and patrolling their borders. Costa Rica's 'national park' system is arguably a quintessential example of the protectionist 'fortress conservation' model of the welfare state. In fact, and in spite of the rather common claim that Costa Rica's 'Payment for Environmental Services Program' (PSA)[56] – arguably the country's strongest, and most consolidated market-based environmental policy– has been instrumental in reducing the country's deforestation rates since the mid-1990s, Sanchez-Azofeifa, Pfaff, Robalino and Boomhower (2007) show how in fact "[a]ll of the prior policies [to the PSA], including the creation of national parks and biological reserves and the 1997 [forestry reform] law, have very effectively lowered deforestation […] The success of these previous programs subsequently left the PSA program with little forest clearing to prevent" (p. 1172). This conclusion is not an isolated one, but is on the contrary shared by several scholars engaged in studying the PSA program and its impacts.[57]

However, Fletcher argues that Costa Rica has shifted its environmental governance discourses and practices from enacting the *sovereign environmentality* determined on 'preserving biodiversity' in national parks and through banning deforestation for example, towards a *neoliberal environmentality* focused on conducting a campaign against 'climate change' –and hence in reaching 'carbon neutrality'–. As a result of this shift of paradigm, or 'master

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[56] Which constituted the country's first effort to link the country's forests to the emerging carbon markets.

[57] See Blackman & Woodward (2010); Daniels et al. (2010); Fletcher & Breitling (2012) and Rosendal & Shei (2014) for some of such examples.

concept' as he calls it, "Biodiversity preservation has thus shifted from a worthy conservation goal in its own right to an instrument, in many cases, in the campaign against climate change" (Fletcher 2016, p. 139).

As a conclusion to this brief discussion, I contend that each enactment of environmental *governmentality* targets a different set of socio-material actors, uses different methods of *translation* and serves different, and sometimes competing purposes. Accordingly, while 'national parks' are enforced and policed directly by the state through a series of top-down directives, restrictions and taxes on Costa Ricans intended to preserve the country's flora and fauna, the 'C-Neutral' certification program and its the INTE B5: 2016 normative are primarily intended to enroll private businesses and organizations, carbon emissions, preserved forests and forest plantations. Instead of direct impositions, these *technologies of government* seduce the targeted entities by promising them access to business incentives, a renewed competitive edge in their respective markets, the chance to be offset in forests, an improved cost-efficiency in their operations, and the chance to be accounted for in GHG inventories.

Additionally, I argue here that through the enactment of the 'C-Neutral' certification program, the Costa Rican state has found a viable mechanism to transfer what is perhaps the largest share of responsibility of reducing the country's GHG emissions to the private sector. This however does not mean that the entire burden of the 'carbon neutral' project falls on the shoulders of the private sector. As was mentioned before, I believe that the ENCC was conceived as a policy that at least partially seeks to render the

country's entire citizenship as responsible for mitigating climate change through the provision of *technologies of government* –education programs, awareness rising campaigns, circulation of statistics, online carbon footprint calculators, etc.– and through the infusion of power through increasingly participatory process intended to objectify, standardize and render carbon emissions, climate change and more generally 'sustainability' governable (Holden, 2011).

Finally, I contend that with such market-based mechanisms, the Costa Rican state has found a viable option to decentralize, privatize and deregulate the country's environmental governance which had historically been overseen and financed exclusively by the central government. A burden that meant a massive –and still unpaid– debt from expropriating lands to establish the country's national park since the late 1960s; a debt that according to one of my informants was approximately 1,727.00 million US Dollars by 2015, and which the country is currently paying at a rate of one million US Dollars per year (P. Abarca, personal communication, February 13, 2017). Ironically, the process of *role-back neoliberalism* (Peck & Tickell, 2002) or *externalization of state functions* (Swyngedouw, 2005) embedded in Costa Rica's current market-based environmental governance practices are presently being oriented towards 'cashing-in' on the country's early environmental actions assembled precisely as command-and-control implementations during the country's earlier welfare-state era.

Briefly: There are several coexisting –and often competing– ways in which environmental governance is carried out in Costa Rica. Each approach differs from the next in the way that they each reproduce a particular 'will to govern'; in the means they each use to accomplish their particular objectives; and in the specific human and non-human entities they each target. For example, while the 'C-Neutral' program intends to seduce private business into adopting 'greener' practices by offering them promises of increased economic revenues, Costa Rica's 'national park' enforces environmental conservation through top-down 'policing' and command-and-control regulations.
Correspondingly, concerns about the protection of biodiversity –protected in 'national parks'– have been gradually downplayed in favor of concerns about 'climate change' –as portrayed in Costa Rica's 'Carbon Neutral' actor-network–. This move coincides with the country's shift from a protectionist and 'state-centered' conservation model to a more market-oriented 'neoliberal' one in which the responsibility of environmental conservation –understood now as mitigating 'climate change' and reaching 'carbon neutrality'– are gradually being transferred from the state to the private sector.

Costa Rica's Domestic Carbon Markets

I would like to call into the reader's consideration that the review of this third section of the present chapter differs from all previous reviews of this dissertation in two ways. First, this subsection is not based on a single policy document but instead on several heterogeneous sources such as policy documents and manuals, academic articles,

and personal interviews. This means that unlike the previous reviews I have done up to this point, in which I have analytically dissected particular policy documents by summarizing what I considered to be their most relevant contents –that is, in relation to the topic of this dissertation–, and by discussing them 'in order'; I will instead review the country's carbon market more 'freely'.

The reason for taking such liberty relates to the second consideration. Namely, unlike all the previously reviewed policies, the country's carbon market is not yet officially running. However, a 'preoperative' version of the market has been supplying 'carbon credits' to the organizations enrolled in the 'C-Neutral' program since as long as that certification was launched. This 'preoperative' carbon market was legally bound to the 'C-Neutral' program through the proclamation of the Country Program decree which stated that "all compensation processes through [UNCs] before the formalisation of the domestic carbon market should be carried out by the [FONAFIFO]." (MINAET, 2012, Article 5, Transitory 3. My translation). Henceforth, the third section of the present chapter will not provide an in-depth analysis of all the minutiae of any given policy document or device but will instead offer a review of how MINAE is expecting to assemble a 'future' domestic carbon market in a broader sense, while simultaneously discussing several relevant issues related to how the market is currently being enacted in a more performative sense.

Therefore, the review of Costa Rica's carbon market will be split into two parts. The fist will review the design of the future carbon market. This review will be largely based

on the 'Domestic Voluntary Carbon Market of Costa Rica' (MDVCCR, for its acronyms in Spanish) and on the 'Costa Rican Market Readiness Proposal' (MRP), both published by MINAE in 2013.

The second part will review the country's 'preoperative' carbon market which is in fact the country's well-established 'Payment for Environmental Service Program' (PSA, for its acronyms in Spanish), and which has been steadily running since the second half of the 1990s.
Having said that, both analyses are expected to differ from each other since one embodiment of the carbon market is little more than a future projection, whereas the second has accumulated over 20 years of experience and has consequently been reviewed numerous of times by scholars around the world.

2.1. Costa Rica's 'future' Domestic Carbon Market

MINAE introduces the domestic voluntary carbon market (hereinafter 'carbon market') in both the MDVCCR and the MRP documents by acknowledging that the need to develop such market was considered in the light of the existence of the ENCC, the Country Program and the INTE B5:2016 normative, and hence it was required to put those three long term policies into motion. More precisely, MINAE argues that it considered the design of the domestic carbon market as a means to make the generation of Costa Rica's indigenous carbon credits or UNCs viable, while rendering these as feasible alternatives to the CER and VER credits recognized as available compensation options by the INTE B5:2016 normative.

MINAE describes the carbon market as a mechanism of voluntary participation that will help Costa Rica reach the '2021 goal' through the provision of guidelines to generate and commercialize carbon credits as established in the INTE B5:2016 normative and the Country Program; and from projects or activities located in the territory defined by the legislation (Salgado, Dumas, Feoli, and Cedeño, 2013 p. 18). Moreover, MINAE argues that the Costa Rican government "intends to establish a Domestic Carbon Market as the *primary* policy tool to achieve its Carbon Neutrality target. [And that such market] is intended to assist Costa Rica to meet its target in the most flexible and *cost-effective way*" (MINAE, 2013, p. 8. My Emphasis). Hence, not only does MINAE render the 'carbon market' as nothing less than the primary tool to reach the '2021 goal', but it also insistently argues throughout the available documentation that the market is the most cost-effective mechanism available domestically to meet such challenge.

In both the MDVCCR and the MRP it is insisted time and time again that the primary objective of the country's future carbon market is to contribute to national carbon neutrality in general, and to the '2021 goal' in particular. MINAE also argues that all though the domestic market may eventually be extended to enable international participation through the establishment of multilateral agreements, the priority of the market must never conflict with the nation's self-appointed carbon neutrality pledge (MINAE, 2013, p. 57). In other words, the future carbon market is primarily concerned with figuratively 'cleaning up the house' –in terms of offsetting domestic GHG gas emissions–, rather than accommodating a new

international business niche, or as MINAE puts it "a system that generates businesses, or a market per se" (Salgado et al. 2013, p. 104. My translation). Moreover, MINAE holds that the future carbon market must assure a degree of environmental integrity that would allow it to be recognized globally as a source of reliable carbon credits, and not as a 'branding' instrument to sell the image of carbon neutrality without concrete actions (p. 70). Nevertheless, MDVCCR stipulates that through the promotion of a 'low emission' development model, the future carbon market will have the capacity to 'improve' the country's overall image (p. 85). MINAE adds that a key consideration in this matter is the nation's international recognition for its environmental policies which implies that the transparency, robustness and above all, the environmental integrity of the future carbon market system should not be questionable (p. 104).

Once again, despite the market being strictly a 'domestic' one, MINAE does not dismiss the possibility that UNCs can be acquired by international buyers, and that the market can eventually 'interact' with other domestic or regional markets in the future (Salgado et al., 2013, p. 18). The supply side on the other hand is expected to include project developers and wholesalers of offsets generated by verified GHG emission reductions or CO_2 removal by sinks. Moreover, the market is expected to eventually include intermediaries such as retailers and brokers (MINAE, 2013, p. 8).

-Regulatory and institutional framework.

According to MINAE, this framework has been designed to closely resemble two of the world's most recognizable standards: The Clean Development Mechanisms (CDM)[58] –as a reference for regulated markets– and the Verified Carbon Standard (VCS)[59] –as a reference for voluntary markets–.

Four key institutions are to be created as part of the market's regulatory and institutional infrastructure. Some of these institutional bodies have already been 'approved' in particular official decrees and legislations, however at the time of writing this dissertation, none of these have been officially appointed.
Therefore, only a short description of each of these, and their primary function will be provided as follows:

a) Carbon Board: The highest governing body of the domestic carbon market and the basis of the general market structure. Its task is to ensure the fulfillment of the different criteria and procedures related to the market, and to systematically and continuously revise-and-improve the overall implementation of the market (Salgado et al., 2013, p. 55).
   Two permanent committees will provide operational support to the Carbon Board: the 'Methodologies and Protocols Committee', and the 'Control and Transparency Committee' (see points 'c' and 'd' of the

[58] Covered under the Kyoto Protocol.
[59] A particular modality of the Voluntary Emission Reduction (VER) standards.

present list). This board is expected to be constituted by a variety of representatives from the public and private sectors, as well as from academia and civil society.

b) Secretariat: The main role of the Secretariat is to provide technical and operational support to the Carbon Board in the development of projects related to project developers, activities and protocols. The Secretariat is to be led by the DCC.

c) Control and Transparency Committee: Its role will be to support to the Carbon Board in promoting the optimum functionality of the market and overall transparency. This committee is expected to be comprised of members "linked to the market, but with no interest in participating in it" (MINAE, 2013, p. 34), such as the IMN, union chambers, etc.

d) Methodology and Protocols Committee: MINAE states that this committee is intended to be a 'purely technical' one with the main objective of proposing methodologies adopted by other standards or systems to the Carbon Board, or to supervise the development of context specific or indigenous methodologies. This committee is to be populated by 'experts' from the ECA, FONAFIFO, ICE and the Ministry of Agriculture and Livestock.

-The future carbon market is expected to accept two types of projects:

a) Independent projects: Projects developed in sectors where there are no registered protocols, or from developers that prefer not to participate in any given protocol.
b) Protocol projects: These are projects developed in prioritized sectors designated as being of national interest. These projects are defined as a voluntary action to either reduce or offset GHG emissions. Unlike the above these projects are under the direct coordination of the Carbon Board.

-Carbon 'reserves'.

The DCC proposed the creation of a 'reserve account' intended to act as a mitigation mechanism and to promote market confidence. This 'reserve account', to be managed by the Carbon Board and its Secretariat, "may be used as a last resort to make up [UNCs] when a major event results in non-permanence" (MINAE, 2013, p. 38). The idea of these reserves is that buyers of UNCs will be issued with replacement credits from this reserve account in case of any unforeseen environmental or performative incident that could eventually affect the supply side of the market. These 'replacement credits' are to be readily available since the Carbon Board is expected to withhold a pre-determined percentage of the UNCs from each project producing such credits, indistinctly if they are produced by private and public parties (Salgado et al., 2013, p. 73).

-Benefits and incentives of the future carbon market.

MINAE enlists 11 benefits for participants of the market including those that are attainable through the 'C-Neutral'

certification program. Although I will not go through each one them, I consider it to be relevant to briefly describe the incentives that MINAE expects to offer participants from both the demand and the supply side of this future market.

Cost-efficient system	The market is to operate in a simple and low-cost way so that all the enrolled actors obtain overall better conditions than they would typically obtain in any international market.
Flexibility	The market may use simple protocols based on the standardized conditions for either each particular sector of Costa Rica, or for carbon markets regulated under the UNFCCC.
Specificity	The market conditions will be based on the national context; and not on generic international standards –which are understood as the 'norm' under CDMs– and which do not target countries that developed 'early measures', or that have limited levels of emissions such as Costa Rica.
National exposure	The organizations that compensate their residual emissions with UNCs 'could' be included in a list of recommended products and companies elaborated by MINAE for the national market.
International exposure	The organizations that compensate their residual emissions with UNCs 'could' be mentioned in the audiovisual material [PowerPoint presentations, videos,

	infomercials, etc.] used by PROCOMER (the Costa Rican Foreign Trade Promotor).
Savings	The incorporation of emission saving activities and technologies will lead enrolled organizations to operative savings.
Long term market	The nation's compromise to reach the '2021 goal' indicates the permanence of the political compromise of the state which assures the stability of the market.
Best price control on a national scale	The country's future carbon market will provide competitive prices to those selling UNCs which are projected to be higher than those being currently offered by FONAFIFO in the existing 'preoperative' market. Additionally, the Carbon Board will retain the authority to control the supply of UNCs, and the market prices. MINAE promises that "the price of compensations will not constitute an impediment to reach [carbon neutrality]" (Salgado et al., 2013, p. 96. My translation.)

Table H: Benefits for carbon market participants
(Source: Salgado et al., 2013, pages 95-97. My translation.)

-Benefits and incentives of the UNCs

MINAE on the other hand enlists the benefits that the production and consumption of UNCs will have over the alternative CERs and VERs credits which will also be

accepted in the 'future' domestic carbon market. It is however stated in the MRP that entities wishing to be certified as 'C-Neutral' may only submit CER and VER credits if the Carbon Board authorizes them to do so. MINAE argues that the purpose of this additional administrative step is to incentivize entities to surrender UNCs instead and, that way, lend support to domestic GHG mitigation projects (MINAE, 2013, p. 40).

Moreover, the MRP dedicates one subsection of the report to literally compare the UNCs to the CER credits, and hence the CDM compensation mechanisms. MINAE enlists the following as advantages of the UNCs over their international alternatives:

-The UNCs standard allows offsets to be generated in new sectors not sufficiently covered by the CDM (e.g. transport) where the marginal cost of GHG abatement may be relatively low. This is particularly relevant to Costa Rica where the highest amounts of GHG emissions are found in the transport sector, as opposed to CDMs that typically focus on energy production industries.

-UNCs have 'a more programmatic approach' than CDMs which in practice follow a more project-by-project based approach. Hence, UNCs are produced following a broader approach than their competition.

-The approval and issuance of UNCs is designed to be flexible and less complex than the CDM, reducing costs and entry barriers, particularly for small-scale projects.

-Costa Rica's voluntary scheme is expected to impose fewer transaction costs than CDM, especially through the participation of national experts in the validation and verification process. Hence, the administrative costs offered at a national level will be lower than their equivalent counterparts typically found in the international level of the CDM.

-Besides the reduced administrative cost offered by the UNC system at a national level, delays in the approval of projects are also expected to be lower than those of CDMs.

-Since UNCs are tied to Costa Rica's long-term Carbon Neutrality goal, it is grounded in a long-term policy framework that offers a long-term price signal for investors and decision-making. This situation stands in high contrast with the CDM market that, according to MINAE, is currently facing uncertainties regarding market demand and price which have in turn already affected the continuation of efforts to develop CDM projects.

-Voluntary market mechanisms + Command-and-control regulations.

The carbon market will only issue UNCs, and not rights to emit GHG, which are typically linked to markets based on 'Cap and Trade' systems. However, in spite of the market being initially based exclusively on voluntary mechanism, mandatory regulations may be assessed in the future if the scheme's objectives are not met on a voluntary basis. These voluntary mechanisms are by the way based on the

motivation of private organizations enrolled in the 'C-Neutral' certification who seek greater competitiveness, product differentiation and access to markets with environmental standards (MINAE, 2013, p. 8).

MINAE also argues that there does not exit a 'quantification' capable of predicting the contribution that the market will have on the country's '2021 goal' since such program is essentially voluntary. However, MINAE insists on the importance of linking that voluntary scheme with other possible binding mechanisms for the compulsory reduction and compensation of GHG emissions. Thus, on the MRP document MINAE holds that:

> [The commitment to the country's] low emissions development strategy has been reinforced by the government's eco-competitiveness policy, in which the environment and development agendas converge to guide the design of *command-and-control* instruments that range from legislation and regulation on one side, to voluntary approaches and market-based instruments on the other side, including voluntary mechanisms like adoption of *standards and schemes of self-regulation*" (MINAE, 2013, p. 9. My emphasis).

More precisely, MINAE argues that "Costa Rica intends to pay close attention to the *strengthening of demand* with the study of a range of policy options to determine if the C-neutrality goal requires going beyond voluntary participation into mandatory measures" (MINAE, 2013, p. 14. Original emphasis). This concern is at least partly grounded on MINAE's own projection that the supply of

UNCs will exceed the demand side of the market which is currently based on the exclusive demand of carbon credits linked to the 'C-Neutral' program. Therefore, the MRP suggests that the government will evaluate additional policies to encourage further voluntary participation through mechanisms such as the demonstration of convenience of C-neutrality programs to increase the 'eco-competitiveness' by companies, and industry/sector benchmarks as context specific references. Additionally, MINAE suggests that the application of mandatory policies like the obligatory declaration of emissions by large emitters, and emission regulation and caps for industries or sectors with high carbon footprint are to be explored (MINAE, 2013, p. 31). In short, MINAE proposes that the country's 'low emission' development strategy, and consequently also the '2021 goal' are likely to be unreachable goals if the nation's voluntary mechanisms (such as the 'carbon market' and the 'C-Neutral' certification program) are not accompanied with more binding or compulsory measures which respond more to a model of environmental governance tied to more 'command-and-control' measures rather than 'free market' mechanisms. Similarly, MINAE insists on the need for the future 'carbon board' to retain the authority to control the supply of UNCs, and that way to closely control market prices. Hence, right from the outset of the 'future' carbon-market design, MINAE calls for a more 'hybrid' approach to its environmental governance model rather than a purely 'market led' or *neoliberal* one. In other words, Costa Rica's future carbon market is projected to work more as a *civilized market* that stimulates the redistribution of economics and politics while recognizing and maintaining 'internal' differences and multiplicity; rather than a *textbook*

market in which 'perfect' neoliberal environmental economics are enacted 'by the book' (Ureta, 2013). I will return to this discussion later in the Punctual Observations 3.

2.2. Costa Rica's 'preoperative' Domestic Carbon Market

Growing international pressure from international financing parties in the first half of the 1990s, combined with the appointment of a hardline neoliberal government administration (1994-1998) led Costa Rica to downscale its protectionist conservation model of the previous two decades. This process ultimately led to the establishment of the **Forestry Reform Law (No.7575**) in 1996; which also created the National Forestry Financing Fund (FONAFIFO), a semi-autonomous division of MINAE assigned to manage and distribute the **Payments for Environmental Services Program** (PSA, for its acronyms in Spanish).

In May 1997 Costa Rica received $2 million US Dollars from Norway as an initial payment in exchange for 200,000 tons of carbon equivalent offsets on 4,000 hectares of Costa Rican tropical forest. This exchange in fact became the world's first international exchange of 'Certifiable Tradable Offset' (CTO). This transaction, heavily based on the PSA framework, already reflected the country's interest in selling carbon credits on an international market that was expected to develop from the Kyoto protocol that was

proclaimed later that same year[60], but that took an unexpected turn that will be discussed later in Chapter 3.

Later that same year, FONAFIFO began providing payments to land owners either for maintaining existing forest, or for planting new trees on their privately held lands. Hence, the PSA program represented a groundbreaking implementation for its time that partly targeted to influence landowners on land-use choices for conservation or forestry purposes. The PSA program recognizes 4 environmental services:

> Mitigation of greenhouse effect gas emissions (fixation, reduction, sequestration, storage, and absorption).
>
> Protection of water for urban and rural use, and for hydroelectric plants.
>
> Protection of biodiversity for conservation and sustainable use for scientific purposes, for the pharmaceutical industry, for research, and for genetic improvement, as well as for the protection of various ecosystems and forms of life.
>
> Protection of the beauty of natural landscapes, to the benefit of both the tourist industry and scientific purposes.
>
> (Source: http://www.fonafifo.go.cr/home/psa_eng/)

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[60]However, Costa Rica officially approved the Kyoto Protocol later in March 2002 with Law No. 8219.

These four distinct services are bundled together into a single payment, which varies according to the specific PSA modality in which a given parcel is enrolled (Fletcher, 2013, p. 157).

Despite this, and as can be deduced, our interest lays on the first service of the above enlisted. In practice, the 'Mitigation of GHG emissions' service is provided through contracts for either planned reforestation, sustainable forest management, forest conservation, forest natural regeneration, or agroforestry.

However, Blackman and Woodward (2010) found that the difference in demand between these contracts is remarkably asymmetric since payments for 'forest conservation' are by far the most popular of PSA contracts. More precisely, these authors show that 85% of all land enrolled under FONAFIFO's service payments are enrolled under contracts for 'forest conservation'. By contrast, contracts for 'planned reforestation' and 'sustainable forest management' have respectively accounted for 9% and 3% of all hectares receiving payments (p. 1629). Lansing (2013) suggests that a possible reason for this may be that despite consisting of smaller payments than those earned in reforestation contract[61],

[61] At the time of Lansing's study (2013), 'forest conservation' payments consisted of $64 USD per hectare, per year; while 'reforestation' payments consisted of $980 USD per hectare in total. Today payments for 'forest conservation' consist of approximately $289.75 USD per hectare, while payments for 'reforestation' contracts amount to a total of approximately $1,288.96 USD per hectare –in both cases distributed in payments throughout a 5-year span– ("Pago por Servicios Ambientales," n.d.).

forest conservation requires less labor input and a smaller initial investment from the landowner who simply has to ensure that her or his land remains out of any sort of production during 5 consecutive years (versus the 16 years required in reforestation contracts). As I will discuss in greater depth later in Chapter 3, keeping this asymmetry in mind is relevant considering that the Kyoto Protocol (alongside its CDM mechanisms) and consequently the UNFCCC does not recognize GHG offsets from 'avoided deforestation' –hence from PSA's 'forest conservation' contracts– as a valid source of carbon credits.

Regardless of this, in making payments for the 'mitigation of greenhouse effect gas emissions', what FONAFIFO actually does is to purchase the rights to a landowner's carbon storage, which allows the agency to later re-sell these rights to a third party in the form of 'non-Kyoto' UNC carbon credits. Finally, these 'third party' entities are essentially those organizations enrolled in the 'C-Neutral' program, who are required to purchase UNC credits in order to compensate their residual GHG emissions, and that way obtain the 'C-Neutral' certification.

At a discursive level, Stefano Pagiola (2008) argues that the 1996 forestry reform law that frames the PSA program changed the justification for the payment of subsidies at a discursive level from 'support for the timber industry', to the 'provision of environmental services' (p. 713). In practice however, the PSA program does not survive on the environmental services it is set out to provide by a long shot. In fact, only 0.5% of the program's income can be regarded as purely market-generated (Matulis, 2013, p. 256). Instead, in 2001 the state proclaimed the 'Ley de

Simplificación y Eficiencia Tributaria' which provides a 3.5% tax revenue over all fossil fuels sold nationally directly to the PSA program through FONAFIFO. This tax is presently the greatest source of income for the program (www.fonafifo.go.cr/psa/).

Until recently however, the fossil fuel tax represented approximately 40% of the program's total funding, whereas an even greater source of its funding (approx. 45%) was provided by international and multilateral financial institutions, including loans and grants from the World Bank, the German Federal Government through the *Kreditanstalt für Wiederaufbau* (FfW), and the Global Environmental Facility (GEF). These sources of funding – which have recently been due– where intended to merely 'kick start' the market by providing a temporary support to FONAFIFO while at the same time encouraging the consolidation of future self-regulating markets (see Fletcher and Breitling, 2012). Thus, despite the obvious market-orientation of the program at a discursive level, in practice the PSA continues to be unable to survive on self-regulating market mechanisms and has instead heavily relied on international aid and direct state involvement while employing the very mechanisms that it was intended to replace. This means that despite FONAFIFO's own claims introduced above, the PSA continues to survive on 'subsidies' provided by both multilateral financing agencies, and the national government through the creation of a PSA *quasi-market* (Sierra and Russman, 2006).

What is more, Blackman and Woodward (2010) showed how of all the funding that FONAFIFO categorizes as

user-financed[62], 73% has come from sources that are not purely private in nature. To be more precise, the authors show how 71% of these payments came from the government-owned electric companies CNFL and ICE, while only 27% came from private firms, organizations and individuals. Not only that, but Blackman and Woodward also show how 93% of all funds of the entire PSA program –and 78% of funds from purely private sources– targeted hydrological services, while carbon sequestration was the only other environmental service of the remaining three modalities of the program targeted by more than 1% of the program's funds (p. 1631).

Barquero (2017) revealed that FONAFIFO is only capable of paying between 20% and 30% of the solicitudes it receives from landowners interested in enrolling their lands in the program. The overflow of interested parties in the program derives from the landowner's impossibility to enroll their lands in anything other than 'forest conservation' since the 1996 forestry reform law legally forbids any change of use over these lands. In other words, a property that was not previously enrolled in agriculture, ranching or even forestry plantation cannot, by law, be enrolled in anything other than 'forest conservation'. In this scenario, landowners can only generate income from their privately held forest covered lands either through the PSA program, or through ecotourism –that is, if their land happens to have any 'touristic' potential at all–.

Despite these difficulties that the program continues to

[62] Which FONAFIFO itself calculates to merely have represented 0.5% of the PSA's total income in 2011 (Matulis 2013, p. 256).

face; and besides the fact that the program is not entirely focused on carbon sequestration but instead encompasses several other services embedded in different environmental concerns; the PSA program embodied the country's first rigorous effort to participate in the growing global effort to address anthropogenic climate change through forestry policy (Fletcher, 2013) and to link the country's forests to future carbon markets.

Punctual Observations 3.

I would like to start this section by continuing the discussion surrounding the uneasy relationship between the 'market-oriented' rhetoric that embeds both embodiments of the Costa Rican domestic carbon market –that is, the 'future' and the 'preoperative' versions of it– and the more 'command-and-control' implementations that the future domestic carbon market is expected to have, and that have in fact ensured the financial survival of the PSA program.

In contrast with the commonly accepted idea that both 'Payment for Environmental Service' programs and 'carbon markets' are representative of a global trend to neoliberalization within environmental governance which promotes the *externalization of state functions* (deregulation, decentralization, devolution of governance to non-state stakeholders), and creates markets for trading a commodified 'natural capital'; Costa Rica's PSA and its future carbon market provide examples of how neoliberal tendencies in environmental governance are performatively morphed and hybridized in practice. Again, *neoliberalism* is not used here as a mere tag to describe a particular

economic or a political program, but as a way of thinking, being, and acting; as a *governmentality*.

The process of creating a *hybrid monster* (Callon & Latour, 1981) of environmental governance speaks of the commonly overlooked gap between rhetoric and practice that nevertheless was identified by some scholars in regard to the PSA case. More precisely, Fletcher and Breitling (2012) argued that in spite of the program being originally designed with a strong neoliberal vision which explicitly promoted it as a neoliberal market-based mechanism controlled by non-state actors; the PSA has in practice deviated substantially from that original vision.

These authors show how the program does not only survive on revenues from fossil fuel tax, and more recently by a 25% share of the national water-use tariff imposed on consumers of public water supply, but how there exists a gap between vision and execution in the program's administration in three additional aspects: its governance, its motivation and its outcomes (Fletcher and Breitling, 2012, p. 408). However, Matulis (2013) argues that in spite of the apparent 'failure' of the Costa Rican state to deliver the PSA as a pure neoliberal governance mechanism – identified by the above authors–, the negative effects of 'pure' neoliberalism have in fact been 'socially' and 'ecological' detrimental. Moreover, he argues that "it is possible that the shift in ideology embodied by the PSA can represent the onset of the neoliberalization process, despite the many overtly non-neoliberal practices that have endured" (p. 256). Nevertheless, discarding carbon markets for simply being another 'neoliberal excess' (Ureta, 2014a), and therefore being inherently flawed, may lead to having

no serious instruments for climate change abatement left at a national and an international scale (MacKenzie, 2009, p. 451).

I believe that Costa Rica's 'preoperative carbon market' – embodied as the state controlled PSA program– is a clear example of a neoliberal + state centered hybrid that prescribes market-based transactions between 'private' consumers of 'carbon credits' and private holders of forest covered land. At the same time, however, it also requires at least two direct state interventions:

> -The purchase of over 71% of the total of environmental services sold in the PSA program by the government-owned electric companies CNFL and ICE[63].
>
> -The imposition of a tax revenue over fossil fuels, and a water-usage directed towards sustaining a quasi-market that has handsomely failed to survive on its own during its 20 years of existence.[64]

In fact, the present dissertation further contributes to this perspective by arguing that the future carbon market of Costa Rica not only does not distance itself from reproducing this hybrid further, but instead it has been designed from its very conception to further combine elements from neoliberal market-mechanisms and state-centered command-and-control regulations. A combination that MINAE itself describes simply as the

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[63] See Blackman and Woodward (2010).

[64] See Fletcher and Breitling (2012), and Matulis (2013).

country's 'eco-competitiveness' policy (MINAE, 2013, p. 9).

More precisely, it has been insistently stressed in both the MDVCCR and the MRP policy documents that the 'Carbon Board' will maintain control over the pricing of domestic carbon credits in the country's future carbon market either by controlling the 'price floor' of UNCs, or by controlling the supply side of the market by either restricting market access to actors that could potentially 'flood' the market with overly cheap prices or by introducing government owned UNCs in order to increase the systems overall liquidity (Salgado et al. 2013, p. 105).

Finally, I find that that the explicit favoring of sales of UNCs over other alternative 'carbon credits' represents another evidence of this *hybrid monster*. As was discussed earlier in this chapter, both the Country Program, the 'C-Neutral' program –based on the INTE B5:2016 normative–; and now the MDVCCR and the MRP documents –which sustain the design of the country's future carbon market– all recognize –at least rhetorically– VERs and CERs as available alternative compensation options for domestic buyers of carbon offsets. However, as was shown until now, each of these policy documents have at the same time explicitly recognized UNCs as the favored –if not the only– recognized carbon credits in Costa Rica in one way or another. MINAE states that conditioning the submission of CERs and VERs for applicants of the 'C-Neutral' certification represents a mechanism to incentivize these entities to surrender UNCs instead on the one hand, and to lend support to the nations own domestic GHG mitigation on the other

(MINAE, 2013, p. 40). In other words, restricting the purchase of international carbon credits will not only ensure the liquidity of the country's domestic carbon market –and consequently the survival of the forestry sector which supplies the market–; but will also avoid the 'leakage' of offsets which could potentially undermine Costa Rica's chances of reaching its '2021 goal', and its post-COP21 commitments[65].

These hybrids of command-and-control and market-mechanisms are evidence of the heterogeneous nature of 'neoliberalism' understood as a process that is not only *heterogeneous*, but a necessarily incomplete one under continuous transformation (Peck and Tickell, 2002). Once again, I make use of the concept of 'neoliberalism' not as an end-state, but as a process of ever unfolding failures and successes of articulations between heterogeneous socio-technical entities and materialities as they are all performatively (re)imagined, (re)interpreted, and (re)assembled to influence forms of knowledge through *the conduct of conduct* (Springer 2012, p. 137), and temporarily succeed –or fail– in becoming a commonsense of the times (Peck and Tickell, 2002).

Another key argument that can be subtracted from governmentality studies here, and which applies to the hybrids discussed in this section, is that there is no such thing as a 'pure' or 'paradigmatic' version of neoliberalism, but rather a series of performatively enacted hybrids that are geopolitically distinct and institutionally effected that

[65] I will return to this particular issue in the Punctual Observation of Chapter 3.

nevertheless rely on the fluctuating interchange between local and extra-local forces at work within global political economy (Springer, 2012); and in our case, within global environmental governance networks. After all, Collier (2009) contends that a more faithful reading of Foucault's own understanding of neoliberalism would entail a more *topological* analysis fit to show "how styles of analysis, techniques or forms of reasoning associated with 'advanced liberal' government are being recombined with other forms, and to diagnose the governmental ensembles that emerge from these recombinations" (pg. 99. original emphasis).

Hence, when understanding Costa Rica's 'preoperative' and 'future' carbon markets, applying one or another definition of *environmentality* as was coined by Fletcher (2010b) –introduced in the Punctual Observation 2 of this chapter– fails to recognize that both these enactments combine elements of what he calls *sovereign* and a *neoliberal environmentalities*. In other words, both enactments of Costa Rica's carbon market refuse these neatly delineated categorizations because they in fact behave more as *messy objects* (Law & Singleton, 2005) that cannot be ruled out by prior methodological commitments to particular and limited versions of clarity. Instead, Costa Rica's *messy* carbon markets are interpretatively complex objects that mean different things to different people, and at the same time *multiple objects* enacted into reality in numerous –and often conflicting– simultaneous ways.

In other words, instead of trying to categorize Costa Rica's carbon offset markets as one or another *environmentality,* I believe these particular enactments are best described

under the particular kinds of 'work' identified by Ureta (2014) for emission trading schemes. More precisely, I believe that Costa Rica's 'preoperative' carbon market can best be described as the enactment of a *civilized* market in that as it developed, it strived away from the initial *textbook* pure-vision over which it was conceived –which according to Matulis (2013) envisioned much more radical and 'idealistic' marketization and state withdrawal processes– and morphed into a hybridized program assembled over a much more heterogeneous set of practices, concepts, policies, technical devices and (extra)local entities which have together performed the overall common objective of keeping the PSA up and running.

Considering that direct user financing for all four services provided in the PSA program has funded less than 3% of the area enrolled in the PSA program (Blackman and Woodward 2010, p. 1627), and that 71% of those purchases were made by government-owned companies; it can be argued that Costa Rica's PSA program (as a whole) has performed poorly as a pure *textbook* market. Let alone considering the 'carbon-market' modality of the PSA program on its own. This modality is the only environmental service besides hydrological services to receive payments by more than 1% of the program's funds (p. 1631). On the contrary, as a *civilized* market, the PSA has developed into a complex network that not only recognizes heterogeneity, but stimulates the maintenance internal distinctions, and loops back a redistribution of economics and politics under much more mutable, adaptable and permeable configurations.

I believe that the lessons learned during the first 15 years of the PSA allowed the Costa Rican state to re-evaluate its overall approach towards designing its domestic voluntary carbon market during the first decade of the 2000's, and the subsequent readjustments and trials undergone until this date. This learning curve was always intended to be a key element of the PSA since this program was always expected to function as a 'quasi-market' that marked an "intermediary stage in the formation of true markets for environmental services" (Sierra and Russman 2006, p. 133).

Henceforth, I believe that Costa Rica's 'future' carbon market represents an *exemplar* of validity in which a much more civilized market is projected to be tested *in vivo* (Callon, 2009) soon. More precisely, MINAE already acknowledges the need to combine command-and-control regulations with voluntary mechanisms not only in the eventuality that schemes objectives are not met on a voluntary basis (MINAE, 2013, p. 8); but as means to directly favor the sales of UNCs –over the alternative VER and CER credits–; and to guarantee the permanence of competitive market prices through exercising direct control over the supply of UNCs, and through the establishment of the market's 'price floor'.

Now, despite this market being designed –to a certain extent– in both the MDVCCR and the MRP documents *in vitro* (Callon, 2009) –as was reviewed in this chapters–, a closer look at these policies reveals that they act more as a

'roadmap'[66] intended to guide the development of the market *in vivo* rather than providing a rigid *textbook* of how this market should precisely operate. This assertion is in fact made explicit by MINAE itself by stating that "based on the experience of different carbon markets systems, [the MDVCCR] inform proposes the basic institutional, technical and legal elements to establish a carbon market in Costa Rica […], and provides *suggestions* on how the domestic voluntary carbon market of Costa Rica could operate" (Salgado et al. 2013, p. 14. My translation and emphasis).

Although Costa Rica's 'future' domestic voluntary carbon market has been developed as its own program, with its own sets of goals, visions and its own legal, administrative and economic arrangements; it could be argued that it represents a third phase of experimentation derived from a predeceasing 'preoperative' carbon market that was tested *in vivo* during the last two decades, and which culminated in the *in vitro* re-design of the market's socio-technical arrangements, only this time separated from the PSA framework.

Briefly: Both the 'preoperative' and the 'future' versions of Costa Rica's carbon markets have developed into 'imperfect' or 'incomplete' exemplars of neoliberal markets because they are deliberately and fundamentally intertwined with several command-and-control

[66] The concept 'hoja de ruta', which translates to 'roadmap', is explicitly used to describe the function of the MDVCCR manual at least six different times throughout the document (see Salgado et al. 2013).

mechanisms in their very core. However, this should not be seen as a 'market flaw' because there is no such thing as a 'pure' or 'perfect' neoliberal market in practical reality. Hence instead of a weakness, this 'hybridity' has in fact provided Costa Rica's 'preoperative' market –or PSA– the ability to operate through apparently impenetrable dissidence, and to constantly adapt and transform itself however it may be fit. Finally, from the experience accumulated on the ground with the PSA market, the country's future carbon market has incorporated a fundamental 'hybridity' that is intended to be tested 'on the ground' rather than 'by the book'.

Now I would like to turn the focus of the discussions towards the particular way in which both embodiments of Costa Rica's 'carbon market' construct, mobilize, calculate and manipulate 'nature', and how it is reduced to, and re-assembled as, tradable 'carbon offset credits'. This discussion will focus on three different transformative processes –which in practice are inseparable and at times indistinguishable from one another– that determine the performative ontological re-assemblage of 'nature' as emergent 'carbon credits'.

Firstly, and as was introduced on page 245, Costa Rica's future carbon market intends to establish a 'carbon reserve' account intended to act as a mitigation mechanism and to promote market confidence. The establishment of this fund perhaps partly responds to some voiced criticism regarding the inexistence of a penalties associated with potential failures to deliver carbon rights in the PSA, anytime that forest holders break their long-term commitments to reduce deforestation and enhancing forest

carbon stocks (Corbera, Estrada, May, Navarro and Pacheco, 2011). Additionally, this 'reserve' is intended to back up the carbon market in the eventuality that 'nature' itself threatens the permanence and proper functioning of the *forests-as-carbon-sinks* (Lansing, 2009) enrolled in production of UNC credits. Hence, this 'carbon reserve' is intended to keep the market running uninterruptedly whenever human and/or non-human entities fail to hold their own liabilities associated with producing, holding and exercising carbon rights.

The crucial thing to understand this 'carbon reserve' at a greater depth is to consider what exactly it is that is being held, replaced and eventually redistributed in and through it. I find no better way to describe this but to quote MINAE itself which states that "[t]he Costa Rican Compensation Unit [UNC] is to be the currency of Costa Rica's voluntary carbon market" (MINAE, 2013, p. 44).
So the most basic question to ask here is 'How is (the inexistence of) an invisible 'gas' transformed into a measurable, tradable, storable and circulatable currency?'. For the sake of order, I will discuss the issue of 'inexistence' –as found in the above question– in the last segment of this particular discussion.

I find the work of David Lansing particularly useful in this discussion since it not only focuses on the analysis of Costa Rica's particular carbon markets, but it does so by concentrating on how the materiality of 'carbon credits' are performatively assembled through contingent practices of calculation, and through the precarious assemblage of heterogeneous socio-technical entities, materials and devices. In short, the present dissertation not only shares

the same general 'object' of study of Lansing's work, but it also shares its material-semiotic sensitivity and analytical approach.

A great deal of Lansing's work elaborates on the ontological conditions that allow 'carbon offsets' (the object of exchange) and carbon exchange markets and schemes (the field of exchange, also known as 'the economy') to emerge through performative practices of calculation, measurement, representation and displacements. Additionally, his work pays attention to how 'carbon offsets' and 'the economy' –which in turn defines the agencies of the 'consumers', 'producers' and 'sellers' of carbon– are mutually emergent and co-constituted effects of those contingent and situated practices. It is here that, following the work of Heidegger, Lansing elaborates on how under the purview of carbon trading, all materials, bodies and beings that constitute 'the world' are performatively reduced, calculated, displaced and revealed as a *standing reserve* of objects subject to further ordering (Lansing 2009, p. 57). Hence, understanding Costa Rica's intention to establish a 'carbon reserve' –as a sort of 'trust fund' for its future carbon market– through Lansing's overreaching argument is pretty straightforward. However, Lansing's thesis is linked to this particular issue far beyond the obvious etymological similarity (that is, the similarity between Lansing's concept of standing reserve and the market's proposed 'carbon reserve'). In fact, I find that the present dissertation closely relates to Lansing's research in at least the three different ways, which will be elaborated below. Consequently, I have chosen to discuss three key issues related to Costa Rica's carbon markets departing from Lansing's own theoretical stands. At the

same time, I have linked this author's positions to other key scholars that have equally influenced the present research.

First, Lansing discusses how the value of 'nature', objects, beings and literally everything are not found in the things themselves, but rather, the value of things lays in the reductively understood notion of their designated 'usefulness' (Lansing, 2009, p. 55; 2010, p. 719). For instance, the author shows how the value of trees is neither an inherent or impregnated characteristic of these, nor simply a 'culturally assigned' thing; but instead an emergent effect of socio-technical practices that allow these entities to be understood in terms of their ability to contribute to a worldwide ordering of carbon. This understanding, he argues, "is an approach that is predicated on a conceptual understanding of the entire world as a singular, orderable space" (p. 56). And precisely that planetary 'singularity' is what ultimately renders the exchange of 'carbon credits' in carbon markets as a feasible solution to global climate change.

I find that this argument can be complemented with Asdal's (2008) assertion that 'nature' is made real through practices of calculation in support of specific 'economic' arguments. Additionally, the purpose of protecting nature, she argues, is not grounded on 'nature', but for the sake of particular productive industries and markets (in Asdal's case fish-stocks in Norway, in our case carbon-stocks in Costa Rica).

Lansing's work, just like that of Asdal –and other authors influenced by Michel Callon's work on the socio-technical

emergence, performance and effects of markets– point towards the need to study 'nature' and 'natural sciences' "in relation to another whole and another science: The economy and practices of accounting" (Asdal, 2008, p. 130). Needless to say, the present dissertation attempts to contribute to this particular call, and to this general analytical sensibility.

Second, Lansing's work sets out to establish links between the socio-technical arrangements through which carbon offsets emerge and the field of exchange in which these emergent socio-material entities are performatively framed. In doing so, Lansing engages in a material-semiotic analysis of 'neoliberalism' that enriches the analysis carried out in the present dissertation which has so far framed neoliberalism as an active process of *governmentality*. To be more precise, the author understands neoliberalism as a socio-technical *performance*, and not 'just' a way of thinking, being, and acting as has been augmented until now. A position that is congruent with Collier's call for precaution in misreading Foucault's own depiction of neoliberalism as an imagined outreaching master category only definable by certain technical elements. A misinterpretation that furthermore does not allow empirical observation as it is misused to both understand and explain all manners of political programs across a wide variety of local settings (2009, p. 97).

Lansing' (2009) depicts neoliberalism as a "[performative] process that acts on the world in a way that is productive of natural, cultural, and social hybrids: socio-natures, cyborgs or quasi-objects (p. 89)." Hence, instead of foregrounding it as an Marxian 'hegemonic ideology'

(Springer, 2012); Lansing reads neoliberalism from the 'bottom-up' by focusing on the agency that 'nature' and 'forests' themselves possess in the performative assembling of not only 'carbon offsets' but 'the economy' itself. He places particular interest in how the process of commodification embodies the transformation of environmental processes into tradable commodities that can be bought, sold and reserved for a price (Lansing 2014, p. 1313). These tradable commodities I would add, emerge either as objectified goods like timber, fish stocks, etc.; or as providers of specific 'environmental services' such as offsetting carbon emissions or hosting ecotourists. Lansing recognizes the agency of 'non-human' entities in the particular neoliberal process of world-making embodied in the assembling both carbon-offsets and 'the economy' itself. He suggests that instead of thinking of commodification as a process that acts upon 'this forest' or 'those trees' "[…] the commodification of carbon should be thought of as a performance where both the forest and the circuits of exchange through which it circulates as a commodity are co-emergent as temporarily stabilized, mutually imbricated, moments of being" (Lansing, 2009, p. 90).

Third, Lansing (2009) argues that in the neoliberal process of assembling carbon offsets and markets, the materiality of forests themselves 'are not good enough', instead what counts are credible reports that register, displace and tell the story 'about' the *forests-as-carbon-sinks* (p. 88). In the author's own words, "[…] under the overdetermined framework of carbon offset trading, an offset's materialization becomes inseparable from its representations, and the calculations themselves become

the useful thing." (Lansing, 2011, p. 748). Hence, what determines the value of 'carbon offsets' is not the carbon-on-the-ground, but "the *relational ordering* between the spaces of carbon storage, the carbon dioxide emitter, and the atmosphere itself" (p. 747. My emphasis). 'Value' is here again understood reductively and instrumentally as degree of 'usefulness'.

I believe that a further link can be drawn between Lansing's focus on the performative socio-technical calculations of carbon and Lippert's attention to the "practices which bring corporate impacts on 'the environment' into social, economic and political reality [which] are now framed in terms of carbon" (Lippert, 2013, p. 1). The focus of both of these authors –and of the present dissertation– is not on the chemical, physical or climatological discussion of carbon (p. 20); but instead on how carbon is being enacted by carbon technocrats and on the contingent ways in which it is collected, measured, accounted, displaced and (re)circulated. Or as Lippert puts it, on the 'social form of carbon' (p. 20). The potential value of approaching these issues from this perspective lays in the possibilities it opens for analytically dissecting how the socio-technical process of *neoliberalism* (understood as the particular process of world-making from where 'carbon offsets' and 'carbon markets' simultaneously emerge) is performatively assembled and *black-boxed*. In Lansing's (2011) own words "[…] natures, and bodies come to be represented in ways that allow for **neoliberal projects to emerge as the logical solution** to longstanding development problems, with their final form ultimately conditioned by the requirements of capitalist value" (p. 734. My emphasis).

Briefly: 'Nature' is reduced to 'carbon offsets' (which in turn are framed as the circulating currency of carbon markets) through performative socio-technical calculations embedded in neoliberalism. Hence, the materiality of carbon does not pre-exist its economic manipulations. However, nor does the field of exchange in which 'carbon-as-a-commodity' is circulated (commonly known as 'the economy' or 'the market'). Instead, both 'carbon' and 'markets' are the co-emergent effects of socio-technical practices of 'neoliberalism' (understood here as a productive process of new realities).
Finally, in the socio-technical construction of 'offsets', the physical, chemical and climatological properties of carbon stored 'on the ground' are not enough. Instead, what really matters are precisely the different practices of carbon-calculations performed by 'experts' who *socially* determine the emergent 'form' of carbon.

Having discussed these three initial ontological conditions about carbon markets, carbon offsets, and the performative process of neoliberalization, I would like to turn the attention towards an additional issue that has, to my knowledge, not been addressed by contemporary scholars. This issue pertains the *material emptiness* of the 'carbon offset credits' exchanged in 'carbon markets'.

As Lippert explains, under climate change, 'Green House Gases' –commonly abbreviated simply as 'carbon'– have become the enemy to mankind. Here, "capitalist economics organised to assumably allow the optimal allocation and reduction of carbon" (Lippert, 2013, p. 5), also known simply as 'the market', has emerged as the primary mechanism. This instrument, Lippert adds, has

presupposed the privatization and commodification of carbon emissions. MacKenzie (2008) adds that the goal of these markets is to convey emissions within the frame of economic calculations by giving carbon a price. He claims "[a] carbon market is thus an attempt to change the construction of capitalism's central economic metric: profit and loss, the 'bottom line'" (p. 441. Original emphasis).

Lippert (2013) here again very sharply explains how emission trading means that "an entity [B] can buy reduced (saved) emissions from another entity [so that] entity B can declare having zero emissions, being carbon neutral" (p. 6). An assertion that is reaffirmed by MINAE who stated that Costa Rica's 'preoperative' carbon market (PSA) is based – literally– on the principle of *quien contamina paga* or 'whoever pollutes, pays' (Ministerio de Ambiente y Energía [MINAE], 2011, p. 10). Hence, Lippert (2013) explains how what is being sold in emission trading markets and schemes are really *negative emissions* (p. 7). This means that in Costa Rica, the objectified goods that emerge as the tradable commodities of exchange in carbon markets are in fact numbers in a computer screen or on a printed spread sheet. These numbers intend to numerically represent the results of certain sociotechnical calculations that estimate the *absence* of the material presence of certain quantities of GHG emissions in 'Costa Rica's atmosphere'.
In other words, when an organization purchases a certain amount of UNCs, they are not really buying the presence of 'X' amount of material goods (i.e. oxygen or any other gas); instead they are buying the *absence* of another material entity (Carbon, Methane or any other GHG). In order for this exchange to work, different gases have to be 'equalized', or as MacKenzie (2009) argues 'made the same'

so that they can be "allocated to market participants, made transferable and tradable, and so on" (p. 443). Thus, the performative process of 'making things the same' is also instrumental –and indispensable– in the re-construction of GHG as 'carbon –equivalent– emissions', and in the construction of gases as tradable 'emission rights'.

Moreover, MacKenzie (2009) discusses how this process is both highly heterogeneous and politically contingent by arguing that "[gases are] made the same by a combination of measurement devices, complex natural science, and the capacity (at least so far) of the [IPCC] to keep the estimation of global warming potentials bracketed off from carbon-market politics" (p. 447). Hence, the capacity of the IPCC to project itself as an indisputable and unbendable scientific authority on climate change is instrumental for GWPs to remain *black-boxed* as "a matter for technical specialists" (p. 446), that way keeping the 'exchange rates' between gases as a *subpolitical* matter based on sound scientific practices separated from political and economic disputes.

So once again, I argue that what is sold in carbon markets in general are neither simply 'rights to pollute', nor cubic tons of whatever gas –or gases– consist the imagined entity colloquially called 'clean air'; but instead an imagined *void-like* entity capable of 'erasing' the materiality of another polluting gas in an 'equivalent proportion'. Here I use the term *void* precisely to allude to the capacity of these imagined entities to exist as sort of abstract hollows inhabited with nothing. Furthermore, two key taken-for-granted assumptions must be put to work in order for these *void-entities* to exist: First, that these entities can be brought into existence through carbon-offsetting actions –

particularly through forest protection or plantation projects in the case of Costa Rica–; and second that these entities come into existence 'at the expense' of other material entities, particularly –and I would say conveniently no other than– GHG emissions. Therefore, an *offset-as-a-void* brings into being a patterned *order* of interwoven *absence* and *presence* which cannot conceivably exist if all of its (non)materiality is brought together in a single space and time.

Hereafter carbon offsets are made in disjunction as *fire objects* (Law & Singleton, 2005). They are transformative objects that emerge from "sets of present dynamics generated in, and generative of, realities that are necessarily absent" (p. 343). The transformations they embody are nothing like the gentle and adaptable flows seen in *fluid objects* (also known as *mutable mobiles*) like say carbon calculations themselves[67]; but instead they take their provisional form from jumps and discontinuities. In other words, carbon offsets are *fire objects* in that they depend on the abrupt enactment of difference between *absent* carbon emissions, and the *present* forest biomass (trees, soil, etc.).

Lansing (2012) argues that "[f]or this equivalence to hold, however, carbon must be stored in a specific place with a degree of *permanence*. Otherwise, the consumer's contribution to mitigating global climate change, and the ultimate point of purchasing this commodity, will be in doubt" (p. 212. My emphasis). Therefore, neither the rarely disputed assumption that forests *ipso facto* sequester carbon;

[67] See page 187.

nor the tables, charts and graphs that 'demonstrate' the amount of carbon being offset are 'enough' to determine offsets as a 'fixed' commodity because the variable of *permanence* renders offsets as a necessarily unstable commodity.

Aside from the introduction of this additional ontological modality, Lansing (2012) suggests that the statement "'this forest sequesters [X amount of] carbon, so long as the forest remains intact'" (p. 209) presupposes the *black-boxed* assumption that forests in fact sequester carbon. In other words, while the modality of *permanence* remains a *matter of concern*, the assumption that 'forests sequester carbon' has been stabilized as a *matter of fact*.

Although it is not the intention of this dissertation to discuss the 'veracity' or even the 'appropriateness' of relaying on forest biomass to offset GHG emissions, it is relevant to mention how Baltodano (2008) elaborates a small but wide-ranging review of literature discussing the different 'social', 'economic' and 'environmental' impacts behind the deployment of forestry plantations and monocrops in the offsetting of GHG emissions. For instance, he enlists the degradation of water, the drainage of wetlands, and the displacement of communities among other negative consequences (p. 10).
Additionally, to the issue of *permanence* introduced above, the Baltodano argues that Costa Rica's 'carbon neutral' initiative has failed to include an analysis of how much of the country's territory is necessary to enroll as carbon-sinks in order to mitigate its own emissions –let alone the idea of establishing an international carbon market–. This issue, he argues, may well lead to an eventual competition for

available land between carbon-forestry, urban development and agriculture. All in all, the author concludes that "the possibility of offsetting carbon produced by anthropogenic processes from the atmosphere through the establishment of natural sinks is very slim" (Baltodano 2008, p. 11. My translation). Moreover, Falkowski and colleagues (2000) add that several different evidences seem to predict that negative feedbacks between different climatological processes and GHG are almost certainly signaling the weakening of natural sink strengths in the foreseeable future. They state "although natural processes can potentially slow the rate of increase in atmospheric CO_2, there is no natural 'savior' waiting to assimilate all the anthropogenically produced CO_2 in the coming century" (p. 291). Instead they suggest that these sinks may buy some time, but they do not have the capacity to mitigate the CO_2 emissions projected in current emission scenarios. The concept of 'anthropogenic' introduced in the last assertions of this discussion, constitutes yet another key ontological modality over which 'carbon offsets', 'carbon markets' and 'climate change' itself are all constructed on. I will return to discuss this condition in the next –and final– chapter of this dissertation where I will explore its fundamental role in the ontological construction of both 'the problem' of, and 'the solution' to, climate change.

Briefly: Carbon Markets embody the privatization of carbon emissions. However, what is sold is not 'carbon' but –on the contrary– its *absence*. More precisely, what is being sold are numbers derived from calculations that estimate a balance between the material absence of a certain GHG in one part of the globe, and a certain amount of forest biomass intended to offset it in another.

The production of carbon credits therefore requires a process in which gases *are made the same*. A process that despite being politically contingent, is purposely projected as being purely 'scientific' (objective).

Two assumptions make the emergent tradable entity –the 'carbon offsets'– possible. First, a belief that carbons are 'producible' (in forest plantations); and second that by coming into being, they are capable of 'erasing' equivalent amounts of hazardous gases elsewhere.

The idea that forests can in fact offsets has been largely assumed to be factual. However, the problem of 'permanence' of a certain forest-as-a-carbon-sink is necessarily unstable. Finally, the mitigation of GHG emissions through forest sinks may prove not to be 'enough' to cope with the ever-growing rate of global carbon emissions.

–Chapter 3–

Capitalizing 'early actions'

Introduction.

To this date, the UNFCCC refused to recognize 'avoided' deforestation as a valid source for generating carbon credits. As I will show in this chapter, this negativity responds to the belief that 'primary' or 'old growth' forests lack a necessary 'anthropogenic' component which would enable them to be conceived as a 'man-made solution' to a 'man-made problem'. Therefore, the CDM mechanisms defined in the Kyoto protocol accept carbon offsets from reforestation and afforestation projects, but not from forest 'conservation' projects.

The impossibility to generate authorized carbon offsets from already standing forests has presented a particular challenge to all those nations that established a series of environmental governance devices at some 'early' stage and managed to maintain significant parts of their forests unspoiled. Therefore, several of such nations –led precisely by Costa Rica– developed a proposal for a global environmental governance device intended to persuade the UNFCCC to recognize 'forest conservation' as a feasible way to mitigate to 'anthrophonic' climate change. This proposal, which would eventually be known as 'Reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries', or **REDD+**, is expected to allow rain forest preservation to qualify for CDM project status,

and thus to deliver economic incentives to all those nations that had 'already' stopped or diminished their deforestation rates. In other words, based on a 'results-based' payment system, REDD+ presents these 'already green' nations the opportunity to 'cash in' on all previous actions, policies and efforts to stop or revert the destruction of their 'natural' forests. Hence, the driving logic behind REDD+ challenges the UNFCCC's separation between 'natural' and 'man-made' problems and solutions to 'anthropogenic' climate change.

This chapter describes Costa Rica's proposal for its own REDD+ strategy as an eminently market-based mechanism based on the same framework as the country's 'preoperative' carbon market reviewed in the previous chapter, the PSA program. It then ventures deeper into exploring the key ontological modality of 'anthropogenic' and follows how this imagined concept is being mobilized in the construction of carbon 'emissions', 'offsets', 'market mechanisms' and even 'climate change' itself. Here, I will show how the 'anthropogenic' factor is a fundamental component of the ontological construction of the 'problem' of climate change, and at the same time of its 'solution'. Moreover, I will discuss how the imagined separation between 'man-made' and 'natural' conditions, that this ontological modality presupposes, further accentuates the largely taken-for-granted belief in a separate 'social' world ordered by politics on the one hand, and on the other hand a 'natural' world populated by non-human resources waiting to be disposed of through 'pure' techno-science. Additionally, I will show how this imagined separation in fact has concrete, material impacts 'on the ground'.

In the following, I show how Costa Rica's 'carbon neutral actor-network' enacts a second ontological division that this time determines the circulation, not the 'nature', of carbon offsets 'in' and 'out' of the country. More precisely, I show how an imaginary border separating an 'internal' and an 'external' distribution of offsets has led to the emergence of the potential outflow of offsets 'outside' of national boundaries. This is a form of market *overflow* I have named *offset leakages*. In spite of the potential threat that the *leakage* of offsets poses to Costa Rica's ambitious carbon neutral targets, I argue that the country still firmly advocates the international recognition of REDD+ as a means to capitalize its 'early efforts' in reverting its deforestation rates. Simultaneously however, I hold that Costa Rica implements specific procedural safeguards to prevent the *leakage* of offsets in the 'pre-operative' carbon market that supplies the 'C-Neutral' certification program because. The reason for this is, I argue, that while the latter certification program enables a tool for extending *action at a distance,* REDD+ is seen merely as a tool to cash-in on the country's large extensions of protected forests. An intention that is nevertheless presented with several challenges that remain to be met by Costa Rica's 'carbon neutral actor-network'.

Finally, drawing on the work of recent literature focused on the economic practices that shape the emergence and performances of markets –understood as socio-technical assemblages (Callon, 1998; Çalişkan and Callon, 2010; Pellizzoni, 2011; Ureta 2013) – the chapter discusses the ontological conditions that determine –and that feedback from– the emergence and *leakage* of *offsets* as they are brought into existence through the myriad of practices of

qualculations mobilized in all embodiments of Costa Rica's carbon markets. I argue here that the country's 'preoperative' carbon market as well as REDD+ operate under the ontological belief that *overflows* –such as *leakages*– are accidents that must be put to right by a properly *framed* market. By contrast, I argue that Costa Rica's 'future' domestic carbon market departs from an understanding that *market failures* –rather than properly executed *textbook* markets– are the rule. An assertion that is consequent with neoliberalism's tendency to operate "through, rather than in spite of, disorder" (Pellizzoni, 2011, p. 795).

As a result of this analysis, I arrive to the identification of three key aspects pertaining the *material* inferences of *carbon* emissions, offsets and leakages as they are enacted in both of the contrasting attitudes towards the *framing* of markets I identified above: First, I discuss how 'offsets' are imagined *void-like* entities believed to be able to 'erase' the materiality of polluting gases liberated elsewhere in equivalent proportions; second, I explain how entangled beings –such as biosphere– are transformed into a passive and ownable 'commodity'–such as a carbon credit– through a process of *objectification*. When the emergent commodities are invisible abstract entities –such as offsets– state intervention is required in order to establish formal 'property rights'; and last, I argue how the creative capacity of neoliberalism is characterized by a process of *intense abstraction* meant to increase the manipulability and controllability of all the emergent commodities and all the possible worlds they populate.

Before continuing with what will be the last policy review of this research, I would like to remind the reader once

again that this third and last chapter of the dissertation will by far be the shortest segment of this three-part study due of the following reasons:

First, much like Costa Rica's 'future' or 'projected' voluntary domestic carbon market reviewed in chapter 2, to the date of writing this dissertation, the REDD+ program is neither yet officially running nor has it been conclusively admitted or dismissed by the UNFCCC in light of many technical, financial, legal and socio-economic issues still remain unsettled. In spite of this, several REDD-based projects and start-up initiatives have already been developed, or underway in a number of countries –including Costa Rica–.

Second, and as a consequence of the above reason, this last chapter will not provide an in-depth analysis of the minutiae of any of the currently available policy documents created to plan Costa Rica's strategical immersion in the expected international REDD+ initiative. Instead, this last chapter will offer a modest insight to Costa Rica's REDD+ initiative by drawing on some of those documents –which largely focus on particular technical aspects such as the establishment of emission and absorption 'baselines', addressing issues concerning land tenure ship, etc.; and organizational aspects such as planning for participatory consultation processes and future institutional arrangements –but will instead offer an interpretative depiction of how Costa Rica sees in REDD+ a valuable opportunity to further expand its 'carbon neutral' *actor-network* by means of establishing new market spaces capable of reaching beyond the current limits established by the UNFCCC via the Kyoto protocol.

Hence, instead of going into detail describing the performative practices through which the country intends to establish a referential 'baseline' for REDD+, for example, I will focus the discussion on an analyses of how such initiative is performatively being assembled as a potential international carbon-market capable of capitalizing the nation's 'early environmental efforts'.

1. Capitalizing avoided deforestation and forest conservation: REDD+

In 2005, the Coalition for Rainforest Nations (CfRN) which was led by Costa Rica and Papua New Guinea at that time, drafted a proposal titled *Reducing emission from deforestation in developing countries: approaches to stimulate action* for the COP11 convention celebrated that year in Montreal. The idea behind this proposal was the recognition of 'forest conservation' as a way to mitigate climate change under the UNFCCC authority. This proposal, which underwent two years of negotiations and re-designs, culminated it what came to be known as the 'Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (REDD)' policy by the time of the Bali Action Plan of December 2007. This new policy proposal, which essentially focused on the role of conservation, sustainable management of forests and enhancement of forest carbon stock in developing countries, finally became consolidated as **REDD+** once the initiative came to include 'the role of conservation, sustainable management of forests, enhancement of forest carbon stocks and reforestation' (hence the added 'plus').

The purpose of REDD+ is to develop a series of climate change mitigation policies and programs intended to reduce GHG emissions by essentially paying developing countries to stop cutting down their forests. For this reason, the program is expected to allow rain forest preservation to qualify for CDM project status which would in turn deliver economic incentives to nations that have 'already' stopped or diminished deforestation –like Costa Rica–, and not just for countries that still have large and unresolved deforestation problems (Araya, 2015, p. 27). Unlike what currently takes place in 'carbon markets', where a landowner is paid in exchange for allowing certain amount of gases to be emitted, REDD+ is intended to pay for the conservation and sustainable management of forests in order to decrease global GHG emissions (MINAET, 2011, p. 29). In other words, while 'carbon markets' consist of spaces in which carbon offsets are sold 'at retail' to private entities seeking to 'compensate' their residual GHG emissions, REDD+ intends to establish itself as an international exchange framework in which –developing– countries that still conserve their forests are economically compensated by those other –developed– countries who constitute the world's most contaminating nations.

Despite that since its first inception, the UNFCCC has been less than clear regarding the positive incentives that developing countries would obtain from reducing GHG emissions through the implementation of REDD+ strategies, the present discussion will depart from the understanding of REDD+ as an eminently market-based mechanism. This particular approach seems to best describe the path that Costa Rica has taken in the design of

its own strategy as can be seen in seen in the country's **Readiness Preparation Proposal (R-PP)**[68] from 2011, the **Costa Rican National REDD+ Strategy: An initiative of the Program of Forests and Rural Development**[69] from 2015; as well as in a wide variety of other related documents, some of which have been already been referred to in the present study. Under this market-based approach, REDD+ is to be understood as an 'emission trading scheme' based on the exchange of 'carbon credits' in a verified result-based system. An overall scheme that resembles the Certified Emission Reduction (CER) system recognized under the Kyoto Protocol through its CDMs.

According to Saenz et al. (who were commissioned by the Costa Rican government to elaborate the country's R-PP document), "Costa Rica has successfully implemented a series of positive incentives directed to avoid deforestation and improve the country's carbon reserves during the last 15 years; yet has not obtained fair reparations for its mitigation actions" (2011, p. 40. My translation). Hence, the R-PP acts on the assumption that REDD+ will increase the 'value' of Costa Rican forests through the economical recognition of the 'environmental services'. This includes services such as offsetting of GHG emissions, the production of 'sustainable goods' –like 'sustainable' timber– and the possibilities for tourism they

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[68] Saenz, et al. (2011) *Propuesta para la Preparación de Readiness R-PP Costa Rica.*

[69] Ministerio de Ambiente y Energía (2015c) *Estrategia Nacional REDD+ Costa Rica: Una iniciativa del Programa de Bosques y Desarrollo Rural.*

provide.

Costa Rica's REDD+ strategy is largely based on the PSA program reviewed in the second chapter of this dissertation. The R-PP document contends that the country's REDD+ will develop a series of programs and policies aimed at reducing the deforestation and degradation through forest 'conservation', 'sustainable forest management' and what the proposal calls 'increase in carbon stocks', all of which will draw from the experience accumulated in the PSA program (Ministerio de Ambiente y Energía [MINAE], 2015c, p. 8). Furthermore, the R-PP states that perhaps the most important lesson learned from the PSA program is the need to be 'flexible' and to adapt to any circumstantial challenges (Saenz et al., 2011, p. 42). Thus, the REDD+ largely echoes the way in which the PSA program provided a basic model for the development of the country's 'future carbon market' (reviewed in chapter 2) which is also intended to be embodied as a *civilized* carbon market.

However, Costa Rica's large reliance on previous policies such as the PSA program and others mentioned in the nation's different REDD+ documents are not be understood as an exception to the rule. Instead, the UNFCCC established that national REDD+ strategies should adapt to the particular national circumstances, and to the particular efforts that each of the participating countries had previously assumed. Moreover, REDD+ strategies should also adapt to each country's existing institutions and mechanisms that address the various aspects that REDD+ intends to tackle. The idea behind this is to maximize the efficiency of each particular

strategy, and to respect the sovereignty and particularity of each nation while avoiding the duplication of particular efforts or actions (MINAE, 2015c, p. 30). In other words, each country is expected to design their own national REDD+ strategies in direct relation with their existing environmental governance frameworks.

Therefore, Costa Rica's REDD+ strategy is based on 10 'strategical options' directed to either avoiding deforestation and enhancing carbon stocks or strengthening national technical capacities and forest governance. From these 10 'options', the first addresses the need to 'integrate carbon sequestration in national parks and biological reserves'. Another five of the 10 options intend to further consolidate and expand the existing PSA program, three propose the strengthening of key state entities in charge of monitoring and enforcing control over illegal deforestation, and the remaining one intends to "Promote the substitution of products with high carbon footprints for sustainable wood from primary, secondary and reforestation natural forests" (Saenz et al., 2011, p. 43. My translation). MINAE identified the lack of an efficient and successful forestry sector capable of producing, industrializing and commercializing timber and other forest-derived products as one of the main triggers for deforestation in Costa Rica, and as one of the most important obstacles for REDD+. According to MINAE, the reason for this is the currently lower profitability of forest management in comparison to the profitability of agricultural production. Considering that under Costa Rican forestry law (law No. 7575) 'forest management' is the only admissible productive alternative for forest property owners, the latter will likely tend to keep their

lands currently enrolled in agriculture production as such, rather than 'switching' these to the much less profitable 'forest management' alternative.

What is more, Saenz et al. (2011) argue that the PSA has fomented an imbalance towards forest 'protection' of old-growth forests over 'reforestation' and 'afforestation' which has directly resulted in a deficit of timber in the national market and consequently in the felling of plantations at a faster rate than the technical availability of timber. Additionally, this deficit has stimulated the reemergence of illegal gross deforestation (p. 41). Hence, REDD+ will discourage illegal logging by promoting the production and consumption of 'sustainable wood' from primary and secondary forests, and from forestry plantations (Saenz et al., 2011, p. 47). I will return to some of issues surrounding this specific topic later in the Punctual Observation 1 on page 296.

According to MINAE (2015), REDD+ has been implemented through a series of phases since 2011, which are expected to culminate in a final 'implementation phase' based on a system of 'result-based payments', that will generate economic incentives based on the country's performance in meeting its reduction targets expressed in tons of CO_2eq per year. In order to do so, the UNFCCC defined five REDD+ activities which will shape its specific projects or actions[70].

[70] However, Pedroni, Espejo and Villegas (2015, p.27) argue that the UNFCCC has not explicitly defined these activities yet.

1	**Reducing emissions from deforestation**	Reduce agricultural incursion in an area of natural forest through creation of alternative livelihoods
2	**Reducing emissions from degradation**	Provide woodlots close to villages to reduce the need for firewood collection
3	**Conservation of forest carbon stocks**	Designate new national parks
4	**Sustainable management of forests**	Introduce a policy that logging concessions create reduced-impact logging management plans
5	**Enhancement of forest carbon stocks**	Restore a degraded forest through the planting of native species

Table I: UNFCCC's five REDD+ activities
Based on Goodman (2015)

Costa Rica's REDD+ implementation strategy comprises the following three periods:

Economic recognition for the countries 'early efforts'	Result: Costa Rica reduced gross deforestation rates.	Period: 1997-2010 –Starts: creation of the PSA program. Finishes: Official initiation or

		REDD+ program–[71].
Economic recognition for the implementation of the country's REDD+ strategy	Result: Pending	Period: 2010-2020 –Starts: official initiation or REDD+ program–.
Mid-term implementation of the country's REDD+ strategy	Result: Pending	Period: 2020-2030

Table J: Periods of REDD+ strategy implementation in Costa Rica (Based on MINAE, 2015c, p. 34).

As 'Table I' shows, Costa Rica's REDD+ strategy has been envisioned as a 'result-based' payment system in which economic returns are retrieved retrospectively and thus not in advance like in the case of Costa Rica's 'pre-operative' and 'future' carbon markets where payments are issued either at the start of a contract, or during its duration. This condition, as will be discussed further in the next subsection, represents a key opportunity for Costa Rica to 'cash-in' on some of its key environmental policies implemented already over two decades ago.

According to MINAE (2015c), Costa Rica's REDD+ strategy is not only consequent, but an integral part of the efforts that the country has set in motion in order to reach the carbon neutral goal for 2021 and INDC targets

[71] Please bear in mind here that REDD+ intends to capitalize the results from this period 'retrospectively'. Hence the first stage of the strategy concludes with the official 'start' of REDD+.

–reviewed in the first chapter of this dissertation– (p. 30). In fact, a 2010 estimation of the Central American Institute of Business Administration business school (INCAE)[72] determined that the PSA program (the 'backbone' of Costa Rica's REDD+ strategy)[73] would be responsible for 58% of the total emission reductions necessary for the country to reach the 2021 goal (Saenz et al. 2011, p. 48).

I would like to close this review of what is projected to become the country's REDD+ strategy which pertains the role that the Costa Rican state is a expecting to fulfill; how it intends to retrieve and administer profits from REDD+, and finally the closely interrelated topic of ownership of both forest lands and 'carbon rights'.

Throughout the different documents intended to define Costa Rica's REDD+ strategy, there is a latent insistence in the need to set in order the issue of legal ownership over forest covered lands. The reason for this is the fact that the PSA program can only recognize payments for any given environmental service to the legal owners of the forest that provide these services. According to MINAE, the existence of forest lands without formal property registration in Costa Rica does not only generate a disadvantage to land holders, but prevents them from participating in the PSA program which in turn undermines the further development of the program, and consequently the country's REDD+ strategy. MINAE adds that that 'non-expropriations', and the still unpaid

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[72] Acronyms in Spanish for *Instituto Centroamericano de Administración de Empresas.*

[73] Kuper & Fernandez Vega (2014).

expropriations of land converted to national parks since the 1970s have further undermined PSA since confiscated land owners could be allured into committing criminal acts in the surrounding areas, and on the edges of protected lands that were once seized from them (MINAE, 2015c, p. 29).

Saenz et al. (2011) explain that in Costa Rica, "the owner of the land is also the owner of the carbon" (p. 57. My translation). Hence, since FONAFIFO can only buy carbon reductions rights to formal land owners, carbon rights cannot be transferable if land ownership is not legally settled first. In other words, FONAFIFO cannot buy and later –at a higher price– re-sell carbon rights through either the current 'preoperative' carbon market (PSA) or REDD+ unless legal ownership is first demonstrated by the participating landowners. Having said that, one of the main roles that the Costa Rican government (through FONAFIFO) intends to fulfill in the REDD+ is to become the strategy's exclusive broker in the commercialization of carbon rights. According to Saenz et al., the expected profits generated by FONAFIFO in REDD+ will be re-invested in programs to reduce deforestation (2011, p. 59).

Punctual Observation 1.

As is mentioned in literally every single official document with references to Costa Rica's REDD+ strategy reviewed in this dissertation, this strategy can quite essentially be understood as a further phase of 'expansion' of PSA program.

Kuper and Fernández (2014) argue that the Costa Rican state decided to follow this approach in light of the current deaccelerating of forest recovery rates in the country with which under a business as usual scenario, the effects of PSA would level off at 55% forest cover. Hence, to counter that imminent stalling of the system, Costa Rica plans to expand the PSA by another 342,000 Ha. Hence, one of the country's 'strategical options' for REDD+ –mentioned before on page 290– is precisely to ensure that FONAFIFO is capable of expanding PSA's coverage to include 'natural forests under sustainable forest management' so that the current imbalance towards 'forest protection' –as opposed to 'reforestation' and 'afforestation'– on PSA contracts is corrected; and so that the nation's timber market does not continue to worsen (Saenz et al., 2011, p. 42). On this latter subject, MINAE adds that lack of a consolidated timber industry represents one of the strongest barriers for REDD+ in Costa Rica (2015c, p. 28).

Saenz et al. (2011) argue that an important reason for the underdevelopment of the country's timber industry derives from the influence of "certain groups of environmental activists who have *satanized* the consumption of wood as a cause for deforestation and environmental degradation" (p. 44. My translation and emphasis). The argument continues with the notion that the country's REDD+ strategy should finance an 'awareness' program directed by the National Forestry Office (ONF, for its acronyms in Spanish) directed to eliminate cultural, legal, technological and educational barriers the currently disregard the use of wood.

An extraction of an interview conducted by the author with a forestry engineer precisely enrolled in the ONF echoes this position:

> ***Subject:*** *There are two axes at a national level: what the general public sees, and what those of us that work in the sector see. Those of us that are inside the sector agree with conservation […]*
> *As far as the general public, for them utilization is* ***satanized****. [However] utilization, or a correct use of timber, does not necessarily imply that there is no conservation.*
>
> ***Interviewer:*** *Sure.*
>
> ***Subject:*** *So understanding conservation in Costa Rica very much depends on which side you stand on. In other words, if you stand on the side that satanizes, or you stand on the side that should be the one of rational and correct use.*
>
> ***Interviewer:*** *Ok.*
>
> ***Subject:*** *But people, when they hear felling… there is still that culture of [making gestures of people being in panic] "They are cutting down a tree, this is serious!"*
> *So that's what I was saying, people get like scared, they sort of satanize it. But really, we should look at a forest like a dynamic system which will, by nature, have trees die.*

(M. Villegas, personal communication, March 16, 2016. My translation.)

As can be seen in this extract, the subject argues that positions towards the issue of conservation are relative. Either you stand on the side of those who, because of their ignorance, panic at the mere idea of any kind of use of 'natural resources' (such as timber); or you stand on the 'right' side of the balance, that is with those who support the 'rational' (or 'sustainable') use of those resources. Hence this balance is not merely a problem of interpreting 'conservation' as a flexible, multi-interpretable *boundary object* (Star & Griesemer, 1989) capable of moving across a same network while different communities of practice relate to it in different-yet-simultaneous ways. Instead, 'conservation' is here depicted as an object capable of defining the cultural, intellectual and even moral grounds of any given standpoint. Besides, as the subject reasons, trees will naturally die in a forest, hence felling a tree is not morally wrong per se.

Once again, and to add to this position, Costa Rica's 'carbon neutral' *actor-network* enacts the reluctance to 'rationally utilize' forests as a trigger of environmental degradation in its own right. As Kuper and Fernández (2014) argue: "If anything, the pendulum has now swung too far the other way. The strict protection of natural forests and the high barriers to sustainable forest management have led to over extraction from less- well protected agricultural lands and plantations" (Kuper & Fernández, 2014, Forest management, para 4). To counter this then, "REDD+ strategy seeks to finance a program to eliminate cultural, legal, technological, and training barriers that discourage the *massive* use of timber" (MINAE, 2013, p. 27. My emphasis).

Now, I would like to turn the reader's attention towards a key ontological modality over which carbon 'emissions', 'offsets', 'market mechanisms' and even 'climate change' itself are constructed on. I am referring to the concept of 'anthropogenic'. The relevance of discussing this issue here relates to the reluctance of the UNFCCC and the IPCC (in their role of global authorities in climate change) to formally admit 'naturally' existing forests as a legitimate mechanism to mitigate 'man-made' GHG emissions under the CDMs derived from the Kyoto protocol. Hence, I will discuss how the 'anthropogenic' condition is instrumental in the process of semantic reconstruction of 'forests' under the current global environmental regime, which today is largely understood as a 'man-made' climate change. I will show here how the 'anthropogenic' factor is a fundamental component of the ontological construction of the 'problem' of climate change, and at the same time of its 'solution'.

More precisely, the IPCC argues that "global assessment of data since 1970 has shown it is likely that anthropogenic warming has had a discernible influence on many physical and biological systems" (Parry et al. 2007, p. 9). They argue that the gathered evidence suggests that changes in many physical and biological systems are directly linked to human activity. Although the IPCC recognizes that 'limitations and gaps' prevent contemporary science to articulate a more complete attribution of the causes leading to the responses of the observed system to anthropogenic warming, they contend that "the consistency between observed and modelled changes in several studies and the spatial agreement between significant regional warming and consistent impacts at the global scale is sufficient to

conclude with high confidence that anthropogenic warming over the last three decades has had a discernible influence on many physical and biological systems" (Parry et al. 2007, p. 9).

Therefore, the IPCC establishes an explicit separation between 'natural' and 'anthropogenic' forcing factors by using 'climate models' and 'spatial analysis' in order to compare the observable responses of physical and biological systems to changes in global temperatures. Changes that the IPCC separates into 'natural' and 'anthropogenic' warming (Parry et al. 2007, p. 29) which finally sustain other related notions such as 'anthropogenic carbon' and 'anthropogenic climate change'.

This separation, which has been successfully *black-boxed* in global environmental discourse and in scientific communities alike, is based on the modernist binary ontological polarization that separates *human* from *non-human* entities. This modernist dualism can be explicitly found in the definition of the notion of 'anthropogenic' itself. For instance, while the online Merriam-Webster defines the concept as "of, relating to, or resulting from the influence of human beings *on nature*" (Anthropogenic 2018a. My emphasis), the online Oxford Dictionary defines it as "(chiefly of *environmental pollution* and pollutants) originating in human activity" (Anthropogenic 2018b. My emphasis). Hence the notion is already etymologically linked to the problem of 'pollution' on the one hand, and to the modernist ontological distinction between 'humans' and 'nature' –or between the corresponding imagined realms of 'socio-politics' and 'science'– on the other.

Needless to say, that public controversy surrounding global warming by climate change 'deniers' has mainly focused precisely on the reality, extent of and evidence for supporting the thesis of man-made influence on climate change (MacKenzie, 2008, p. 447). Falkowski et al. argue that "[a]s we rapidly enter a new Earth system domain, the 'Anthropocene' Era, the debate about distinguishing human effects from natural variability will inevitably abate in the face of increased understanding of climate and biogeochemical cycles" (Falkowski et al. 2000, p. 295. Original emphasis). However, they also suggest that "[t]his uncertainty should not be confused with lack of knowledge nor should it be used as an excuse to postpone prudent policy decisions based on the best information available at the time" (p. 295).

This leads us to the second use of the notion of 'anthropogenic', only this time in the ontological construction of the 'solution' to climate change. In order to provide some context over the essential 'anthropogenic' ontological modality in the construction of the 'solution' and again, the 'problem' of climate change, I introduce the following extract of an interview made to a forestry engineer member of FONAFIFO:

> ***Subject:*** *One of the arguments at an international level is that emissions are produced by mankind. There has to be an anthropogenic effect to revert this process as well.*
>
> *So they* [UNFCCC] *also argued that forests where*

entities 'created by a divinity'. That they already existed, and therefore could not be included in the compliance mechanism.

Interviewer: *Hmmm.*

Subject: *Forests are supposed to be in balance* […] *So there is no reason to include* [conservation of existing] *forests, but instead new activities like reforestation.*

Interviewer: *Sure.*

Subject: *They said that forests were not provided with any anthropogenic contribution because mankind did not do anything. A tree falls naturally, new ones are born in its place and then there is a condition of balance.*

(M. E. Herrera, personal communication, April 1st 2016. My translation.)

As the subject explains in this extract, the 'problem' of global emissions and consequently the 'solution' to these are both determined by an anthropogenic mediation. Since human entities actively produce GHG emissions, they must also directly and explicitly participate in the production of the forests that will offset those gases. The subject elucidates on how only reforestation –and afforestation– projects are considered eligible options under the Kyoto Protocol –and consequently the CDM–. In other words, how the UNFCCC only recognizes carbon offset from 'man-intervened' forests as the only authorized

suppliers of 'valid' carbon credits. The subject also describes why such global authority does not recognize the protection of forests as a valid source of production of carbon offsets by attributing the UNFCCC with a belief in an ontological distinction between 'man-made' and 'god-made' forests.

Another of my informants provides a further description of the necessary role played by human entities in the construction and legitimization of *forests-as-carbon-sinks* in Costa Rica:

> ***Subject:*** *One of our forests is* ***primary****. When a forest is primary it is basically in balance, so it doesn't* ***offset*** *carbon anymore.*
>
> ***Interviewer:*** *Hmmm.*
>
> ***Subject:*** *But… that's where the question of defending our biodiversity comes in. Because many times,* [forestry] *developers say "Well, it's better, for removing carbon, to cut down all of that* [forest]*, level it and start planting* [trees] *again; and that way we are offsetting carbon constantly."*

(K. Aguilar, personal communication, March 29 2016. My translation. Original emphasis.)

As this second extract shows, there is certain feeling of 'contempt' towards primary[74], or generally 'non-anthropogenic' forests by certain actors participating somewhere along the 'production line' of carbon offsets. This extract provides further evidence of Lansing's argument that the 'value' of forests is understood reductively and instrumentally in terms of their 'usefulness' in contributing to the worldwide ordering of carbon. A 'usefulness' that is nothing other than emergent effect of socio-technical practices of calculation (Lansing 2009, 2011). At the same time the extract shows how, at least for some, the preservation of biodiversity has been demoted to a secondary concern within the global campaign against climate change (Fletcher, 2016).

Accordingly, I would argue that under the current process of performative reconstruction of the leading global environmental discourse –in which the focus of 'conserving' the planet's biodiversity has shifted to 'mitigating' climate change–, Costa Rica's forests have undergone a gradual process of both semantic and material reconstruction. On the one hand, those 'primary forests' protected under the 'fortress conservation' model of the welfare state, celebrated as the pinnacle of human intervention for the preservation of the planet's flora and fauna, are currently being reconstructed as 'useless', or in the best case as 'inappropriate' for the mitigation of global

[74] According to the Food and Agriculture Organization of the United Nations, primary forests are "Forest/Other wooded land of native species, where there are no clearly visible indications of human activities and the ecological processes are not significantly disturbed" (Food and Agriculture Organization of the United Nations 2004).

carbon emissions. Whereas on the other hand the materiality of forests themselves are simultaneously being reconstructed within the economic frames through which carbon offsets circulates at a planetary scale. This can be seen for example in the way in which the FONAFIFO is explicitly incentivizing the plantation of a reduced list of tree species capable of offsetting greater amounts of GHG emissions or in the way in which the FONAFIFO is directly limiting the tree species authorized to generate UNCs in the PSA market, while explicitly incentivizing the use of 'genetically improved' materials (seeds)[75].

Hence, Costa Rica and several other nations with extensive areas of protected forest have mobilized towards establishing REDD+ as the embodiment of a much-expected formal international recognition of 'primary' and other types of existing forests as authorized producers of carbon offsets. They do so partially by claiming that there is indeed an active anthropogenic component to forest conservation anytime that human entities are necessary to prevent the destruction and degradation of these forests, and to ensure their long-term permanence. In short, they argue that in practice even primary forests are assembled with an inescapable anthropogenic factor any time that human entities intervene by 'not doing' anything to them, and by 'fencing them off' so that they remain unspoiled.

For now nevertheless, the UNFCCC's resolve in exclusively recognizing 'man-made' forests (plantations) as the single form of 'anthropogenic solution' to climate change, presents a particular challenge for Costa Rica's

[75] For more details see Oficina Nacional Forestal (n.d.)

carbon neutral actor-network. As was introduced in Section 2.1. of Chapter 2, the vast majority of PSA contracts (85%) are enrolled in the 'forest conservation' modality; whereas 'planned reforestation' and 'sustainable forest management' have instead received a comparatively marginal attention[76]. As was also discussed, this asymmetry is likely to takes place because unlike forest plantations, forest conservation requires scarcer labor and a smaller initial investment from the landowner. The problem, as Pagiola (2008) explains, is that "[a]s most of Costa Rica's emission reductions are generated by avoided deforestation rather than reforestation, no additional sales of CTOs [are being] made" (p. 716). Hence the country has failed to enroll its forests in the grand international market of carbon offsets –*standardized* as CDM projects–, defined in the Kyoto protocol and authorized by the UNFCCC.

I believe that through such formal *standardization* of the carbon exchange framework, the UNFCCC has consolidated a mechanism of exercising *action at a distance* capable of dispersing its authority across national borders. Additionally, this *standardization* of the carbon market has allowed it to emerge as *black-boxed* matter best left to techno-scientific specialists, while simultaneously best left alone by politicians and lay people (Barry 2001). Preserving the imaginary boundary between 'science' and 'politics' is central in facilitating a political *action at a distance* that is capable of working 'outside' and 'beyond' the institutional apparatuses of national-states precisely because it is enacted as a local of *sub-politics* (MacKenzie, 2008, p. 453). In other words, because it claims to be based on 'pure' or

[76] See Blackman and Woodward (2010).

'uncontaminated" technical expertise without any political entanglements (Timmermans and Epstein, 2010, p. 80). What is more, Barry argues that the emergence of transnational political and scientific organizations such as the IPCC itself precisely respond to the need to manage, contain and control the *overflows* or *externalities* of *technological zones*[77] –such as carbon exchange markets– or in between them. Similarly, Swyngedouw (2005) argues that the emergence of these transnational entities is part of a reorganization process of neoliberal governance, where national states increasingly *up-scale governance* to such entities by "increasingly [delegating] regulatory and other tasks to other and higher scales or levels of governance" (p. 1998). This, however, does not mean that the construction and circulation of standards is exclusively performed by transnational organizations to control local action. Instead, as Lippert (2013) argues, "standards allow governmental agencies to exercise oversight over companies. Governmental standards 'dictate', in their view, which corporate materials and wastes a firm has to control, how and how much (p. 13)". Hence, in Costa Rica both 'national' (i.e. UNC credits) and 'transnational' (i.e. CER credits) standards are simultaneously mobilized as *technologies of government* that seek to *translate political realities* into the domain of action (Miller & Rose, 1990).

[77] According to Barry, "a technological zone can be understood as a space within which differences between technical practices, procedures and forms have been reduced, or common standards have been established" (Barry 2006, p. 239)

Having reviewed the country's carbon markets in the previous chapter, and the expected REDD+ market-strategy in the present, I believe two key conclusions pertaining the ontological constitution and enactment of carbon exchange schemes and markets can already be drawn. Firstly, I have shown that the widespread and largely *black-boxed* insistence on emphasizing the need for an 'anthropogenic' factor in the definition of both the 'problem' and the 'solutions' to climate change has further accentuated the modernist belief that 'human' entities are ontologically *other* to 'nature'. I believe that insisting in this imagined separation contributes to the further reassurance of the –also imagined– division between 'knowledge realms' which has insisted in the differentiation between politics (where 'human' entities subjectively construct social reality) and 'science' (where 'nature' can be approached through 'objective' science and technology). This ontological polarization, I argue, has actively and determinedly undermined the *agency* of 'non-human' entities by performatively reducing them to a passive, mute and 'helpless' community of 'natural recourses' waiting to be *ordered* by the modern science and technology of 'human kind'.

Secondly, and once again following the works of Lansing and Lippert, I have shown that the materiality of 'carbon' does not pre-exist the *calculative* practices –embedded in 'economics'– with which it is articulated. Instead, I have shown that it is from the performative *enactment* and *framing* of carbon-markets that both the materiality of 'forests-as-carbon-sinks', and 'the market' –as an emergent space for the articulation of 'neoliberal' and 'command-and-control'

actions–, are simultaneously co-constructed and *black-boxed*.

Briefly: The 'problems' and 'solutions' to climate change have been defined by an imagined division between 'anthropogenic' and 'natural' conditions. This imagined separation has been the base over which global environmental authorities –the IPCC and consequently the UNFCCC– reject the enrolment of 'naturally' existing forests as a legitimate mechanism to mitigate 'man-made' GHG emissions.

This imagined division has further accentuated the widespread believe in a separate 'social' world of human beings and politics on the one hand; and a 'natural' world of non-human resources waiting to be disposed of –by humans– via allegedly 'objective' techno-science. This modern dualist partition is not 'simply' limited to an ontological debate, but instead has concrete material impacts 'on the ground' such as the promotion of certain tree species and genetically 'improved materials' in Costa Rican forest plantations; and the decrease of 'value' of existing 'natural' forests in light of their prescribed 'uselessness' in the mitigation of carbon emissions. In short, neither the materiality of 'forests', 'carbon offsets', nor 'markets' pre-exist the practices of calculations performed by technocrats enrolled in politically biased settings.

In spite of that, widespread trust in the alleged 'objectivity' of such 'experts' is indispensable in assuring the successful 'standardization' of national and international carbon trading schemes. It is through the emergence of 'standards' that both global environmental authorities and national governments are able to exercise control 'at a distance'

without the need to directly enforce order over national states, or private companies and individuals respectively.

As I briefly introduced in the second chapter of this dissertation, Costa Rica's has actively –yet not explicitly– restricted the sale of international carbon credits –such as CERs and VERs– in both embodiments of its domestic carbon markets as a means to ensure the liquidity and the flow of supply of these markets. Simultaneously, this performative restriction has also been mobilized as a mechanism to avoid the 'leakage' of offsets which could potentially undermine Costa Rica's chances of reaching its '2021 goal', and its post-COP21 commitments.

The 'leakages' I refer to above should not be confused with what the IPCC defines as 'carbon leakages' which describe "the increase in CO_2 emissions outside the countries taking domestic mitigation action divided by the reduction in the emissions of these countries" (Baker et al., 2007, p. 665). Instead, several of my informants referred simply as 'leakages' to the potential problem that may arise from the outflow of units of 'carbon offset' sold or bought outside of national boundaries. To better explain this concept, which I will name ***Offset leakages*** for the lack of an existing term –at least to my knowledge–, I present an extract of an interview made to a high-ranking member of the DCC's technical team of engineers:

> ***Subject:*** *Agreement 36-2012, which is the Carbon Neutral Country Program, accepts three compensation mechanisms: the pioneer which was the*

CDM that certifies emission reductions through the voluntary options that can either be the 'Gold Standard' or the 'Voluntary Carbon Standard'. The Country Program also(!) accepts the UCCs.

Interviewer: *Ok, so you mean to say that national markets are a practical response to somehow solidify the sale of national carbon, let's say, independently of whatever processes are taking place internationally?*

Subject: *The thing is that, well, anyone… has the right to go to any market they prefer. I mean it's a matter of 'free market' […] you cannot constrain [buyers] by saying "you can only buy from me" because then it turns into a 'monopoly'.*

Interviewer: *Hmm.*

Subject: *So, what I make is a recommendation… because if we want to reach carbon neutrality, the ideal is that our removed tons of CO_2 equivalent stay here in the country. Because if we start having leakages, well, we probably cannot account these for.*

(K. Aguilar, personal communication, March 29, 2016. My translation.)

In this extract, my informant addresses at least two interrelated issues that concern this type of leakage. Firstly, the subject argues that while the Costa Rican carbon market is based on an alleged overall principle of 'free market' that ensures consumers freedom to buy their 'carbon credits' wherever and from whomever they desire, the Country Program does take the liberty to 'recommend' Costa Rican businesses to buy carbon-offsets units (UNCs)

to national producers instead of their international competitors. Second, the subject suggests that what motivates the Costa Rican state to promote the purchase national carbon credits relates to the country's impossibility to account for (in its national carbon inventories) any carbon offsets bought by local private companies outside of the national borders. Hence, the purchase of national UNCs on the contrary, allows Costa Rica to get closer to its goal to reach the '2021 goal'; and to account for these tons of compensated carbon in its INGEIs, and in its INDC (reviewed in Chapter 2 and 1 respectively).

A different interview with an informant enrolled in the specific department of FONAFIFO in charge of developing and designing the country's REDD+ strategy[78] further confirmed the potential problem of *offset leakages* while adding, among other things, a key difference between Costa Rica's pre-operative carbon market –which supplies the 'C-Neutral' certification program with carbon offsets– and REDD+:

> ***Subject:*** *[Since] the country presented its '[Intended] Nationally Determined Contributions'; the country will have to make a decision. That is:*
> *"[those offsets] I generate with REDD+, those I generated internally, do I sell them 'outside' or not?"*

[78] This particular informant is also credited as a member of the technical team that designed Costa Rica's Readiness Preparation Proposal (R-PP) for REDD+.

Because if I sell them 'outside', I cannot account them anymore. Or should I keep them inside?

REDD is made to sell [offsets] internationally.

Interviewer: *Unlike [the] Carbon Neutrality [certification]?*

Subject: *Unlike Carbon Neutrality which is focused on the national [market].*

In other words, [the] Carbon Neutrality [certification] was developed to support the '2021 neutrality' internally(!); REDD is an international(!) initiative.

Interviewer: *Hmmm.*

Subject: *Now we are in the process of opting for the 'Carbon Fond'. The World Bank, the 'Carbon Fond', will study our [REDD+] proposal and say if it agrees or not.*

Then the Minister [of environment and energy] will have to say "what is the price you are offering me [for REDD+ offsets]?". "5 Dollars?... No, it doesn't work for me… 15 Dollars?... Ok, but let's negotiate… 25 Dollars?... Ok sold."

Interviewer: *Aha.*

Subject: *But why? Because he will have to decide whether it suits me to sell at 5 Dollars, or whether I should keep them so that the country fulfills the*

commitments that it will have to assume.

Interviewer: *Got it.*

Subject: *That is the political decision that politicians must make. But the Minister needs the technical input we are generating for him, so he can make that decision.*

(M.E. Herrera, personal communication, April 1, 2016. My translation.)

As the extract shows, the subject explains how the choice the country must make of whether to sell 'outside' or keep 'inside' the offsets expected to be generated by Costa Rican forests, essentially boils down to a 'purely political' one. A decision that nevertheless relies on the availability of 'purely technical' data generated by the country's carbon-neutral technocracy. Furthermore, the subject explains how the final political decision will likely come down to a matter of establishing the 'best convenience' scenario for Costa Rica, which would largely be determined by the amount of potential monetary profits to be made with REDD+. Put plainly, a marginal amount of profit made from the sale of offsets in an international REDD+ market will almost certainly lead to dismissing such exchange; while large gains may lead to the sale of those offsets at the expense of being able to account these in the nation's grand carbon inventories and reduction targets.

In the subject's appraisal of the situation, the 'C-Neutral' certification program is intimately connected to a 'inward'

carbon markets in which offsets may be sold, but nevertheless remain 'inside' Costa Rica; whereas REDD+ represents a 'outward' market in which profits may eventually be made, but the offsets sold outflow 'outside' of the nation's own carbon inventory. The distinction here made between 'inside' and 'outside' is of course, an *imaginary* and *semi-permeable* one, considering that both embodiments of Costa Rica's carbon markets –the preoperative and the projected one– allow for buyers based outside of the national territory to voluntarily purchase Costa Rican offsets if they so choose to; but those offsets sold are still going to be included as part of the country's own carbon reductions in its national GHG inventory. Consequently, Costa Rica has emphatically insisted on stating that "[it] reserves its sovereign right to use international compensation units to accomplish its goals within the National Contribution [and that any] compensation units traded abroad will be registered in the National Emissions Inventory to avoid double accounting." (MINAE, 2015a, p. 5). Rather than a 'hard' or a 'soft' border, I describe this imaginary border between 'inside' and 'outside' as a *semi-permeable* one with an *uni-directional tendency* (Lippert, 2013, p. 455) in light of the asymmetrical flow of circulating entities – 'carbon offsets'– that it allows.

To recap, by now I have identified not one but two different scenarios from which *offset leakages* may emerge from:

> The first scenario includes locally based clients of the 'C-Neutral' certification program purchasing VER or CER credits in foreign markets –instead of nationally

'produced' carbon offsets in either of the two embodiments of the country's domestic carbon market– in order to compensate their residual carbon emissions.

The second scenario includes internationally located clients purchasing carbon offsets 'produced' in Costa Rican forests sold in the potential international exchange market of REDD+.

The main two differences between these scenarios are, first, that while Costa Rica would still make a profit in the second scenario (from the sale of 'offsets' in REDD+), it would not do so in the first. Hence, as an attempt to avoid this scenario, the country's 'carbon neutral actor-network' has in practice constrained the sale of VERs and CERs, while nominally still offering them as an acceptable alternative to UNCs. And second, that while offsets 'produced' by Costa Rican forests cannot be accounted in the country's National Emissions Inventory if they are sold in REDD+, they can still be accounted in such inventory regardless of whether or not they are purchased in the domestic carbon markets.

The similarities between these two forms of *offset leakages* are perhaps less apparent, and somewhat more complex. The more obvious are first, that to this day, neither the offsets circulated in the country's 'preoperative' carbon market, nor those expected to be commercialized through REDD+, are fully recognized by the UNFCCC (and the IPCC for that matter) since the vast majority of these offsets are produced –or are expected to be produced– by 'primary' forests, instead of forest plantations. And second, that both of these *leakages* are rendered as a threat to the

country's 'carbon neutrality actor-network' since these offsets are *overflows* (Callon, 1998) that resist being *framed* by the local technologies of accountability intended to aid the country in reaching its 2021 goal, as well as all other reduction targets included in the INDC.

However, I believe that this opens up a question worthwhile considering: If Costa Rica wants to suppress the emergence of these *offset leakages* in order to reach its 'carbon neutral' goals, why does it still push forward for the formal recognition of REDD+ (which will inevitably mean the outflow of tons of carbon offsets), while at the same time deliberately limiting the local purchase of foreign 'carbon credits' as a means to avoid the *leakage* of offsets? I believe that a possible explanation for this could be that while the 'C-Neutral' certification program –and with it the domestic carbon markets that supply that program with purchasable carbon credits– extends an *action at a distance* capable of translating the 'self-interests' of private organizations and individuals into a certain domain of reality aligned with the state's *political rationalities*, REDD+ is seen mainly in terms of its potential to literally capitalize the country's 'early efforts'. However, the following extract shows how the explicit use of the notion of 'capitalization' does not sit well with at least some 'experts' enrolled in Costa Rica's 'green technocracy'; at least not at a strictly rhetoric level:

> ***Interviewer:*** *Is there an intention to capitalize existing forest 'stocks' through REDD; like the reforestation activity does with carbon offsets?*

Subject: *Capitalize?*

Interviewer: *In other words, what does the country gain from REDD?*

Subject: *Well, we are betting on getting a financial recognition. I mean, financial [recognition for] those actions made. But maybe when… when using the word 'capitalization' it seems more like 'mercantilist', right?*

Interviewer: *Hmm, aha.*

Subject: *I am not sure if I am understanding you wrong?*

Interviewer: *No, no no.*

Subject: *Well, but… but let's say that what the country wants is: "I have invested 'so much'. My institutions, my policies have generated 'this'", right?*

Interviewer: *Hmmm.*

Subject: *'This' is my base-line in reference to 'this', I mean, I want to be recognized 'this' small part; and I am going to continue with 'these' actions to be able to charge in the future for 'this' [much].*

(M.E. Herrera, personal communication, April 1, 2016. My translation.)

Although this particular extract is rather self-explanatory, I believe that a key assertion can be extracted from the

subject's depiction of this core purpose of REDD+. The subject argues that receiving 'financial recognition' from the country's 'early efforts' is somehow other than 'capitalizing' them. This allegation is made over a latent fear of sounding too 'mercantilist' which in turn is based on a depiction of 'capitalism' as a suspicious and greedy evil foe. However, the expected recompense for the country's 'early efforts' should be, as the subject contends, unmistakably monetary.

As was introduced in the previous chapter, several authors[79] have concluded that, in practice, "[PSA has] had virtually no additional impact on lowering deforestation because forest[s] would have been conserved on PES sites even without payments" (Daniels et al., 2010, p. 2124) because, as Sanchez-Azofeifa et al. (2007) explain, all prior policies to such program –such as the creation of the national park system, and the ban on deforestation formalized in the 1997 forestry reform– arguably left the PSA program with little forest clearing to prevent (p. 1172). Fletcher (2013) argues here that "[i]f such assessments are correct, future expansion of the programme in relation to REDD+ funding may be less impactful than anticipated" (p. 169). Rosendal and Schei (2014) go further to argue that even if REDD+ is adopted by the UNFCCC and funds become available at a global scale, Costa Rica may find it difficult to attract such funding because the country's deforestation rate has simply been too low lately; or as they boldly put it, because Costa

[79]See Blackman & Woodward (2010); Daniels et al. (2010); Fletcher & Breitling (2012) and Rosendal & Schei (2014) for some of such examples.

Rica "is not 'bad' enough" (p.80). This has become to be known as the 'baseline problem' in which the additionality that can be claimed by REDD+ can likely be called into question. Furthermore, Rosendal and Schei believe that the latter problem could be a sign of REDD+'s bias towards reforestation and plantations instead of forest protection (2014, p. 80).

Besides the 'baseline problem', Fletcher and Breitling (2011) believe that because of the country's small size and total forest relative to other attention-grabbing nations such as like Indonesia and Brazil, its chances of accessing REDD+ markets may be further undermined (p. 408).

Briefly: The outflow of units of carbon offsets sold or bought 'outside' of national boundaries –which I have named *offset leakages*– relies on the assumption that an imaginary and uni-directional border exists between and 'outside' (where international sales of offsets occur) and an 'inside' (where domestic offsets are sold to local or extra-local buyers indistinctively). In spite of the potential threat that the *leakage* of offsets poses to Costa Rica's ambitious carbon neutral targets, the country still firmly advocates the international recognition of REDD+ as a means to capitalize its 'early efforts' in reverting its deforestation rates. An intent that is nevertheless commonly met with certain discursive precaution. Finally, in light of Costa Rica's comparatively small size and excellent track record in reverting its deforestation rates, the country might 'ironically' find it difficult to attract further international funding for its REDD+ ambition.

I would like to close this discussion by examining the ontological conditions that determine –and that feedback from– the emergence and *leakage* of *offsets* as they are brought into existence through the performative processes of *qualculations* mobilized in all embodiments of Costa Rica's carbon markets.

Form a modernistic perspective, calculations allow the radically indeterminate chaos of 'nature' to be reduced to the manageable order of 'technoscience'. However, Pellizzoni (2011) argues that since neoliberalism does not rely on *prediction* –as did its earlier cousin liberalism– but rather in *speculation*, it understands *disorder* as a positive, enabling system condition capable of carving out provisional room for purposeful maneuver (p. 797). Hence Ureta's (2013) depiction of the *civilization* of neoliberal carbon markets is resonant with Pellizzoni's hypothesis in that, according to the former author, these markets tend to embrace irreconcilable differences, constant mutations and hybridity instead of *textbook* prescriptions of normality. In short, the more heterogeneous, unstable, fluid and mutable the world, the more manageable. Moreover, Pellizzoni (2011) suggests that the construction of possible worlds under –or rather, as– neoliberalism, is based on uncertainty, creativity and imagination, rather than the properly executed calculations of risk and formal descriptive forces allocated to such *textbook* markets. The latter type of markets, according to Çalişkan and Callon (2010), can be defined as socio-technical assemblages that "organize the conception, production and circulation of goods, as well as the voluntary transfer of some sorts of property rights attached to them" (p.3). Hence, unlike *civilized* markets, *textbook* markets are expected to perform a

series of complex practices that neatly *frame* (Callon, 1998) the identities of the 'goods' being circulated, the 'buyers' and 'sellers' who calculate the values of those 'goods' and the multiple locations or 'markets' in which trading takes place (Ureta, 2013, p.3).

According to Callon's definition of the opposing attitudes towards *framing* and *overflows* of economic *externalities*, Costa Rica enacts REDD+ and its 'pre-operative' carbon market on the belief that "*framing* [or the *textbook* market] is the norm –in the double sense of something that is desirable and also statistically predominant– and that *overflows* [in our case, the *offset leakages*] are exceptions which must be contained and channeled with the help of appropriate investments" (1998, p. 250. My emphasis). In short, under Callon's pure view, market *externalities* –like the outflow of carbon offsets to foreign buyers– are simply the result of imperfections or failures in the *framing* process of the market, which in turn place the effectiveness of the market in jeopardy (p. 251). Hence, *offset leakages* are still seen by the country's 'carbon neutral actor-network' as a kind of accident which must be put right while 'the market' is something that happens by itself.

I believe that in contrast to REDD+ and the 'preoperative' carbon market –which are not coincidentally both based on the same PSA program–, Costa Rica is attempting to approach the design of its 'future' carbon market following the opposite attitude towards *market failures* –or externalities– identified by Callon (1998). This attitude has that "overflows are the rule and framing is a fragile, artificial result based upon substantial investments" (P. 252). Costa Rica's more *civilized* 'future' carbon markets is

projected to emerge *in vivo* from a fluid, heterogeneous, mutable and incomplete process of framing based on "reasoned bets over unpredictable futures" (Pellizzoni, 2011, p. 797) rather than predictive calculations and *in vitro* 'tried-and-tested frames' (Callon, 1998., 251).

There is at least three key points to be made in relation to the *material* inferences of *carbon leakages* and more generally *carbon offsets* in both of these contrasting attitudes towards the *framing* of markets. **First**, and as was discussed in the second chapter, the 'carbon offsets' sold in emission trading markets are imagined *void-like* entities capable of 'erasing' the materiality of another polluting gas in an 'equivalent proportion'. To do so, they bring into being a patterned *order* of interwoven *absence* and *presence* which cannot conceivably exist if all of their (non)materiality is brought together in a single space and time. However, this does not mean that *offset-as-voids* are entirely stripped away from all *materiality*, nor that they are entirely *abstract* entities. Instead 'offsets' *materially* exist as numbers –displayed in computer screens or printed on spread sheets– and intend to numerically represent the results of certain sociotechnical *qualculations* that estimate the *absence* of the material presence of certain quantities of GHG emissions in 'Costa Rica's atmosphere'.

Second, the instance of the Costa Rican state on the need to formalize the legal ownership of all forest covered lands participating in the PSA market (hence also those willing to participate in REDD+) has very concrete *material* implications. As was discussed earlier in this chapter, 'carbon rights' can become transferable to landowners only if ownerships are legally recognized first. Hence, the Costa

Rican state (through FONAFIFO) cannot profit from the re-sale of 'carbon offsets' if such ownerships are not legally demonstrated. This exchange is built on the notion that "the environmental services generated by a forest or a plantation can be considered an 'active' or 'good' that belongs to the owner of the service provider" (Saenz et al., 2011, p. 57. Original emphasis. My translation). Put plainly, whoever owns the forest land also owns the 'carbon credits' it 'produces'. Hence, Callon's appreciation on the role played by national states in *framing* formal ownerships is spot on, particularly in light of the non-material qualities of carbon emissions and carbon offsets: "Only in cases where 'property rights' are difficult to establish (so in the presence of indivisible entities, for example: it is quite impossible to establish a property right to the atmosphere with a view to resolving pollution-related issues) is state intervention required" (Callon, 1998, p. 264).

Costa Rica's interest in settling forest/carbon ownerships represents one of the five processes of *marketization* –or market framing– recognized by Çalişkan and Callon (2010) which they termed the process of *pacifying goods*. According to the authors, this process implies that *objectification work* must be set in motion in order to disentangle things from their networks of connections. I believe that in our case this work takes place in several moments. For instance, when a forest covered area is set aside from its immediate context and defined as a 'ownable property'; when particular sets of trees are highlighted from their surrounding 'eco-system' as entities capable of sequestering carbon; when the imagined 'offsets' produced by a particular rainforest in Costa Rica are re-circulated as a certain number of carbon 'credits' which end up being

bought by private clients in Norway; etc. All these examples of *Objectification work* transform entities from entangled *beings* into passive *things* waiting to be *ordered*. The 'goods' that emerge from this process of disentanglement can finally be transferred as 'property'.

Among the several forms of commodification of objectified things identified by Çalişkan and Callon (2010), two are particularly relevant to REDD+ and carbon markets in general: the emergence of 'property rights' – which I have already introduced above– and the emergence of 'service provisions'. The latter form reflects a transition from an economy of 'material goods', typical of classic liberalism, to a 'service economy' as found under neoliberalism. As has been discussed throughout this dissertation, Costa Rica's 'carbon neutral actor-network' has clearly intended to demonstrate the economic value of *in situ* natural resources. Hence, rather than 'extracting' them, it has developed the notion that 'nature' provides the 'environmental service' of offsetting carbon emissions in forests. In this market-based mechanism, which has been quite literally been embodied in the PSA program, "[s]ervices are framed with a view to objectifying and transforming them into packages, 'things' which can be valued. Like other goods, they must be made describable and predictable, with built-in safeguards to warn of unexpected overflows" (Çalişkan & Callon, 2010, p. 7. Original emphasis). The latter assertion can be seen in the way the Costa Rican state has designed its 'carbon reserves' as an attempt to safeguard its 'future' carbon market from unforeseen environmental or performative incidents that could affect the supply of 'carbon credits'; and in the mobilization of procedural obstacles to contain the *leakage*

of offsets in the country's 'pre-operative' domestic carbon market.

However, selling an environmental service such as the 'offsetting' of carbon emissions is not exactly the same as selling papayas or even 'ecotourism' packages[80]. In spite of the fact that the latter commodity can be understood as a 'service' rather than a particular stock of objects –like the former–, it is a service that requires a wide range of material entities –such as sand, palm trees, hotel rooms, quetzal birds, airplanes, smoothies, etc.– to hold together. 'Carbon offsets' on the contrary are really imagined –and fully abstract– *void-like* entities without any *material* constituency whatsoever. Unlike a walking tour in the rainforest, when an offset is sold, what is really being purchased is the *imagined* material *absence* of a gas elsewhere. This observation then brings us to the **third** aspect to consider in relation to the *material* inferences of carbon offsets, emissions and leakages.

According to Pellizzoni (2011), the key to the creative capacity embraced by neoliberalism, is precisely *abstraction*. Similar to Çalişkan and Callon (2010), he asserts that free market capitalism *objectifies* 'nature' into *fictitious commodities* – such as water, trees, or offsets– disentangled from their socio-cultural and biophysical networks and are re-assembled as increasingly *dematerialized* commodities. This process of abstraction, he argues. "translates differences into exchangeable equivalences, which means giving

[80] Although it may appear that I suggested the exact opposite in the introduction of this dissertation, in that earlier formulation I meant to imply that what is being sold in each respective market was neither just a 'papaya', a walk in a national park or 'clean air' from the rainforest, but the *abstract* imaginary experience of buying something 'clean', 'green' and 'pure'.

disorder or contingency an ordered, manageable form" (Pellizzoni, 2011, p. 797). Hence, the author argues that the neoliberal era has been characterized by processes of *intensive abstraction* which operates at an ontological level, rather than at the epistemic level in which the capitalist performance of classic liberalism operated. More precisely, Pellizzoni argues that the ontological reconfiguration of the biophysical world which gives way to the emergence of a new plastic 'nature' –characterized by an ontological fluidity– "[…] entails an increase in its manipulability and controllability, since the limits of the world as manufactured represent also its limits of meaning and salience" (2011, p. 800).

The performative socio-technical process of dematerialization and ontological reconstruction of 'nature' as 'carbon' –emissions, offsets and leakages– which this dissertation has set out to follow, entails that the resurfacing construction of 'nature' "is no longer conceived as an objectively given, though cognitively mediated, reality, but as a constitutively fluid entity, a contingency purposefully produced and controlled for instrumental ends" (Pellizzoni, 2011, p. 802).

Briefly: Discussion on the ontological conditions that determine –and that feedback from– the emergence and *leakage* of *offsets* as they are brought into existence through the myriad of practices of *qualculations* mobilized in all embodiments of Costa Rica's carbon markets. I argue here that the country's 'preoperative' carbon market as well as REDD+ (both in reality being different embodiments of the same PSA program) operate under the ontological

belief that *overflows* –such as *leakages*– are accidents that must be put to right by a properly *framed* market. By contrast, I argue that Costa Rica's 'future' domestic carbon market departs from an understanding that *market failures* – rather than properly executed *textbook* markets– are the rule. This assertion, I argue, is consequent with neoliberalism's reliance on uncertainty, imagination and disorder in the construction of possible worlds.

Three key observations are made in regards to the *material* inferences of *carbon* (emissions, offsets and leakages) in both of these contrasting attitudes towards the *framing* of markets: (1) 'Offsets' are imagined *void-like* entities believed to be able to 'erase' the materiality of polluting gases liberated elsewhere in equivalent proportions; (2) Entangled beings –such as biosphere– are transformed into a passive and ownable 'commodity'–such as a carbon credit– through a process of *objectification*. When the emergent commodities are invisible abstract entities –such as offsets– state intervention is required in order to establish formal 'property rights'; (3) The creative capacity of neoliberalism is characterized by a process of *intense abstraction* meant to increase the manipulability and controllability of all the emergent commodities and all the possible worlds they populate.

–Conclusions–

The present conclusions intend to close this dissertation with a series of speculative reflections on some key aspects that arose during the development of this dissertation and that I find worthwhile commenting on. Finally, I will raise a series of specific questions, and some future challenges coined throughout this study.

I would like to start these conclusions by addressing what is perhaps the most speculative conclusion I will draw here. One that loops back to the examples of 'green actor networks' provided in the opening two pages of this dissertation's introduction which depicted a general meta-narrative around the eruption of 'green' consumer goods, spaces and experiences on the one hand; and a 'trending' population of 'environmentally aware' consumers on the other. Only this time I would like to comment on what in my opinion is a difference in the motivation between buyers of 'bio' or 'eco' products in retail stores, and booking an ecotourism vacation package in Costa Rica, for example; and those organizations looking to 'offset' their corporate footprints by buying CTOs in carbon markets. I believe it is possible to conjure that while the first type of buyer frames what is commonly assumed to be a global ecologic crisis such as 'climate change' in a 'moral' sense, the second type instead does so in an 'economic' one. More provocatively, while buyers of 'bio' and 'eco' goods and services are motivated to consume these products as a way to mitigate their environmental 'guilt' –which may often respond to very real concerns about ecological

degradation, or personal wellbeing–, organizations buying carbon credits 'produced' in forestry projects do so either to access particular business incentives, to 'greenwash' themselves or in order to faithfully contribute to mitigate the negative ecological consequences of an environmental cataclysm that could potentially endanger their business. The Costa Rican Institute of Electricity, for example, is the largest consumer of PSA contracts directed to protect the river streams that drive their hydroelectric power plants.

A second key issue I would like to revisit in these conclusions is the troublesome definition of Costa Rica's carbon markets as precisely that: a market. According to Çalişkan and Callon (2010), markets are socio-technical assemblages that among other things "favour the creation of values by organizing competition between autonomous and independent agents" (pg. 3). Hence, they are assemblages that delimit and construct a space of confrontation and power struggles between independent companies selling similar products and services. These struggles, commonly known as 'market competition', motivate companies to increase sales volume by offering the best price, best product or best conditions –among other strategies– to their potential buyers so that these choose their product, rather than the product of the competitors. However, I have shown that the Costa Rican state has actively mobilized a series of practical –yet not explicit– mechanisms to discourage or outright prevent the market's consumers from buying offsets from private, and extra local alternatives (i.e. VER and CER credits) while simultaneously offering its own carbon credits as the only feasible option to consume. Furthermore, I have shown how by controlling the only recognized 'Carbon Neutral'

certification option in the country –in fact, the only eco-certification available for any productive sector outside of the tourism industry[81]–, the state also directly controls the market's demand for carbon credits. In short, I believe it is possible to conclude that in spite of being generally regarded as an archetypical market-based mechanism prescribed under an eminently neoliberal framework of environmental governance, both versions of Costa Rica's carbon markets in practice embody a state centered monopoly that controls the demand and the supply side of the market. A monopoly that by bypassing any sort of external competition, aims at capturing all revenues and market shares from all sides of the market at once.

A third conclusion worthwhile drawing here pertains to the agency of *imagination* in the construction of 'carbon'. I believe that this dissertation has shown how –in spite of the modernist believe that the problems of 'climate change' and other embodiments of what could be defined as global ecological crisis are challenges to be met with objective scientific methods, instruments and knowledge– the problems and solutions to these challenges only really emerge through an intense use of imagination. For instance, I showed how the UNFCCC has established that emissions from international aviation and maritime transportation "should be calculated as part of the national GHG inventories of parties, but should be excluded from national totals and reported separately" (UNFCCC, 2017)

[81] The 'Certification for Sustainable Tourism' or CST program exists as a viable option for private organizations of that productive sector. Nevertheless, the CST program is also controlled by the state through the Costa Rica Tourism Board (ICT).

because they are instead contained in an imaginary 'international deposit' specifically assigned for these emissions. But in terms of *materiality*, it is not difficult to realize that such 'deposit' is nothing more than a metaphor presumably reflected in numbers on a spreadsheet which nevertheless I could not find neither online nor elsewhere, despite my persistent attempt to do so. As I have shown in this dissertation, a very similar thing can be said about the way carbon 'offsets' are brought, or better, imagined into being as transferable void-like-entities capable of erasing GHG emissions produced elsewhere, and in equal proportions.

Consequently, under this perspective it could be concluded that carbon markets are spaces of exchange that rely on the 'trust' placed in the assemblage of 'expert' knowledge, calculations and technical devices rather than on the chemical, physical or climatological attributes of any given gas. Hence, I would suggest that the carbon technocrats followed in this research at times arguably resemble the weavers in Hans Christian Andersen's short tail of 'The Emperor's New Clothes'. Like the vain emperor who parades before his subjects naked while believing to be wearing a 'magic' new suit that is invisible to anyone who is unfit for their position, offset buyers must rely on nothing more than on a deep sense of trust in the practices of calculations performed by technocrat 'experts'. Of course, I am not trying to suggest that 'carbon technocrats' are con-men or charlatans; nor that the calculations that the former agents perform are a thing of 'magic' or improvisation. On the contrary, I believe that these particular techno-scientific practices require high degrees of skill and rigor especially in light of the overall

uncertainty and ontological fluidity that characterizes this actor-network. However, I am suggesting that imagination, belief and guesswork play a crucial part in the making, accounting and trading carbon emissions and offsets.

In the remaining pages of this conclusion I will address a series of the questions and challenges that rather than focusing on the particular case of Costa Rica will address more general concerns for the consideration of potential researchers regardless of the particular case and context they wish to tackle. These conclusions relate to three key analytical dimensions of the study which I will attend in the following order:

a) The dissertation's contribution to the fields of architecture, urban design and planning
b) The study's contribution to the development of environmental governance policies
c) Some potential aspects worthwhile exploring further in a potential follow-up research at a post-doctoral level.

As was centrally argued throughout this dissertation, socio-technical calculations are not limited to rhetorics or to a series of things performed among 'experts' at closed doors. Instead, the *material* form and attributes of any given entity or object are emergent results of such interactions. In this dissertation, I have traced how the calculative practices of carbon calculations transcend spreadsheets and computer screens and largely determine the materiality of 'forests' through the prescription of incentives supporting monocrop plantations intended to offset carbon emissions on the one hand, and to produce 'sustainable timber' for the industry that is expected to emerge in close relation to REDD+ and PSA.

I believe that the present dissertation could be follow up by a study on the socio-technical practices in play in the current process of rediscovery and resemantizing of 'wood' as a "low footprint' and 'sustainable' constructive material for an architecture attuned with the global campaign against 'climate change'. A material semiotic study of this issue would, in my opinion, allow to trace how the agency of global environmental governance assemblages –such as multinational carbon exchange markets and the global parliaments of techno-scientific 'experts' that mediate them– actively contribute to shape the material and discursive outcomes of contemporary architecture. Such a study could also follow the symbolic trajectory of wood through different historical periods determined not only by architectural tendencies, but shifting social-environmental-economical regimes. Likewise, this exploration could reveal some of the key conditions behind the historical fluctuations of socio-economic 'value' of wood and for example reveal why this particular was considered 'cheap' or 'ordinary' in one period, and 'sustainable' and 'elegant' in the next.

In this same line, I believe that the field of architecture remains a wide-open field to engage in studies focused on exploring how theoretical and empirical 'expert' knowledge remains largely unchallenged and *black-boxed*; and how it is broadly mobilized and reproduced at a global scale at particular points in times. An ANT-informed study on architecture's own *black boxes* could promote a critical self-reflection on the role we designers and architects play in our practices both out 'in the field'; and inside classrooms and workshops. I believe that such a study could potentially help designers and architects become aware of

their *networked* practices, and to potentially avoid reproducing existing power constellations unknowingly as we mobilize taken-for-granted concepts (which we often don't fully understand) while playing the role of 'experts' in our highly politicized fields.

Additionally, I believe that the fields of architecture and design certainly represent a fertile ground for future research engaged in theoretical and methodological approaches which, like ANT and STS in general, are sensitive to the agencies that non-human entities play not only in design and planning practices –like those played by digital and analog representation tools–, but in urban environments –like trees, bridges and rail lines–. Needless to say, I believe that such a study could reveal a certain parallelism between the way the techno-scientific 'experts' mentioned in this dissertation purified their calculations as a means to 'simplify' unnecessary complexity for decision makers; and architects and designers –in their role of technical experts– engaging in equivalent 'simplifications' to shorten decision making processes. What is more, the same study could reveal how architecture's own technocratic discourses and representational devices are often mobilized to deliberately silence-off any uncooperative or unaligned actors and entities avoiding that way the proliferation of controversies for the sake of a so-called 'common good'.

The last concluding consideration I would like to address in regard to the dissertation's contribution to the architecture, design and planning fields arises from a particular concern discussed in the end of the third chapter. As I argued, the creative capacity of neoliberalism,

has meant an overall process towards *intense abstraction* which, instead of reducing 'nature' to stocks of *material* recourses like timber, beef or coal like classic liberal capitalism, neoliberalism has shown a tendency to reduce 'nature' into more abstract and *non-material* entities like 'carbon emissions' and 'carbon offset credits' through performative processes that operate through disorder and imagination rather than through order and predictive calculations. Consequently, I believe that future research could address how this ontological reconfiguration of the biophysical world has influenced, and will continue to influence, the development of architecture and design's ever emergent tendencies and paradigms embedded in neoliberalism. I believe this challenge is particularly relevant in these particular fields which not only are believed to essentially produce concrete objects and spaces; but that also rely on very visible and tactile *material* qualities in their *creative* processes and expressions. Perhaps such a study could reveal some insights towards why current architecture and urban design tendencies embedded in neoliberalism like 'smart', 'resilient' and 'sustainable' cities are so hard to grasp and to thoroughly define.

I believe that research engaged in evaluating the performance of the global campaign for mitigating the negative effects of what has become defined as climate change, is as relevant as ever in light of the current rise and spread of rightwing populism. This widespread political turn has largely shown a marked tendency towards climate change skepticism which either denies the 'reality' or the evidence for 'anthropogenic climate change' and may in time distance the development of global environmental governance policies and devices away from those

embedded in neoliberalism into something that still remains to be seen. Hence, I believe it may be relevant to ask ourselves if we are in the process of forgetting about 'climate change'? And if so, what will the next embodiment of 'ecological crises' look like?

Similarly, I believe that future research could seek out to understand what I consider to be key questions that have risen from this research in regard to the development of future environmental policies such as: what 'good' is it doing to insist in differentiating between 'anthropogenic' and 'non-anthropogenic' climate change, and between 'man-made' and 'natural' solutions to mitigate it? And, how would 'climate change' policies and devices look like if they were not embedded in market mechanisms and generally in neoliberal world views? In the particular case of Costa Rica, I believe it may be interesting to determine if the country will lose or is already losing its 'carbon neutral' competitive edge in light of the recent commitments assumed by all signing nations of the UNFCCC's Paris agreement (2015) to set up their own emission reduction targets for the next decades. And if so, what will Costa Rica –in its already historical role of a leading 'green nation'– do next?

In these last pages of the conclusions, I would like focus on some issues that I believe are worthwhile exploring further in a possible follow-up research, perhaps even at a post-doctoral level. While some of these issues derive from my personal interest to understand better the particular case of Costa Rica's leading 'green' actor-networks; others are concerned with more general aspects of the contingent

practices of *qualculations* at play in the performative socio-technical construction of 'nature(s)'.

I believe that an interesting controversy to explore in the particular case of Costa Rica would be to follow the ongoing process of socio technical assemblage of what several of the informants interviewed in this dissertation called the 'environmental label' for Costa Rican products for exportation. This new 'eco-certification' is expected to guarantee the entry of the country's agricultural and industrial products to the European market, and other strategic ones at a time when the latter are expected to start demanding some form of certified 'technical' proof about the 'footprints' of each imported product. As my informants explained, these footprints are not limited to 'carbon emissions', but will apparently include other relevant aspects involved in the manufacturing processes of the goods being circulated –i.e. an 'energetic' footprint, a water footprint, etc.–. I believe that the 'environmental label' that members of INTECO and the DCC said to be developing at the time of the interviews, represents a continuation of the 'C-Neutral' certification program, only instead of certifying the manufacturing organizations themselves, what is to be certified are the specific 'goods' they produce for exportation purposes only. This introduces several other –and not so obvious– differences with the 'C-Neutral' certification. For one, manufacturing organizations may produce 'certified' and 'non-certified' products at the same time; the difference lays on determining to which market those products will be directed to. Second, non-compliance with this 'voluntary' certification may very well mean the exclusion of exporting producers from entire markets. Hence, this new

certification standard could be seen as a new *technology of government* capable of extending action-at-a-distance from 'first world' markets to 'third world' national states; and again, from national sates to private sectors.

Additionally, I believe that this follow-up research could also benefit from engaging in an in-depth analysis about the inclusion or exclusion of the environmental footprints derived from the means of transportation required to physically position these certified products in international markets. This may be particularly interesting in light of the current exclusion of the emissions produced in international air and maritime travel and transportation as was discussed in this dissertation.

Another interesting approach for a follow-up project to the present study could be to invert the focus of the inquiry and focus on the 'demand side', rather than the 'supply side' of national and international carbon markets. This study could trace the different socio-technical calculations that 'offset buyers' engage in, in order to estimate the cost-effectiveness of aligning their organizations in 'green' actor-networks –i.e. eco-certifications programs and standards, Kyoto and non-Kyoto carbon markets, etc.–. Put plainly, what are the economic and socio-political incentives that attract these organizations to undergo processes of 'green auditing', and how do they calculate the balance between the perceived benefits versus the necessary investments? Such a study could follow the practices of calculations performed by local organizations enrolled in the 'C-Neutral' program reviewed in this dissertation as well as other national eco-certifications and standards such as the 'Sustainable

Tourism Certification' provided by the Costa Rican board of Tourism or the future 'environmental label' introduced above.

Finally, I believe that another potential follow-up project to this dissertation could engage in a more ethnographical on-site exploration of how 'expert knowledge' is assembled, transported and *black-boxed* within and beyond the country's 'carbon neutral actor-network'. This study could on the one hand follow the particular ways in which techno-scientific 'experts' *purify* their calculations as a means to shorten the decision-making processes of political and technocrat actors by reducing 'unnecessary complexities'. And on the other hand, follow how those same 'experts' simultaneously mobilize calculative devices, numbers, language and discourses impregnated in thick techno-scientific complexity in order to constrain the participation of 'non-expert' actors in debates over climate change mitigation, and that way avoid the proliferation of further ecological controversies for the sake of a so-called 'common good'.

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