CAN THE POSTNATURAL SPEAK?

Can the postnatural speak?

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abstract

The thesis explores the territory of the river Scheldt in Northern Europe and the spatial relations within its water basin and network. Through an articulated survey rooted in genealogical, socio-economic, and political aspects, the research shows that the very existence of the river Scheldt has been determined by the relation with other subjects, mainly humans, through their existence and actions. In fact, we are dealing with an economic corridor and a freshwater supplier for crops, that has been subjected to so many transformation that is impossible to recognize its physiological behavior. In a way, the river can not be defined as a "natural" element but a hybrid system of interactions or even a machine. According to such an assumption, the river Scheldt is an example of a radical interaction that questions the very idea of Nature itself. On this base, the hypothesis of the thesis is that Nature does not exist anymore, or maybe it has never existed, and proposes a paradigm shift from the concept of Nature, as traditionally and culturally intended, to the one of Post-Nature, as an operational concept. The work explores such a concept in three different ways: a theoretical development, a territorial survey, and an alternative cartography. The first part aims at defining the Postnatural starting from Posthuman Studies: in spite of being identitarian and binarian, postnatural subjects are nomadic and relational. This means that their very existence is bound to the existence of other subjects and their mutual relationship: relationality is what makes evolution possible. Hence, the contraposition between man and Nature, human and nonhuman, becomes obsolete in favour of a paradigm shift that considers living beings as equally capable of acting and self-regulating. The second part explores instead the territory of the Scheldt and eventually focuses on a complex survey with the aim of understanding how the postnatural machine works in terms of hydrological and societal relations and by disassembling its foundational elements. The last part reflects on the implications of the Postnatural hypothesis on the relation with humans. Also if to one extent human subjects have radically transformed the river into a machine, on the other side they kept on describing, designing, and managing it as a natural separated element by neglecting its hybridity. An alternative for designing otherwise may eventually come from the recognition of this status of the river: is there a specific form for it of relating and expressing? For allowing "the postnatural to speak", this part adopts traditional technological tools such as remote sensing and GIS with the aim of "listening otherwise". Summing up, the thesis proposes the concept of Postnaturality not only as a lens for better understanding the relation between space, humans and climate, but also as an eventual operative shift in Urbanism discourse.

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0. INTRODUCTION

can the postnatural speak?

The thesis deals with Nature and water in their contemporary condition. The preamble is based on a supposed crisis on today's practices of architecture and urban design, which, because of Climate Change and contemporary neoliberism, are encountering a series of issues that appear unsolvable through a traditional conception of what Nature is (Gentili, 2020). The hypothesis of the research is that Nature, as culturally and socially intended, does not exist, or maybe it has never existed. Therefore the reflection moves from the concept of Nature to the one of *Postnature* (Coccia, 2020), proposing a shift to a new kind of subjectivity, that by definition is dynamic and relational rather than identitarian and binarian.

Starting from a broader reflection on how Nature and water have been dealt with in the Western culture — and, by consequence, in practices of architecture and urban design — the thesis moves to the reflection on the posthuman (Braidotti, 2013) intended as a new kind of subject which has a different relation with the other species — namely nonhumans. The distinction between humans and nonhumans appears now as obsolete, since the posthuman subject is a subject thanks to the relationship it establishes with other species. The application of the posthuman theory to the architectural realm brought to the eventual birth of a new paradigm, namely the postnatural, which may be a new way to see the territory and work *with* it — and not *on* it — so as to improve the cohabitation between species.

The title of the thesis is a question: *Can the postnatural speak?* The issue of voice[1] is fundamental since different species with different background are able to interact through some sort of mediation between their forms of expression. Hence, once defined the postnatural as

1. The "Discourse of voice" is rooted in Sociology and, before, in Narratology. Starting from Bachtin (1981-1986), voices are defined according to the speaker (social, individual). Moreover, the problem of voice can also be connected with Structuralism and more specifically with Jacques Derrida (*De la grammatologie*, 1967) (*La voix et le phénomène*, 1967). According to Gayatri Spivak, the usage of the term "voice" is directly connected with "responsability" and can bth find its foundation on Bachtin "answerability" and Derrida's approach. In Spivak's word, "speaking is a transaction between speaker and listener" ("Subaltern talk Interview", 1993).

a new, relational subject, the next step that was made was a reflection on how it could speak in the contemporary condition. The thesis deals with the debate around subaltern studies (Spivak, 1988) so as to try to find some answers, or at least hints, on how humans intended as the dominant subjects in today's planetary context[2] could let some space for the other subjects to express themselves. Subaltern studies are mainly related to human categories which do not respond to "western" parameters[3], but the hypothesis is that these assumptions could also be intended within a broader conception and distinction which takes into consideration also the nonhuman[4]. In fact, there are some, such as Moore and Braidotti, who also include in the category of nonhumans those humans which were naturalized, hence exploited, in favour of the development of western Capitalism, namely minorities which traditionally did not have the space and the means to express themselves. The problem of the voice therefore deals with at least two issues: one is the language, which has traditionally been western, white and male, and the other one is the space, that was never enough: «If we are imprisoned by language, then escape from that prison-house requires language poets» (Haraway, 1997). Following the nonrepresentational theory (Thrift, 2008) the thesis proposes a possible method to interact with the postnatural as advocacy but avoiding iper-representionality: letting the 'other' subjects the space and the time to express themselves. The device that was used is a perfectly man-made one, that is the GIS and the satellite imagery manipulation: in fact the proposal is an approach that does not exclude humans from the debate, moving in this way against all the positions which tend to see humans as the responsibles of the issues of the Anthropocene (Crutzen, 2000) and for

2. This is the hypothesis of the "Anthropocene" definition as a proposed geological epoch (Crutzen, Stoermer, 2000: *Have we entered the "Anthropocene?"*).
3. "Subaltern studies" are specifically connected with the term "subaltern" coined by A. Gramsci in his prison experience as a way to describe the cultural hegemony excluding and displaining specific people of social groups. As an effect, those groups can not express their agency nor take part of the society and spae construction. The term endured during the last century thanks to the historian Ranajit Guha who used it to found and suppoert the SSG (Subaltern Studies Group) in the University of Sussex. The role of Spivak in Subaltern Studies is definitely fundamental, not only because she connects the work of Gramsci and the SSG with the discourse of voice rooted in Structuralism and Narratologie, but also because she refined the word "subaltern" itself by delimitating its applicability: "Subaltern is not just a classy word for 'oppressed', for the Other, for somebody who's not getting a piece of the pie. In post-colonial terms, everything that has limited or no access to the cultural imperialism is subaltern-a space of difference. Now who would say that's just the oppressed? The working class is oppressed. It's not subaltern... Many people want to claim subalternity. They are the least interesting and the most dangerous. I mean, just by being a discriminated against minority on the university campus; they don't need the world 'Subaltern'. They should see what the mechanics of the discrimination are. They're within the hegemonic discourse, wanting a piece of the pie, and not being allowed. So let them speak, use the hegemonic discourse. They should not call themselves subaltern." (de Kock, L. (1992). *Interview With Gayatri Chakravorty Spivak: New Nation Writers Conference in South Africa*).
4. The usage of the concept of subalternity in the non-human discourse has been widely adopted by Antispecism Studies, Posthuman Studies and Environmental Hisotry. To mention few main examples: Chaplin, J. E. (2017). *Can the Nonhuman Speak? Breaking the Chain of Being in the Anthropocene*; Morris, R. C. (2010). *Can the Subaltern Speak? Reflections on the History of an Idea*; Chackrabarty D. (1998). *Minority Histories, Subaltern Pasts*; Haraway, D. (1997). *Simians, Cyborgs, and Women: The Reinvention of Nature*; Walther, S. (2021). *Multispecies Modernity*; Arcari, P. (2019). *'Dynamic' Non-Human Animals in Theories of Practice: Views from the Subaltern*.

that reason do not include them in the debate in favour of a utopian (or dystopian) vision that claims Nature to re-take its space back. The question returns to the concept of Postnature, meaning that **there is no way in which Nature can re-take its space back, nor it is preferable**. Humans, whether we like it or not, are part of this complex planetary condition as well as other species, so it is necessary a dialogue and an interaction between them and the other species, as between the other species and them, in order to retrieve a new, different view based on relationality and not identity: the postnatural.

The case study that was chosen to experiment this new paradigm was not an exceptional case study for the Climate Change related risks or for its subaltern condition under contemporary Capitalism. It is a perfectly working piece of land which however revealed itself to be a good example of what a postnatural machine is — or could be: the Scheldt river, which flows in the Northern Europe crossing France, Belgium and Netherlands[5]. Economic, political and environmental issues are stratified over a river that does not respond anymore to the traditional conception of what a river is, inside its basin and with its tributaries. In fact, the functioning of the river could be understood on one side even without thinking about the existence of water, since at the European scale it is a strategic node that works only economically and politically (*river without water*). On the other side, in a more local scale one could consider water without thinking about the geographical features of the river (*water without river*), since a series of operations were made in order to move and deviate water so as to solve the demands of the market, without the need nor the will to consider the geography of the area. The Scheldt was therefore described in its European context and in its watershed's features and contradictions, until a zoom into a sub-basin in the southern Belgian area, which is the one that was less studied because less influenced by tides and very functioning for the needs of contemporary Capitalism. This section of the river was defined as a real postnatural machine, since it exists and works thanks to the hegemonic relation established between humans and water, built through an history of domination. A series of elements were then recognised, namely those who made the river a postnatural machine, such as canalizations and locks, but also those more local and almost invisible operations which are not recognisable by an eye that does not want to see.

As previously mentioned, after the definition of the river as a postnatural subject the next operation was that of trying to give some hints on how it could express itself: the device used was the one of the manipulation of satellite imagery, which is able to calculate and show some issues that would otherwise be invisible. These operations where done through the GIS, Geographic Information System, which allows the collection, manipulation and visualisation of georeferenced data. It is indeed a form of listening the voice of the postnatural subject, even though it is done through a translation in order to be understood by the human language[6]. The translation gave birth to new geographies, which could be useful for a new, contemporary and relational practice of architecture and urban design that is not applied on the territory, but works with it.

The final part of the thesis is based on the theoretical background and its pratical implications in a more projectual way, even though it is not proposing a real project. Two scenarios are proposed, based on those that were considered the main risks of contemporaneity: ecological crisis and neoliberal Capitalism crisis. In fact, it is stated that the two of them are strictly connected when we consider Postnature as a active part of contemporary market dynamics. This means that also non-humans are included into the neoliberal capitalist system and a crisis which involves non-humans is consequently affecting humans and the system both of them are existing in its contemporary form. The last part of the thesis is therefore aimed at explaining this connection and how the shift from a subject which has historically being considered as identitarian to a relational subject, that is nomad and exempt from binarian interpretations, could bring to new ways of seeing and actively contribute to a new shift of paradigm. Humans are involved in this, as well as non-humans, which are not weak subjects but able, as well as human beings, of expression and action: the needing of a translation is something that is necessary in order to comprehend forms of expression which are different from our habits but equally valid and worthy of listening.

5. Also if this thesis firsly refers to "the Postnatural hypothesis" and then proposes a case as a key to show the valuability of such an idea, this should be seen as a rhetorical device. The research actually started in 2021 in Belgium, during a workshop "Eurometropolis: a blue space in transition". While exploring the Scheldt and its specificity, we understood that contemporary approaches could not work well to define that river. By discussion, literature, public talks and design strategies proposals, we developed the hypothesis of the postnatural as both a lens to understand and a tool for designing. A special thanks sould be given to: Catherine Christiaens, Maarten Gheysen, Loic Delhuvenne, Chloé Geldhof, Joshua G. Stein, Theresa Schubert, Alba La Torre.

6. We are perfectly aware of the limits of translations. "Tradurre" is "tradire" ("translating" is "betraying") (Cicero (46 B.C.). *De optimo genere oratorum*; Girolamo (396). *Epistulae LVII, 5: Liber de optimo genere interpretandi;* Dante (1304-1307). *Convivio*; Lutero (1530). *Lettera del tradurre*) not only because the two words share the same root ("tradition" as well). But also because translation can be intended as a form of voluntary manipulation of languages (Hermans, T. (1985). *The Manipulation of Literature*; Eco, U. (1991). *I limiti di interpretazione*; Eco, U. (2003). *Dire quasi la stessa cosa*; Giacomarra, M. G. (1997). *Manipolare per Comunicare*; Munday, J. (2008). *Introducing Translation Studies*; Spivak, G. C. (1993). *The Politics of Translation*).

1. THE POSTNATURAL HYPOTHESIS

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This chapter presents the theoretical apparatus of the thesis and is based on of two essays: the first one is the backbone of the research hypothesis of the thesis, the one that is naming it. It is a decomposition of the title which is explaining the theoretical background of each term. The reflection starts from the historical conception of Nature as a cultural-built one, moving to Rosi Braidotti's posthuman theory and proposals, trying to apply them to the architectural debate and finally proposing the postnatural hypothesis, moving then towards the topic of the voice through the application of subaltern studies' assumptions on a wider conception which includes every human category and every species, biotic and a-biotic.

The second essay is an overview on how water has been intended and explained through the tradition of architecture and landscape urbanism, with a glimpse on its international policies of management. It proposes three lenses: *water as an object, water as a determined subject, water as a determining subject*. *Water as an object* deals with all the positions that have considered water as a mean through which humans could retrieve something, both cultural/perceptional and material. *Water as a determined subject* is about the debate that started to consider water as a subject inside the Landscape Urbanism tradition, more in general through the comprehension of the difference between the time of man and the time of Nature: it is the debate in which we can observe all the reflections of Landscape Urbanism. *Water as a determining subject* finally gives an overview on some parts of contemporarity that are trying to institutionalize subjects that historically were considered as objects, in order to recognise their rights in quality of thinking and expressing-able entities. The two essays are distinct but a whole in order to carry on the reflection through the presentation of the case study of the Scheldt and the reasons why it was chosen, as mentioned above.

1.1.

the postnatural hypothesis

"WORMS" — Chaetopoda Haeckel, 1879

The hypothesis of the research is that Nature no longer exists, or maybe it has never existed.

The structure we are used to call Nature can be conceived as an open system constantly moving: the idea of Nature as a fixed context in which something happens doesn't suit anymore in the debate about the contemporary ecological crisis. When we historicize the Nature-system we realize that what we call Nature isn't characterized by fixity, but a profound dynamism, given to and received by.

The prefix post- is in fact resulting by the inclusion of the temporal factor inside these dynamics: postnatural is a condition in which the ecological processes persist in any case, within a context that has been irretrievably compromised by anthropic activity (Moore, 2011). This doesn't want to be a qualitative judgment, rather it is intended as a track with which to reflect on how effectively everything we call natural has been touched, manipulated and managed by Man for a variety of reasons, all related to its dominance towards other species – biotic and abiotic. Postnatural is definitely an anthropic condition with a colonial background; especially during the XX century the processes of land conquest have brought to a severe run towards a rapid exploitation of resources, which is the main reason we are talking about post-: the XXI century began with a massive ecological crisis, and we are called to understand and investigate the consequences of the colonial dynamics of our recent past (Demos, 2016).

The title of the thesis is in fact the result of the intersection of multiple research fields, an attempt to join them within a question (literally, a question!) in which architectural and urban design practice can or could navigate for the next future: can the postnatural speak?

The trial is to materialize this theorical apparatus on the territory: the case study of the Scheldt as a postnatural machine has proved suitable for the observation of how the river and its surroundings, including the living beings who inhabit it, exist thanks to a mutual interchange of matter between them. The Scheldt, in fact, has been the subject of various transformation and historical events who are stratified in a river which is the result of multiple activities by a network of actors that are both human and nonhuman, biotic and abiotic. At the European scale we can observe how the Scheldt is interconnected within economic and political dynamics: at the core of northern Europe, the connection with the Seine, the Rhine and the Thames through their deltas both facing the Northern Sea makes the Scheldt not just a river, but a strategic node for the international fluvial transport of goods. Zooming in a bigger scale we can observe how the river has been manipulated through history in order to facilitate farming and transportation practices: infrastructural works such as the building of locks, the control of the riverbed in order to facilitate the navigability and the building of canals to manage the irrigation of the fields and the constant supply of water make the river not just an ecological object, but the very subject which exists in its actual shape thanks to the relations initiated with other species, in particular the human one. The thesis will therefore analyze the Scheldt as a postnatural machine destructuring its elements through different scales and practices: in particular, in the last part, there

will be a focus on the theme of the voice. Considering the Scheldt as a subject in relation with other subjects in fact is not enough if one does not think about how it could speak: hence there will be an attempt to show what it could say through means which belong to different theoretical and practical fields.

Nature as an anthropological construction

Can Cartesian dualisms be questioned in the epoch of the Anthropocene? The contraposition between given and constructed which has historically characterized the debate in social sciences is nowadays becoming progressively blurred in favour of a more hybrid approach that touches the fields of ecological, feminist and posthuman studies (Wolfe, 2010; Crenshaw, 1995).

Nature has hence been compared to other more 'human' categories through an oppositional relationship. Leaving out the historical debate that could be misleading as well as off-topic compared to this research, the focus will be held on some contemporary critiques and neohumanist points of view on this topic. Keeping the focus on the ongoing climate crisis and the network of subjects involved in it, the question of the intentionality is crucial in order to confirm or deny the significance of these dualisms (Braidotti, 2008).

In particular, Andreas Malm claims that the contraposition between Nature and society is the key to deal with the ecological crisis in a tangible way. By saying that of course man is the advocate of the increasing emissions of pollutants and the consequent raising of temperatures and environmental catastrophes, his thesis is that it is necessary to separate society from Nature in order to see the real source of the problem. He is against what he calls hybridity between categories because he claims that the assumptions are purely theoretical hence not suitable for questions that need answers in the material world. In fact, to him the main distinction between the social and the natural is that manhood acted on the territory in an intentional way, which is the main reason of the disastrous consequences of the human activity on the planet. By saying that he indirectly claims that in this state-of-fact the other species are the victims that need to be cured from the intentional behaviour of the dominant, violent species (Malm, 2017). Although Malm strongly criticizes contemporary Capitalism as the main driver of Climate Change and asserts the necessity to move from it towards a new system (what he calls 'socialist climate realism'), the critiques he moves are still too embedded in an anthropocentric vision, as he gives for granted that there is a difference between humans and the 'material world' which we call Nature, that is mainly given by intentionality, and that the relationship between humans and the 'alter' is a relationship of violence, submission and exploitation. This is not a false statement, although the ideology of the 'victim' does not appear opened to actual change and evolution from an obsolete model: forcing some parallelism, in the feminist debate about patriarchal systems the issue is that to unhinge women as victims who can't manage their actions and make them as subjects as what has historically been defined as dominant

towards them (man). As well as we can talk about toxic masculinity in feminist studies, we can perhaps talk about toxic humanity in social studies (Donovan, 1996).

Dario Gentili asserts that these binary systems were born in ancient times, when man chose, through the means of technics, to paradoxically separate himself from Nature in order to establish a relationship with it, hence to manage and dominate it (Gentili, 2020). There have been some attempts to move from the fixity of dualist models so as to recognize the complexity of contemporary planetary patterns. Philippe Descola is strongly unsatisfied about what is left of XIX century's anthropologic studies: the binary model Nature/culture, which has shaped the occidental world and the rest of it flattening any complexity and differences, is not enough to understand and explain the relationship between man and the rest of the world. What he is proposing is a «denaturalization of naturalism», which means a rupture with the traditional contraposition between Nature and culture and an opening towards new ways to perceive the human/non-human relationship (Descola, 2015). The research conducted by Jason Moore on the concept of 'Cheap Nature' and advanced Capitalism is aimed at pointing out the correlation between environment-making, intended as the results of anthropic activity on the territory, and relations of inequalities, power, wealth and work. Moore's thesis is therefore focused on the critique of the Nature/capital dualism: his main point is that natural resources, both biotic and abiotic, are embedded in capital's mechanisms as well as human resources. The difference between them is that historically natural resources have been considered as free and endless and these dynamics, together with technological development, led to an unreflective and reckless exploitation of what the planet "offered" us. In fact Moore talks about Cheap Nature, which does not include only biotic and abiotic species, but also all these kinds of humanities who do not belong to the dominant category, such as women, natives and every kind of human being which has been (in fact) naturalized in favour of western's capitalist development (Moore, 2016). What Moore is trying to clarify is that in the contraposition between Capitalism and Nature, Nature reveals itself as a passive category, whereas dismissing this boundary and considering instead the idea of "Capitalism-in-Nature", the role of naturalized elements in advanced Capitalism becomes a more active one, defined by relationships of moving patterns between all kind of environments and organisms (ecology) inside the circuits of capital. When Capitalism is historicized and it becomes 'historical Capitalism', the temporal width is amplified and it allows to recognize a series of recurrences which reveal that, in fact, ecological dynamics have been the main responsible of a series of crisis and successes in capitalist history; therefore natural and social limits are coincident, not independent from each other: the limit is socio-ecological (Moore, 2011).

Nature in the architecture and Landscape Urbanism tradition

Nature as utopia
Trying to come back to architectural fields, it is worth to shortly investigate on how Nature has been historically perceived and constructed. The imaginary of Nature in the medieval city was tied on one side to the idea of the garden as a place of idleness and meditation and on the other side to the countryside and the places of production of goods (Moore, 2015). As Bernardo Secchi asserts, the countryside has been progressively separated from the city to the point that there was an attempt, in the modern age, to rejoin natural and urban life throughout public parks and gardens. Nature in these cases had more of a perceptional value, it was a mean for man to find a place of rest and calmness from the frenetic city life – it is not a coincidence that projects of gardens and parks were made with a fake spontaneous matrix in order to give the idea of a selva in which a person could get lost and enjoy his rediscovered relationship with Nature. Secchi assumes an unconscious sense of guilt through which human beings were already somehow aware that they had removed Nature from themselves and were in some way trying to find it again: therefore the role of natural elements had a sort of evocative meaning, a context made by humans for humans (Secchi, 2005). The organic metaphor has shaped the debate around Nature and architecture for a long time: based on a classic contraposition between man (reason) and Nature, we can trace its origins with Illuminism and the theoretical work by Jean-Jacques Rousseau which found its heir in the architectural field in the abbot Laugier. With the renowned *Essai sur l'Architecture*, Laugier asserts that a quality architecture should be legitimized by Nature and Reason; hence, the primitive hut reveals to be the perfect marriage between man and Nature, given and constructed, stripped of any excess (Laugier, 1753). Laugier has been considered as the first theorist of modern architecture (Summerson, 1966): taking a leap in time in fact, we can find the same assumption in Modernism and in organic architecture. The aim was in any case the achievement of the equilibrium between architecture and Nature: natural elements constituted the surroundings, the context, in harmony with the built (Curtis, 1992). The two together formed an organism, which worked exactly like a human body. Famous modern architects, such as Alvar Aalto and Frank Lloyd Wright, pursued this goal keeping anyway a firm division between what was man and what was Nature.

Nature as a device
There was a shift from this perspective which can historically be collocated after Modernism: the acknowledgment of the removal of Nature from the urban life brought poststructuralist movements to the recognition of its value as the object of project. There has been some revolutionary authors which wrote, in the last decades, about Nature in a totally different way. The first of them is Ian McHarg, who, with "Design with Nature" (McHarg, 1969), started giving to natural elements the same importance of architectural ones in the architectural practice. Some other scholars were not only important theorists concerning the debate around architecture and Landscape Urbanism, but also gave to their theories the shape of actual projects. To James Corner Nature has

some dynamic features that make it an important part of architectural projects, not only a context in which the life of men could happen: there is a distinction between the time of man and the time of Nature, and it should be considered in the design phase (Corner, 1999). Nature as an object means that natural elements passed from being considered as ornamental and perceptional to being considered as devices which could contribute to the life of man as much as the artificial ones. Nature becomes Landscape, and Landscape was joined with urban design becoming Landscape Urbanism taking in this way a new, active meaning (Waldheim, 2006). Hence, Landscape assumed some other attributes, such as the one with which Bélanger destroyed every last little idea that saw landscape as an oneiric context: landscape becomes nothing more than infrastructure; a strong, massive element that contributed to the existence of the urban, such as roads and buildings (Bélanger, 2016). This comes with a parallel reflection on the emergent phenomenon of globalization which blurred the conception of cities as circumscribed elements and inserted them in a wider context: Planetary Urbanization (Brenner, Schmid, 2012; Brenner, 2014). Landscape is hence «operational» (Brenner, Katsikis, 2020), actant involved in the construction of the Urban.

Nature as material
Since these key moments the certainty related to the distinction between Nature and man and natural elements in the architectural realm started to waver, and the theories and movements which were born cover a variety of fields and conditions: the debate around Landscape Urbanism and what is Nature today is becoming more and more complex that it is difficult to trace some evolutional patterns. In general, we could say that the tendency is to consider natural elements as fundamental parts of the design phase, moreover considering the recent ecological crisis that is calling for a reconsideration of our relationship with the rest of the planet. The call for sustainability brought to life some other movements that consider natural elements as materials that must be involved in the design phase: it's not the contraposition between natural and artificial anymore, natural becomes artificial. Andrea Bocco Guarneri coined the term *Vegetarian Architecture* as a more ethical way to rethink architecture: while contemporary technologies are not considered as democratic, vegetarian technologies could be multicomprehensive regarding some ecological issues we are facing today: vegetarian architecture works with Nature which means reducing to the minimum the human contribution, it considers local materials and the most performing ones (Bocco Guarneri, 2020). Focusing on the degradation of the ecosystems, Dominique Gauzin-Muller claims the necessity of being more aware of the need to protect it: the focus is on the maximum technological performativity of buildings in order to reduce their impact on the surrounding environment from the point of view of energy, materials, use and management (Gauzin-Muller, 2001). The contemporary era is the one of Nature-based solutions: the limit between Nature and technology does not exist anymore, advanced technologies are used to manipulate Nature in order to obtain the best

solutions ever in terms of environmental impact. The debate around the Anthropocene and the raising awareness towards Climate Change brought away every assumption about Nature as something which needs to be protected; rather it is considered as a strong device which, through its metabolic functions, could be able to build the cities of tomorrow (Bratton, 2019).

What this research is assuming is that considering Nature in its objectivity inside the architectural practice is not enough. Hence, the proposal is to move from the reflection on Nature to the one of Postnature. In the following part the discussion will be held around the concept of Postnature which is defined as a nomad subject, existing through its relation with other species, capable of self-organization. The shift from Nature to Postnature has been done through the investigation on the posthuman, in particular through Rosi Braidotti's postanthropocentric and trans-specific point of view. What is Nature inside the posthuman theory?

The starting point is a rethinking of the category of the subject and a reflection of a new kind of subjectivity. The transition that is proposed is the one from the traditional subject, which is static and identitarian, to a subject that is in movement, nomad, who is shaped through the relationship with the 'other' (Nail, 2021). Braidotti's reflection starts from a critique to humanist values which are still really solid in today's social sciences: these humanist values are based on an anthropocentric vision that tends to place man as a universal model through which the rest of the world is shaped. By man she does not mean mankind, but a subcategory which is the male, white, straight occidental model: the consequence is a confirmation of the binary systems that some are trying to deconstruct. So, if mankind in its subcategory is the first component of this systems, which is the second? What is the role of the rest of the human species? And the other species? Braidotti includes in the category of the nonhuman all the rest of the human species which she claims that have been naturalized, namely women, natives, slaves etc., and the rest of the biosphere: biotic and abiotic. Moreover, she includes in the nonhuman also the technological component, which, in the era of advanced technologies and Capitalism, has reached an important degree of autonomy. With a critique on these dualisms and the proposal of a subjectivity that is deterritorialized and relational, the subjects that have been part of the Cartesian model become egalitarian subjects that exist thanks to the relationship with the others. The 'alter' that in the humanist theory is constructed by difference is the mean through which subjects can evolve: when an environment is constituted of only one species the absence of the 'other' makes positive difference missing, hence there is no evolution possible (Coccia, 2020). The definition of this kind of subjectivity is though not obvious nor it's involved in a linear process: Braidotti admits that there is a tendency to overcome the differences between species through a new relationality, which she defines as "postanthropocentric humanism". To her, this kind of relationality is negative: it is based on a common sense of vulnerability which is affecting both human and nonhuman spheres, in particular through the recent ecological crisis. The reason is that

contemporary economic mechanisms and exploitation of resources, especially with the advent of new systems of advanced technologies, cancels the differences between human and nonhuman and encloses them together within the greedy mechanisms of advanced Capitalism. Humans have been dehumanized and nonhumans have been metamorphosized and both have been incorporated in the circuits of capital and treated in the same way (Moore, 2011). These dynamics became more evident since technology has become so developed that it can be a substitute both of humans and nonhumans, contributing to the destitution of the division between them.

Braidotti's aim is to reach a condition which is both postanthropocentric and posthuman. Dealing with relational subjects, there is a distinction between what she calls *Zoé*, that is the «dynamic strength of life itself, capable of self-organization», and the *Bios*, which concerns the anthropic sphere.

Coming back to the reflection on Nature, if we think of it inside the sphere of the posthuman theory we include it in the mechanisms of life-Zoé which is capable of organizing itself: it is not simply an object, it becomes a subject (Braidotti, 2013). This vision has still the risk of being neohumanist, therefore another passage is needed: the risk is that Nature is perceived as a vulnerable subject, which has not the strength of self-organization and relational capabilities. In the posthuman debate Nature is not even vulnerable: **it becomes Postnature, a nomad subject that exists thanks to the relationships with other species**. Far from being something to be preserved or something to be exploited, **the postnatural is a subject capable of acting and undertaking decisions through its capability of dialoguing with the 'other'**, which in this case is not intended in its diversity, rather as a further subject in an egalitarian relationship with the former. This overcomes anthropocentrism chasing principles of democracy between species, and this overcomes humanism chasing principles which affects the sphere of values and sensitiveness that are not proper of human beings, but of *Zoé*. In a way, we may say that Postnature is a project. As the Horizontal Metropolis starts as a statemet about a state-of-the-art of the contemporary European planetary pattern but becomes the founding element of a new kind of urban design (Viganò, Cavalier, Barcelloni Corte, 2018; Viganò, Cavalieri, 2020), the Postnatural has the potentiality of changing our relations with a territory that is in transition and that is made by interaction, through design strategies made of interactions. The reality in which humans and nonhumans are living is not a given reality, nor it is constructed – it is a reality which exists in its relational sense. The postnatural hypothesis in architecture could bring the design practices to a new phase, which is not aimed at preserving nor at exploiting, rather at working with the 'other' intended as a subject, overcoming that kind of intentionality which is typical of the Anthropos. Given that architecture and urbanism are practices which are conducted by human beings, the next issue is how to obtain this relationality dialoguing with the nonhuman beings, without overcoming them. Once defined what is postnatural, the following question is what gives the thesis a title: can the postnatural speak?

Braidotti herself points out the issue of language and representation as a significative challenge concerning this new kind of subjectivity. How can the postnatural speak without being misunderstood? Can it really do it in the era of the Anthropocene?

Posthuman and postnatural

"Can the Postnatural speak?" is a quote from a famous essay written by Gayatri Chakravorty Spivak, an American philosopher with Bengali origins, who talks about the subaltern as subjects, the «unnamed subjects of the Other of Europe» (Spivak, 1988), whose voice and capability to speak have been oppressed by the dominant mechanisms of the Western world. The reflection around dualisms and definitions given by difference is a recurrency: the tendency is to conserve the western subject as the universal one without geopolitical implications. The consequences are that there are groups of subjects which are not adequately represented, and even if there is an attempt in this way, the description of the subaltern subject is often constructed as the 'other' compared to the dominant model. Spivak speaks in fact about epistemic violence that can be traced back to the Imperialist period, in which colonies were forced to educational programs that were planned to be culturally and epistemically the same as the ones of colonial countries: this was however fundamental in order to keep a dialogue with the empire even though the expressive abilities of the oppressed subject were completely cancelled. Against every vision which tends to preserve the subjectivity of the dominant categories as a universal model and against those who claim that the oppressed who can't speak do not want to fight, Spivak takes the side of the subaltern pointing out the importance of silence. A way to listen and understand the subaltern subject, which is not enough represented by words, is actually an exercise of «measuring silences» (Spivak, 1988). **It means measuring the distance between what she calls *the elite*, named as those who can express themselves, and the subaltern**: as in space, where the distance of celestial bodies from us is determined indirectly by measuring the frequency of the radiation, also in our planet those who are epistemically so far from us could be understood throughout indirect mechanisms.

Postnatural subjects are subaltern subjects. If subaltern can be defined as "everything that has limited or no access to the cultural imperialism" (de Kock, 1992), postnatural is definetely outside the cultural imperialism that has always been based on the contraposition between Man and Nature: postnatural subjects almost do not even exist inside the contemporary debate, hence their access to the construction of this debate is of course limited, if not denied: this is why postnatural subjects are subaltern subjects. It has been said that this type of subjectivity is dynamic and relational, but it is a fact that the needle of the scales tends towards those subjects who historically have been the dominant ones. How to make the postnatural speak (if they want to), then? How could one apply the exercise of measuring silences to the postnatural? There have been some attempts which can mainly be

classified in two typologies (none of them has ever measured any kind of silence).

It has been said that advanced technologies made the limit between natural and artificial blurred, contributing to the destitution of this binary model. The interpretation of data which are the result of experiments and measurements on the territory is one way to measure tendencies, therefore to try to make previsions and scenarios. The use of a series of software and technological tools in order to interpret apparently silent signals that come from the territory is one way which is today used to monitor the planet obtaining some information on precise issues, such as those related to Climate Change: this is the case of the interpretation of satellite data in order to acquire some indexes and parameters that could be helpful to prevent and manage climate emergencies in fragile territories. The hand of man in this case is very strong, since it is made a scientific operation of translating some inputs which are in any case filtered and selected by devices that are built by man himself; it is a useful operation since it is actually able to show new kinds of geographies which would otherwise be invisible, although it takes the risk of being considered as precise and deterministic that it is the only way to translate and understand a language which does not belong to humans. It is said that the postnatural is a relational subject capable of self-organization: hence how can the postnatural speak and being translated with advanced technologies, but maintaining its capabilities of self-organization? It is not an easy question and this thesis does not have the ambition to find the answer, even though it is evident that with just the use of advanced technologies the self-organizational ability of the subject is missing. There is the need of something more. Or less.

Another strategy that is very popular in the mainstream debate on the practices of contemporary architecture and Landscape Urbanism could be attributed at what Rosi Braidotti defined humanism postanthropocentric, which could be translated into the will to make Nature speak itself. In the design practices it means removing man's hand and let Nature re-take its place on the territory: practices of renaturalization are considered some of the most respectful and ethic ways to preserve the planet and its biodiversity (Corner, 1999). Is renaturalization really possible? If we replace the idea of Nature with the one of Postnature we say that subjectivity becomes no more static and identitarian, but nomad and relational: can humans really stop talking and exchanging matter with the nonhumans? Is it really useful? In order to really include nonhumans in the project in a posthuman way relations must happen: without relations between species there is no evolution possible. As in cities the relationality has been denied because the other species have been expelled (Coccia, 2020), also in this case expelling humans is probably not the best way to seek for evolution and an actual transformation which could be really inclusive for all species. Also this strategy denies a part of the definition that has been given to the postnatural.

How to speak?

Finally, how could one apply Spivak's proposal of measuring silences? What does it mean? It is a fact that humans' thought(s), word(s) and language(s) are the dominant one(s) (Braidotti, 2013). Hence, the point does not become removing man's hand: if we really want to maintain relationality it is more about limiting our control towards how other species communicate and express themselves. The practice of silence then becomes the practice of observing and listening without the presumption of being the only living beings gifted by reason and self-organizational capabilities. In 2008 Amin Thrift speaks about non-representational theory after a critique to the iper-representational tendency of contemporary geographers: the aim was that to give more space and meaning to that *non* used as a prefix that too often was sacrificed in favour of a language, then a representation, which was too attached to the human(ist) vision of the world. Non-representational theory was in fact also named as more-than-representational theory, which is an echo of how scholars are dealing with the interspecific approach (nonhuman, more-than-human...) in the era of the Anthropocene (Lorimer, 2005). Non-representational theory is not an actual theory, is more a provocation to push our reflection beyond our limits of comprehension of the planet (Thrift, 2008); not representing, stimulating ourselves to practices of observation in silence is what could bring to a transpecific approach to the project. Knowledge as it is intended is a human construct, and knowledge itself has been historically built under an anthropocentric view of the world: when it crosses this limit it becomes a tool which has the potential to maintain and improve the relationality between the human and the 'other'. This gives both humans and nonhumans the capacities of communication and expression: humans come off their pedestal and nonhumans get more space. In this sense Appadurai speaks about «full citizenship» which is obtained by the application of the «right to research» (Appadurai, 2006), meaning that research is an innate tendency of all species: research is intended as the ability of questioning oneself about something one does not know but wants to know, it does not belong to a particular élite. Being able to question ourselves means being able to simply being, or being able to undertake and maintain an egalitarian and constructive relationship with the other species (Latour, 1993). Knowledge in this sense is already action, a stance in favour of a more democratic and inclusive approach: could thi be the key for the transpecific project? Could postnatural speak then?

1.2.

"POLLUTION" — Franco Battiato 1972

water, landscape
and Climate
Change: a survey

Urban design has always been concerned with the issue of water in relation to the territory; especially within the tradition of Landscape Urbanism, the theme of water has been widely treated in its dual role as an object catalyser of new spaces and subject to which protection and enhancement are due (Corner, 2006; Bélanger, 2016; Mostafavi, 2016).

The essay aims to use water within landscape design as a lens to observe phenomena related to the Anthropocene and Climate Change in their contemporary definitions. The hypothesis underlying the essay is that firstly, contemporary landscape design considers water in at least two possible meanings, the objective and the subjective. Secondly, we suggest that this double declination has implications on at least three levels: that of the content of the project, which gradually assumes different objectives, that of the role of the designer (and therefore of the technique) with respect to the possibility of responding to Climate Change, and that of sustainability. These hypotheses are dealt with in the essay in three different areas: the first is that of the internal debate on international policies, the second is that of the literature of Landscape Urbanism, and the third is that of projects.

The first part deals with the theme of water in the debate within international policies and investigates how the two meanings described are contextualised: the first, that of object, through a definition of it within the framework of United Nations policies (specifically through the HLPW Action Plan of 2016) to understand the direction in which we are moving for its management; the second, that of subject, through a critical reading of the debate that is articulated around the so-called 'rights of rivers' which, in an antithetic way to a purely anthropocentric approach, pursues a multispecist vision for the recognition of the rights of rivers understood as non-human subjects.

The second part, on the other hand, identifies some conceptual nodes around the design dimension of the relationship between water and territory within a critical selection of the vast literature concerning Landscape Urbanism, observing the transformation of the theoretical model and practical approach over time. Starting from the founding The Landscape Urbanism Reader by Charles Waldheim, the junction between landscape and urbanism to landscape urbanism, followed by an approach that goes backwards on one hand — tracing its prodromes in some works by McHarg, Corner and Marot — on the other hand towards the subsequent trends linked to the concept of Planetary Urbanization — through the studies of Brenner, Schmid, Katsikis, Bélanger and Mostafavi — with further hints concerning the contemporary debate by some of the main international institutes (Delta Urbanism and Terraforming, to name a few).

On the basis of the previous observations, the third and last part of the essay analyses a series of projects in order to identify some of the main strategies through which the contemporary dimension of landscape design deals with water. Specifically, at least three categories emerge from the critical reading of some significant projects: (i) water as an object and the theme of risk, where the project deals in particular with prevention and cure from disasters and/or potential disasters related

to environmental and urban phenomena; (ii) water as a specific, and therefore institutionalised, subject, in which the project, often cross-border, places blue infrastructures within a series of policies aimed at enhancing them and their ecosystems; (iii) water as a determining subject, in which the project sees water as an element that regenerates ecosystems often linked to the industrial past of the western world.

Water and the international debate

Water as a subject: the position of the contemporary debate
The recent definition of the Anthropocene is based on the assumption that human actions of land transformation and anthropisation are such that they have induced irreversible transformations in the planet (Moore, 2016). On the one hand, the debate on the Anthropocene deals with the effects of human action, either by circumscribing and scaling them down or by expanding them. On the other hand, it deals with the causes, citing not so much the *anthropos* as specific contemporary determinations of human culture as the reason for the contemporary geological era. We therefore speak of Capitalocene, Plantatiocene, Chthulucene, Maleocene and so on (Moore, 2016; Haraway, 2019; Di Chiro, 2017). Whatever name we give to the geological era we are living through, it is clear that no one wants to take responsibility for the ecological crisis that among many other things has ensued. However, today Climate Change is constantly in the spotlight: the effects of man's actions on the environment are becoming more and more apparent. The direction in which we are moving is therefore towards ideas and practices linked to the concept of environmental sustainability, following the principles of mitigation and adaptation outlined in one of the 2014 IPCC reports (Wilbanks, 2014).

In 2015, the UN drafted the famous 2030 Agenda in which the 17 universal, indivisible and revolutionary Sustainable Development Goals (SDGs) are outlined: the ambitious aim is to outline supra-local strategies for the smart management of the now limited natural resources, seeking to create synergies between economic growth, social inclusion and environmental protection (UN General Assembly, 2015). In particular, the sixth SDG states: "Ensure the availability and sustainable management of water and sanitation for all"; water is a notoriously urgent and important issue when it comes to Climate Change, whether we are thinking of factors linked to environmental risks (droughts and floods) or problems linked to the scarcity and pollution of water sources in certain areas, in both cases with worrying implications for communities and ecosystems. Water in this case is an element that possesses both risk factors and important potential, and is understood as an object, i.e. as a means of catalysing a series of significant transformations, with consequences for the environment and above all for human beings.

In April 2016, the UN Secretary-General and the President of the World Bank Group convened a High Level Panel on Water (HLPW) to provide the leadership needed to support a comprehensive, inclusive and collaborative way of developing and managing water resources and

improving water and sanitation services. The focus of the Panel was to provide tools to mobilise the commitment of countries to ensure the availability and sustainable management of water and sanitation for all (SDG6) as well as to contribute to the achievement of the other SDGs that depend on water development and management. From the resulting document, it is evident how the issue of water ties in both directly and indirectly with all SDGs, and this is indicative of how smart and conscious management of water is key to ensuring the overall sustainability of all the directives set out in the 2030 Agenda (HLPW, 2018). Part of the contemporary debate is increasingly focusing on the issue of Earth-centred law, defining non-human Nature as a subject with rights. Recognition of Nature's rights not only brings positive consequences at the environmental level, but also with regard to local communities and their relationship with their surroundings (Wilson, Lee, 2019). In particular, the issue of 'river rights', considered as complex living entities, is addressed as a crucial factor for the protection of ecosystems. Some local policies have indeed recognised these rights: the right of rivers to flow, to perform essential functions within their ecosystems, to be free from pollution, to feed and be fed by sustainable aquifers, to maintain their original biodiversity and to undergo remediation processes (Wilson, 2019); we speak mainly of several areas in South America that are home to some of the most important — and most polluted — rivers on the planet. Veronica Strang argues that in any case these policies are still not enough: she speaks of short-term solutions that are still underpinned by a neo-liberal and anthropocentric vision of rivers, when what is desired is a recognition of water as a subject, not as a mere means, a function of the needs of human beings (Strang, 2020). In her call for water not to be considered purely as a resource, Nadia Breda speaks in this sense of the authoritativeness of water: "it [water] is rather an active subject, even a creative agent in some cultures [...] that stands in multiple positions between the opposite poles often indicated by discourses on water" (Breda, 2005); the criticism that is made is mainly linked to the appropriation of water by humans. The recognition of this authority, therefore, is an invitation to give water a "space for action", a margin of freedom proper to any subject with rights: this is not a point of arrival, but rather a starting point for the restoration of a relationship between human and non-human beings that is now compromised.
"Water rights must be a right extended from humans to animals, to plants, to soils, to lands, to subsoils, many of which have an environmental existence and role because they are imbued with water. [...] Water as a right needs to expand as a category of right for the living and the non-living, to include stones, granules, sands, clays, fissures, rocks, soils and terrains, breaking down the separation between the living and the non-living. This would overcome the insidiousness that asks "who has the right to receive" and consequently decides "who has the duty to give", postulating cumbersome presences of power." (Breda, 2005).
The proposal is to move from anthropocentrism to multispeciesism and consider human beings as inhabitants of the planet together with the rest of the living beings: this, according to Strang, would lead to more socially and environmentally sustainable practices and ideas (Strang, 2020).

Water and Landscape Urbanism

In 2006, as a result of a conference held in Chicago in 1997, Charles Waldheim published "*The Landscape Urbanism Reader*", considered today a manifesto for the contemporary conception of landscape architecture.
The terms landscape and urbanism are combined in a single formula: on the one hand the phenomenon is therefore single, on the other hand each word maintains its autonomy, thus indicating a hybrid condition of interdependence. The aim of the book is to unhinge the traditional conception of the landscape conceived as locus amoenus, detached from its surroundings and complementary to the city, and to make it a design practice, a great superstructure that includes within itself the space of the city, and indeed it is the city itself that expands into the landscape. Here the term urbanism takes on meaning: talking about landscape without considering urban forms that enter into relation with natural ones is a problem today. James Corner, in the text *Terrafluxus* contained in the book, speaks of urban metabolism, stating that natural systems, if considered separately from urban ones, are not sufficient on their own to solve problems of pollution and reduction of biodiversity — which are problems linked mainly to the man-made territory. This is why the practices of urban planning and landscape architecture must converge. In four points, Corner proposes a new methodological approach: it is important to consider the temporal dimension and the fact that Nature's times are longer and more complex than man's, and extending the scale of observation to the territorial scale allows us to consider horizontally how Nature and the city are actually linked by intricate relationships and how it is therefore necessary to evolve design practice in this direction (Corner, 2006). Although Corner's text does not speak specifically about water and focuses more on the relationship between urban and natural, it offers assumptions that will be fundamental in the subsequent literature: the understanding of natural dynamics as deeply dependent on urban ones — and vice versa — is the starting point for a series of considerations that will be made later, related to the consequences of anthropic mechanisms on ecological ones.
Some foundations of this approach can be traced back to earlier works. Five years earlier, a book was published as the result of an exhibition on the Mississippi, which was to form the basis for certain methods of landscape conception and representation that are still used today. *Mississippi Floods* brings together a series of documents, maps and photographs that Mathur and Da Cunha, landscape architects in the United States, had compiled following studies of the river. The book's proposal was to provide an image of the complexity of the Mississippi that could support the management of the river and, by extension, of other similar situations. The need arose following a number of floods that characterised the river in 1993: these are seen on the one hand

as catastrophic events requiring engineering intervention — the river is an object and its management is functional to human needs — and on the other hand as the actions of an 'enigmatic landscape' that we need to understand better in order to inhabit it as best we can — the Mississippi is almost a subject that needs to be understood by the other living beings with which it coexists. Although still hinted at, *Mississippi Floods* provides a new image of landscape that brings together cultural, environmental and historical elements that design practice should begin to consider (Mathur, Da Cunha, 2001).

In the preceding years, a series of steps were taken to redefine some models and practices: in 1999, James Corner published *Recovering Landscape*, a collection of texts written by authors involved in landscape architecture, with the aim of recovering (to recover) a vision of landscape that could go beyond its traditional connotations — landscape as pure Nature — and instead explore its 'hidden potential' — landscape as a field of action. Within the volume, environmental and ecological parameters are defined in relation to cultural issues and the fact that in practice they have been treated mainly as technical and engineering components is criticised, as if Nature had no cultural character and as if the expressions of ecological phenomena were only to be found in Nature. The reflection on water in this volume is treated mainly in relation to the emerging environmental issues that were already starting to be taken into account at the end of the 1990s: water systems, as well as other natural components, are objects within which complex ecological dynamics develop and manifest themselves, and the proposed concept of landscape helps to understand and act within these dynamics — landscape is both indicator and victim of "environmental atrophy" (Corner, 1999).

In 1995 in Europe, particularly in France, Sébastien Marot published an article in *Le Visiteur* in which he spoke of a 'new territoriality', focusing on the transformation of the suburbs of European cities into spaces of transit indifferent to the geography of places (a 'third state' of the territory, the banlieue): it is no coincidence that ten years later another French author, Gilles Clément, will speak of a 'Third Landscape' (Tiers Paysage) that is precisely the residual spaces characteristic of the French banlieues and in general of the European suburbs, forgotten, atrophied places that could constitute one of the keys to rethinking the territory (Clément, 2005). In the light of this nouvelle territorialité, Marot proposes two ways of looking at landscape and design: (i) if landscape is understood as public space, design can be encouraged around a vision of it as a necessary resource and common good; (ii) if public space is designed as landscape, the open spaces of cities (paysage urbain) become structuring and structural spaces, no longer the 'voids' in relation to the 'solids' of the built environment. Referring to the natural elements, Marot underlines the need to understand and read the physical, cultural, geographical and historical data that regulate the territory and under this lens initiate practices in which "the site is both the starting point and the horizon": the landscape project is not integrated in the site, but allows it to manifest itself (Marot, 1995).

Thirty years earlier, Ian McHarg, founder of the Department of Landscape Architecture at the University of Pennsylvania, published *Design with Nature*, with which he became one of the pioneers regarding the relationship between landscape architecture and ecology, a discipline which at the end of the 1970s had not yet been included in the debate, but which was already considered essential for an integrated design of natural systems — design with Nature (McHarg, 1969). The climate emergency leads to a re-reading of McHarg's work, which, however, must be integrated with other issues: just as Corner criticises the fact that for a long time the role of landscape architecture was merely engineering, in the same way one cannot think of Nature without social systems, which have been neglected in McHarg's work. Social systems that have come to light clearly especially in recent decades, with the expansion of cities and the advent of globalisation that has significantly reduced distances: in this period, a new way of interpreting the territory emerges more and more strongly that tries to unhinge the dualism between city and countryside. Although Waldheim and earlier authors had already introduced this trend, since 2001 "when the population living in cities surpassed that in the countryside", talking about cities has become increasingly complex. In 2012, Neil Brenner and Christian Schmid published a short text in a book edited by Matthew Gandy in which they used the expression *Planetary Urbanization* to try to redefine the role of cities and the processes of urbanization, which have in fact taken on a planetary dimension: the scale at which urban phenomena are observed is changing, the articulation of the same, natural spaces and hinterlands are disintegrating and also becoming an expression of the city (Brenner, Schmid, 2012; Brenner, 2014). At this point, talking about the city becomes obsolete, and the term 'landscape' is used in an increasingly broad field: if the scale of the urban is enlarged, there is no longer any distinction between city and countryside, because what is outside the city also has an urban character. Brenner and Katzikis speak in this sense of 'operational landscapes', i.e. large parts of the global territories (the vast majority) that exist and are anthropised in function of the city — extractive landscapes, extensive agriculture and all the massive infrastructures that serve to connect these systems to that of the city (Brenner, Katzikis, 2020). The city and what is outside of it become a single, complex system, composed of inflows and outflows for which the city could not live without its operating landscapes and vice versa: the landscape becomes infrastructure (Bélanger, 2013; Bélanger, 2016), it is now 'dispersed', composed of intermediate spaces that are on their way to acquire different configurations and disrupt the traditional form of the city (Viganò, 2004).

On the one hand the focus is on the complexification of the urban phenomenon, on the other hand some authors concentrate on the consequences of planetary urbanization. Among the many, Moshen Mostafavi in *Ecological Urbanism* gathers a series of contributions from different authors, with the aim of (re)introducing the ecological issue in cities: it is necessary to think about a sustainable city through a multidisciplinary approach (Mostafavi, 2016). In fact, the book

brings together architects, landscape architects, engineers, artists and scientists to provide complex strategies to manage future urban transformations. The issue of Climate Change is addressed and there are important contributions on the theme of water: in particular, a research by the Harvard Graduate School of Design is presented in which the city of Almere, in the Netherlands, is analysed as an ideal case study for outlining mitigation and adaptation strategies with regard to the risk of flooding in the Dutch territory, in perfect line with the 2014 IPCC reports.

Remaining within the European context, there are other important contributions on the theme of water from an equally fragile territory: the Venetian lagoon. This is defined by Paola Viganò as an 'extreme city' due to the degree of urbanisation and water-related risks: to act in such a fragile territory it is necessary to define an integrated approach (Fabian, Viganò, 2017; Cavalieri, 2021). In fact, Marco Ranzato, architect and urban planner, speaks of water as an 'urban issue' whose relationship with the city is challenged by human beings' belief that they can control it (Ranzato, 2017).

In addition to the IUAV, other institutes have initiated research projects around Climate Change and the topic of water. *Anthropocene Curriculum*, a project of the Haus der Kulturen der Welt and the Max Planck Insitute for the History of Science in Berlin, since 2013 unites experts from multiple fields in research projects on the Anthropocene, so as to find common ground for future studies and practices with a transcalar and transdisciplinary approach. In the three-year period 2020-2022, the Strelka Institute in Moscow has launched a research programme entitled *Terraforming*, whose title indicates the transformation of ecosystems of foreign planets to make them habitable and which is obviously a reference to the human-caused environmental disasters that are making our planet uninhabitable. The research programme focuses on the 'artificial' as a key element in responding to environmental phenomena, going against any notion that advocates a phantom return to pristine Nature (Bratton, 2019). Back in the Netherlands, the *Delta Urbanism* research programme has been introduced at TU Delft, which aims to combine water management strategies with Landscape Urbanism models by studying the fragile Rhine territory. Finally, it is worth mentioning the *Habitat* research platform founded by the EPFL, which in the three-year period 2017-2020 has tackled Climate Change by questioning the possible new forms of living and the ecological, technological and social transition through environmental analyses, mapping, scenarios and projects.

Water and project

Below we present a number of contemporary projects (2010-2020) in which water plays a central role. Without any ambition to be exhaustive, the choice of projects is rather intended to investigate some of the issues raised by contemporary design, and the choice of projects was also made with this objective in mind: the archive of projects to which reference is made are considered relevant to the

theme and relevant to the issues raised. The projects thus identified define three ecategories in relation to water:
(i) Water as an object, i.e. as a medium that must be managed and designed in such a way as to meet human needs. In this case, projects mainly deal with the theme of risk and aim to treat and/or prevent environmental damage.
(ii) Water as a determinate subject, with projects and policies that attribute to the element of water a series of rights through which it becomes an institutionalised subject.
(iii) Water as a determining subject, where projects treat water as a living being capable of regenerating and revitalising ecosystems, in a condition of coexistence with them.

Water as an object[1]
With Climate Change, the risk of extreme environmental events is increasing and there is a need to design resilient systems, so that spaces can not only survive the risk, but learn from it. There are many practices that attempt to address this need, from hard engineering systems to softer approaches such as depoldering. The Hedwige-Prosper polder project, part of Belgium's Sigma Plan, is worth mentioning: the aim is to open up flood areas to protect land along the Scheldt estuary; opening up these areas to the tides provides space for water during flooding periods, thus reducing the risk of uncontrolled flooding. In Finland, the Kirkkojärvi Flood Park uses the same strategy: the park is located along the Espoonjoki River, near the city of Espoo, where there used to be a lake that was drained in 1959: the risk of flooding has always been quite high, even more so in recent years due to Climate Change. The park has therefore been divided into two areas, a wetland that holds water during periods of flooding and a higher functional area. In South Holland, on the North Sea coast, a project called Sand Motor was launched in 2011 to protect the area from storm surges: it involves beach nourishment, i.e. the placement of a volume of sand off and along the coast as to form two dunes and a lagoon between them: the dunes act as buffers against rising sea levels, according to the Building with Nature approach. James Corner himself has not only postulated definitions of new models and theories, but has also tried to apply them in a number of projects, including the South Bay Sponge, in which the concept of the 'sponge' is used to generate a resilient system to protect the South Bay from flooding; the sponge is a green infrastructure and has the role of collecting, filtering and dispersing the resulting flood waters. In Sicily, after a cloudburst in 2009 caused violent landslides in the village of Giampilieri, near Messina, Marco Navarra took part in the post-flood intervention project together with a team of hydraulic engineers. The aim of the project was not to let purely technical solutions prevail, which would only have generated new fragmentation in the village: Navarra and his team think

1. Nature-based solutions can be intended as the extreme objectification of nature. Here nature becomes an artificial device in the hands of human: the Nature-Tool.

of a 'resili(g)ent' project, in which the safety intervention is integrated with an opportunity for urban regeneration through a reconstruction operation that renewed the public space (Navarra, 2017).

Water as a determined subject
When water infrastructures are given a set of rights, they become institutions in their own right. There are a number of projects, both landscape and governmental policies, that do not use water as a means to achieve something else, but rather protect and safeguard it as a fragile subject. One of the most famous landscape architects on an international level is Michel Desvigne, and although his projects are renowned and of undoubted quality, they use natural elements as a means, a function of an objective that is aimed at human beings, whether we are talking about protection or real leisure: among the many, however, the Paris-Saclay project, whose main objective is to build a research centre in the immediate vicinity of Paris, has features that make it peculiar with respect to Desvigne's traditional projects, and to the French-speaking panorama in general. The landscape project, in addition to uniting some functional areas of the campus, has been conceived not in function of the users of the centre, but rather as an oasis of biodiversity for other living beings that are not human: one speaks of 'amplified geography' in the outer areas of the campus, which through a set of 'ecological compensation' measures counterbalance the effects that in the project lead to a loss of biodiversity (Desvigne, 2020). In the Netherlands, the Oosterschelde Nature park is worth mentioning, the result of a number of disputes concerning the Dutch Delta Works in the 1950s: instead of completely damming the river estuary, a number of local action groups managed to carry out less invasive, albeit very technical, interventions; the barrage may close in the event of particularly extreme storms, but it usually remains open to ensure a natural flow of water, which is housed in the park's wetlands and guarantees the survival of particular types of flora and fauna that would otherwise have been lost.
Still in the Netherlands, the Delta Metropolis association was founded in 2000 as an initiative of the then councillors of the main cities of the Randstad: Amsterdam, Rotterdam, The Hague and Utrecht. The aim is to provide supra-local strategies that consider these cities as a single agglomeration, thus ensuring a series of synergies between the different areas of the territory that would otherwise have gone unnoticed, through the coordination of various independent research projects on the metropolitan areas of the Eurodelta. The issue of water, in particular, is a very important one in the Netherlands: in the seminars, workshops and brainstorming sessions held by the association, it is one of the most widely and deeply discussed topics. With Climate Change, the country faces significant risks, and water management strategies are aimed at ensuring the survival of cities that are largely located below sea level, while meeting the 'demands' of these particularly fragile natural systems: watercourses deserve room for manoeuvre and respect, which the association ensures in all the projects and initiatives it coordinates. On the border between Belgium

and France, the Eurométropole Lille-Kortrijk-Tournai region was conceived with the aim of progressively abolishing the borders between countries and thinking, on the same model as the Dutch Eurodelta, of the territory as a single agglomeration, regardless of borders and allowing its inhabitants to know and inhabit it better. Within the project, Espace Bleu in particular refers to the rich network of rivers, canals and streams that criss-cross the Eurométropole territory unconcerned about borders, and which, when considered as a whole, can give way to projects that ensure the protection of ecosystems, the territory from flooding, the supply of water and its treatment in an efficient way (Viganò, 2018).

Water as a determining subject
In the following we will present some projects in which natural systems have been reintroduced to regenerate the territory: they have therefore been understood as subjects capable of determining, over a more or less long period of time, a new configuration of space that takes into account the natural element as a constituent subject and not as a means to an ulterior objective.
James Corner also talks about this in *Terrafluxus*: in the 1930s the Los Angeles River was forced into a concrete channel because of the high risk of flooding to which the Los Angeles area was subject, with an ambitious project by the US Army Corps of Engineers. Since the 2000s, a number of environmental groups have been working to revitalise the river: in 2013, a plan was recommended to restore the river's ecosystem by renaturalising some 200 hectares of wildlife habitat. Assuming that flood protection was to be maintained, a feasibility study for the LA River Masterplan was published in March 2021, which envisages revitalising historic habitat and enhancing connectivity between habitats through the re-introduction of ecological and physical processes — specifically for the channel, it is envisaged that a more natural regime will be introduced that can reconnect it to the floodplains and its historic tributaries. Opportunities for passive recreation, i.e. using the site in a passive manner with minimal disturbance to ecosystems, are included in the overall design. In Switzerland, along the delta of the Dranse river on Lake Geneva, ADP Dubois has created a small but very interesting landscape project. The Parc de Port Pinard is a project to renaturalize an old industrial area, and is designed primarily to give back the river delta its characteristic habitat: it is a work on the topography of the place, which in some areas creates higher dry zones and depressional wetlands, allowing the river to branch out and reach the lake in an un-channelled way, but creating a situation of continuity between land and water typical of some particularly large deltas. Similarly, in 2016 in Louvain-La-Neuve, Erik Dhont Landscape Architect designed a unique landscape project in the area surrounding the headquarters of the Asahi Glass Company: the aim was to enhance the site's biodiversity. Following studies of the Nature of the site (slope, orientation, type of soil), the site was organised into three types of zones: wetlands and high and low vegetation. The resulting soil remodelling project allows the creation of

a series of different microclimates and, consequently, the proliferation of a great diversity of plant and animal life.

Final considerations

Today, the reflection on the topic of water in the field of architecture and urbanism is a complex issue: theoretical models and practical approaches are multiple and sometimes divergent. The main reason for this is first of all that the literature in the field of Landscape Urbanism is relatively young, and as such still needs some time to find more definable trajectories (Sampieri, 2008). Even this aspect is actually relative: if we talk about theoretical models, the direction seems to tend towards similar objectives, which are accentuated even more by the emerging environmental problems. If we talk about a practical approach, on the other hand, at least two main directions can be recognised: more technical proposals, aimed at management and control that is as inflexible as possible, and softer ones, which instead possess some degree of greater sensitivity towards the territory.
In both cases there are potential problems: in the first case, acting in a purely technical way, as shown in the project in which Marco Navarra participated, leads to neglecting the territory and the people and, although it may solve environmental problems, it could create others at spatial and social level. In the second case, however, attributing exclusively to natural elements the role of solving environmental problems is sometimes illusory: the consequences of Climate Change are typically linked to the anthropic world, and the planet is largely man-made. If Nature was once able to manage itself and the Earth was in perfect balance, it is now too late to hope for a return to those conditions (Bratton, 2019). The role of anthropogenic mechanisms and the man-made element is crucial in the search for strategies and modes of action that arrive at efficient responses to environmental issues. Within practice, there are even more fractures based on the degree to which landscape elements are involved in the project. Sometimes the landscape project is seen as an 'accompaniment' to a more general project, and parks, green areas and blue areas have an aesthetic and leisure function: in these cases the commitment to environmental issues is still minimal, and this is the direction in which the European tradition has historically moved, since the Renaissance garden projects. However, Europe is facing important changes, and in particular some very fragile areas (such as the Rhine Delta in the Netherlands and the Venetian Lagoon) are standing out as spokesmen for the consequences of Climate Change in a very evident way, highlighting the need for more efforts in this direction. Input comes mainly from universities and research centres, and from there extends into practice: the tendency is to unite different disciplines following a holistic approach, and to combine in varying percentages practices such as architecture, urban planning, engineering, botany and natural and social sciences to come to a strategy that is as comprehensive as possible, in the literal sense of the term 'comprehend', of all the systems to be accounted for in a context that is becoming increasingly

complex, stratified and intricate.
This evolution of modes and practices is mainly linked to a change in the conception of natural elements within the project. From the moment these elements are thought of as objects, they are treated as such and in the project they have an instrumental function in fulfilling certain tasks, often related to an improvement of human practices — from the scale of public space to the more intimate one of living. If Nature is institutionalised, if it becomes a subject, the question becomes more complex and the problem of the rights of these subjects becomes part of the set of instances to be taken into consideration in the project. From here one can move in at least two directions: it is a fact that improving environmental conditions and seeking an answer to Climate Change in the project is, over a relatively long period of time, primarily beneficial to human beings; therefore, the project can be anthropocentric even if the natural element is considered in its subjective dimension. More sympathetic approaches, on the other hand, try to include a multispecies vision within this dimension: although it is always human beings who "give voice" to other species (Latour, 1993), at least there is an attempt to set up a relationship between human and non-human that is not merely instrumental. The binomial architecture-democracy has always been a slippery one, especially when the sphere widens to include other living species that do not speak the same language as us. What does the designer do in this case? Does giving other species a say mean giving them freedom or trying to interpret a language that does not belong to us? On the one hand, there is the risk of having too much 'trust' in Nature, which is unfortunately in danger of not being efficient in a context where environmental damage is mainly caused by human beings; on the other hand, how can we interpret the language of Nature if not by using technology? And, when using technical tools, is it a given that we will fall back on an equally technical project (which therefore takes little account of social systems) or is it possible to achieve a result that integrates environmental and social systems? Is environmental sustainability a condition that can be measured analytically or is it a more complex and inclusive concept?
The ambition of the essay is not to find answers to these questions, any kind of answer would run the risk of being premature and not reflective enough: the question remains open.

1.3.

a case study: the Scheldt
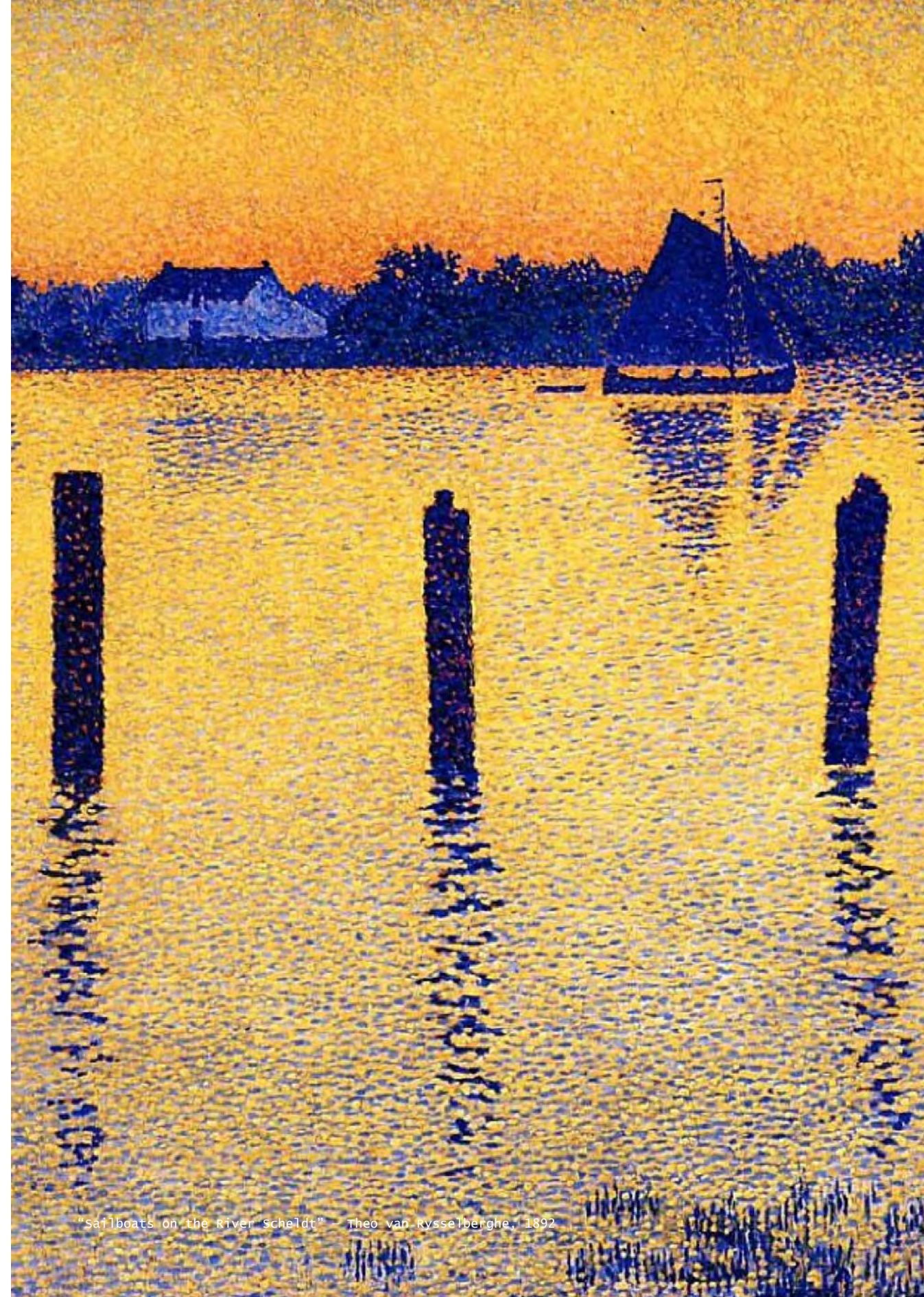
The theoretical apparatus finds its application in this thesis in a river which has been considered as an adequate example of what a postnatural subject could be. This river is the Scheldt, which flows in the Northern Europe starting from France, passing in Belgium reaching its delta, in the Netherlands. The river is called a "postnatural machine", meaning that its functioning both in the European context and in more local ones is reduced as the one of a device that is used by the human species for a series of purposes – economical, political, productive and so on. The research on the Scheldt becomes in the summer 2021, through a workshop done at the border between Belgium and France. The workshop "Eurometropolis: a blue space in transition" was focused on the crossborder territory that consists in part of the Scheldt's watershed. The results of the reflections that have been done were focused on the fact that the human contribution in shaping the river and its surrounding was not ininfluent in its ecological dynamics, hence the interpretations related to the classical division between Man and Nature were not enough to support a supposed design strategy on the case study. Reading the river as 'postnatural' came out then as a theoretical concept with the aim of developing it as a practical tool useful for future design strategy. The postnatural hypothesis was tested through literature, public and private debates, fieldwork. More in detail, the river works within at least two systems and scales. The first one is the European one, in which the Scheldt acts as a political and economic mechanism. In fact, its strategic position allows connections with other rivers – the most important are the Seine, the Rhine and the Thames. All these rivers are navigable, meaning that the economic corridors which have been established cover if not the whole European scale at least the Northern European one. What is the meaning of 'river' in this case? Does water and its flow have any importance at this scale and with these purposes? The Scheldt's riverbed is just a trace in which one can recognize the same functioning as a highway, meaning that the presence of water is absolutely subordinate to the economic and political dynamics of the countries which are crossed (and not) by it. In fact, the riverbed has been subjected to a series of transformations and control mechanisms which run against the functioning of the naturalistic idea of what a river is: these elements will be shown in detail in the following chapters. The second scale is a more territorialized one, which means that it is more related to the logic of the watershed, despite the massive presence of regulation mechanisms built by human beings. Along the Scheldt in fact, besides ports, locks, canals and all the elements which are able to ensure its physical and political navigability, one could recognize a series of conditions in order to extract water with productive aims, meaning factories and most of all a dense agricultural system spread all over the river which has historically determined the building and transformation of the tributaries in order to ensure the right supply of water.

To sum up, the Scheldt has been subjected to a series of transformations concerning both its riverbed and its whole watershed. These transformations are related to the human activity which is historically stratified over the physical evolution of the river and its surroundings. The word 'evolution' has not been chosen by case: if we intend the Scheldt as a postnatural subject, therefore we include it inside the postanthropocentric and posthuman debate, it is not anymore inserted into a binary system in which distinguishing natural and anthropic transformations is somehow meaningful: in the posthuman reflection, evolution is given by the interaction between species, therefore if we can recognize some elements which are subsequent to the human activity, we are still talking about evolution. The ecological crisis brings to the table issues which are questioning the human relationship with the rest of the planet: the postnatural discussion asserts that in order to change the perspective the meaning of what a subject is has to change. The introduction to the question of the postnatural subject as a relational one means that a proactive attitude has to consider a sort of cooperation with the other subjects, meaning that it does not have to be subordinated to one species' domination: this is both regarding the environment as an object but also the environment as a weak subject. The environment is a strong subject, capable of self-organization and for this reason able to face a constructive dialogue with the other subjects: in order to dialogue a language is needed, and this language has not to be subjugated to a dominant species. If translation is a form of voluntary manipulation of language (Hermans, 1985), every form of interpretation finds itself in a struggle between the risk of understanding and misunderstanding, translating or betraying (Cicero, 46 B.C.). The thesis deals with this problem by doing some sort of experimentations on the analysis and interpretation of the language of the nonhuman, specifically in this case the river and its geographical and atmospheric expressions. When we are dealing with a language that is not ours, the consequence is that of trying to translate it in order to make it more understandable: the thesis is careful in doing this in order to avoid every kind of iperrepresentionality which is a diffuse tendency in today's architectural and urban practices. (Thrift, 2008). The use of satellite imagery and its potentialities has been therefore evaluated as enough neutral to read and interpret the expressions of the river and its watershed: in fact, the operations conducted concern the visualization of some climatic and environmental manifestations through the widening of our spectral seeing capability. More specifically, some frequencies that humans are normally not able to see have been visualized by the GIS software in order to return a broader pattern which could describe the status of the river and its watershed in the Climate Change era. The ecological and climatic expressions of the watershed have thus produced new geographies which may be helpful starting points for a different perspective towards a cooperation between humans and nonhumans intended as postnatural subjects, therefore equally capable of choosing and organizing themselves. Nonhumans are not victims nor goods with the only aim of being used by human beings: nonhumans are equally committed as humans in the future transformation of a new, postnatural planet.

Fig. 1.

a. Polyconite operculée
b. Anax imperator
c. Portus hominum
d. Taenia intestinalis
e. Asplenium ceterach
f. Lichen cinereus
g. Vanessa virginiensis
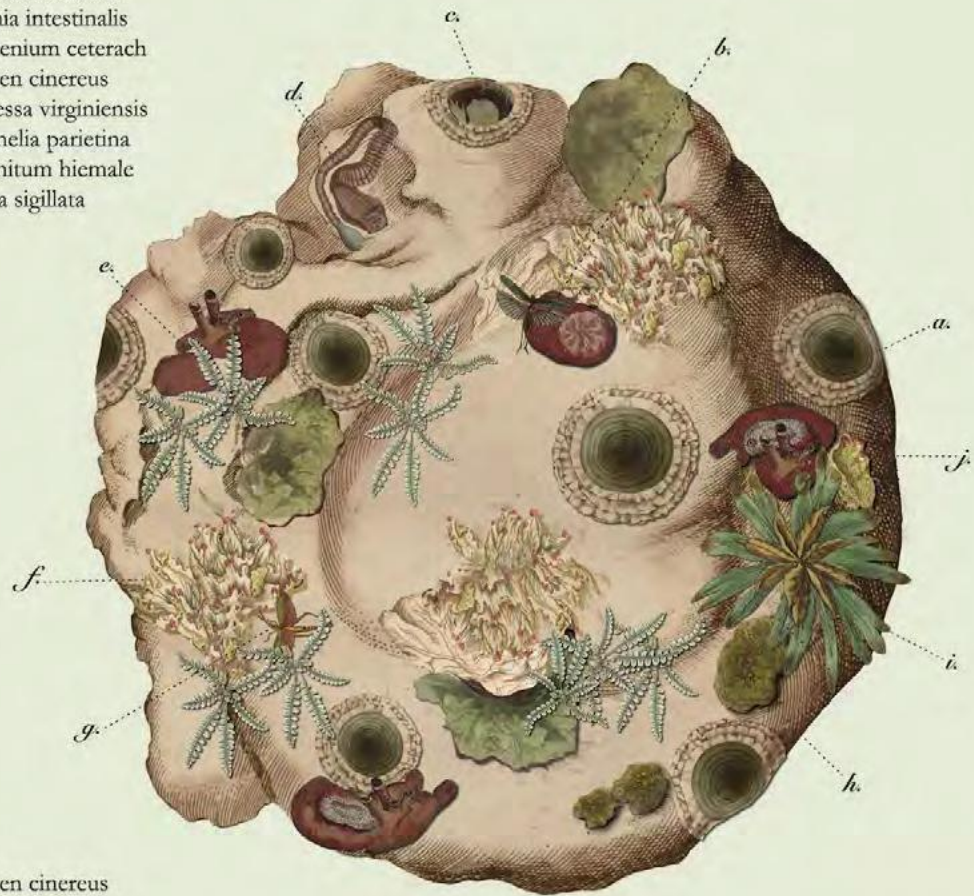h. Parmelia parietina
i. Aconitum hiemale
j. Terra sigillata

a. Lichen cinereus
b. Mons et tubis
c. Corallium rubrum
d. Aura judicae
e. Cladonia fimbriata
f. Polyconite operculée
g. Humana et animalis tubis
h. Homo non-portus
i. Ascidia aphrodite

Fig. 2.

2. THE SCHELDT. A POSTNATURAL MACHINE

2. THE SCHELDT. A POSTNATURAL MACHINE

In the following part the Scheldt as a postnatural machine is defined through two strategies.

The first one is the description of the river within the European context. At the beginning a small atlas of images gives an overview on how water has been traditionally intended in the western culture, and then a roundup on the historical events which have transformed the Scheldt in a postnatural machine, meaning those operation that were aimed at exploiting the river so as to obtain profit — political and/or economic. Then, an overview of who owns the river is given. In fact, the geopolitical conditions under which the Scheldt's management is developing are fragile and particular, since it crosses three countries (France, Belgium and Netherlands) and one of them is a federal country (Belgium is divided in three autonomous regions: Bruxelles, Wallonia, Flanders). Moreover, other than regional and national management policies, there are other sovra-national groups and associations which are trying to cover the whole basin scale and avoid breakups that obviously do not follow the ecological continuity of the river.

The focus is then moving on the watershed scale with a description of the Scheldt's valley in its topography and uses, identifying three typologies of landscape: the dense city, the diffuse city and the harbor city.

Finally, the analysis focuses on a sub-basin in the southern area of the river, more in detail between the cities of Tournai, in Wallonia, and Oudenaarde, in Flanders. The focus is useful to recognise and identify more local elements that define physically why and how the river can be intended as a postnatural machine. Locks, canalizations, typologies of crops, drainage capability of the subsoil and water collection strategies contribute to the transformation of the Scheldt, which becomes more than a 'simple' river, but a very device able to merge its own ecological features and human-made ones, even though in a not egalitarian manner.

2.1.

the European posthydrological machine

panta rhei

Water imaginaries are strongly rooted in the European cultural heritage. Apart from being considered as one good with the infinite potentiality of being exploited and extracted by human beings, water is culturally related to questions about life itself and its meaning. Water's ability to flow, to change in its form and status within dynamics which are not linear but cyclical, has always been a metaphor of human life, transformed by interactions, the flowing in time and space (Goethe, 1956). Rivers in their naturalistic meaning have always been the inspiration sources in literature, music, cinematography, and arts in general: this tradition could not be irrelevant in the management practices of water itself, starting from the building of natural parks to the transformation of riversides in order to guarantee the persistence of the human/natural relationship, or is it better to say postnatural?

Water is the source of civilization: along rivers and seas we can assist to the birth of every culture and language. Water is an identitarian element in which man is able to recognise himself. In Europe colonial activities have been shaping and permanently modifying ecosystems since Prehistory, meaning that basically every environment that one would call as 'natural' is not exempt from anthropization, in one way or another: even natural parks are maintaining specific ecosystems due to human's choice of acting less on the territory and enclosing it within borders. Choosing not to act is still a choice.

We both step and do not step into the same rivers; we both are and are not (Heraclitus, *Flux*)

The metaphor of the flowing river as always changing like human life which will never be the same again as time 'flows', is at the origin of every form of introspective reflection on what humanity is in its cultural, social, religious and political meaning. In works of classical authors, such as Heraclitus' *Flux* (*pantha rei*) and Pindar's *Olympian*, water has played a central role in defining what is the sense of our existence. Not only classical authors looked for the sense of life through the element of water: water was also at the core of a more individual and perceptional research of successive literatures and arts epoques, such as Monet's lilies in which the surface of water reflects the changes in time and atmosphere, metaphors of changes in humans' life and perspectives, and Cezanne's naked bathers and their newfound bond with a Nature that industrialization had removed from daily life, to the cinematographic tradition of water that is both metaphor of death and life as well as the background of a 'dolce vita' which slowly flows together with the life of the main characters, the imaginaries of water have always been strongly related to our culture. In almost every religion, water represents purification: Christians are baptized as well as Buddhists reach purity through bathing in the Ganges. As water cleans the body, it is also able to clean the inner, more spiritual parts of human beings (Eliade, 1959).

Even moving to more scientific fields, in astronomy the search of life on other planets is strictly connected to the search of water. Water is life, life is water. There is no living being who is able to live without water in every status: if a planet has no water, it is considered inhabitable; when we had the proof that once Mars was hosting water, it reopened our imaginaries to not-so-different-from-us forms of life which could have lived in a planet similar to Earth, dreaming of what an interaction with these other living forms would look like and what humans could have learned from the 'other'.

How have these imaginaries influenced the shaping of the territory we are living in? Imagining postnatural landscapes without water is almost impossible. Water as a hybrid technical/symbolical element is present in our tradition since the Middle Ages: in Palermo the XII century's castle of the Zisa with its *iwan* room is a majestic example of how water could be both a climatization system and a perceptional element in which one could enjoy the breeze from the sea and from the fountain by looking at the astonishing Arabic garden. On the other hand, during Renaissance, the element of water was diffusely used in gardens through fountains and canals that together with statues and vegetation created a parcour into a postnatural landscape where the relationship between man and Nature was given by contemplation. The imitation of the behaviour of water was not easy to replicate, so it must be said that any work of that kind is accompanied by an important development of technical hydraulic skills. During Modernism architects such as Frank Lloyd Wright and Louis Kahn became carriers of the organic metaphor, meaning the rejection of the simply aesthetic conception of natural elements in favour of a more respectful approach to a new, different bond between humans and (post)Nature.

With time, the relationship between the architectural practice and wa-

ter did not evolve so much in spite of the improvement of the technical skills: in general, concepts behind architectural projects are related to water as a loisir element, whereas few of them are considering water in its ecological potentialities. Riversides, waterfronts, parks and squares finds in water an element of meditation: everyone knows the beauty of a bench facing the sea.

In the architectural and urban research agendas the question is slightly different. Territories which are fragile from the ecological point of view are hosting research groups that are dealing with the territory and climate in an innovative way. To name a few, at the TU Delft the Delta Urbanism research group is facing Netherlands' risk of sinking due to the rising of the sea level: the relationship between protection from the risks related to Climate Change and spatial planning is brought on through a holistic approach which is aimed at increasing sensibility towards these topics. As said before, other research agendas are dealing with water and Climate Change, such as IUAV and the works of Fabian, Cavalieri and Viganò related to the venetian lagoon conceived as an 'extreme city': the deviation of some rivers which were meant to flow out in the lagoon in order to let them flow outside of it brought to the total rupture of the relationship between the lagoon itself and the whole water network system in the inner parts of the region. At the same time, to protect Venice from sinking, the islands that are closing the lagoon have been conceived as dykes, which, with works such as the famous and ancient 'murazzi' and other ones on the Adriatic side, are aimed at trying to avoid the inundations by the seawater. The Scheldt's case study has many similarities with these conditions: this thesis therefore tries to enter into this debate by proposing a holistic approach which is including technical skills, such as the use of the GIS in order to read climate-related data, and social studies that are trying to create a theoretical apparatus in which a design reflection could be held.

The proposal, inside this debate, is to use the skills we have gained through research and practice with a different aim. Postnature is not a weak subject, although it is a fact that the progressive anthropization of the territory has brought a series of issues because of which we will no longer be able to live in the same way we have been living. What is the solution then? This thesis tries to give some tips on how we could deal with the postnatural territory in a different way.

0   125   250   375   500   625   750   875 km

0   125   250   375   500   625   750   875 km

WATER LILIES

THE LARGE BATHERS
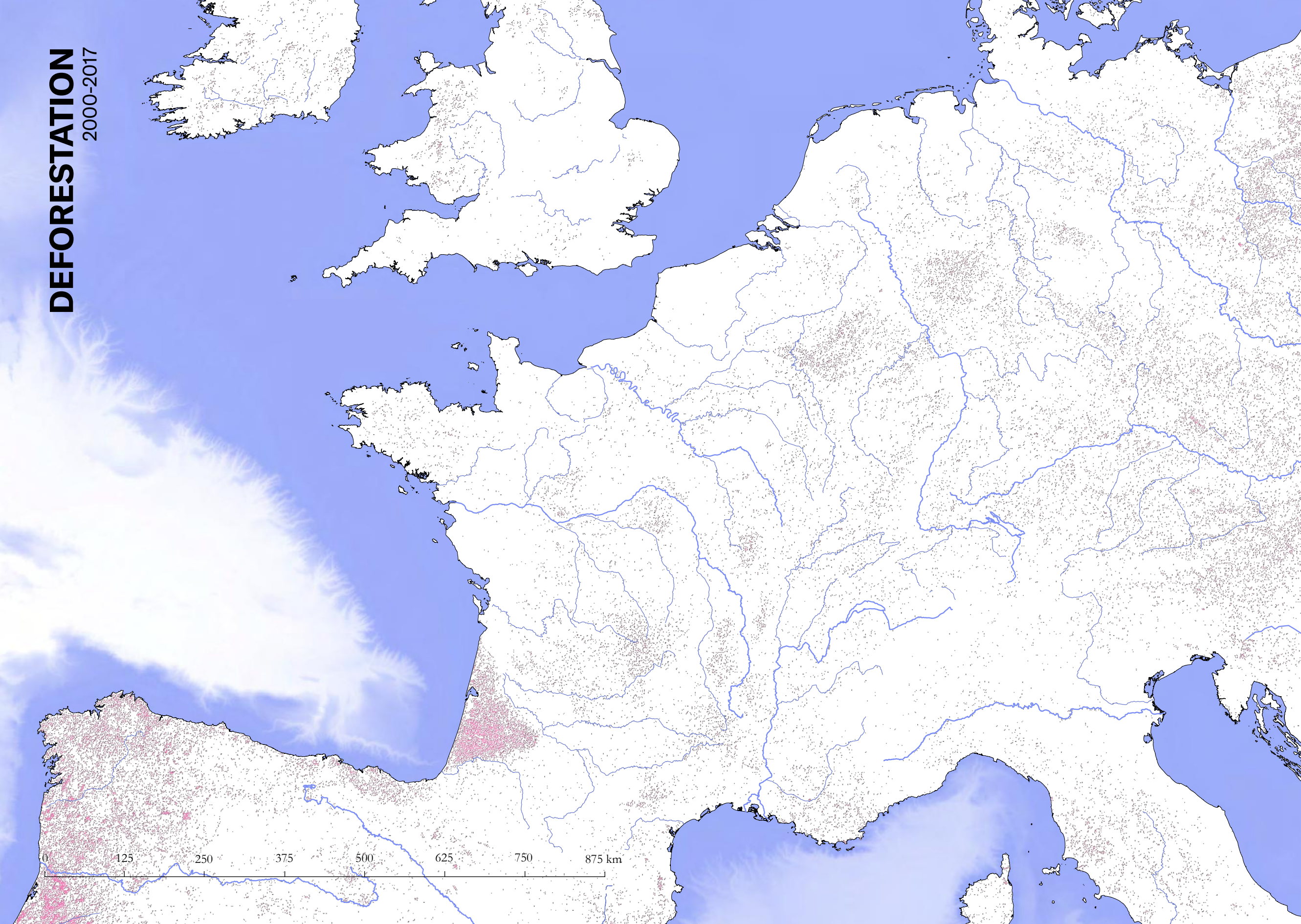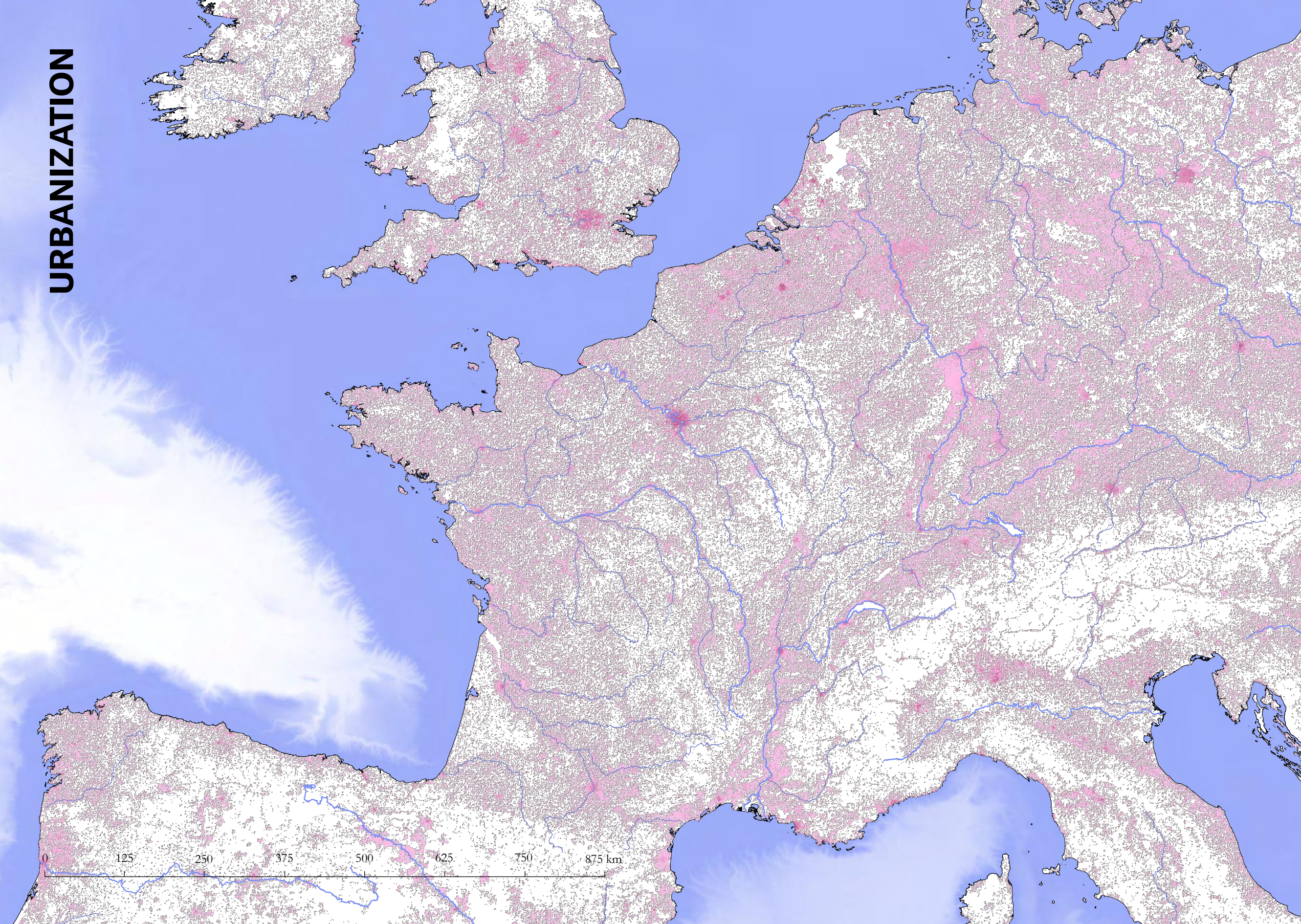
Europe's surface
water oaecn beneath ice
name: N/ASA/JPL/Space Science Institute

traces of a riverbed in Mars
name: ESA/DLR/FU Berlin

infrared map of Enceladus
(VIMS) fresh ice and ice
vapour in red
*name: N/ASA/JPL/Caltech/University of Arizona/
LPG/CNRS/University of Nantes/Space Science*

Titanus' surface
atmospherically corrected
in black possible
water-related geological
activity
name: N/ASA
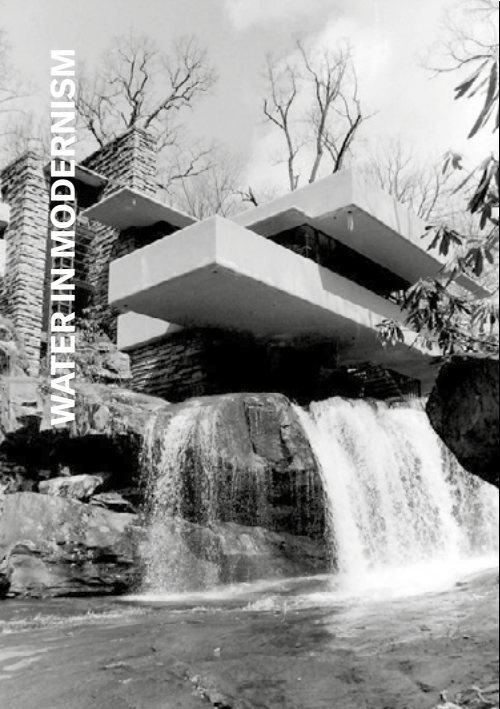
Salk Institute
Louis Kahn
La Jolla, California
1959

Fallingwater
Frank Lloyd Wright
Stewart Township, Fayette
County, Pennsylvania
1935
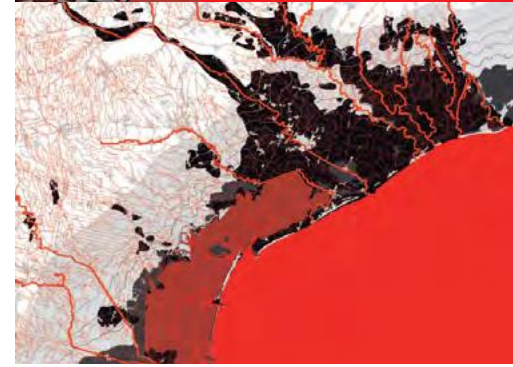
**The architectural project
of fluvial landscapes:
politics and Space**
Seminar Series
DUIED BK TU Delft
LABPROJ FAU USP
2021, Delta Urbanism

**Extreme City
Climate Change and the
transformation of the
waterscape**
Paula Viganò Lorenzo Fabian
2010, IUAV

WATER IN MOVIES

JAWS
1975 *directed by* STEVEN
SPIELBERG

WATER
1982 *directed by* CETIN
INANÇ

LA DOLCE VITA
1960 *directed by* FEDERICO
FELLINI

WATER IN GARDENS

Zisa castle
Palermo
1165-1166

Mirroring Venus
Reggia di Caserta's English garden, Caserta
1790-1794

WATER AND ARCHITECTURE
contermporary research fields
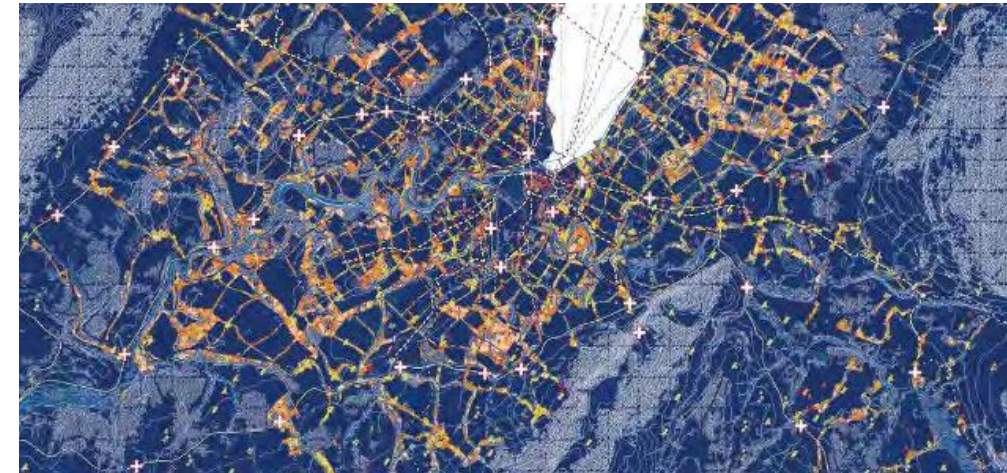
Consultation Greater Geneva
Braillard Foundation
2019, Habitat Research Center
[below and on the left]

THE UNSEEN RIVER
2020 *directed by* GIONG
DÒNG KHÔNG NHÌN THẤY

Waterafalls in Villa d'Este
Tivoli
1560-1572

how did the Scheldt become postnatural?

The Scheldt has historically been within a strategic node concerning economic and political relationships between countries. Its watershed, in fact, confines with the Seine's and Rhine's watersheds. Moreover, its delta, shared with the Rhine's one, is flowing out on the North Sea: on the opposite side there is the Thames' delta. This means having a direct connection between two of the major European capitals: Paris and London. Due to these geographical features, the Scheldt has been modelled and remodelled by man in order to ensure and maintain relationships making it part of a waterways network which was built to be exclusively an economic corridor.

In particular, focus was often given to the Scheldt's estuary, which in time was alternatively closed and opened to the sea so as to guarantee economic power to Netherlands and to harbours such as Amsterdam's and Rotterdam's ones, at the expense of Antwerp's harbour. Still today the Scheldt's access to the sea is belonging to Netherlands. Other works were aimed at transforming the riverbed for economic purposes: in fact, operations such as rectifications of meanders and widening of the riverbed were useful for the transit of bigger and bigger cargo ships. Together with this, canals were built in order to connect different watersheds and guaranteeing the connection between important poles, such as the St Quentin's underground canal, which is connecting the Scheldt's watershed to the Seine's one. Furthermore, since the Scheldt is crossing more than one country, it was necessary also to build locks to manage and regulate the flow of cargo ships (de Rive, 1835).

Hence, it is evident how the physiological functioning of the river within its watershed and tributaries lost importance in favour of an economic and political consideration of it. The scale in this case is concerning not only the Scheldt's watershed, but the whole Europe. From Paris to London, passing from Amsterdam and Rotterdam, this postnatural water network was fundamental for the historical development of Northern Europe. In the following map, a more detailed list of events considered significant for the postnatural transformation of the Scheldt is stipulated: it moves from 1600s, which were the years of the first massive modifications of the river, to today. It is important to notice that more recent events were aimed on one side at preserving the river and considering it from source to mouth: in fact, the crossborder condition does not appear useful in managing pollution issues, which are clearly more and more critical as the river lost part of its physiological behaviour.

WHERE IS WATER?

London

Tamis

NE

Antwerp

Scheldt

BE

Tournai

Meuse

Rhine

Cambrai

Ywuy

St Quintin

Paris

FR

Seine

LUX

Up:
Antwerp and the frozen
Scheldt (1590)
Lucas Van Valckenborch
On the left:
St Quentin's canal (1769)
sources: france-pittoresque.com
On the right (top image):
Arrival of Napoleon
Bonaparte, First Consul, in
Antwerp (1803) - *Mattheus
Ignatius van Bree*
On the right: Tournai (1897)
sources rtbf.be

CANAL SEINE-NORD

On the other side, the Scheldt is still considered as an economic corridor. Among all the projects in which it is involved, one has been considered as exemplificative: the connection Seine-Scheldt is a project aimed at connecting the two watersheds with a wider canal than the St Quentin's one, considered as too dangerous and obsolete. The law of mobility orientation was presented in 2018, confirming the project which is scheduled to end by 2027.

Fundings are provided by the European Union (until the 42%) and from the Hauts-de-France and Ile-de-France regions. Seven locks are envisaged in order to solve the difference of eight of the two basins; water supply is coming from the Oise and Aisne rivers, and the locks are helping in this sense also to limit the water supply and keeping water inside the canal. The pros related to the building of the canal are those of reducing the traffic on the French highways, although it has been evaluated an increase of the 199% of the building costs to effectively reduce the congestion on the streets. Critiques at the project concern the fact that the Northern European highways are considered as adequate to provide the necessary amount of goods, so some consider this project as useless and environmentally damaging.

For example, there is a section along the canal that is about a kilometer long, called the "pont-canal de la Somme": this section is built at the Somme valley, and consists of a canal raised above the valley, in which there is an area of landscape interest, whose ecosystems are to be preserved. The canal-bridge is a prime example of how in reality waterways are considered outside their physiological behavior and are used as machines with socioeconomic and political objectives. In this case Nature and artifice are separated in such a way that the canal-bridge water is only a means which connects two poles, ignoring the ecological and environmental characteristics of the rest of the hydrographic network from which they come and to which they will flow.

étangs de Haut de Cléry-sur-somme
sensible natural space

PONT-CANAL DE LA SOMME

lenght: 1330 meters
height: 30 meters

phases
2022 / launching the procedure to select candidates for the conception-realization of the bridge-channel;
2022-2024 / comptetition;
2024 / selection of enterprise groups that will build the bridge-channel;
2028 / channel-bridge conception and construction.
source: canal-seine-nord-europe.fr

2.2.

the Scheldt: postnatural landscapes and water

"A Line Made by Walking" — Richard Long, 1967

outside the machine: postnatural water

The Scheldt's geographical and administrative boundaries are dynamic and blurred. Being a strategic node in contemporary geopolitics, it presents issues tied to its governability, since its geopolitical features do not respond to its ecological continuity. This means, for example, that the issue of pollution is managed differently by each country, whereas the water as an ecological element is flowing and crossing the territory regardless of any administrative border. For this reason, lately there have been some attempts to enclose management policies within some more general directive lines: the crossborder issue diminishes, but is not completely avoided.

The actors included in the river's management vary a lot, depending on the nation considered; everyone of these actors is claiming something different, from the more unhetical economic and physical exploitation of the river until more hetical practices of preservation and restauration of its biodiversity. In any case, human's domination towards the river is a fact, whether man is claiming to destroy the river or to cure it as it is a weak subject. The thesis proposes a review of this conception. Moreover, works such as canals and dykes are completely breaking up the logics of the watershed: this means that even the most simple operation that could be defining the basin limits in their geographical connotations becomes a complex operation, made up of cuts and irrational waterways that are flowing against what should be the physiological behaviour of the river, although they are following different patterns, bending the territory in order to satisfy other needs and finding other kinds of relationalities between water and the species that interact

with it, humans included: water becomes postnatural.

Therefore the aim is that of giving an overview on how the Scheldt is managed, who are the actors involved and at what scale, and how the operations which were showed above transformed the river into a machine. Then, what are — or may be — the consequences of this historical pattern?

Urbanization and climatic issues are showing even more how the river is not anymore — or has never been — a natural element. The rising sea level risks to increase the salinity level inside the inner parts of the area: is it a risk? For who? Salted soil risks to have bad consequences over agriculture, which is indeed a consequence of urbanization and soil exploitation made up by humans during history. The territory is clearly asking for a dialogue: in order to ensure our survival in an area which is expected to become unconfortable for us, it is needed a paradigm shift. Salinization risk is something that the Scheldt is potentially able to manage really well, as well as pollution and the presence of chemicals. These are problems for other subjects, most of all human subjects. Hence relationality is needed in order to find a mediation point between the time of the river, which is at a totally different scale from the time of man. The river is then not something weak: weakness comes when humans interact with it (we are doing it and we have always done it, in one way or another) and are not able to translate and find a mediation point which ensures their survival inside a system that is changing.

WHO OWNS WATER?

Today, the Scheldt and its hydric resources is managed by the "Scheldt Water Development and Management Scheme" (SAGE) for the French side, wherease in the Wallonian side it is managed by the "Scheldt-Lys contract", but also the "International Scheldt Commission", "Water Agency" and other actors. The "ScheldeMonitor Project" is a Flemish-Dutch platform aimed at researching and monitory the Scheldt's estuary.

One of the main issues concerning the Scheldt's management is regarding the coordination difficulty of the many actors involved, whereas the river's ecological status is characterized by a territorial continuity that does not know borders and owners. In 1994 the intergovernmental body of public international law "Internationale Schedecommissie" (Scheldt International Commission) was born with the aim to protect the river through its environmental requalification: it is ratified by the signatory parties, namely France, Belgium, Flanders, Wallonia, Bruxelles, Netherlands. It has the role of coordinating the individual operations made by the single countries. Also in 1994, the "Escaut Vivant" association was born with the aim of encouraging an integrated management of the river in order to preserve its natural environments. In the same years, more precisely in 1992, "Escaut sans frontières" was born as an international association to promote the transboundary collaboration to improve the environmental features of the river.
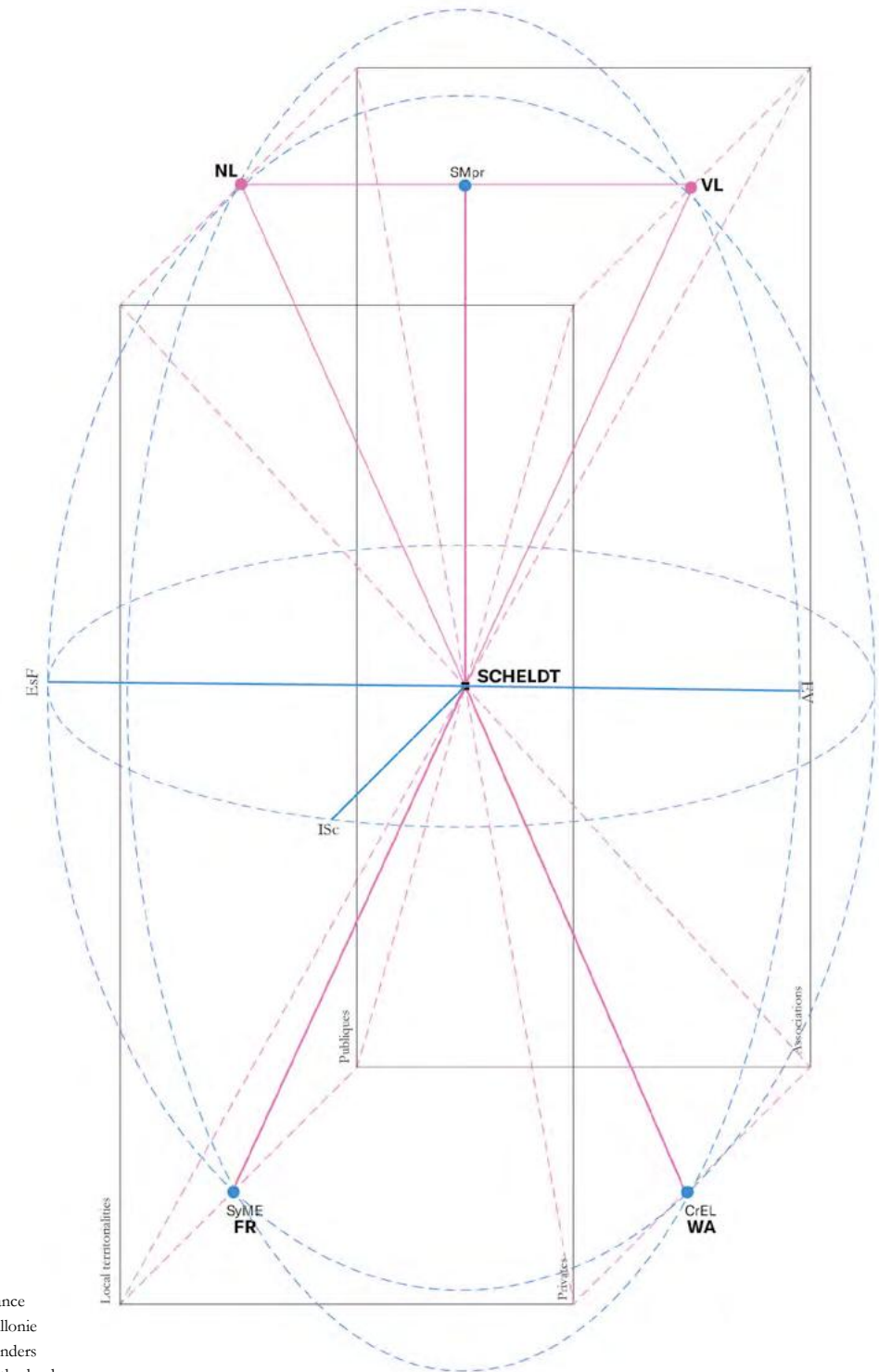
FR   France
WA   Wallonie
FL   Flanders
NE   Netherlands
▽   countries and/or partnership between countries
SMpr   ScheldeMonitor Project
SyME   Syndicat Mixte Escaut et Affluents
CrEL   Contrat de Rivière Escaut-Lys
◯   transboundary associations
ISc   Internationale Scheldecommissie
EsF   Escaut sans Frontières
EV   Escaut Vivant

national actors

Flanders — Netherlands
ScheldeMonitor Project
Privates
Flemish Dutch Scheldt Commission
Flanders Marine Institute
Publics
Vlaanderen is monbiliteit & openbare werken
Rijskwaterstaat — Ministerie van Infrastructuur en Milieu

Wallonie
Contrat de Rivière Escaut-Lys
Privates
Parc Naturel du Pays des Collines
Parc Naturel des Plaines de l'Escaut
Publics (comuns)
Comines Warneton
Mouscron
Estampuis
Pecq
Celles
Mont-de-L'Enlcus
Tournai
Frasnes-Lez-Anvaing
Rumes
Brunehaut

Antoing
Peruvelz
Publics (public services)
Service Public de Wallonie (SPW)
Province de Hainaut
Publics (intercomunals)
Ipalle
IEG
IDETA
Wateringues
Wateringue d'Anvaing
Wateringue de Kain-Pottes
Wateringue de la Rhosnes
Wateringue de Pottes-Escanaffles
Wateringue de Wiers
Wateringue d'Hollain-Laplaigne-Péronnes et
Antoing
Associations
Société Publique de Gestion de l'Eau
Société Wallonne des Eaux
and
Association des Wateringues Wallonnes, Association Escaut Vivant – Levende Schelde, Association Tournaisienne de Plongée, CCI Wallonie Picarde, Centre ADEPS de Péronnes, Centre Culturel de Comines-Warneton ASBL, Centre de Populiculture du Hainaut a.s.b.l., Centre de Populiculture du Hainaut a.s.b.l., Centre pour l'agronomie et l'agro-industrie de la province de Hainaut, Cercles des Naturalistes de Belgique – Les Fichaux, Cercles des Naturalistes de Belgique – L'Hellébore, Cercles des Naturalistes de Belgique – Tournaisis, CETA de Thuin, Comité pour l'aménagement et la Défense de l'environnement de Comines-Warneton, Commission locale de l'Eau du SAGE Lys, Commis-

sion locale de l'Eau du SAGE Scarpe Aval, Commission Wallonne d'Etude et de Protection des Sites Souterrains CWEPSS asbl, CRIE de Mouscron, CRIE d'Harchies, Ecole de Plongée le Corail Club, ECO-VIE asbl, Enclus Environnement, Escaut sans frontières, Fédération du Tourisme de la Province de Hainaut, Fédération Piscicole et Halieutique des sous-bassins de l'Escaut et de la Lys, Fédération Unie de Groupements d'Eleveurs et d'Agriculteurs Asbl, Fédération wallonne de l'Agriculture, Fondation Rurale de Wallonie, Foyer socioculturel d'Antoing, GREEN asbl, Internationale Scheldecommissie-Commission Internationale de l'Escaut, La Maison de Léaucourt Asbl, Le Gardon Estaimbourgeois, Le Paradis des Pêcheurs Ramegnies-Chin, Le Rotengle d'Or Peruvelz, Les Pêcheurs de Léaucourt, Les Pêcheurs d'Obigies, Les Pêcheurs du Petit Large, Les Pêcheurs Réunis Calenelle, Les Pêcheurs Réunis Laplaigne, LYS Nature, Maison du Tourisme de la Picardie, Maison du Tourisme du Tournaisis, Maison wallonne de la Pêche ASBL, Natagora Centre Ouest Hainaut, PCDN de Comines-Warneton, PCDN de Mouscron, PCDN de Tournai, PCDN de Frasnes-Lez-Anvaing, PECQ asbl, Peronnes Yacht Club, Port Autonome du Centre et de l'Ouest, Port de plaisance de Peruvelz, R.C.N.T Royal Club Nautique de Tournai, Réserve Naturelle et ornithologique de Ploegsteert, Société Royale Forestière de Belgique, Syndicat d'initiative de FRASNES-LEZ-ANVAING, Team Van Den Eynde Péronnes.

France
SyMEA (SAGE, CLE)
Public
State
Associations
Collective territorialities
CA de la Porte du Hainaut
CA Valenciennes Mêtropole
CC du Pays de Mormal
CA Maubeuge Val de Sambre
CC du Pays Solesmoiss
CA de Cambrai
CA du Caudrésis et du Catésis
CC de la Thiérache Sambre et Oise
CC du Pays du Vermandois

sources:
sage-escaut.fr
symea.net
crescautlys.be
scheldemonitor.org

A POSTNATURAL WATERSHED?

0   28   56   84   112   140   168 km
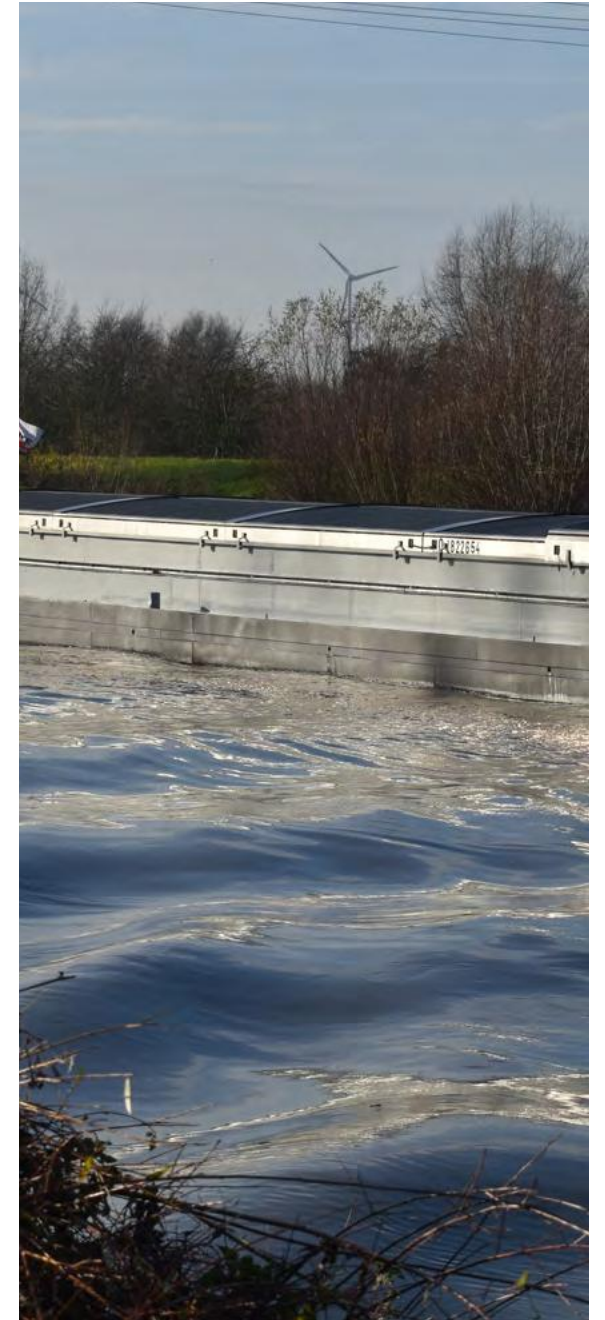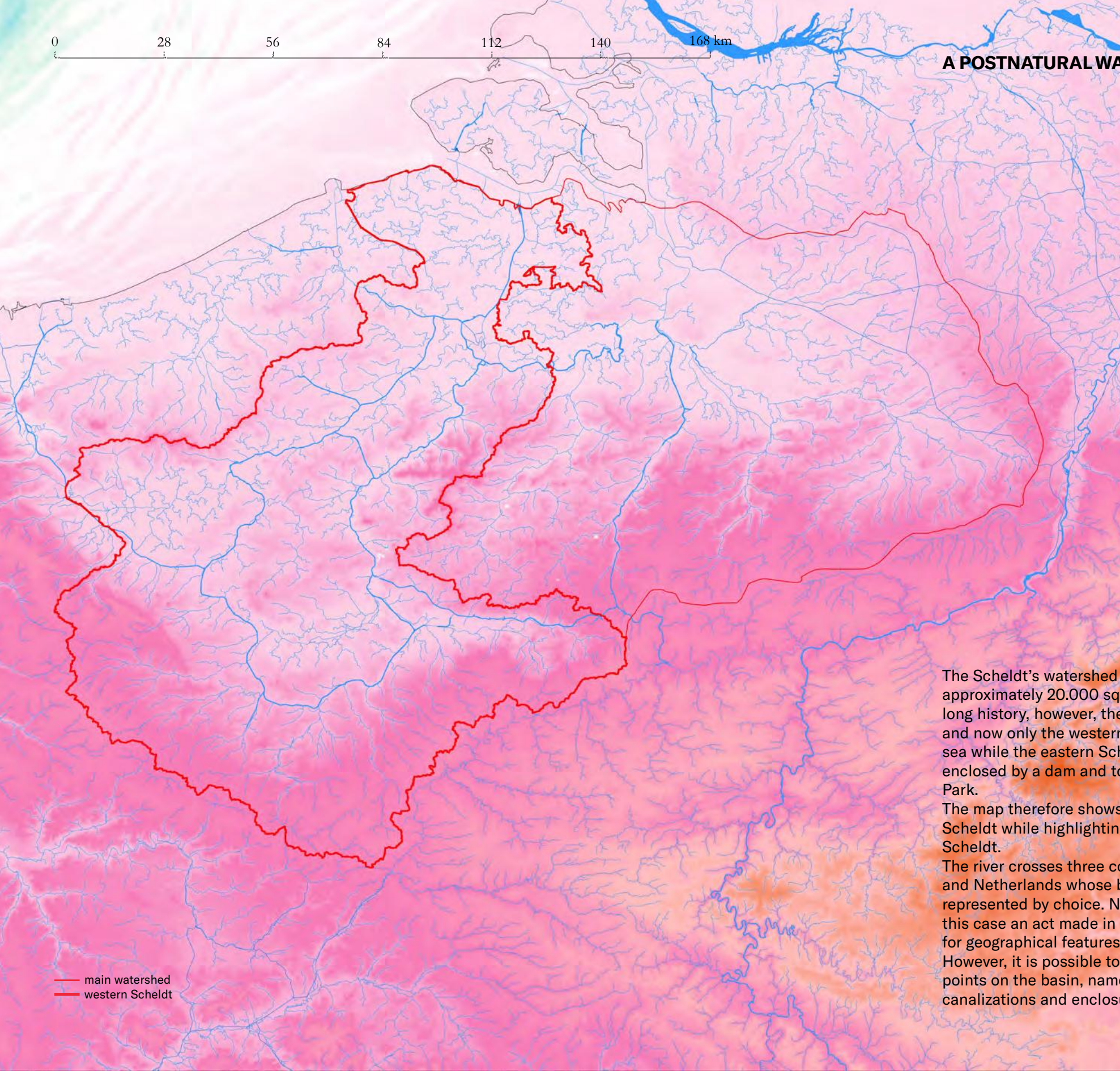
The Scheldt's watershed covers an area of approximately 20.000 square kilometers. Along its long history, however, the delta has been divided, and now only the western Scheldt has access to the sea while the eastern Scheldt, in the Netherlands, is enclosed by a dam and to this day houses a National Park.

The map therefore shows the main basin of the Scheldt while highlighting that of the Western Scheldt.

The river crosses three countries: France, Belgium and Netherlands whose boundaries were not represented by choice. Not representing is in this case an act made in order to let some space for geographical features to express themselves. However, it is possible to notice some rupture points on the basin, namely those produced by canalizations and enclosures.

main watershed
western Scheldt

principal cities
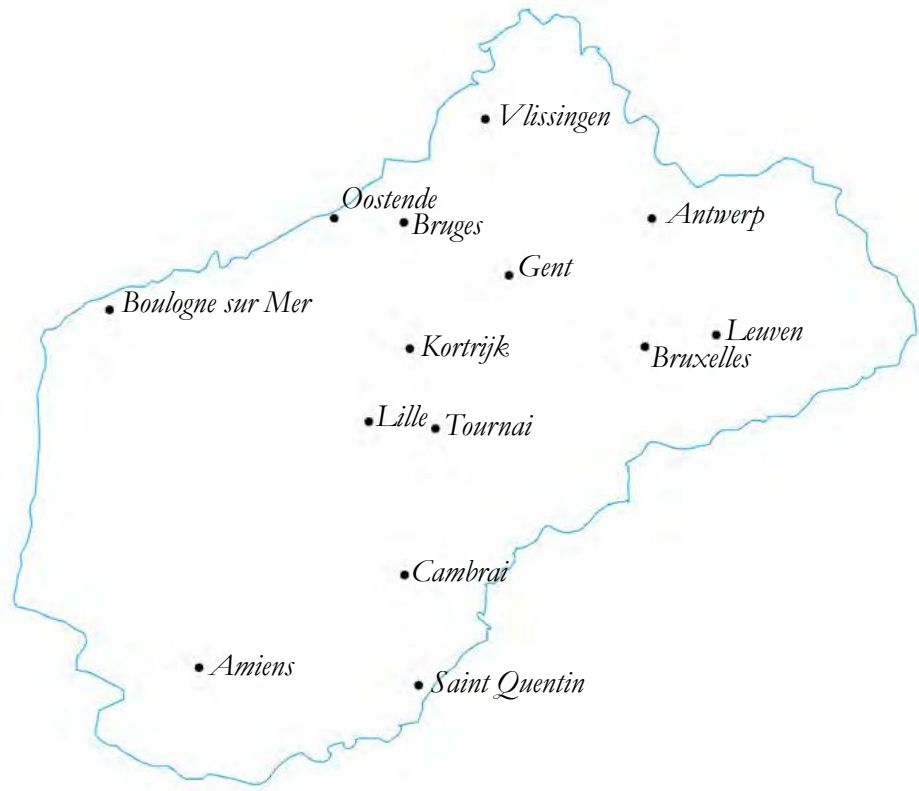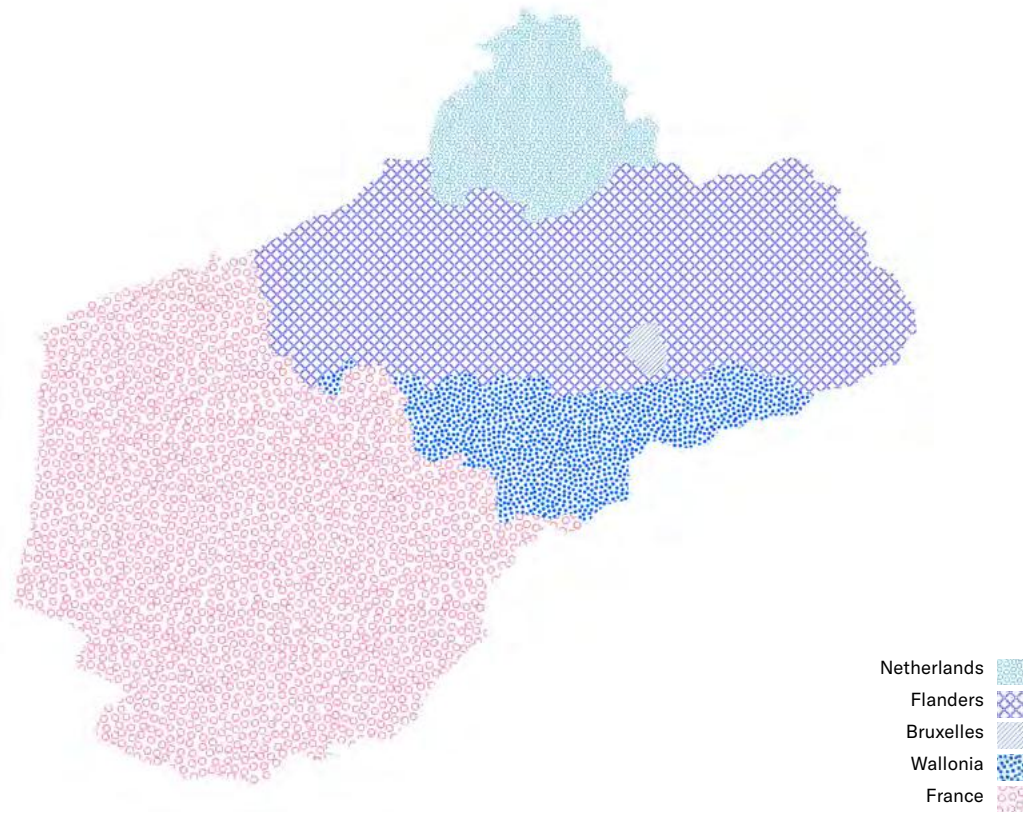
competent authorities

Netherlands
Flanders
Bruxelles
Wallonia
France

water status

strongly modified
artificial
natural

chemical state

bad
good
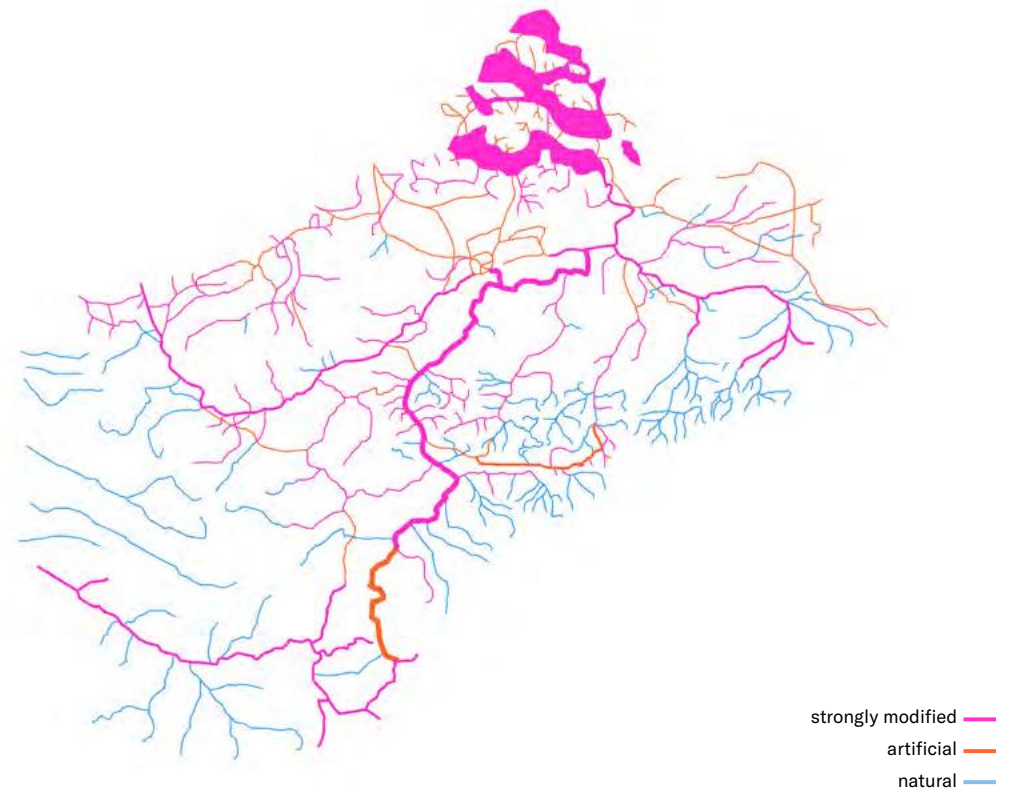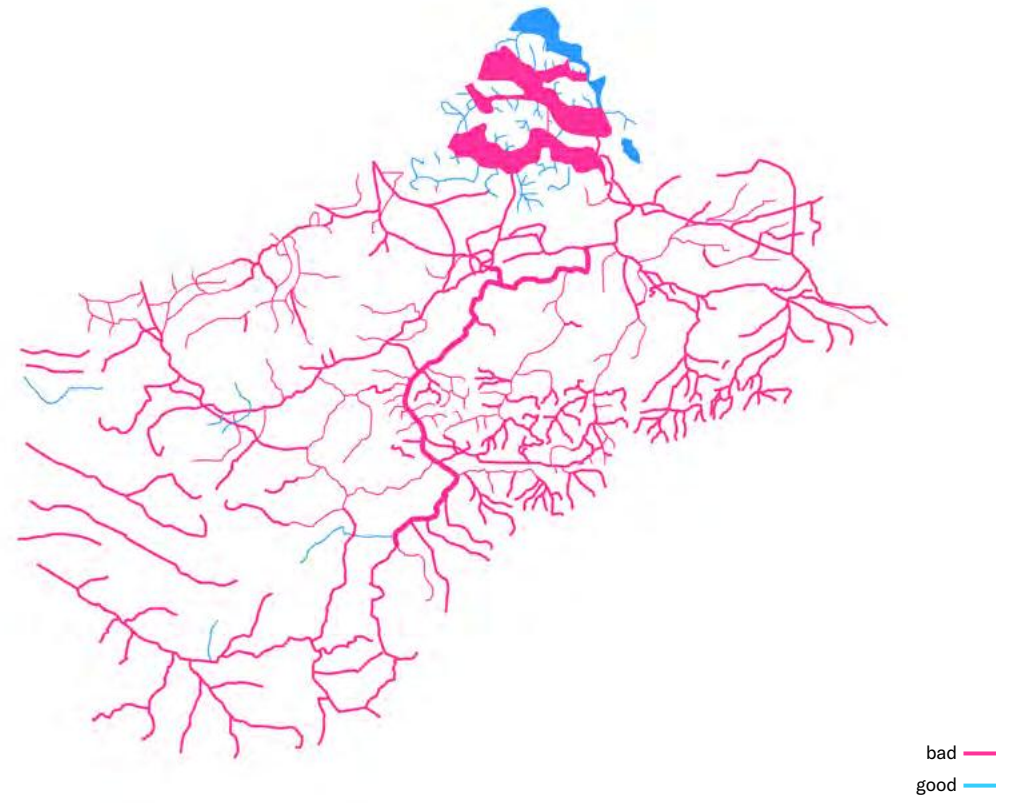
TIDAL INFLUENCE

With its 355 km in length, the Scheldt is one of
the slowest rivers in europe. This implies that the
tidal influence is quite far from the mouth: in fact,
it reaches up to 160 km from the mouth, more
or less at the city of Gent, which is part of the
Belgian hinterland. In fact, it can be seen that the
watercourse right from Gent starts to become wider
and wider until it reaches the large port of Antwerp,
the last city before the outlet to the North Sea.
The influence of the tide involves, among other
things, a number of risks related to salinization. In
fact, in cases of drought, the river level tends to
lower and sea water tends to enter: by consequence,
water would tend to turn from fresh to salty,
compromising a number of activities related to the
river, first and foremost agricultural ones.
The map on the left shows an index, which is called
NDWI (Normalized Difference Water Index), useful to
identify superficial water bodies. The calculation of
the index is very simple, as it is a combination of two
bands, NIR (near infrared) and the green band of the
visible spectrum, through the formula shown below.

Antwerp

Gent

water

urban areas
land

$$NDWI = (\;\text{"GREEN"} - \text{"NIR"}\;) / (\;\text{"GREEN"} + \text{"NIR"}\;)$$
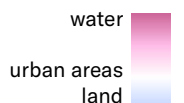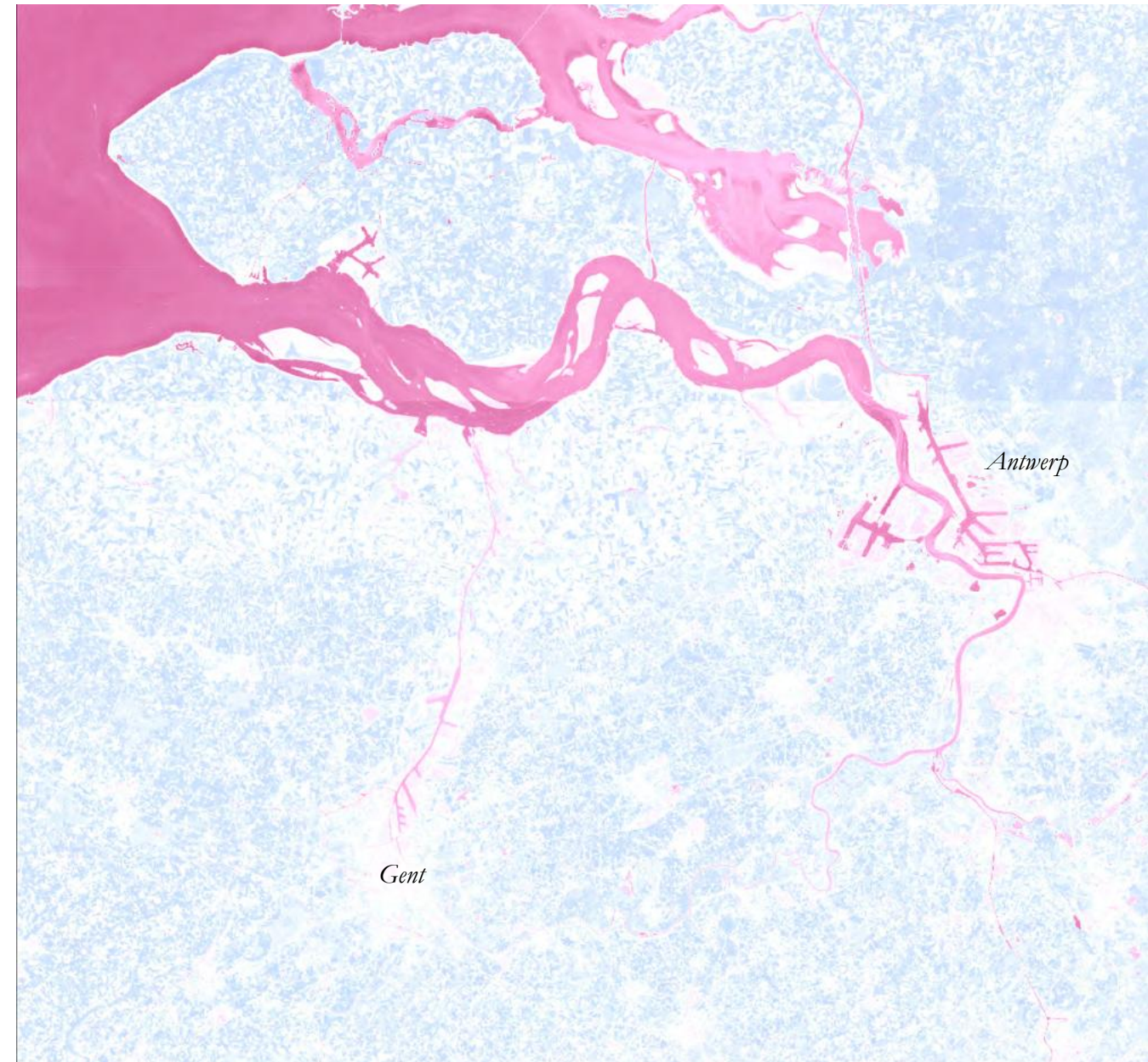
ABSENCE

The lower part of the Scheldt is instead characterized by a dense agricultural system (in dark blue) spread all over the basin, as well as urban areas — in light pink. In fact, agriculture is the main way in which the surface of the soil is exploited in the Southern part of the Scheldt's basin. This leads to a series of operations of water management that bring to the table some issues, mainly related to how the river, its tributaries and in general the whole water network has been bend so as to obey to what was the market demand. Canalizations, building of dykes, locks and rectifications are just some of the operations that were made in order to ensure the functioning of agriculture in this area. These operations will be analyzed more in detail in the following chapters of the thesis.

Also in this case, the map on the left is obtained by an index, in this case the NDVI (Normalized Difference Vegetation Index), useful to gain informations on the status of vegetetation through its capacity of reflecting light. The bands used for the calculation of the index are the NIR (near infrared) and the red interval of the visible spectrum.

Gent
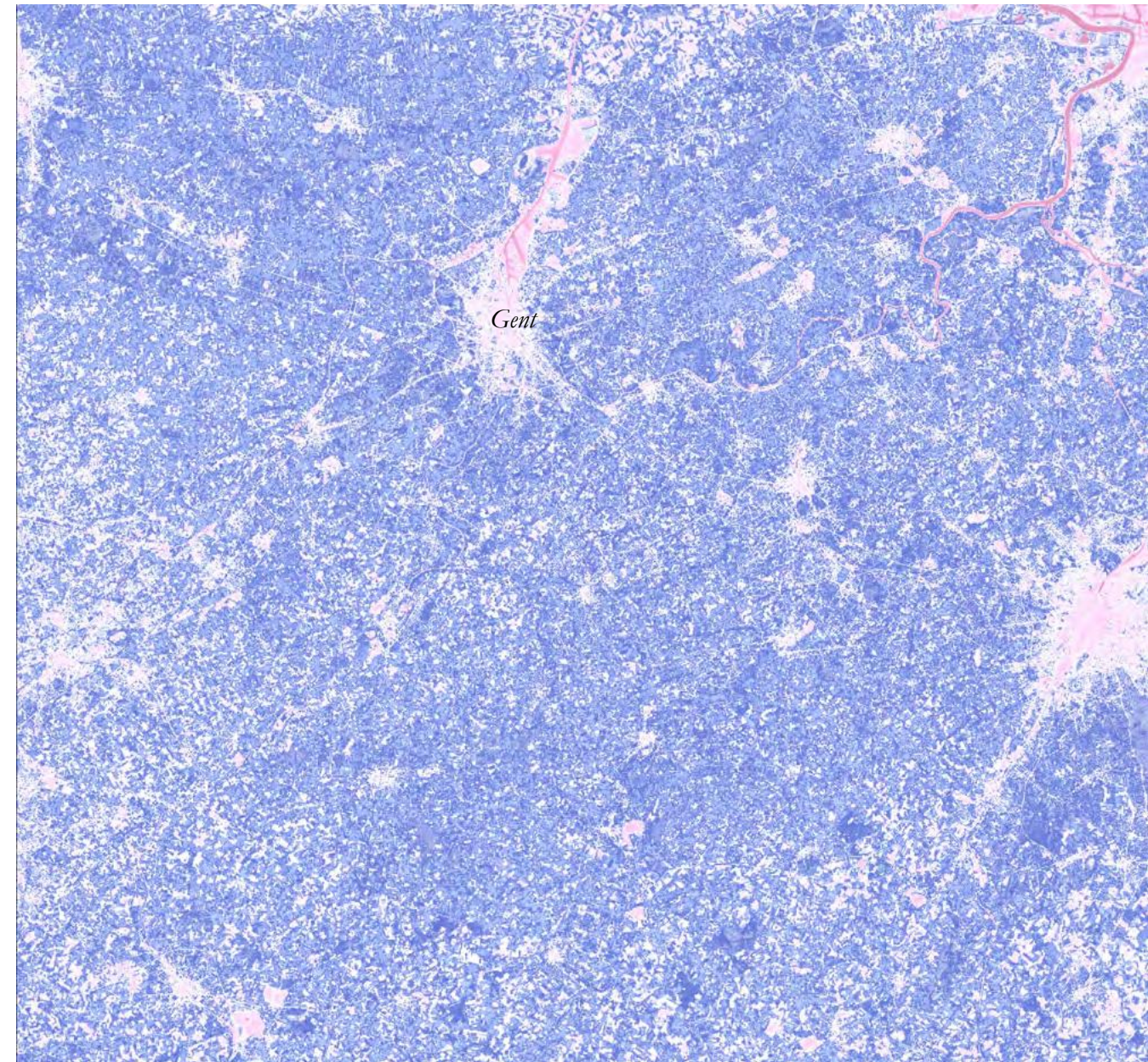
vegetation
agriculture
buildings
water

NDVI = ("NIR" − "RED") / ("NIR" + "RED")

inside the machine: postnatural landscapes

What is the context in which water as a postnatural element is developed? Northern Europe is well known for its diffused anthropic activities, which vary from agriculture to factories, affecting the infrastructure network and the settlements, that are always more spread onto the territory. What is the role of the Scheldt as a postnatural river in it? Which subjects does it meet and how does it relate with them?
In the following section the landscape(s) that the river is meeting are described, in their use and in their geographical location on the basin. In particular, three kinds of landscape are recognised: the dense city, the diffuse city and the harbor city.
The southern part of the Scheldt's watershed is hosting what has been traditionally named as the *dense city*, namely the typical European condition in which ancient nucleus led to a spotty expansion of the settlements, leaving out the countryside. It corresponds to the northern French area, with important cities such as Lille, Valenciennes, Cambrai. The Source of the Scheldt is in this region, corresponding more precisely to the territory of Saint Quintin. While the Scheldt flows, it crosses the French boundary arriving in Belgium: here, the landscape changes. Now we are dealing with the *diffuse city,* in which the distinction between countryside and settlements is more blurred and undetermined (Indovina, 1999). Agriculture fields and buildings are mixed horizontally and a hierarchical construction is more difficult, if not impossible, to find. This territory corresponds to a generally more urbanized territory, in which also the infrastructure network is denser because it has to accompany the diffused mix of uses the area is hosting. It

is indeed the part in which the river has been more anthropized, or infrastructured, in order to satisfy the vast and different uses. In this area cities such as Tournai, Oudenaarde, Gand, are important nodes that were born and developed in function of the river and its economic utility.
The third landscape that has been recognised was that of the harbor city: the Scheldt's estuary, shared between Belgium (Flanders) and Netherlands, is composed by big strategic nodes such as Antwerp, and, by consequence, hosts different kinds of infrastructurations of the river compared to the ones on the inner part. These works are principally aimed at guaranteeing the continuity of the Scheldt intended as an economic corridor: in fact the Scheldt's estuary, flowing out on the North Sea, is meeting the Thames' estuary, which means that the Scheldt in its linearity is an important connection that begins in France and ends in the United Kingdom, known for being two of the most fluorishing countries in Europe. The harbor city then is all focused on the importance of postnatural water, but it's also very subjected to climatic risks such as the rising sea level. In fact, works such as dykes and enclosures are present in this area, to ensure a regulated water management by man and avoid as much as possible flooding risks, coastal erosion and subsidence.

0　　　　28　　　　56　　　　84 km

urban areas
non irrigated arable land
agriculture
pastures
forest
marshes
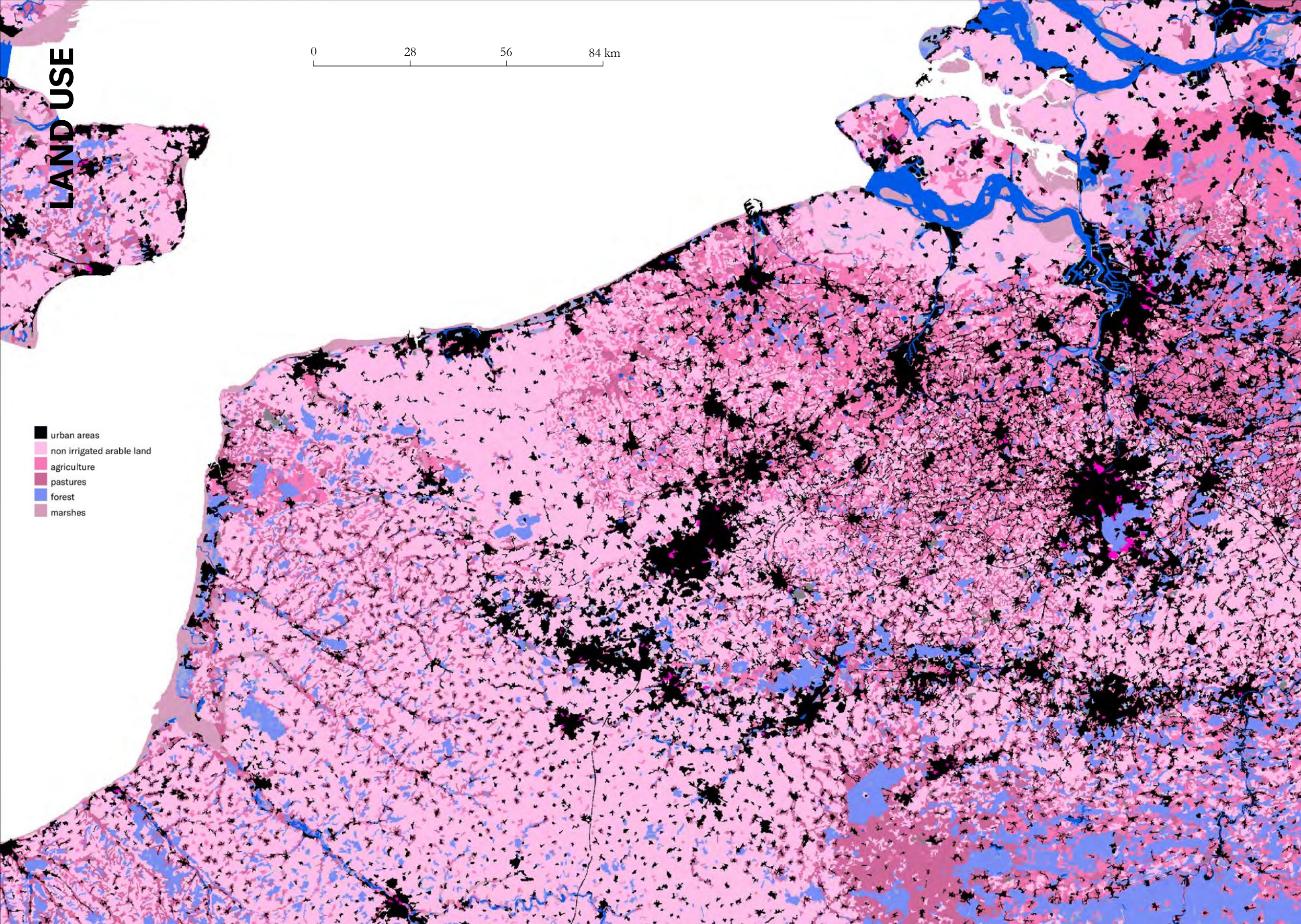
THE DENSE CITY
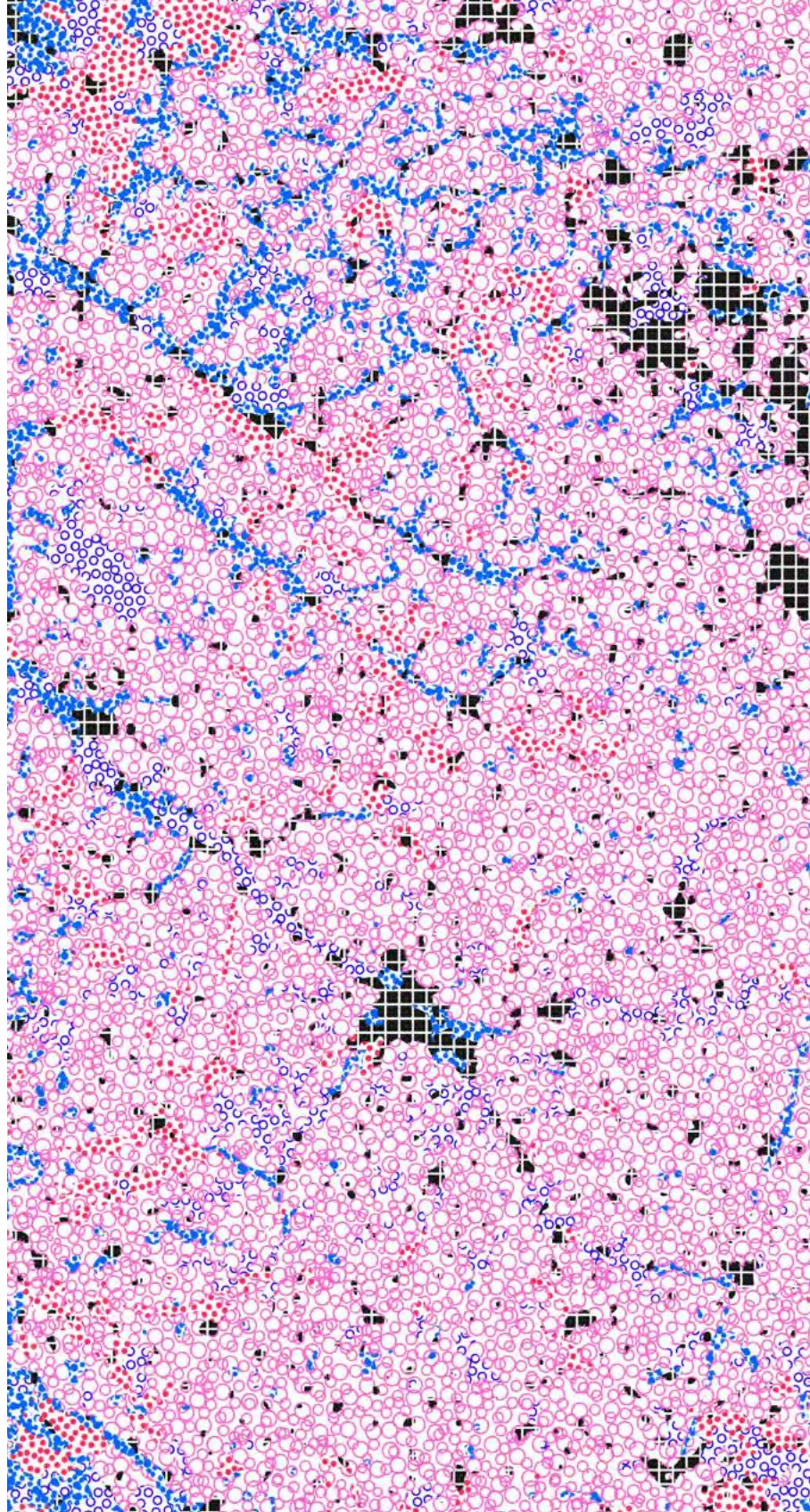
THE DIFFUSE CITY

urban areas
non irrigated arable land
agriculture
pastures
forest

THE HARBOR CITY

| | urban areas |
	non irrigated arable land
	agriculture
	pastures
	forest
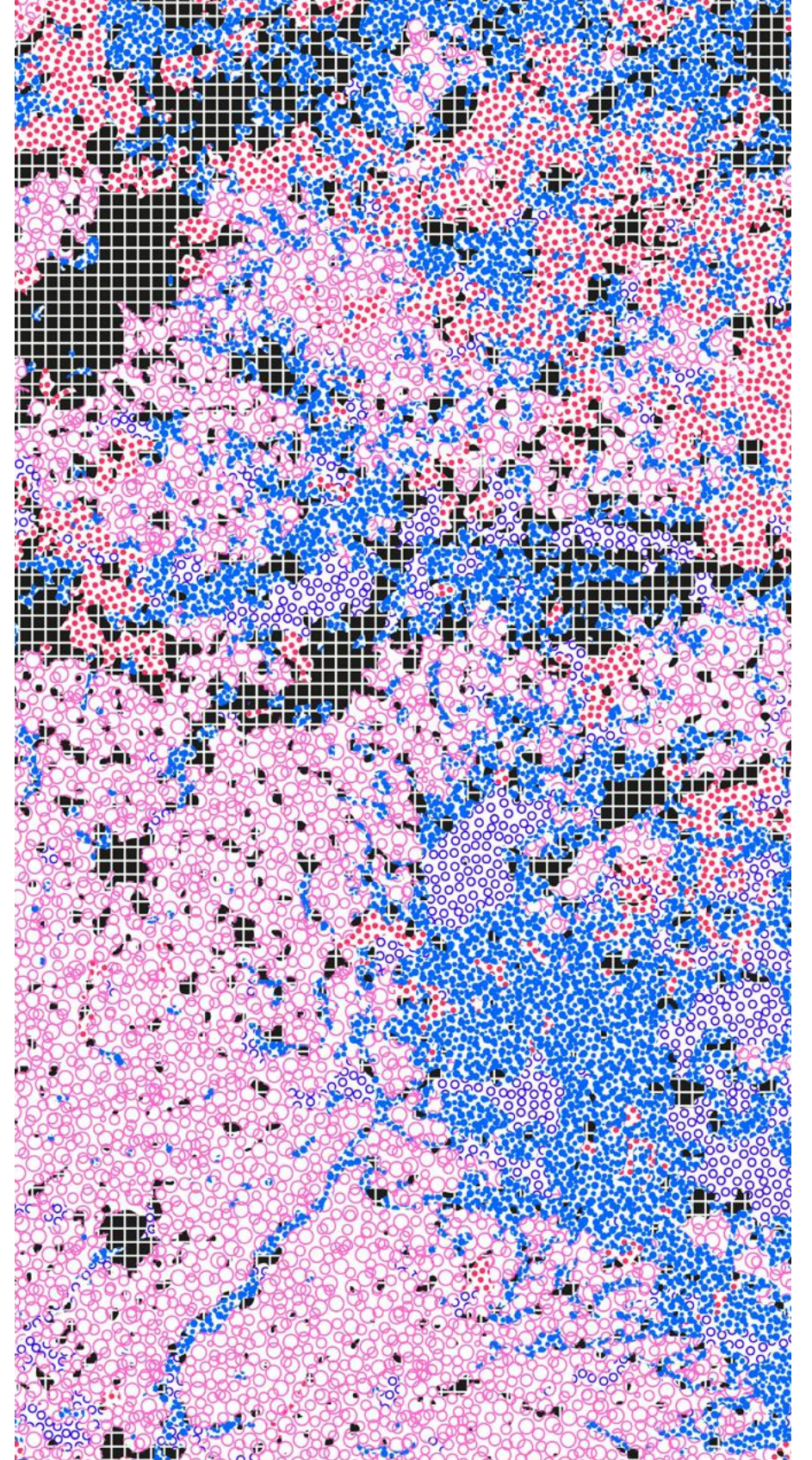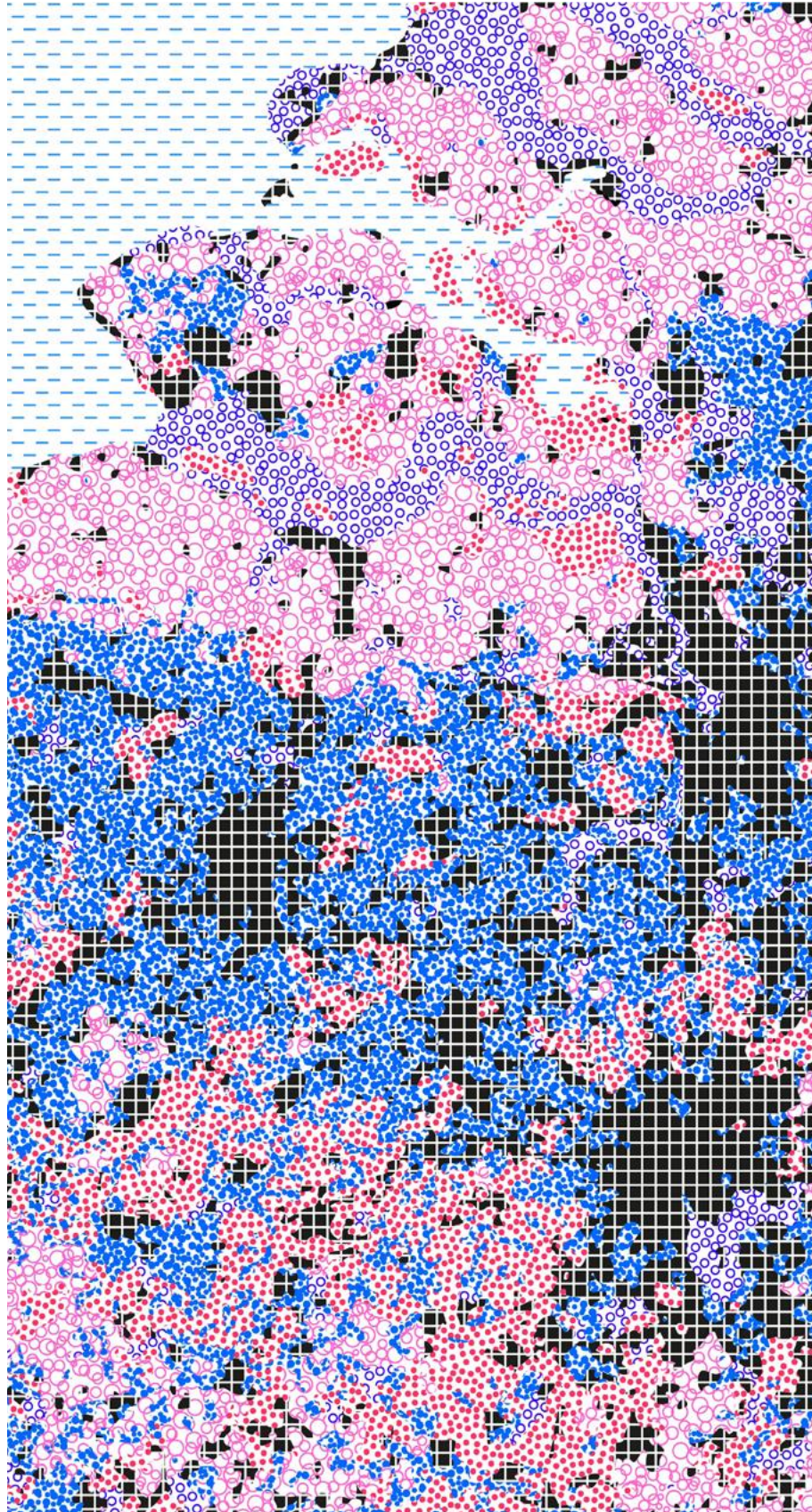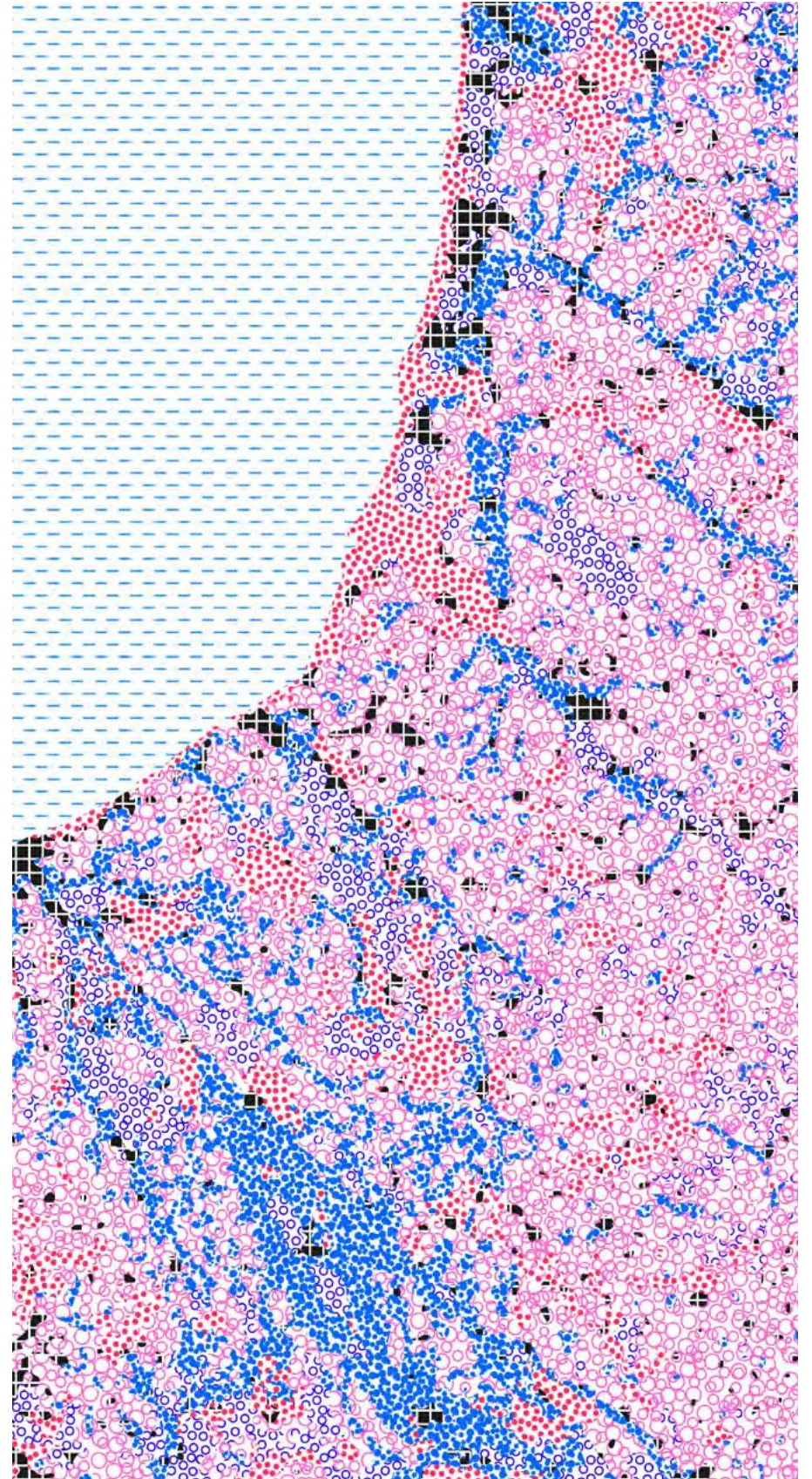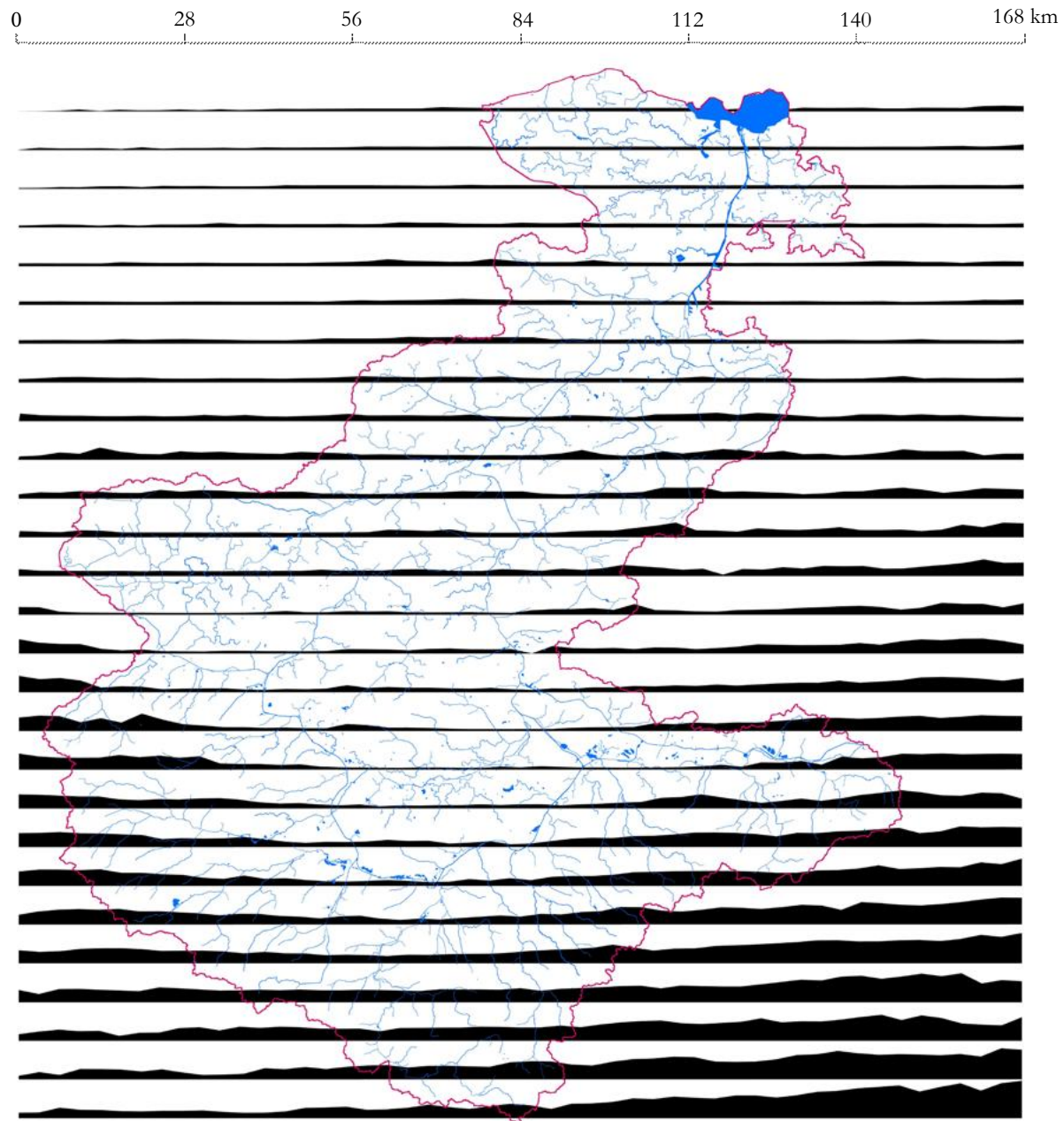
The valley of the Scheldt is characterized by a soft topography, as it can be seen by looking at a series of sections which are cutting the surface through regular distance intervals. The sections are the result of a stretched relationship between the lenght in plan and the height of the reliefs: the aim is therefore that of giving an idea of the topography distribution over the basin.
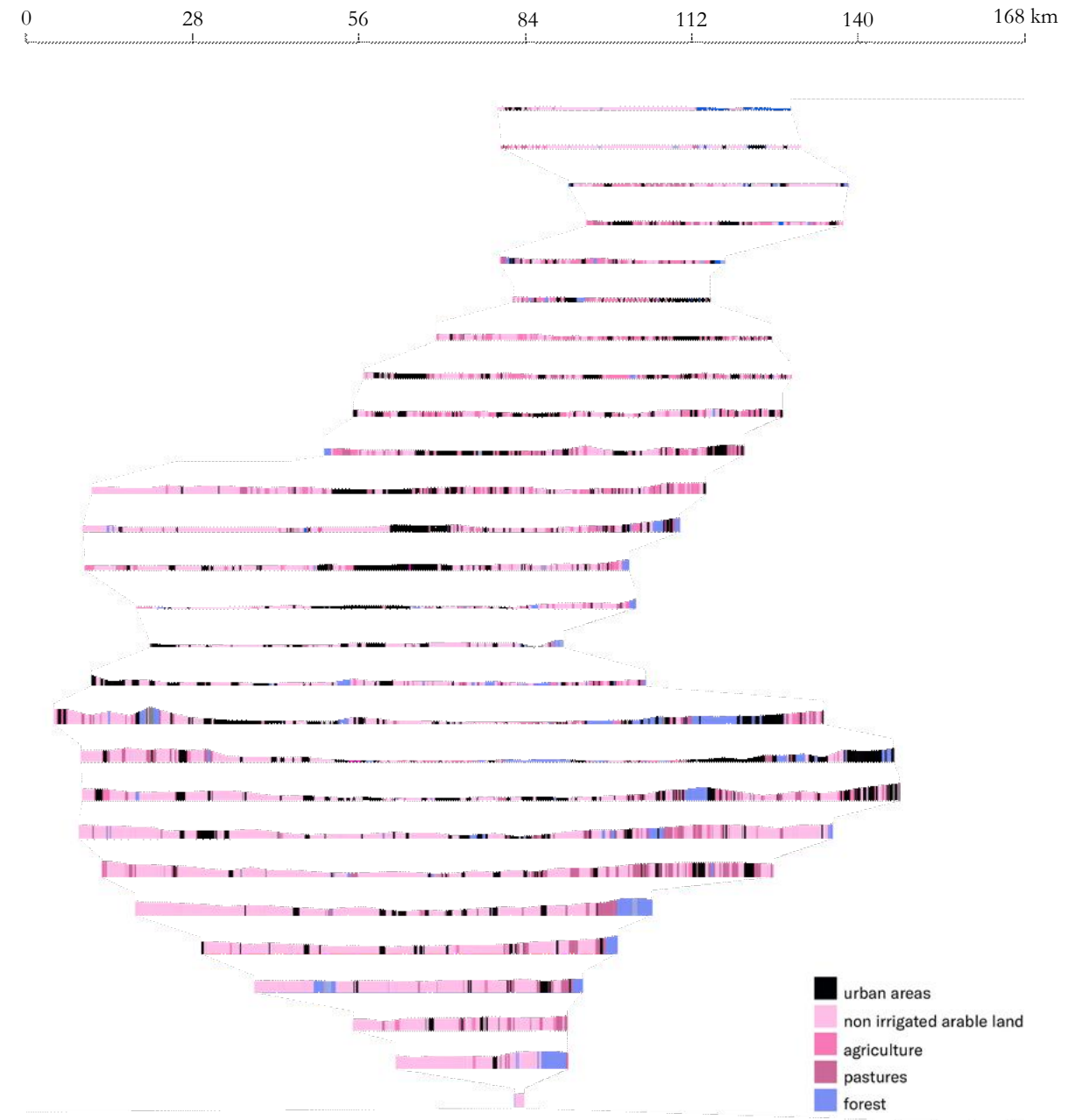
The second operation was that of showing how land use is distributed in function of the height over the sea level rather than in plan, as shown in the previous map. As it can be seen, forests and urban areas tend to be over the higher reliefs, whereas pastures, arable land and agriculture fields are located on the lower parts of the valley.

2.3.

disassembling the
machine
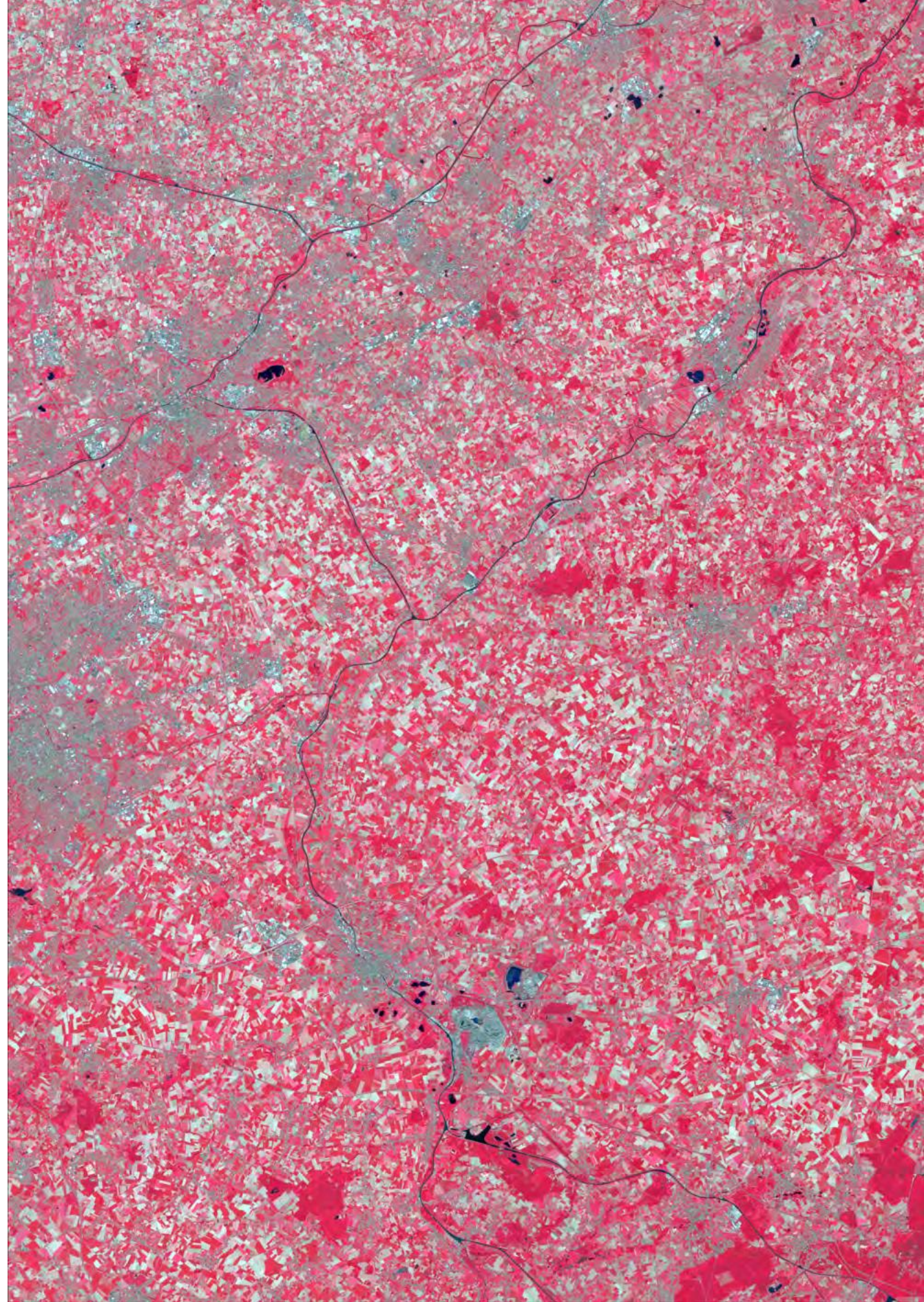
2.3.1.   how the Scheldt became a machine

The sub-basin taken into account for the disassemblation of the postnatural machine in those that were considered as its constitutive elements is inscribed in a 30 km x 30 km square.
As of now, the analysis will focus on this sub-basin, trying to decompose it.
It is a crossborder territory between Wallonia and Flanders, in Belgium. In fact the first important nucleus that can be find is Oudenaarde, in Flanders, and the last one is Tournai, in Wallonia, which is one of the last cities before arriving in France. The methodology with which it was chosen to carry on the analysis was that of firstly showing the general features on the map of the whole sub-basin, then zooming-in so as to see more in detail, making use of a grid made by 5 km x 5 km squares.

5 km

5 km
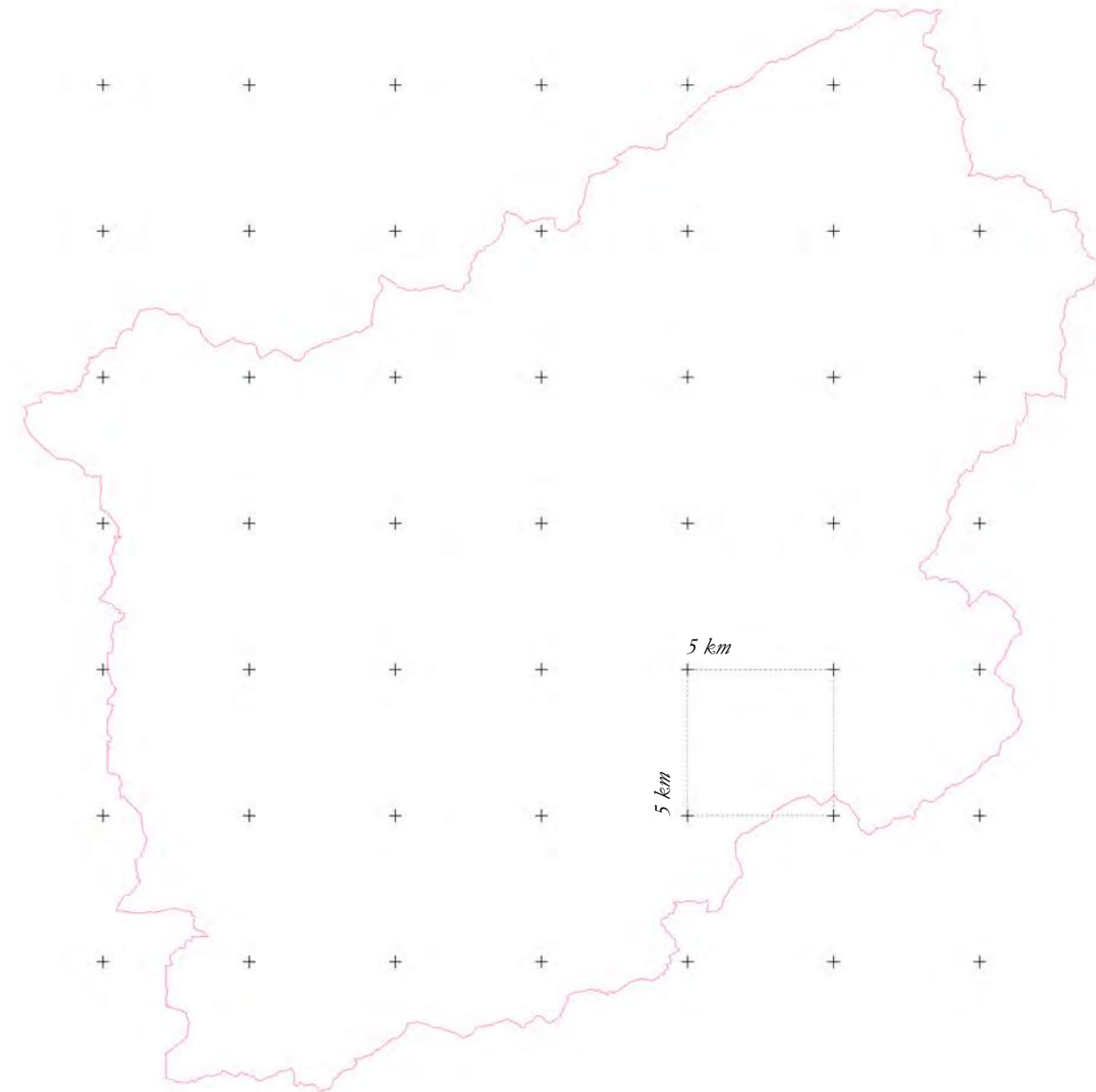
postnatural traces

The first operation that was done was a study of how the trace of the river was physically altered during history. In particular, two historical maps were analysed. The first one is the well-known Ferraris map, drawn in 1777, which covers the whole Belgian area. At that time the area taken in consideration used to host the first settlements and crops, whereas the riparian area of the Scheldt was almost untouched, leaving then space for humid areas in which the soft topography allowed the formation of complex meanders.

However, even on the Ferraris map we are able to recognise the first, small works of canalization of the tributaries in order to cover the agricultural system.

The second map is extracted from the 1841's *Atlas des Voiries Vicinales*, that was mainly aimed at showing the infrastructure network of the area. In fact, while the trace of the Scheldt is recognisable, it is almost impossible to understand the status of agriculture and settlements development around the area. The Scheldt is still full of meanders: however, some rectification works are recognisable, mostly those concerning the more crooked ones, with the aim of facilitating the navigation of always bigger cargo boats, that needed a softer curvature compared to the 1777's ones.

The trace of the Scheldt on these two maps was then overlapped to the contemporary condition of water bodies. The result is showed successively more in detail. As expected, the first thing that catches the eye is the massive rectification of the Scheldt, which has now no meanders, whereas the soft topography could allow their formation. Another

a.

today
1777
1841

CAN THE POSTNATURAL SPEAK?

Scheldt. A postnatural machine
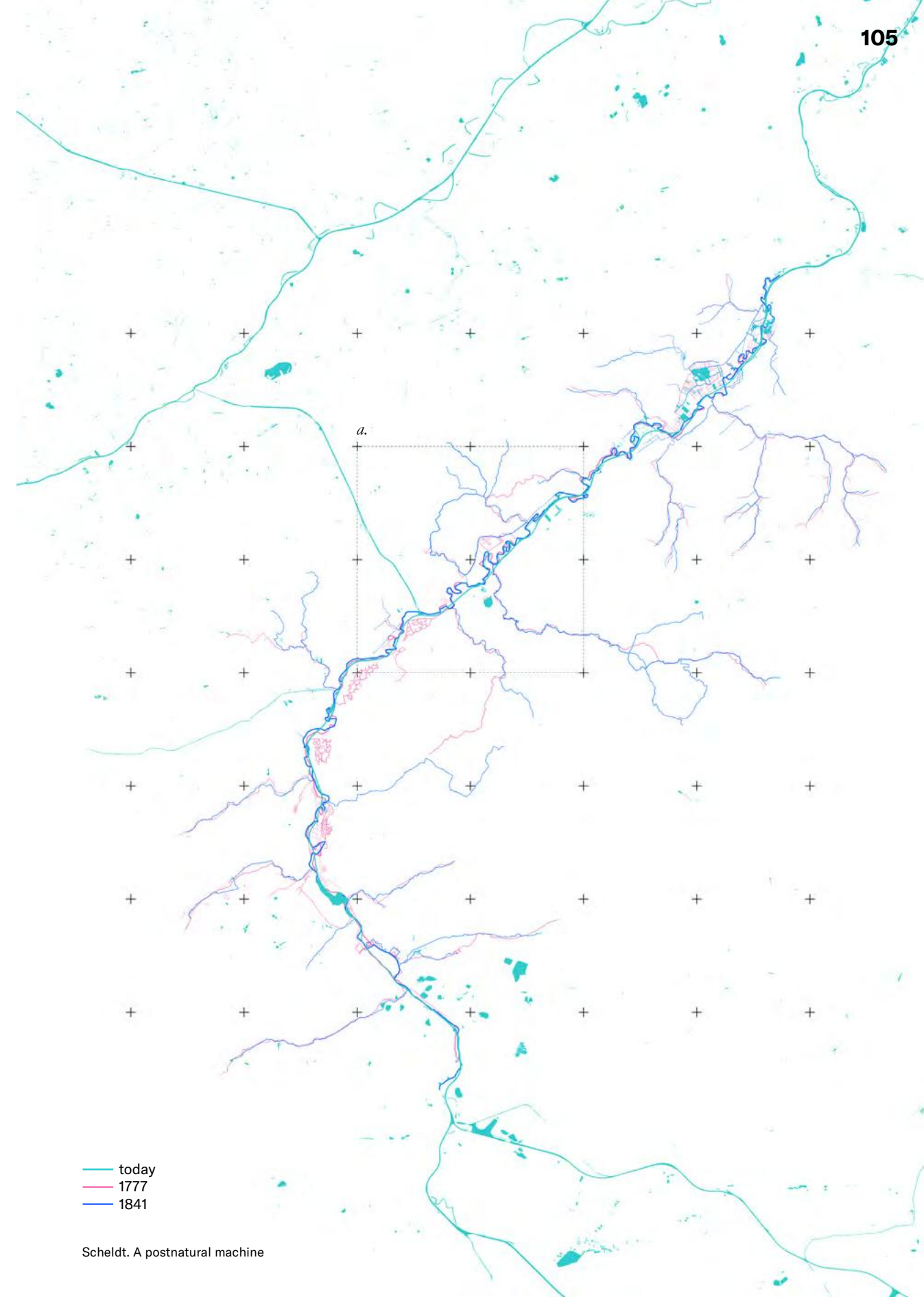
significant change was the addition of a series of canals, such as the one that connects the Schedlt to the Lys river, which is breaking up with the logic of the watershed of the topography. These canals, in fact, were built to ensure navigation continuity between important poles, without taking into consideration the ecological continuity and physiological behaviour of the river.

Along with canals and rectifications, also the tributaries network was amplified and rectified in order to provide water for the fields, which now constitutes mostly of the way in which the land is used in the sub-basin into account. Together with the loss of the meanders, also the riparian area along the river is dropped in favour, again, of agricultural development, showed in black on the zoom shown beside. However, the trace of the old meanders remains on the territory and becomes a place with the potentiality to host different kinds of biodiversity, whereas the main trace of the river is reduced to be a navigation route for vessels and cargo ships.

In addiction to the 1777 and 1841 maps, in the next pages is shown another satellite image taken in 1971. The river in those years was basically the same we can see today, but 1971 was a significant year for the southern part of Belgium. In fact, it is the year in which almost all the modern canals were built. The image is in black and white, making it hard to recognise and distinguish crops from settlements; however, it is possible to see the canals that were under construction at that time. In particular, it is shown a zoom on the canal Scheldt-Lys, that is connecting the two rivers and in particular the city of Tournai and the one of Kortrijk, in the Flemish side of Belgium. It is possible to recognise the building site and the canal under construction; in general, looking carefully on the whole map, one could recognise various situations of the same kind.

a.
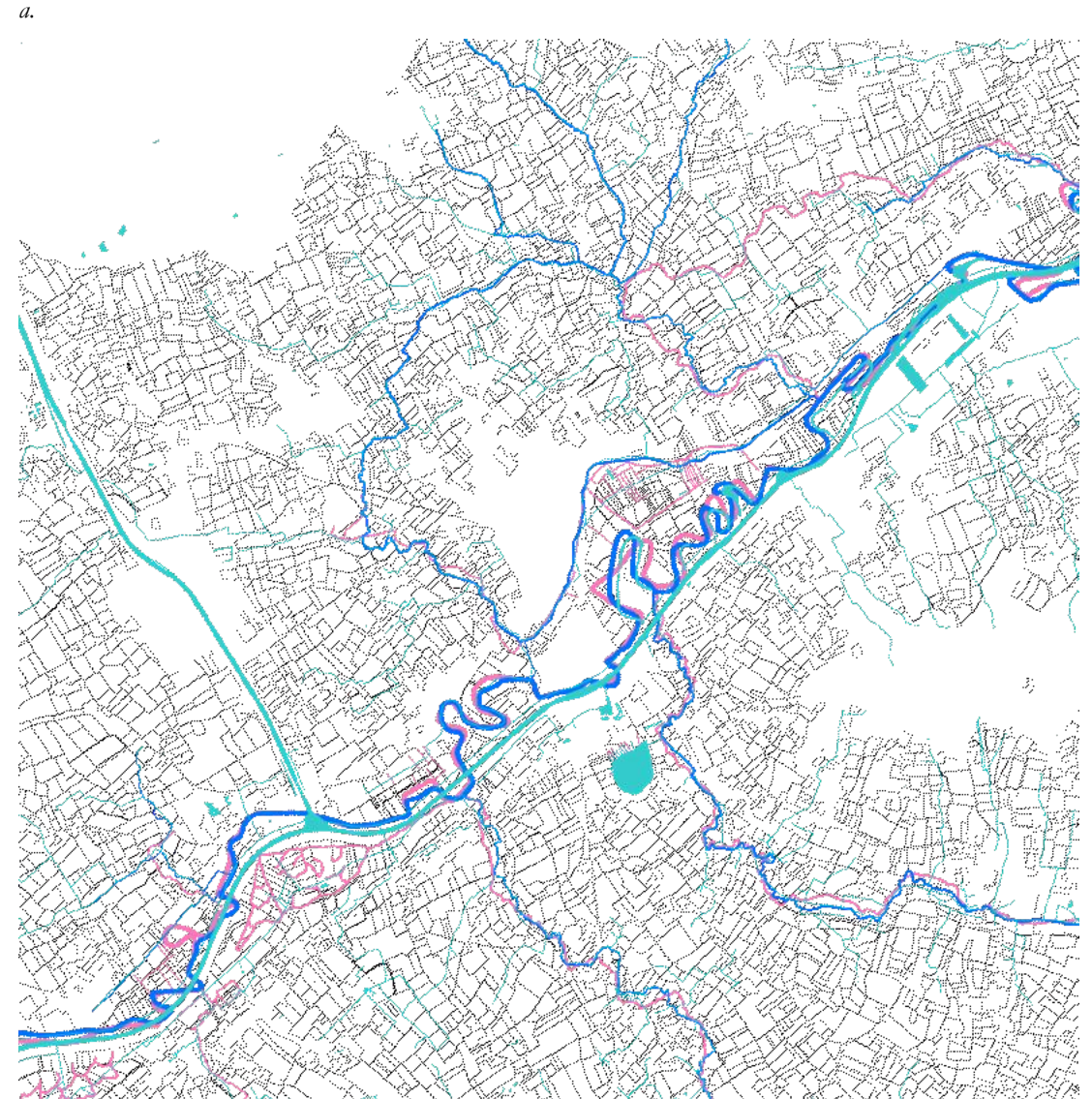
Both historical maps (1777 and 1941) were analyzed in order to obtain the trace of the Scheldt at those times. The two traces were then overlapped with todays' water bodies so as to retrieve where, how and when the river was touched and manipulated by man.

a.

a.

1777

1841

a.

1971
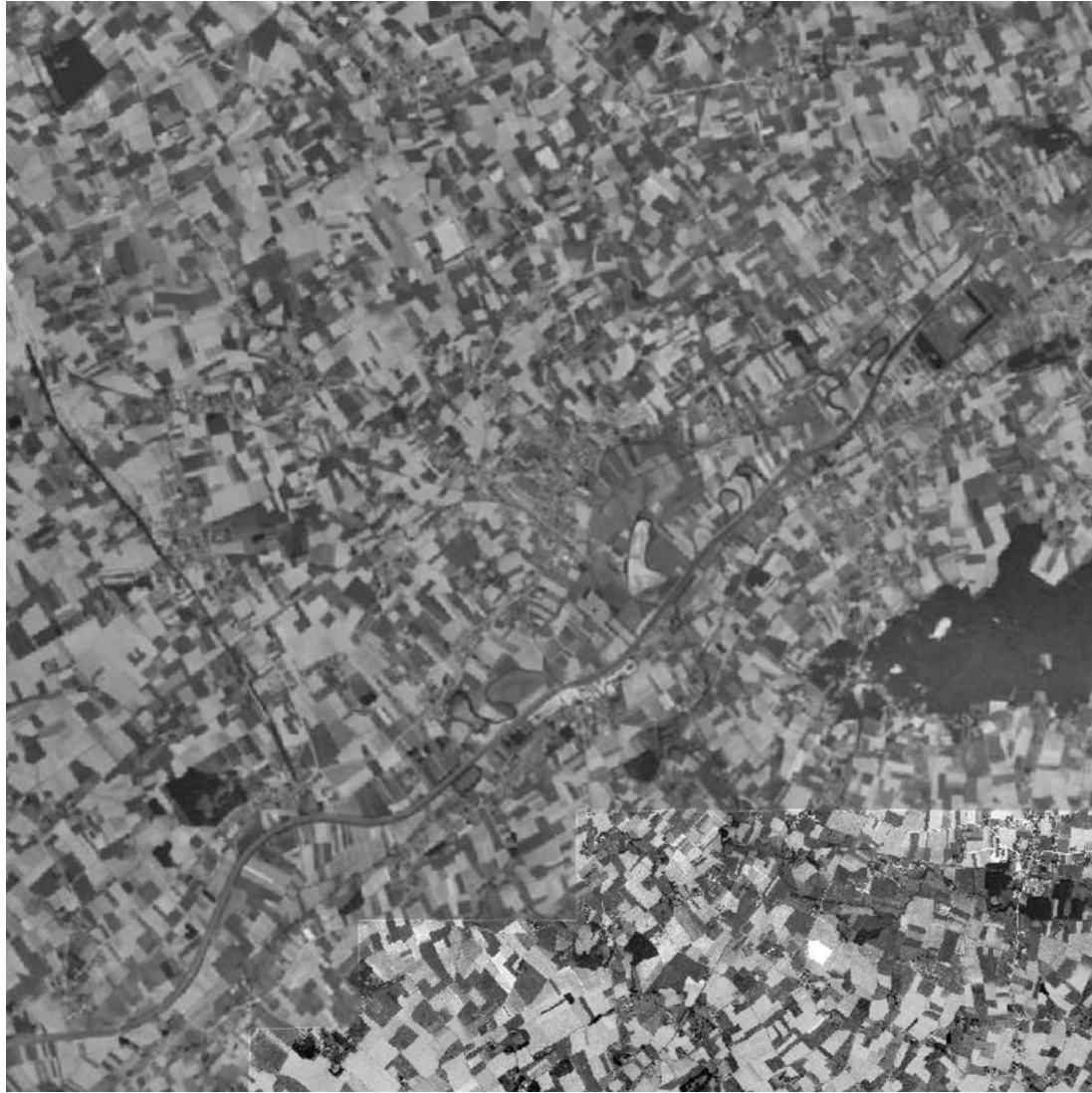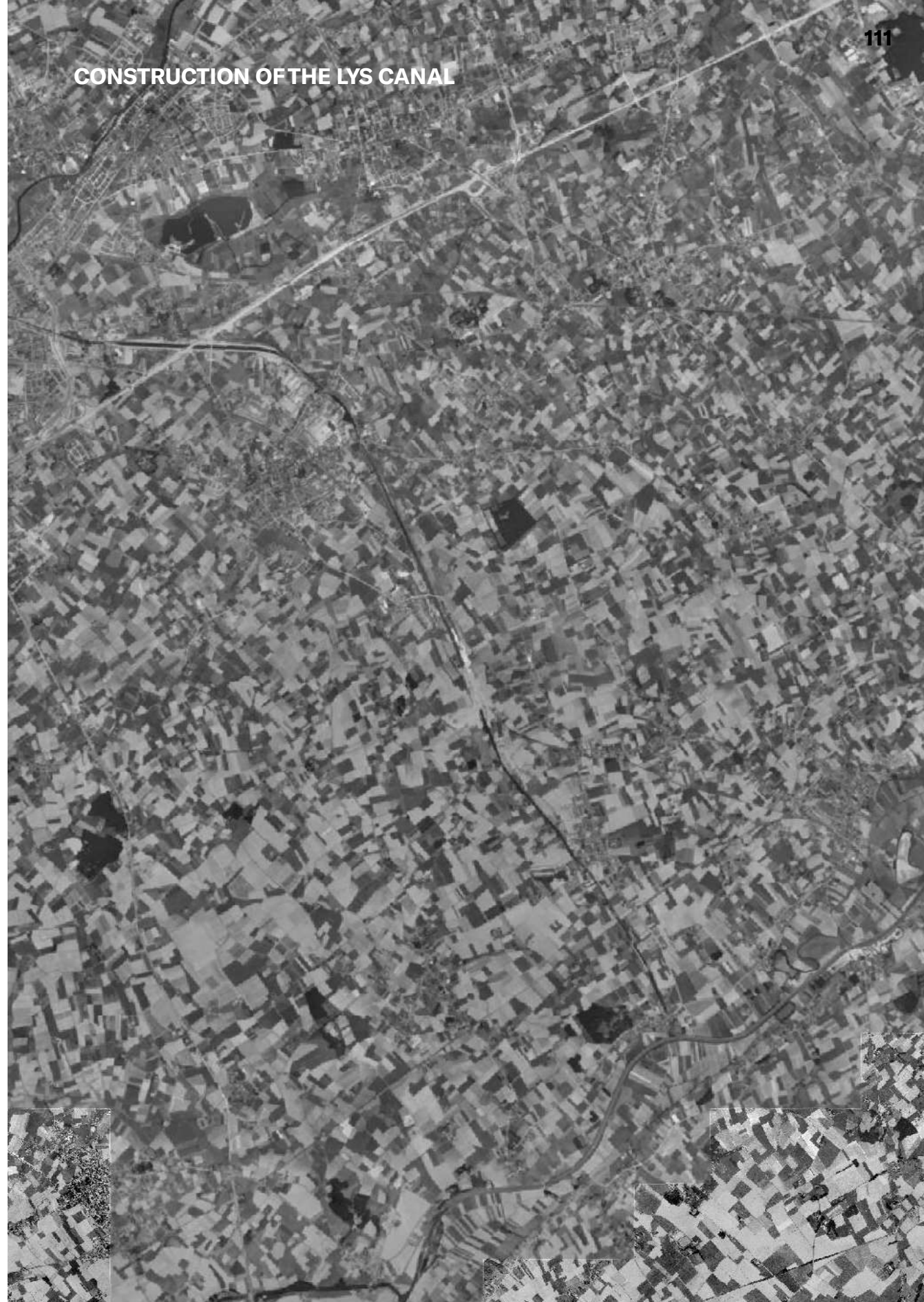
2.3.2. parts and elements of the postnatural machine

Below the river is decomposed in some elements that have been considered as fundamental to explain the functioning of the river in its linearity as a postnatural machine.

The physiological behaviour of a river is well known: questions related to topography, water flow, flow direction, relationship between slope and meander formation, etc.

In this case, the elements introduced, those that make the river postnatural, are those evaluated as in countertendency with this behaviour, that were determined by a relation of dominance applied by humans, with their needs, towards the river. The first element that catches the eye is the riverbank, which has a constant section against a very variable section that should change with water flow rate, slope, wind, soil composition. The second one consists in locks, both very platforms and a punctual elements, which are ensuring the traffic to be on both directions, whereas physiological conditions would consider a one-way traffic flow, from the highest until the lowest point.

riverbank

Anthropocene is considered as a geologic era which has sculped the Earth surface as well as wind, fire, water have sculped it in the previous geologic eras.

This could not be truer. Mountains and rock formations have been created through millennia of uninterrupted work, contributing to the formation of geographical, ecological systems that are able to work in a perfect symbiosis between them. Man has done the same, but in very less time. The map is showing a simple layer, which is the slope of the ground — the darker the pink, the higher the slope: it is obtained by a DTM (Digital Terrain Model), that in turn derives from a satellite image, which is an instant photography of the Earth surface.

The slope map allow us to recognise a series of rock formations and mountains which are contributing to the formation of the sub-basin and the flow direction.

However, some breakup points are recognisable. Some of them are highways, some of them are the Scheldt and its canals: just with this map one would not know how to distinguish them. During history works of rectification were accompanied by works on the riverbank, in order to ensure a constant section to allow the easier passage of cargo ships, as well as the construction of a highway takes into consideration the dimensions of cars and trucks that have to transit along it.

a.

b.

0°

90°

a.

b.
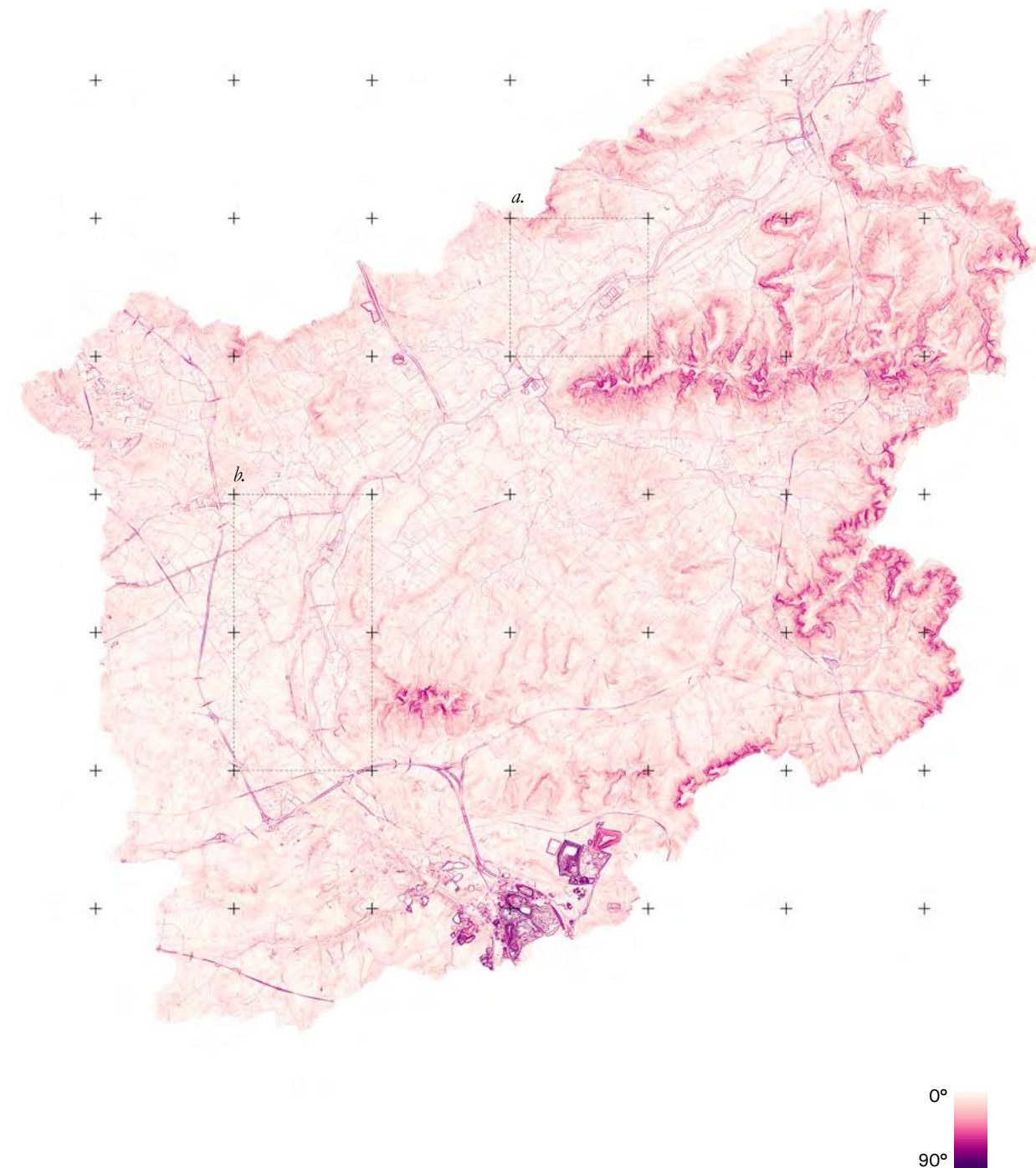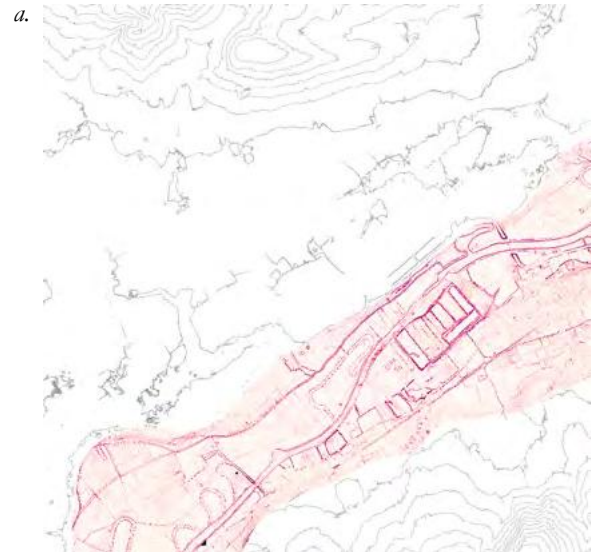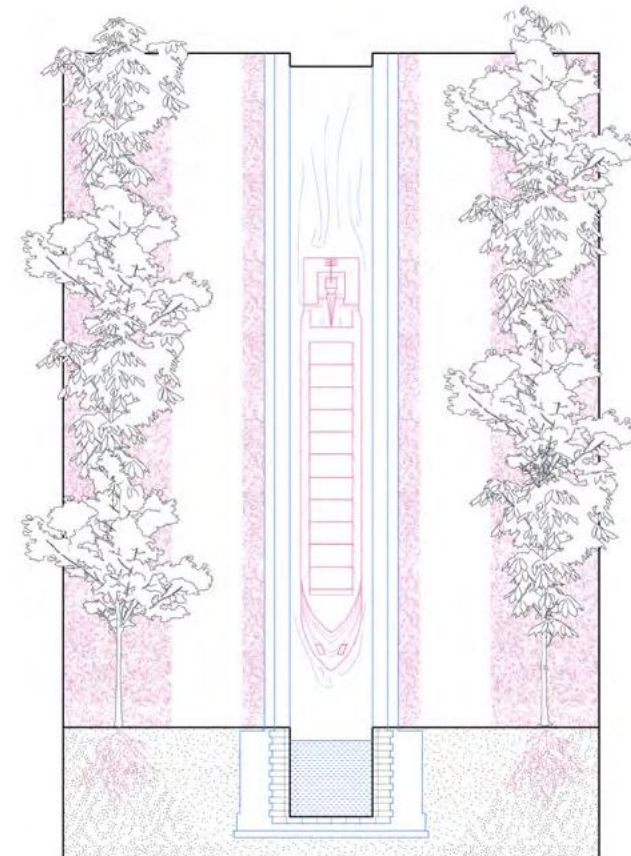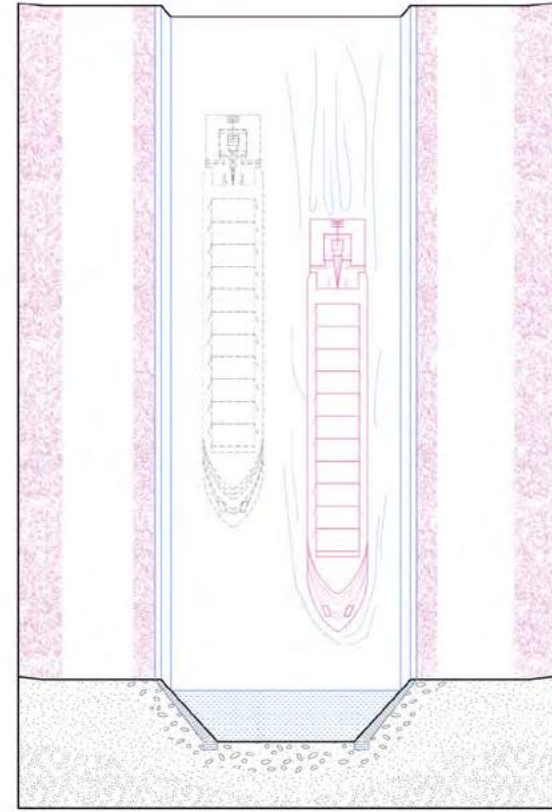
locks

Along the section of the Scheldt taken into consideration it is applied a deep control over the cargo ship bustle. This control is pursued by the building of locks, that are a hydraulic system which, through a floodgate, is able to manage the water flow. It is possible to identify five locks — hence, one locks every ten kilometers. Each lock is located on a strategic node for the economic flow of goods, corresponding to the main cities and the intersection with the most important canals. Locks are useful to manage the traffic flow in every direction, thus failing the principle that the flow of water follows only one direction, and therefore spontaneously everything should move according to that, that is, from the highest point to the lowest point in the valley, the estuary. Locks therefore help to make the Scheldt a perfect postnatural machine because the needs of human beings were translated into physical changes in the land that, through the potential of water and its level dynamism, they were able to exploit. In the following pages hence every lock that can be found within the sub-basin considered was analyzed in its spatial features: locks constitutes actual management platforms. In particular two kinds of waterways can be found: one that is proper of human-related traffic of goods. Another one constitutes the so-called ecological corredor, that is a secondary waterway which should supposedly allow the passage of acquatic species so as to ensure the ecological continuity of the river. It is an evident example of human dominance towards other species, whose space is left in a secondary position in order to give preference to human activities, which for management reasons do not allow ecological continuity.
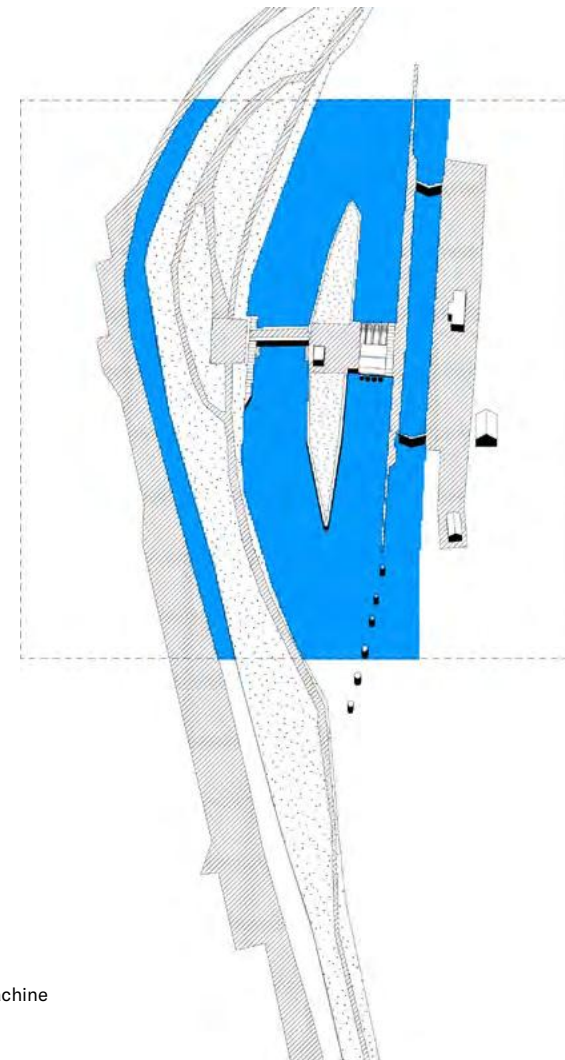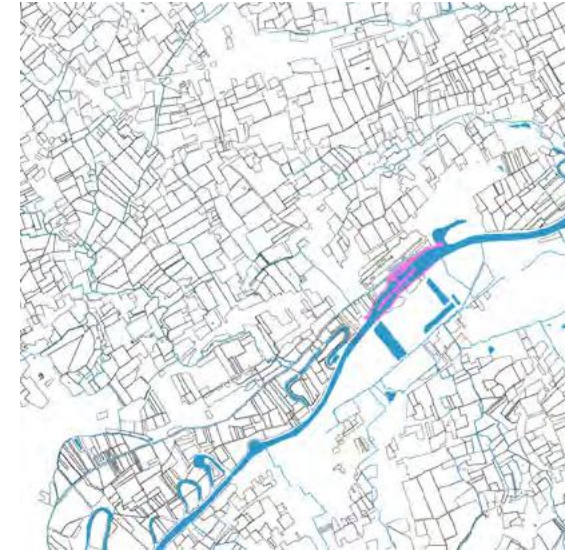
CAN THE POSTNATURAL SPEAK?

A simple scheme of how a lock works is shown below. In general, we could say that a lock is normally breaking up with the topographic logic of the watershed in order to ensure and improve the river traffic of goods. In general a lock is constituted by two doors, that are opened in different moments.

1. The first door opens when the ship arrives;
2. The ship enters the space in between the two doors;
3. The first door is closed: now the ship is located in a space which is isolated from the river;
4. The water level is mechanically increased in order to bring the ship on the same level of the following section of the river;
5. The second door opens;
6. Now the ship is free to continue its navigation along the river, even though against the sense of current.
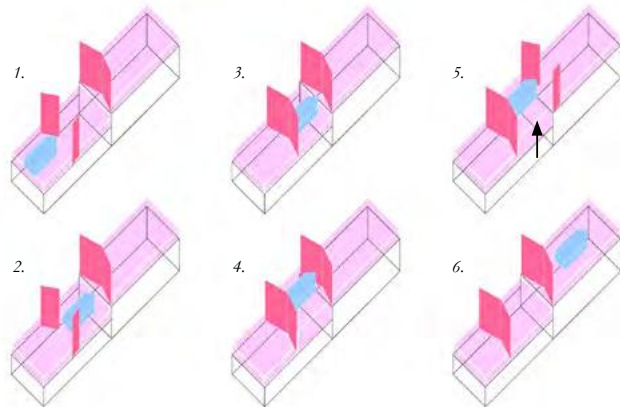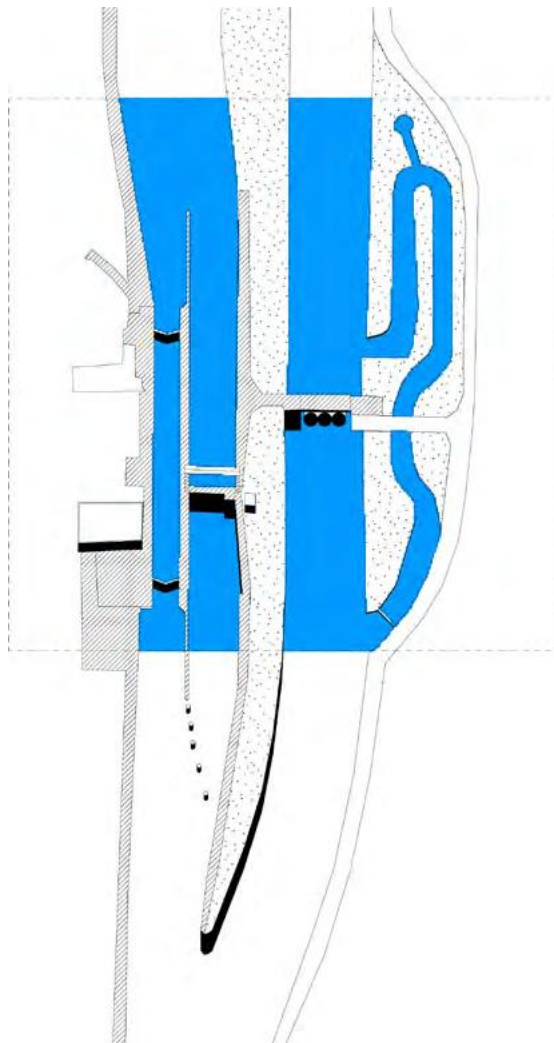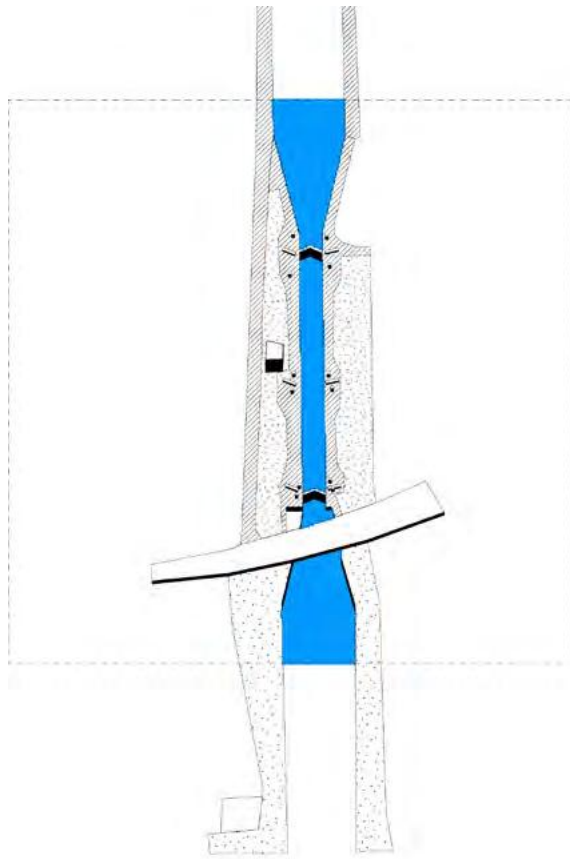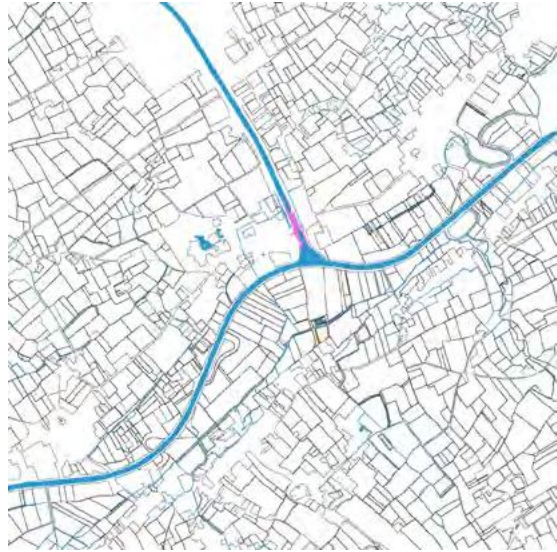
Scheldt. A postnatural machine

a.

b.

c.

d.

e.
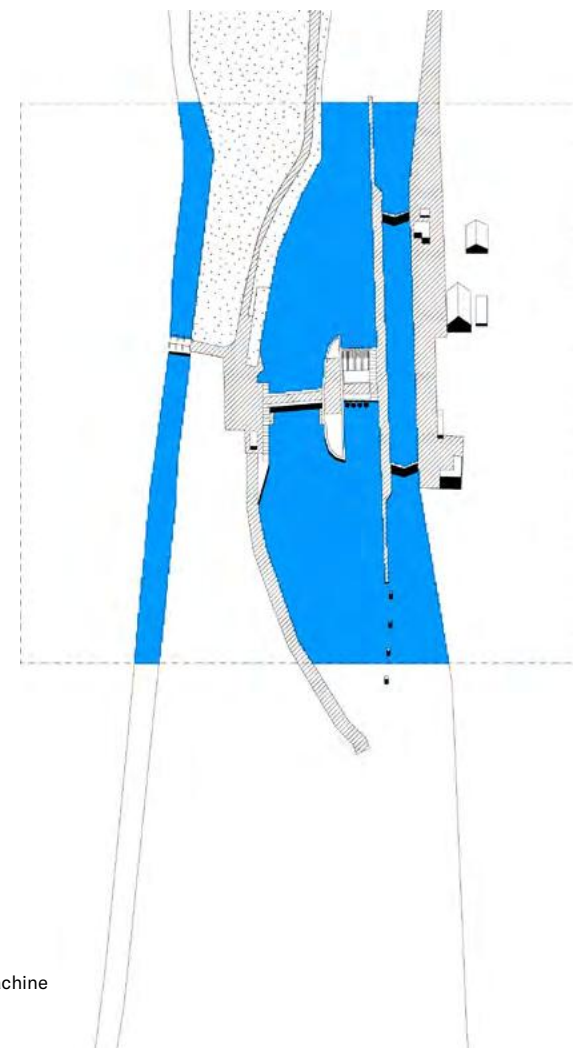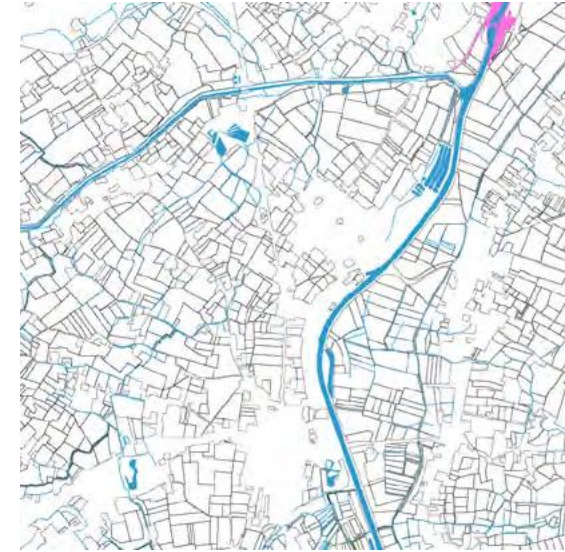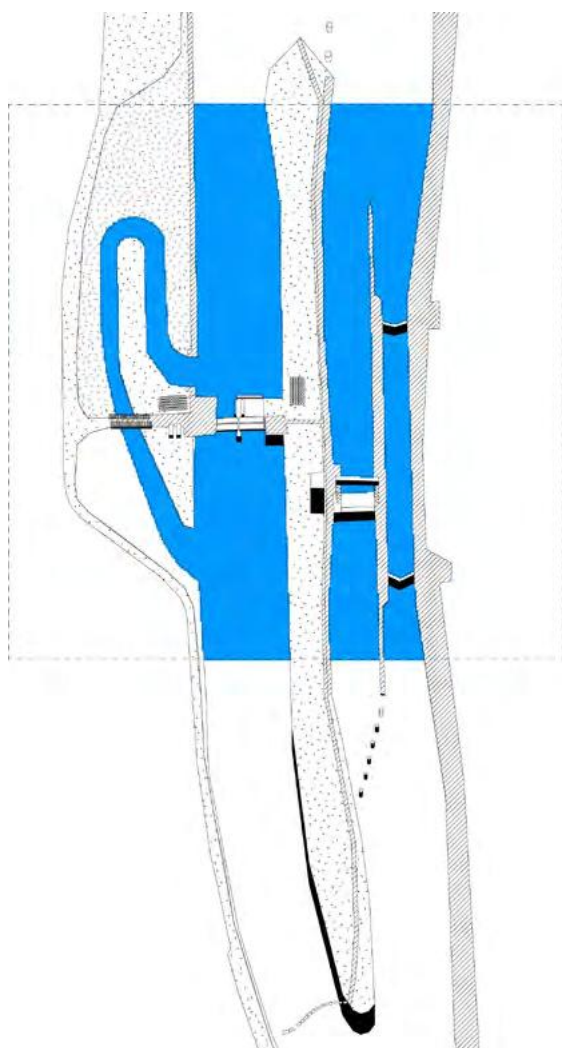
Locks are nodal points for the international traffic of goods. Cargo ships in fact come from all over Europe and the Scheldt is used as a passage between the main European cities, giving even more need to use locks as elements of control and management.

CAN THE POSTNATURAL SPEAK?

Scheldt. A postnatural machine

2.3.3. how the machine works

Whereas the first part of this chapter is focused on those elements that were considered structurant concerning the Scheldt as a postnatural machine, the following part deals with the whole surface of the sub-basin considered, taking in consideration the soil in its intrinsic and extrinsic properties related to water.

More in detail, this section will cover three topics: *water absorption, water consumption, water collection*. By *water absorption* it is considered the potentialities of the subsoil to be more or less draining, which is a property that is strictly related to the flooding risk, that is well known to be frequent in Belgian summers. *Water consumption* gives instead an overview of how the main typology of soil use, which is agriculture, is related to the consumption of water depending on the typology of crop. The third part, the one related to *water collection*, is an analysis of the riparian area of the river, which was previously said to be completely anthropized whereas at the time of the Ferraris map, in 1777, it was left to humid areas in order to accommodate possible floodings. In this area there is a soft mechanisms of flood protection, which is informally called as 'microtopography', that is simply a system of large tanks at a different level from the one of settlements and streets and that normally hosts vegetation used for pasture, but which is expected to be flooded without problems in case of need.

water absoprtion

While the traditional practices of Landscape Urbanism are focused on the surface of the territory, the idea of giving space to the subsoil as a potential element to find a new relationship between humans and the river comes to the plate in this case with a simple analysis of the subsoil of the sub-basin considered. The follwing map divides the sub-basin into three typologies of subsoil considering the drainage capabilities. High drainage capabilities means sandy soil which is able to absorb water. High drainage soil can be found near the river, even though with a distance from it, whereas along the riparian area the main soil typology that can be found is a soil with a low drainage capability. This is due at least to two reasons: the first one is that normally along the riverbed the soil is quite muddy, so as to allow the river to breathe and enlarge or shrink itself in case of need; the second one is that the principal settlements are located along the river, and settlement is synonym of impermeable soil. The medium drainage capability soil is instead mainly located on the highest points of the sub-basin, meaning those where there is the source of the tributaries. The subsoil is known to be layered in an irregular way, and the different drainage capabilities give birth to divergent soil densities where water behaves in a way that is somehow irregular, affecting on the surface the flooding risk of the area. The following part deals with this issue through some examples of layered subsoil as it was a coring, so as to give an overview of the wide pattern of situations one can meet while dealing with these elements.

high drainage capability
medium drainage capability
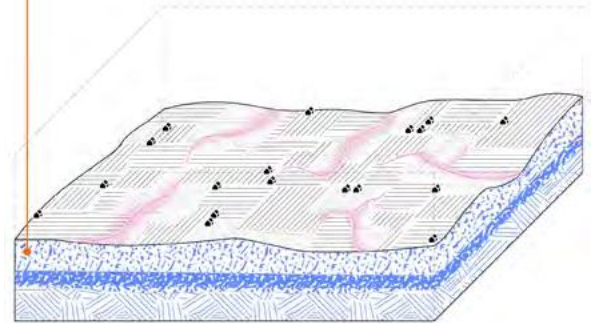low drainage capability
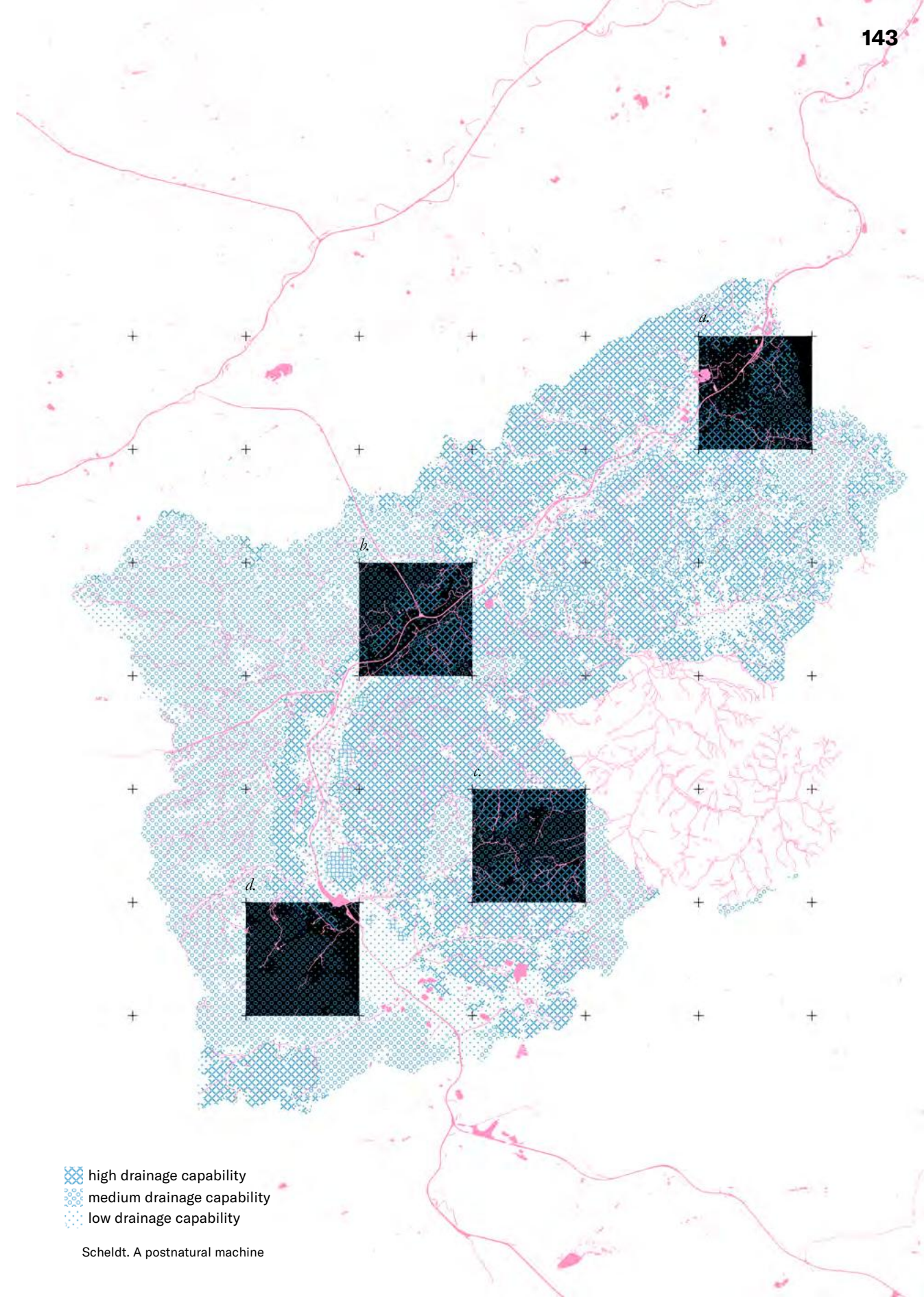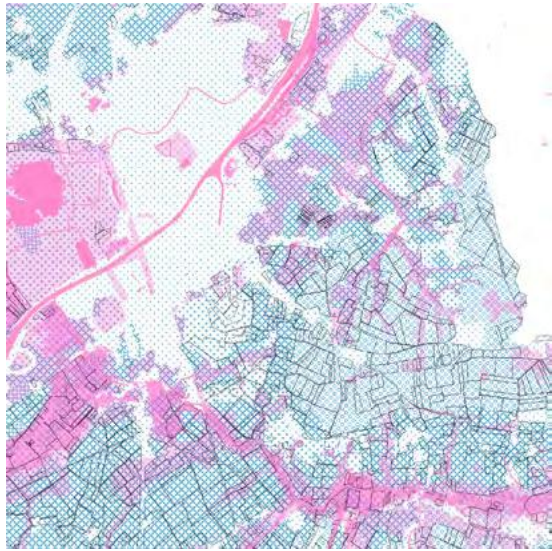
[Pleistocene - Holocene]
aeolian cover sands
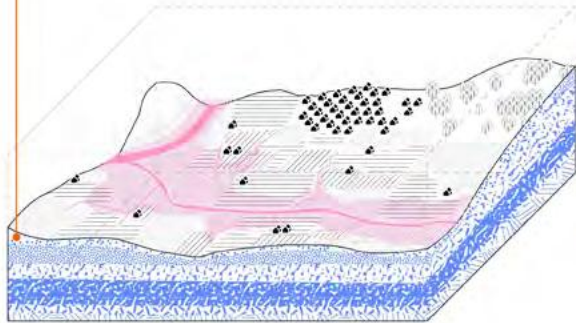
a.

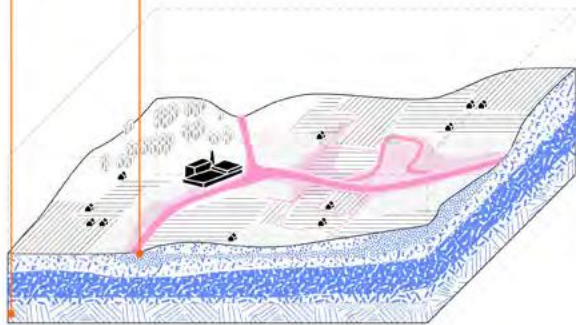[Paleocene]
chalk with marl and sand

c.

[Silurian, Ordovician and/or Cambrian]
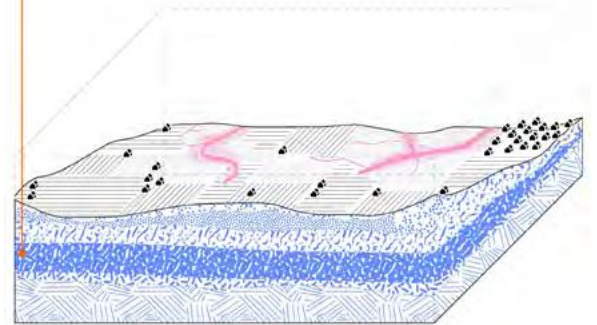sandstone, quartzite with claystone, shale

[Pleistocene]
clay, sand, gravel

b.

[Upper Cretaceous]
fine clay-rich sand with silt glauconite, sandstone

d.

subsoil typology [source: dov.vlaanderen.be]

water consumption

The following section is focused on the primary land use type: agriculture. The main typologies of crops include fodder, potatoes, garden plants, seeds, nuts: each of those enstablishes a different relationship with water, in any case based on water exploitation in order to irrigate fields. Hence, most part of the sub-basin's watershed is strictly dependent on water supply and would suffer if there was a lack in it or some issues related to it.

This means that droughts, floods, and salinization would be able to compromise the area in a very heavy way: we are talking about more or less 900 square kilometers, an area equal to that of Hong Kong, which could suffer the consequences of the climate crisis. This is an evidence of a relationality between humans and water that has historically never been egalitarian: man chose to compromise the physiologcal behaviour of the river in order to satisfy his needs. The problem comes when this kind of relationality fails and what once provided goods becomes both the source and consequence of a problem. Hence, how to deal with water-related issues when economical questions are at stake? Do these problems need a solution which could mechanically manage water supply in a deterministic way or is this the case to review how we have been relating to water and find more egalitarian ways which could let the river and its surroundings breathe in armony with us?
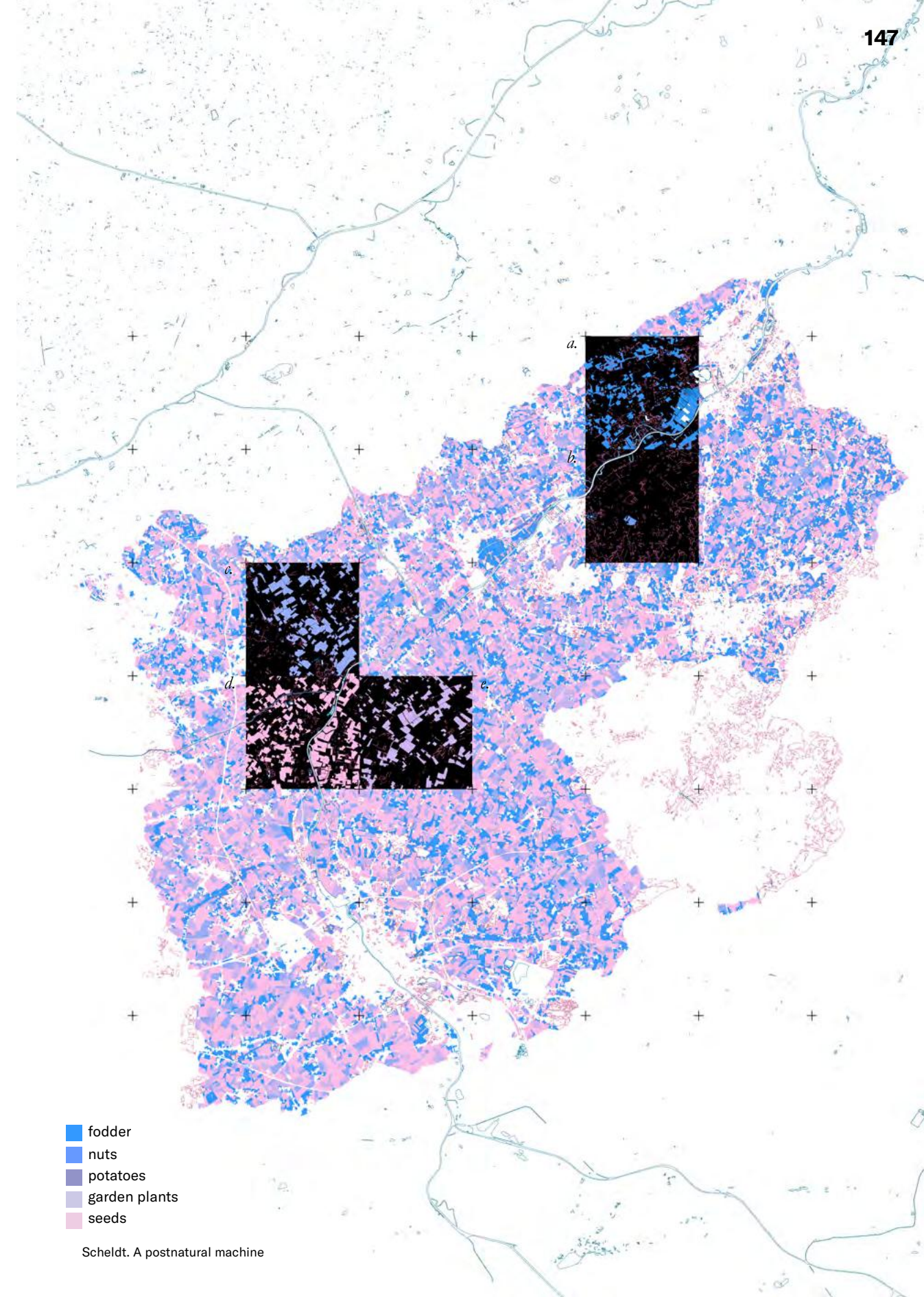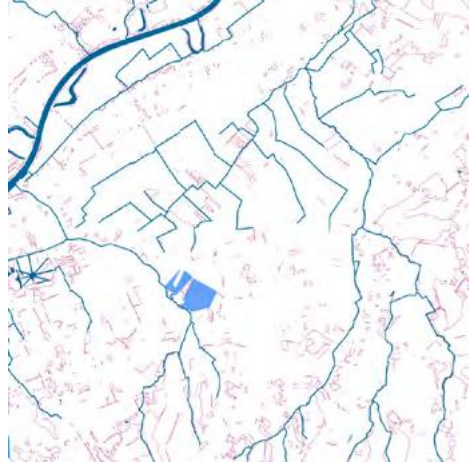
fodder
nuts
potatoes
garden plants
seeds

fodder

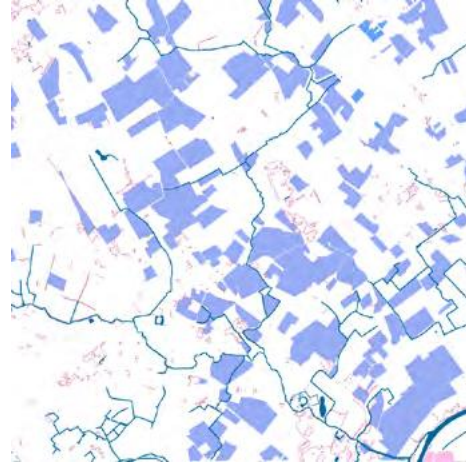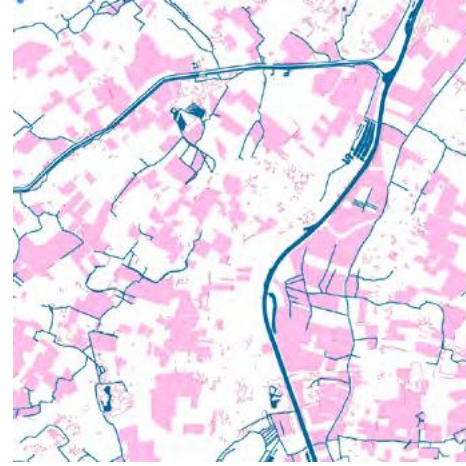**nuts**

potatoes

garden plants

seeds

a.

b.

c.

d.

e.
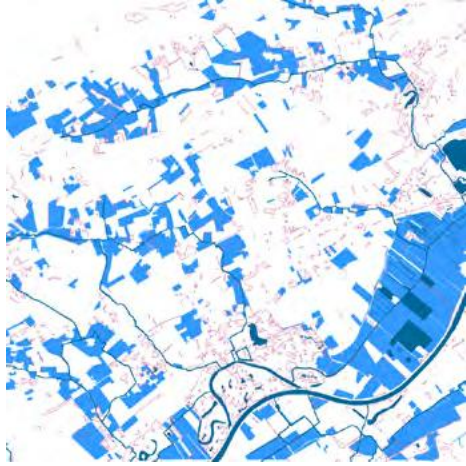
water consumption [l/kg]

fodder 100 l/kg

nuts 4 l/kg

potatoes 150 l/kg

garden plants 60 l/kg

seeds 50 l/kg

0

1 m

2 m

3 m

4 m
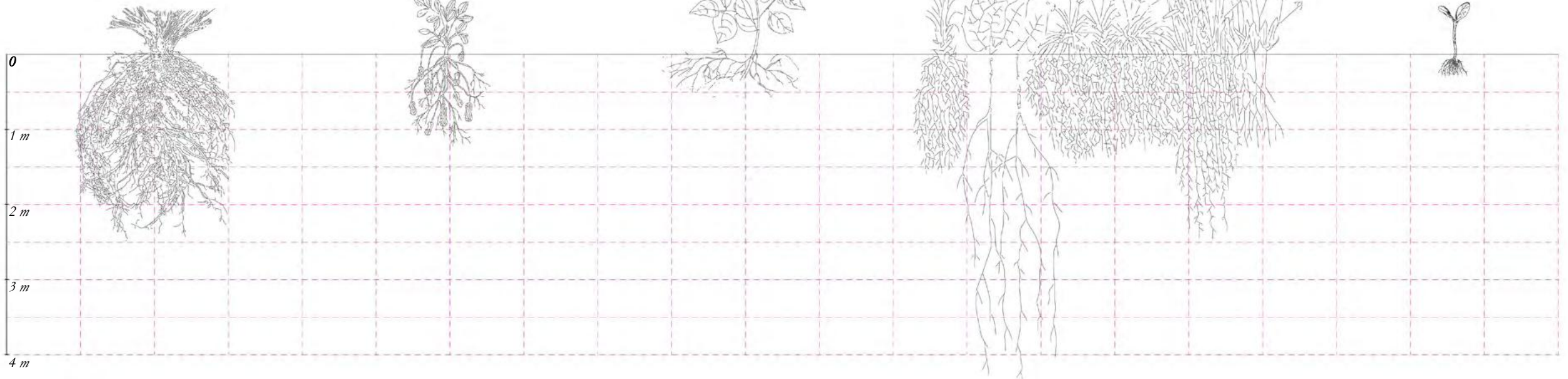
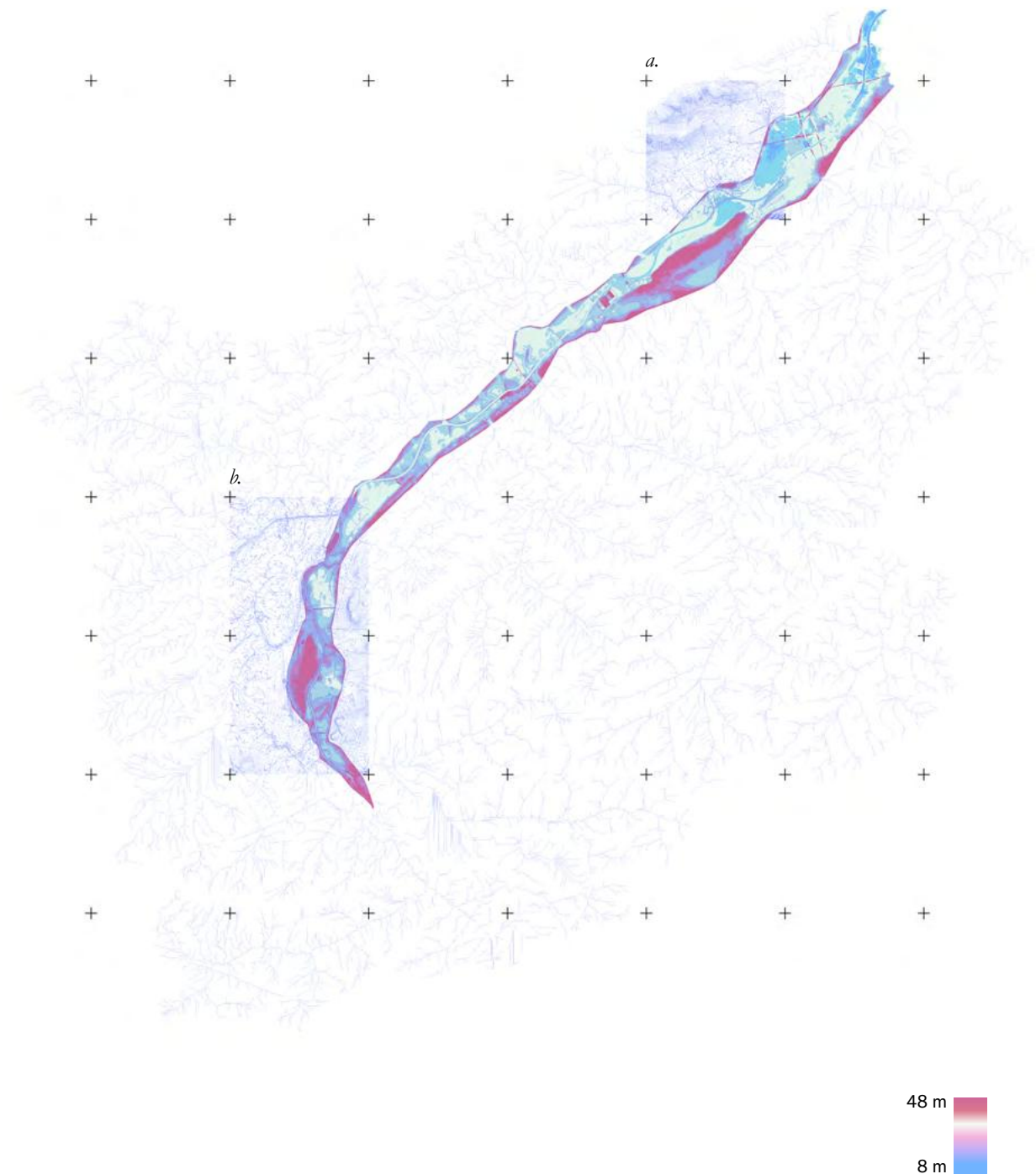crop typology and water consumption [source: worldbank.org]

water collection

It has been said that riparian areas along the river were sacrificed in order to gain soil for productive purposes. In spite of being completely anthropized in favour of crops, mainly fodder, today's Scheldt's riparian area is still managed in order to try to collect water and prevent floodings, as it was before.
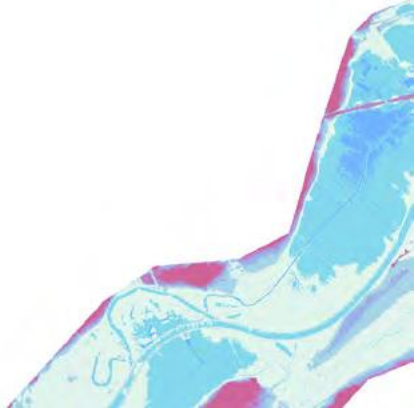
The infrastructure designated to do so is almost invisible, giving the idea of a riparian area that does not exist anymore. It is informally called as 'microtopography' and it consists in a series of tanks which are at a lower level than the one of the streets, settlements and other fields: in case of floodings or excessive rain, water automatically flows inside these tanks, hence avoiding a uncontrolled water flow that could bring problems to settlements and crops.

The whole riparian area of this section of the Scheldt is characterized by these tanks, that are mainly located where once there were meanders, meaning that, due to topography, water tends to deviate in those areas that are not anymore physiologically able to collect water preserving the rest of the basin from inundations.

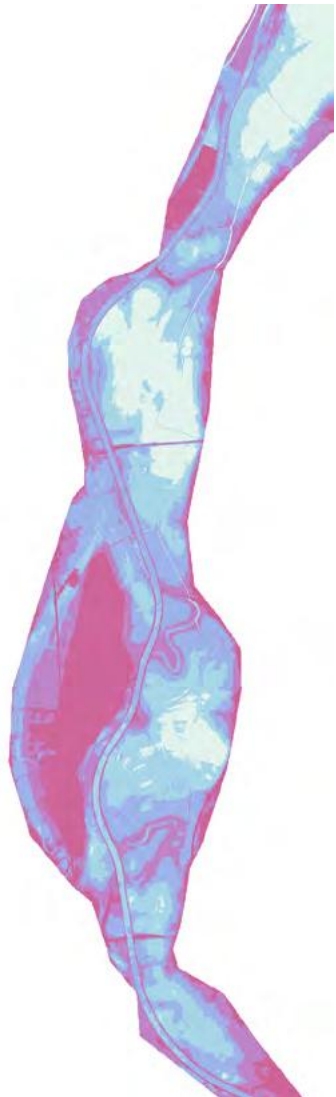These systems are today able to manage a certain amount of water, which is tending to increase: will microtopography still be useful when the amount of water catched by the groun will be more intense? Or do we need to find a new kind of relationality with these dynamics which we can have the pretense of managing in a technical way, but up to a certain point?
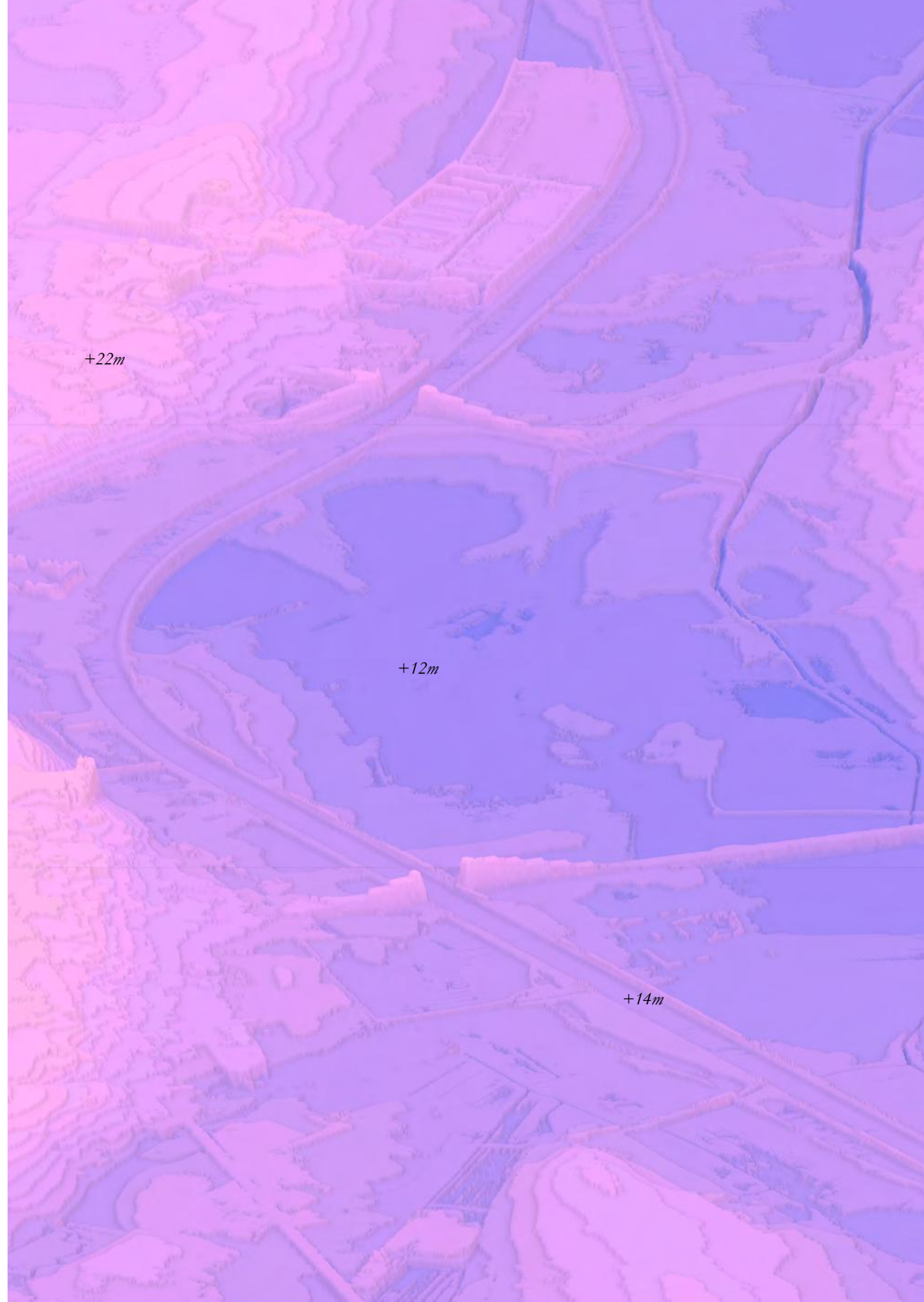

a.

b.

48 m

8 m

Scheldt. A postnatural machine

a.

b.

CAN THE POSTNATURAL SPEAK?

+22m

+12m

+14m

3. INHABITING THE MACHINE

3. INHABITING THE MACHINE

fectively we are managing these issues in a proper way.

In order to do so, some analysis are presented which are aimed at identifying how the territory is reacting to Climate Change related transformations.

Graphics and maps are the result of the translating operations, showing new geographies which could be able to modify and improve the way we chose to define our relationship with the territory.

This chapter is focused on the discourse of the voice. Once defined the Scheldt as a machine in its postnatural elements, the following issue is how to make them speak.

The thesis makes use of a technical contribution, which is the data collection and manipulation through the GIS (Geographical Information System) device. It is a translating operation, which is able to recognise some forms of expression and transform them into a language that is understandable for us. Climate Change is bringing to the table questions related to our relationship with the territory: is the way we are dealing with the nonhuman still sustainable? Has it ever been sustainable?

Letting space and time for different forms of language to express themselves is the first step to understand if ef-

3.1.

the voice of the
postnatural Scheldt

human categories. This research takes the risk of claiming the need to extend the right to research also to the rest of nonhuman categories, which, in the posthuman discourse, may correspond to what Appadurai is proposing. This thesis attempts to do this operation by observing and trying to interpretate historical events and geographical features that have been shaping the territory: needless to say that historical events and geographical features are strictly connected when the transformation of the Scheldt and its watershed is bound to needings related to human beings, both socioeconomical and political. When disassembling the machine, this kind of operation was done: it means identifying and observing certain elements (historical and geographical) in their actual state, and interpreting them as constituent elements of the river as a postnatural machine.

how to listen?

Technics
A second operation that could be done is peraphs a little bit riskier than the first one, and it is that of collecting data and interpretating them. It is about not only observing, but derive purely human language-related parameters from these observations and interpret these parameters in such a way as to recognize something. This operation makes use of technological tools and makes use of them in such a way as to select information according to what is considered significant by us, to obtain results aimed generally at bringing dialogue within the human sphere: in the case of landscape planning, it is, for example, to read parameters related to flood risk and to use them in such a way as to understand where one could build or where to look if one wanted to engineer the river in such a way as to remove water and increase the area of exploitable land. The potential of these tools, however, is to make visible forms of expression that, if interpreted within a logic that does not view human language as dominant, have the potential to increase the dialogue between us and the 'other' and build a relationship that is not only beneficial to humans but also allows other living forms the freedom to express themselves and to enter into an egalitarian form of cohabitation with us. The following section of the thesis tries to perform those operations, using remote sensing: it involves reading the information given by a series of satellites orbiting the planet. We know very well that the electromagnetic spectrum is much broader than what we can see: satellites are able to broaden their spectrum of visibility. This is what is meant when it has been said that the use of technological instruments can enable us to see forms of expression that would otherwise be invisible: again, this is indeed a form of observation, but it broadens the human's own field of view, and it does that through technology. Other parts of the electromagnetic field are indeed capable of returning additional information than what we would normally, with the human eye, be able to see. In the following text the operations that have been done will be explored more in detail.

It has been already said that translating is a risky operation, at the limit between interpretating and 'betraying' what the speaker is telling us (Cicero, 46 B.C.). So, how to listen and then translate postnatural forms of expression without betraying?
There is not a direct and univocal answer for that: however, the thesis investigates some ways of translating that have been experimented in the contemporary discourse that is considering subaltern and antispecist topics, operations that are aimed at avoiding the risk of misunderstanding and overlapping human forms of expressions. There have been also some attempts to experiment with these techniques, while others will only be explored from a more discursive point of view.

Observation and interpretation
The first operation that could be done is the one of observation and interpretation. As Appadurai claims, research as a practice of observation is a form of inquiring what we are looking at but we are not fully understanding: «All human beings are, in this sense, researchers, since all human beings make decisions that require them to make systematic forays beyond their current knowledge horizons» (Appadurai, 2006). This means that it is somehow spontaneous, for both humans and nonhumans, opening up to the 'other' in order to understand it, therefore moving outside their area of expertise. Knowledge itself is then something relational. By saying so, Appadurai excludes the priviledge of knowledge as something that only belongs to a dominant class, extending it in the case of his research to the other

Non-representational approach
The third operation that could be a key to listen and translate, but not betray, is the one of not representing at all. Starting from the

perspective that representing is necessarily an act of selection that tells about some things while neglecting others, non-representational theory is moving against what is defined by Amin Thrift as the tendency of contemporary geographers to iper-represent: this means the tendency to take for real a form of representation, i.e., translation, that in passing from speaker to listener necessarily loses information, or at any rate does not tell it because it is not necessary to the goal of translation: «it is vain that we say what we see; what we see never resides in what we say» (Foucault, 2002). To become aware of the human being's inability to know entirely and truly the forms of expression of the other, thus to accept a margin of knowledge that leaves room for doubt, is to place the human being not above the rest of the living species, considered as a "mere cladding" (Thrift, 2007), but to place it within a relational network that values hybridity and gives equal weight to human and nonhuman bodies in their coevolution. (Harman, 2005). Although the thesis mainly follows the first two operations, the choice not to represent some issues in the narrative of the territory was a conscious choice that tried to emphasize the forms of expression of the territory in their material expressions while neglecting other factors: for example, in the narrative of climate indicators, it was expressly chosen to neglect the drawing of the administrative boundaries of the various regions as they were considered non-determinant in the evaluation of some issues that are instead characterized by ecological continuities. Experiment with the territory and question it is the key, instead of judging it and taking its answers for granted (Nietzsche, 1974).

Art practices
A fourth and final operation is that of art practices. The boundary between art, architecture, and science is very blurry, although it may seem that it is not. There are many contemporary artists who in approaching Climate Change have touched on issues related to antispecism and the practice of listening to and interpreting the nonhuman. In general, artistic forms of expression somehow try to escape the determinism that traditionally characterizes more scientific disciplines instead, even though they are making use of them. For example, recently Theresa Schubert (theresaschubert.com) created a series of installations related to the theme of melting glaciers, which make use of sensors that can measure the amount of pollutants on the mountain and simulate how, in what direction, and at what speed glaciers melt. this is a case where the use of technological tools that can see what would otherwise be invisible to us is used not to make absolute judgments, but to interpret and listen to, thus interrogate, a form of postnatural expression that is facing major climatic and environmental transformations.
In 2022, Sara Leghissa (saraleghissa.com) designs an installation that she calls "Reptilearium" as a space for observing and listening to the nonhuman at multiple scales that intermingle and interact with each other, giving back to the viewer new images, blurred and less absolute, that help defamiliarize with the perception we usually have toward the

world around us. Similarly, Joshua G. Stein (radical-craft.com) breaks down the boundary between architecture understood as a fixed category and water understood as an element in constant motion, through an installation that sees the erosion of monuments as the displacement of artificial sediments that join those of the Piedmont river system and reach as far as the rice fields of Vercelli, which in turn become real monuments.
Speaking instead of the term Postnature, we see how it is actually not so much embedded within the architectural debate as within the artistic debate. In 2020 in Madrid, "Institute for Postnatural Studies" (instituteforpostnaturalstudies.org), a center for artistic experimentation that sees the concept of Postnature as potential for artistic creation, was born. The starting point is always Climate Change, and the IPS aims to unite artists and researchers within a multidisciplinary debate, touching on issues such as ecology, politics, architecture and, of course, art.
As mentioned earlier, this thesis, although it tries to touch on all forms of listening that have been presented here, mainly focuses on the issue of data collection and data manipulation. Experimentation through remote sensing and GIS platforms is becoming more and more specialized, however, running the risk of being too deterministic in terms of evaluating parameters and trends. Such an experimental form of translating should obviously be based on serious and well-developed theoretical basis: trusting Technics unconditionally is more than problematic. Anyway, the contemporary debate about Philosophy of Technics, from Heidegger to Cybernetic Culture Research Unit, from Accelerationism to Posthuman studies may help: what this exercise eventually experiments is "the simultaneity of the non-simultaneous" (Bloch, 1977), since the way we try to use technics is more prophetical then assertive, more relativistic than absolutist, more "magical" than "technical" (Campagna, 2021). Far away from being highly deterministic, technics is used as a plausible postnatural language: the operations done are well aware of this risk and try to move on the one hand by taking advantage of what technological evolution provides us, and on the other hand by not taking the results obtained for absolutes, but considering them as starting elements to establish a more constructive dialogue with other living forms.
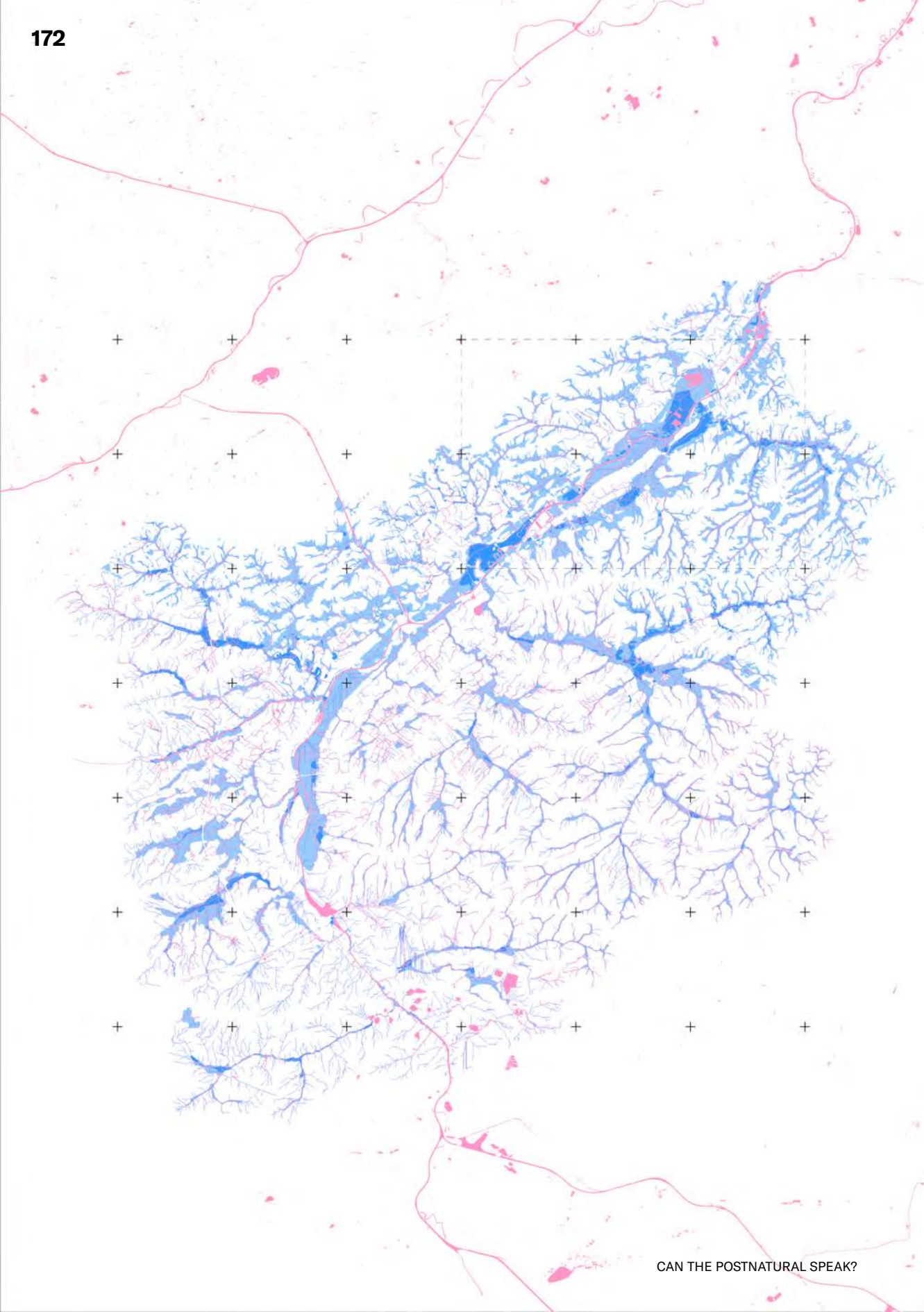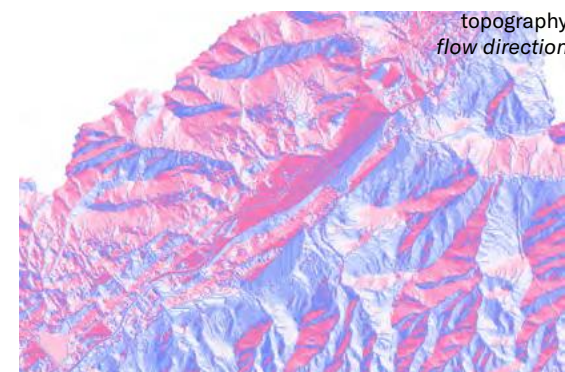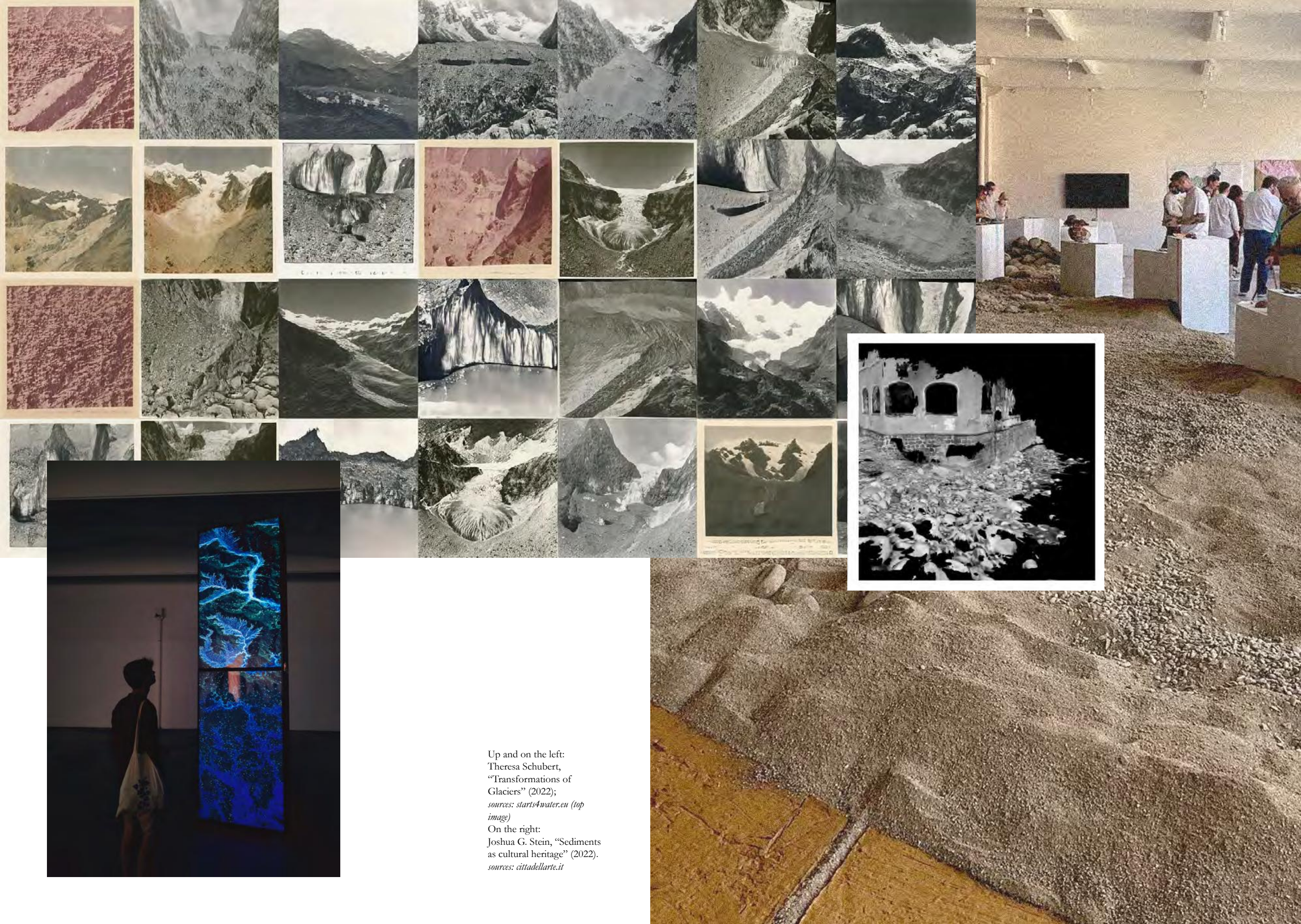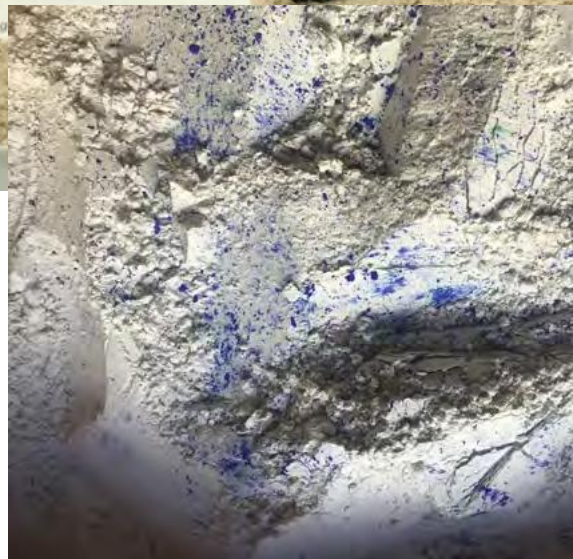
water bodies
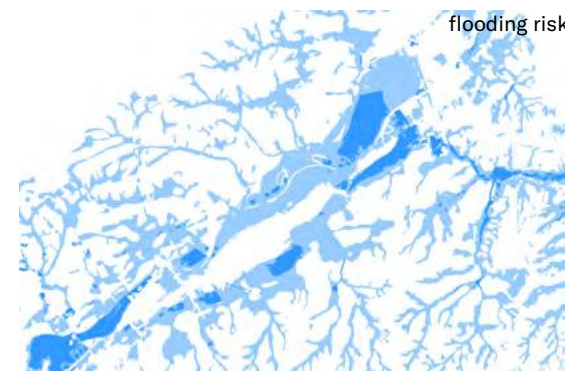
flooding risk

topography
flow direction

inhabiting the machine

Up and on the left:
Theresa Schubert,
"Transformations of
Glaciers" (2022);
*sources: starts4water.eu (top
image)*
On the right:
Joshua G. Stein, "Sediments
as cultural heritage" (2022).
sources: cittadellarte.it

Up:
Institute for Postnatural Studies, "Nymphéas Transplant" (2019);
"PIMOA CTHULHU" (2020);
sources: instituteforpostnaturalstudies.org
On the right:
Sara Leghissa, "Terrarium" (2022);
sources: *saraleghissa.com*

new geographies

Once defined which are the parts and elements of the river intended as a postnatural machine, hence a new kind of relational subject, the next question is 'how can this postnatural machine speak?'
It has been said more than once that practices of observation can be able to let some space for the Scheldt to express itself. Research, together with the technological means that humans possess, could therefore bring to new kind of geographies which are able to encompass the iper-represantionality of traditional geography. A conscious approach to these kind of devices could in this sense bring some useful informations without a deterministic view.
This thesis does not condemn whoever uses technological means to study the territory, it rather wants to be an invitation to use them in order to get some information which could be useful for us to cooperate with postnatural elements in future scenarios. As it was already said, humans should not remove their voice.
The processing of some data recognised by a serie of satellites had therefore brought to the evaluation of how topography and the risk of flooding are — obviously — related. The systems of microtopography and the canals are at the moment technologically able to preserve and manage water in the flooding scenario as showed in the previous pages. However, Climate Change is bringing this static system into a problematic condition in which the excessive floodings (such as the one in summer 2021) could break these engineeristic solutions.
Hence, in the following part satellite images are used to calculate and show a series of indexes related to the presence of water in the

subbasin considered previously.
Satellites are able to acquire images of parts of the planet with a number of bands, each of that corresponding to a wavelenght interval. Red, green and blue are the intervals which belong to the visible spectrum: however, satellites are also able to capture wavelenghts that also belong to the invisible spectrum. Some of these wavelenghts are useful to calculate and view further informations concerning water bodies and the presence of water in the soil.
The first parameters have been obtained through the manipulation of radar images, specifically Synthetic-aperture radar (SAR) images obtained by the satellite Sentinel 1, which are able to capture the presence of water bodies on the surfaces of the area taken into consideration. Through the calculation of stagional means and then annual means a final map was obtained that was able to show the tendency of some parts of the area to be wet. In this case the starting image was a black and white image, meaning that it covered just one band (microwaves).
In the second part satellite images from the satellite Sentinel 2 are used to calculate an index, the Normalized Difference Moisture Index (NDMI), which is able to measure how much water is contained in vegetation. The index is calculated through a formula which takes into consideration two bands: near-infrared (NIR) and short-wave-infrared (SWIR), which are combined into one band — hence also in this case a black and white image, in which some values show conditions of water stress. Also in this case the final map was obtained through a mean of annual means, which were derived from seasonal means.
In the following pages the operations that have been taken will be shown in detail in providing the data and parameters which have been used. The final means have not a big degree of thematic accuracy: in order to have a more reliable result seasonal means should be calculated through a deeper approach, considering more days per season. The limitations encountered are of two kinds: the first, of research, would have made the calculation of seasonal averages too complex and time-consuming when the goal is not that of having a scientical precise analysis, but that of trying to provide directions within which these mechanisms can be used to engage in constructive dialogue with postnatural systems. The second is given by the satellite images *per se* and the typical geographical condition of the northern European regions: in fact, some frequencies are not able to be read by the satellite in cloudy situations, which are unfortunately quite usual in this geographical area: even just finding some data by season proved to be complex.

Understanding data
Together with the specificities of the devices, softwares, and techniques adopted, it is relevant to develop a deeper understanding of their meaning. The first experiment (posthydrological bodies) questions the limits and borders of water bodies. Through an analysis of the tendency of surface water bodies to establish themselves over the watershed in a more or less stable way, in fact, we are able to

understand that the boundaries we traditionally attribute to water bodies are actually blurred and dynamic. The river, therefore, is not limited to the main body and its tributaries, but reveals itself to be a more complex entity. All of this is closely related to geomorphological features, and making this evident through mapping can enable the implementation of water infrastructure management projects that may be more attentive to a territory that is constantly changing and whose boundaries and limits are not given. The relational nature of the project also stems from this: through an amplified vision made so thanks to technological tools, but one that maintains a kind of neutrality and thus keeps well away from giving too determined attributes, one can arrive at design strategies that are able to better understand postnatural subjects and take into account their ability to interact with other systems.

The second experiment (water otherwise) gives a radical alternative description about what water is and how we may intend it. The analysis takes into account the presence of water within the vegetation, establishing a degree of stress (either too much water, or too little) related to the type of vegetation from the microscopic point of view and its ability to absorb water. The connection between the macroscopic of the territorial scale and the microscopic of the internal structure of leaves is a powerful tool that can help us understand that the presence of water exists in other forms, and not only in surface water. Taking into account the fact that there are certain types of vegetation that, as analyzed in the previous chapters, consume water for productive purposes, and at the same time seeing that in general the whole area considered suffers a quite high level of water stress, makes us understand that the way human beings relate to the territory is inadequate because it takes into account a few reading tools and neglects many others, which, however, increasingly need to be re-read and interpreted in a relational key. In fact, the presence of water in other forms than surface water bodies makes us realize, again, that exclusive categorization can lead to misunderstandings, and therefore neglecting this features at the design stage may not make any management mechanisms sufficient.

Other deeper analysis may be hopefully developed. This research is anyway a pilot example about how technological tools may be used otherwise.

2021/07/23

SAR

## *posthydrological bodies*
the evolution of surface water bodies

SAR images appear as shown in the picture. Thanks to the pehomena of 'backscattering' the microwaves emitted by the satellite are able to illuminate the surfaces and derive distances through the measurement of time delay from the emission of the microwave and the reception of the echo by the antenna. Normally radar images are used to measure distances because they can see through clouds and they are not able to distinguish land surfaces: however, buildings and water bodies are very recognisable because of the different amount of energy they are able to absorb and reflect.
In this case, radar images were used to monitor water bodies in the area taken into consideration. We are able to distinguish water bodies since calm water reflects the microwave signal far away from the sensor and no backscatter is measured (Hanssen, 2018; Liang, 2020). The aim of the analysis was to measure trends in formation of water bodies during time: in order to do so, SAR images from different times of the year were used and different years, as shown in the table before.

|	2017	2018	2019	2020	2021
jan	30	28	31	30	30
feb					
mar					
apr	30	28	29	29	30
may					
jun					
july	31	30	31	28	23
aug					
sept					
oct	31	31	26	31	27
nov					
dec					

posthydrological bodies
the evolution of surface water bodies
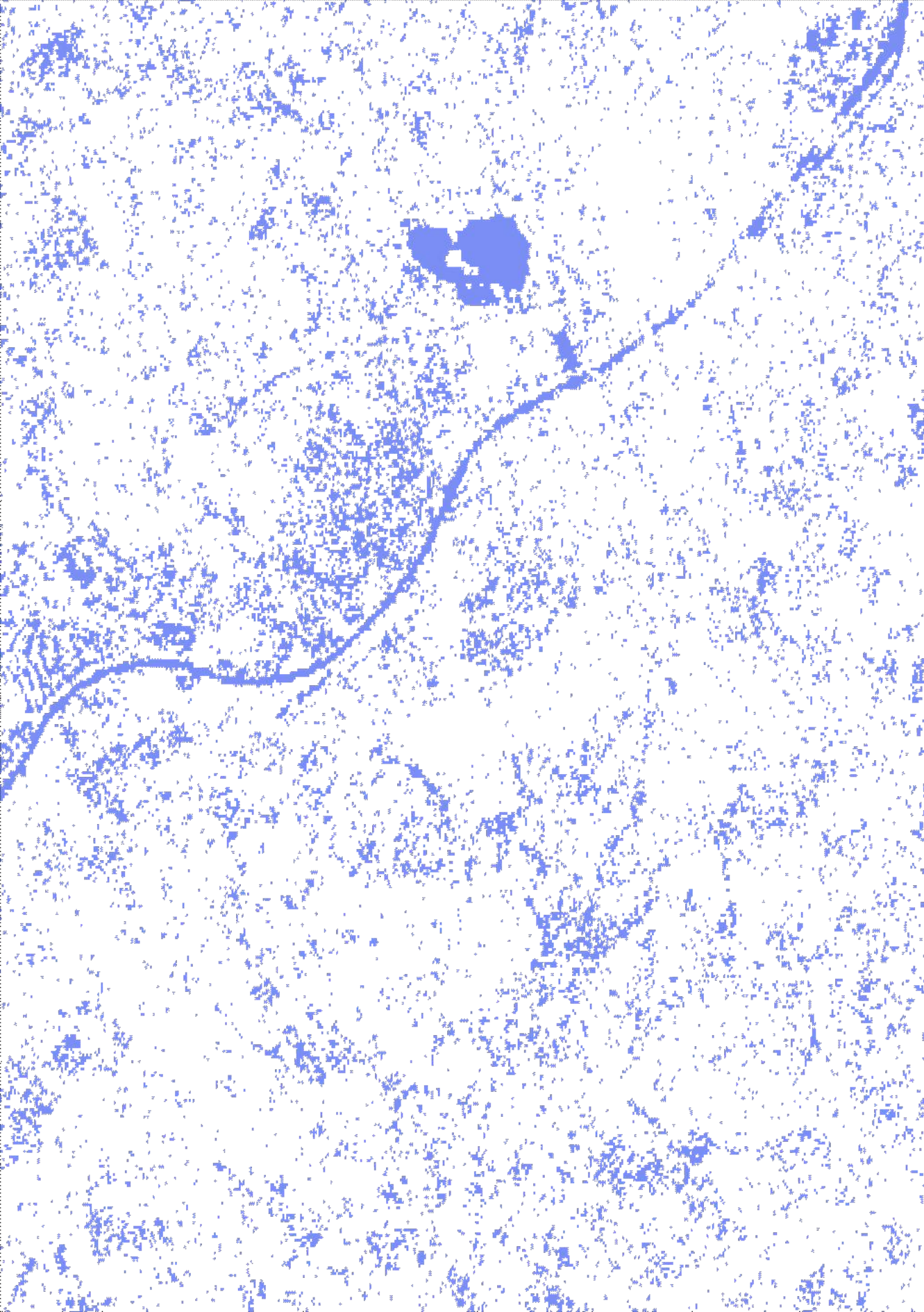
The next step was the evaluation of which was the interval of pixel values that covered most water bodies on the case study. The SAR image was queried and each pixel gave a numeric value: highest values were the darkest ones. Therefore, it was arbitrarily determined a treshold of 130 which has been considered adequate to cover most part of the water bodies present in the area. The operation gave as a result a binary image in which 0 were all the values lower than 130 and 1 were the ones higher than 130. Pixels with lower values than 130 were then deleted so as to consider just the ones higher than 130. The resulting map is showing some disturbances. This calculation was made for each SAR image considered. Below an example of the simple disequation that was undertaken through ArcGIS Pro in order to obtain the binary data.

Raster calculator
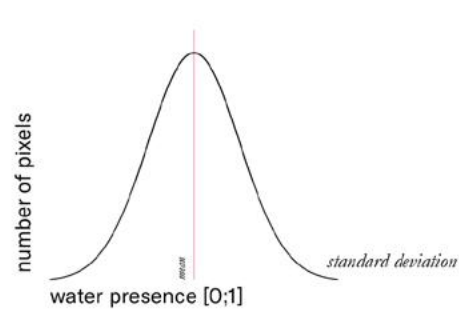
"SAR band" >= 130;
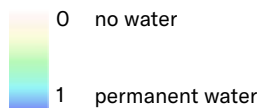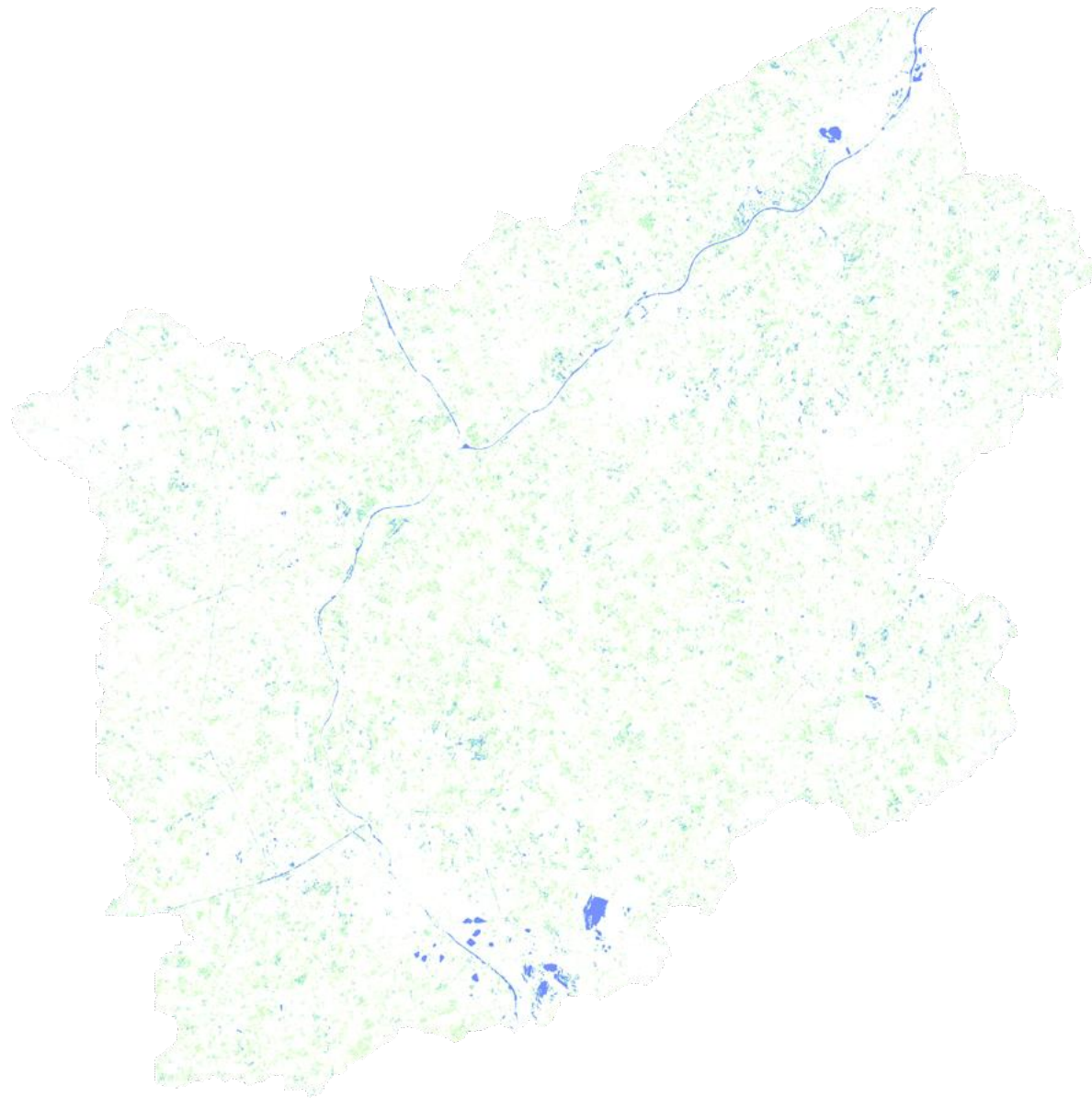
posthydrological bodies
the evolution of surface water bodies

The third passage was the calculation of the annual average through the same tool that was used before. The average was obtained through the sum of the seasonal averagess divided by the number of seasons. This calculation was also helpful to remove some errors given by single pixels. The result is a map with a gradient in which the pixels with the greater superpositions of water bodies tend to be blue and the ones with the less superpositions tend to be greenish.
The same operation was done with the data related to each year in order to obtain five annual means.

Raster calculator

("SAR image July 2021" + "SAR image October 2021" + "SAR image April 2021" + "SAR image January 2021") / 4

0   no water

1   permanent water

number of pixels

*mean* · *standard deviation*

water presence [0;1]

The graphics and the maps are showing the average and the standard deviation of the normalised annual means calculated through the operations explained before.

The calculation is an example on how these kind of devices could be used in order to obtain some informations with satellite imagery, in fact it shows a low precision because of the number of starting days considered for the calculation of the seasonal means, which is of course affecting the result of the annual mean.

However, it is possible to observe a trend which has a linear growing from 2017 to 2020: the mean moves from 0.70 to 0.84. It means that there is a tendence of the SAR images to have more pixels that contain values which tend to 1, namely those considered as permanent water bodies.

The results can be interpreted as a growing tendence to the surface to have more water during the years. The graphic of 2021's annual mean has an average of 0.82: this does not mean that the tendence of the territory is of being less wet; it is probably due to the fact that the stagional means calculated do not consider enough days. In fact, even one rainy day could bring one SAR image to have an excessive amount of pixels classified as water, as it can also be the opposite. In fact, several images per year are used and then averaged over several years, precisely to "average out" the impact of weather conditions on the individual image.
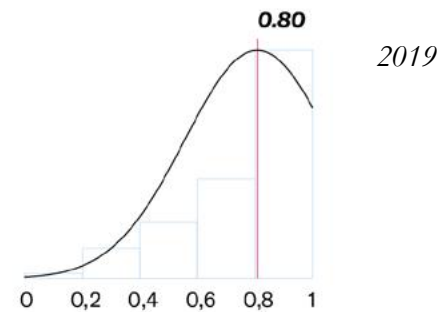
On the contrary, the linear trend is quite clear: the result is then that there is a good probability that during the last five years the surface taken into consideration is always
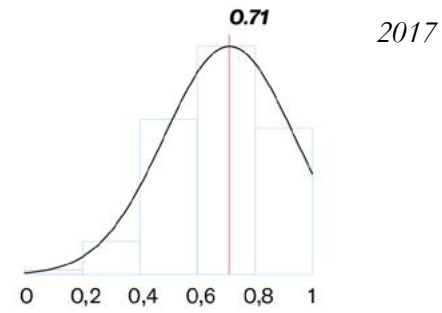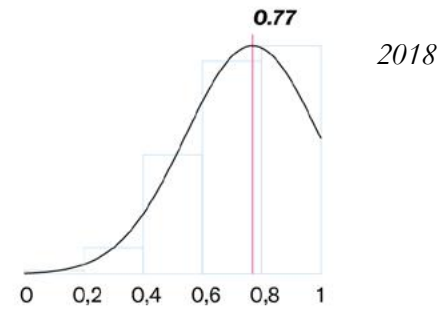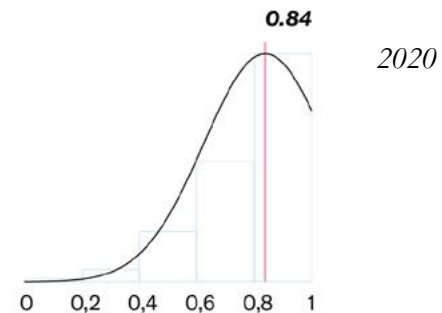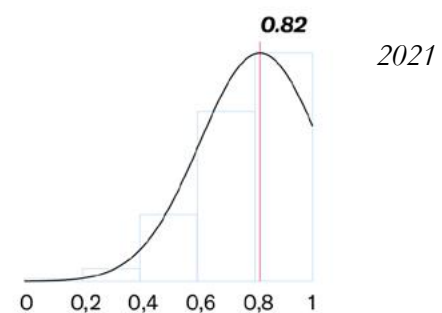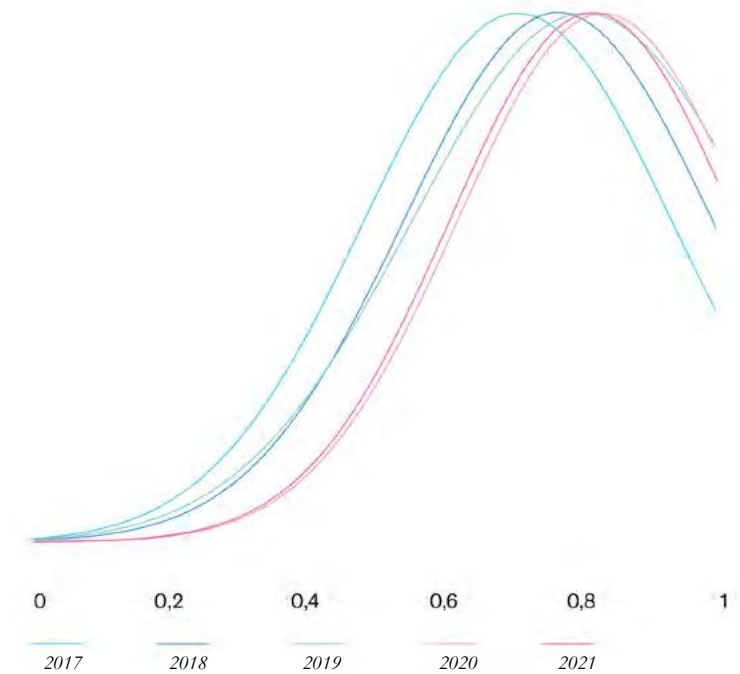
0.71 *2017*

0.77 *2018*

0.80 *2019*

0.84 *2020*

0.82 *2021*

posthydrological bodies
the evolution of surface water bodies


2017   2018   2019   2020   2021

more wet. Causes can be found in the ongoing ecological crisis, which is in general bringing in Northern Europe a series of extreme rains and by consequence flooding and hydrogeological problems.

In the following map, a mean of the annual means was calculated in order to obtain a final map which could show in general what the new wet geographies are, or which new water bodies could be. As might be expected, most of these new geographies correspond to the lowest extremes of runoff axes, that is, those where rainwater tends to flow due to topography.

Raster calculator

("2017" + "2018" + "2019" + "2020" + "2021") / 5

2017 — 2021

a.

b.
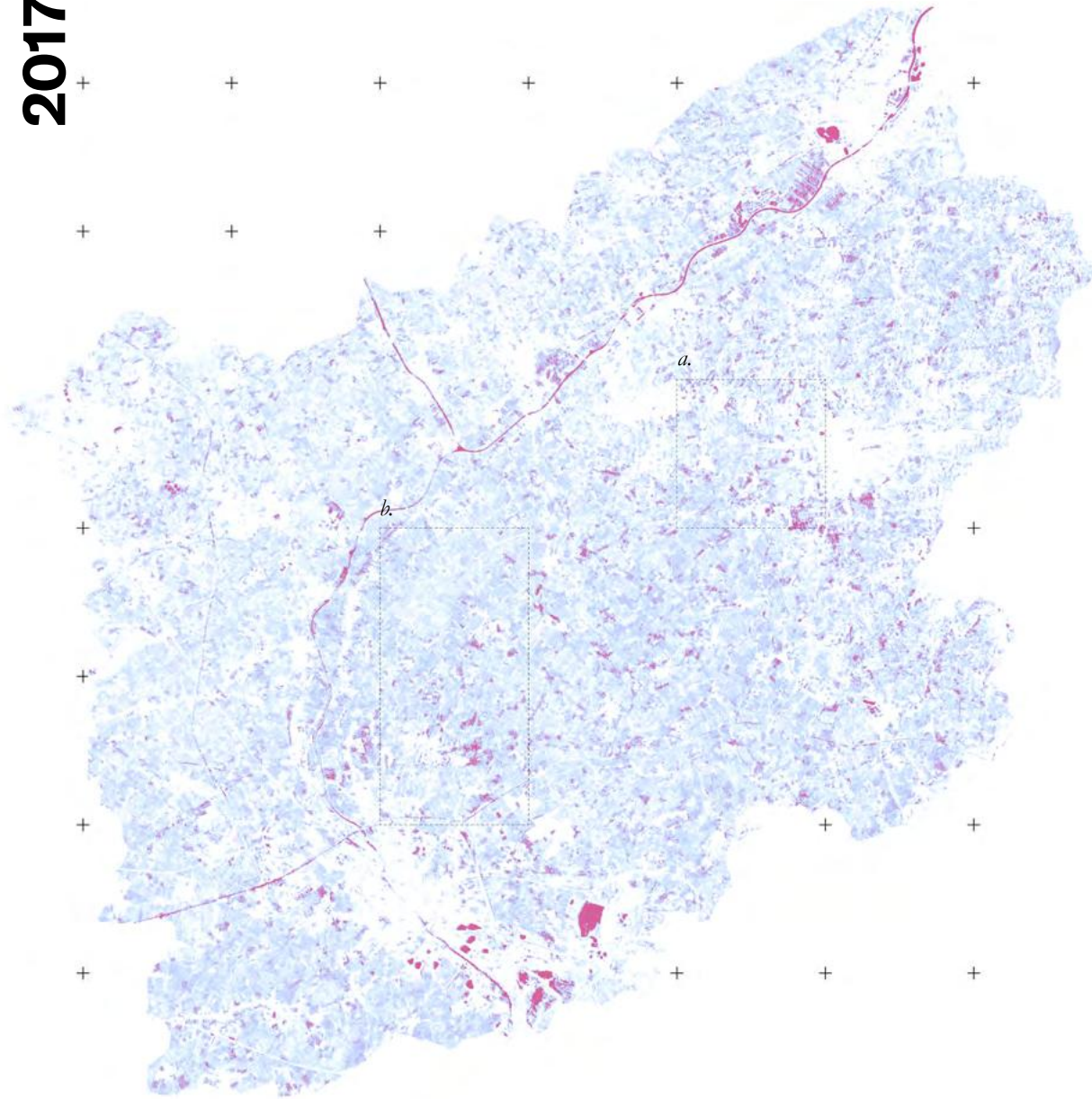
0   no water

1   permanent water

The averages of the binary images give as a result an image with a gradient that goes from 0 to 1. Values corresponding to 1 are those which represent permanent water bodies, that are decreasing until values corresponding to 0, in white — no water bodies at all. This means that, in spite of the river and its tributaries, there are other points where there is the tendence of having permanent water bodies.
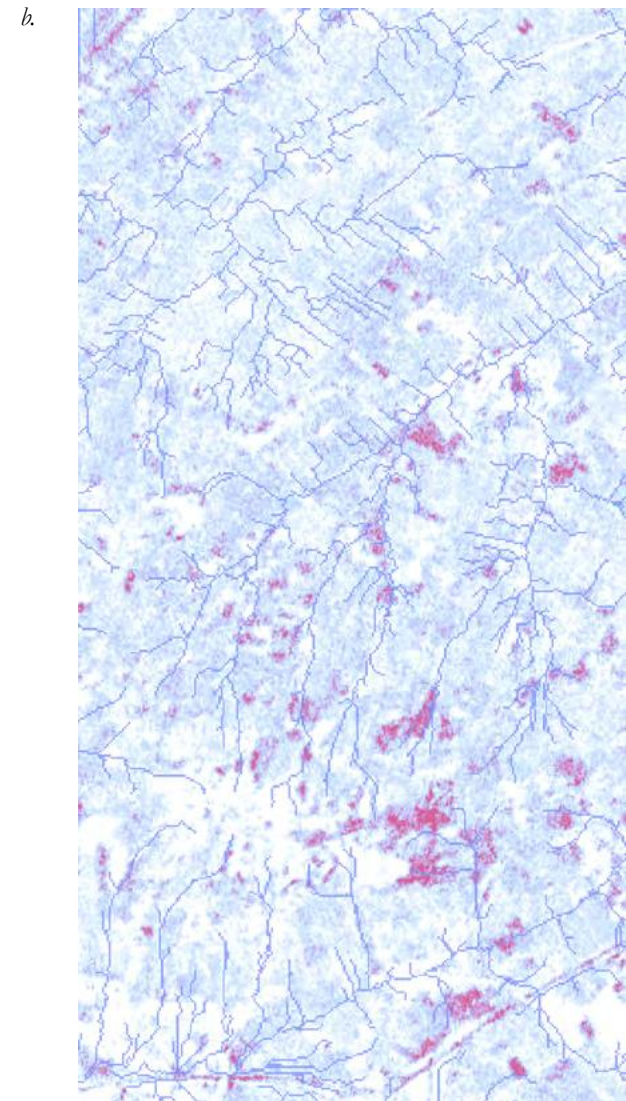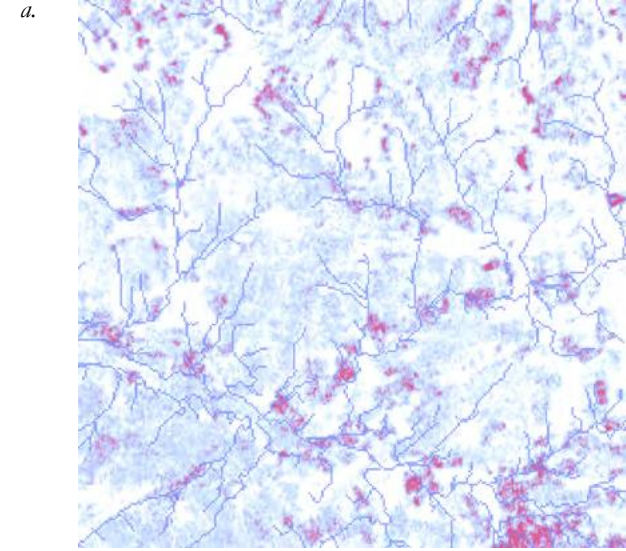
2021/06/14

water otherwise
water stress

The Normalized Difference Moisture Index (NDMI) is calculated starting from images captured by the satellite Sentinel 2. A true color composite from Sentinel 2 appears as in the figure. This constitutes the atmospherically corrected visible part of the spectrum, namely the combination of the red, green and blue bands. As explained before, satellites are also able to capture bands which do not cover the visible spectrum: in detail, the higher is the spatial resolution the less quantity of bands is covered (the spectral resolution is lower). In this case the spatial resolution of the satellite image was 20 m, because it contained also the near-infrared (NIR) and short-wave-infrared (SWIR) parts of the spectrum, necessary for the calculation of the index, while the true color composite is characterized by a spatial resolution of 10 m. Also in this case a stagional mean was calculated starting from the choice of some days per season, as shown in the table below. The days chosen are out of phase due to the fact that NIR and SWIR bands captured by Sentinel 1 are sensible to clouds and in winter months it was complex to find cloudless situation in such a wide area.

	2017	2018	2019	2020	2021
jan					
feb	15	25	25		
mar				26	
apr		21	21		30
may	26				
jun				24	14
july	5	25	25		
aug				13	
sept					7
oct	18				
nov		17	17	6	
dec					16

NDMI

water otherwise
water stress

NDMI is then a combination of NIW (B8A) and SWIR (B11) bands. Infrared is in general very sensible towards vegetation: in particular, SWIR gives information about vegetation water content and the "spongy" structure in vegetation canopies, and NIR reflects informations about leaves' internal structure and amount of dryness. So, the index as calculated below is useful to monitor and evaluate the content of water in vegetation. While SAR images are useful to show water bodies, NDMI gives deeper information about the internal structure and water-absorption capacity of vegetation (Gao, 1996). The index was calculated through ArcGIS Pro and the result, as shown in the picture, is a single-band image (therefore, black and white), with values from -1 to 1: in general, values closer to 1 correspond to water bodies and negative values correspond to dry soil (e.g. urban areas). NDMI was calculated for every day showed on the previous table.

Indices

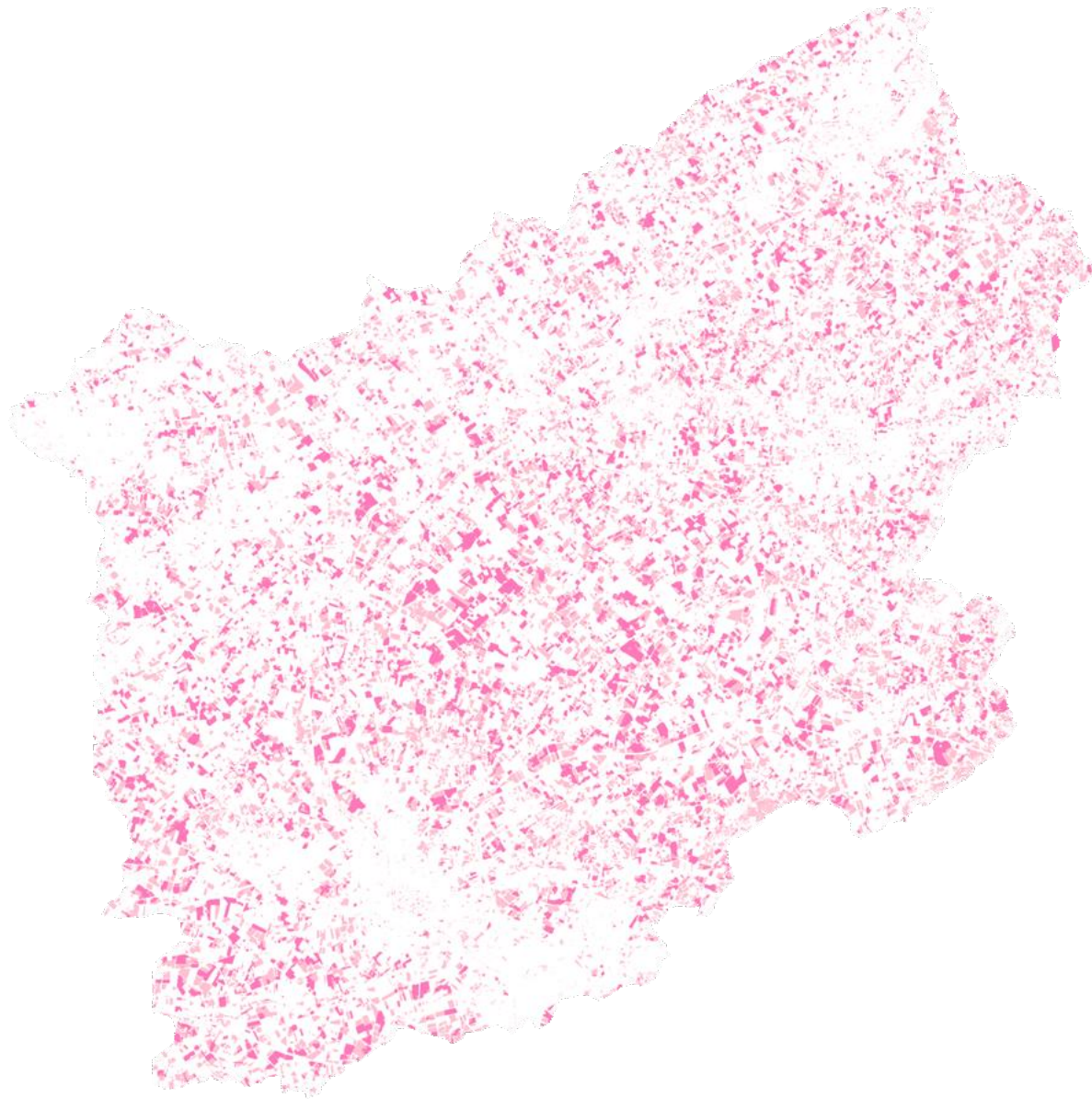NDMI = ("NIR" — "SWIR") / (NIR" + "SWIR")

water otherwise
water stress

Conditions of water stress can be then determined by intermediate values, more precisely from -0,2 to 0,4 (Gao, 1996). The same operation done with SAR images was then done with NDMI images: through a simple disequation lower values than -0.2 and higher values than 0,4 were excluded in order to understand how the area taken into consideration is affected by water stress and evaluate this tendency over a chosen amount of time (from 2017 to 2021). The result is, for each image, a map with a binary model, in which blue areas are the ones affected by water stress, excluding then water bodies (in fact the Scheldt is well distinguishable in white) and urban areas. It is quite evident that the shapes trace the shape of the agricultural fields: in fact the index is very sensible even to recently irrigated fields. This is why a single index taken on a single day is not enough for the evaluation of a trend.

Raster calculator

("NDMI_14062021" >=-0.2) & ("NDMI_14062021" <=0.4)
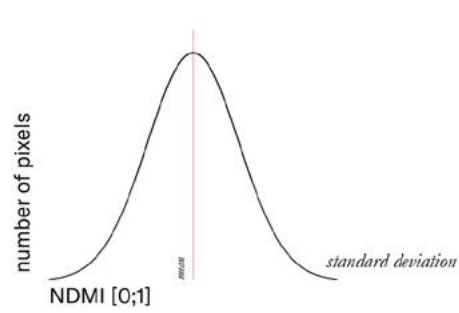
water otherwise
water stress

Every map was then used to calculate the seasonal average for each year taken into consideration. The result shows a gradient in which single fields are very distinguishible for the reasons explained before. This time the range moves from 0, in white, to 1, maximum condition of water stress, or the pixels with the highest superposition of pixels with values between -0.2 and 0.4.
The averages of the binary images give as a result an image with a gradient that goes from 0 to 1. Values corresponding to 1 are those which represent maximum conditions of water stress, that are decreasing until values corresponding to 0, in white — no water stress. No permanent water bodies, nor urban areas, are showed on the map.

Raster calculator

("NDMI July 2021" + "NDMI October 2021" + "NDMI December 2021" + "NDMI April 2021") / 4

minimum water stress

maximum water stress

number of pixels

mean

standard deviation

NDMI [0;1]

0.87 *2017*

0   0,2   0,4   0,6   0,8   1

0.87 *2018*

0   0,2   0,4   0,6   0,8   1

0.85 *2019*

0   0,2   0,4   0,6   0,8   1

0.85 *2020*

0   0,2   0,4   0,6   0,8   1
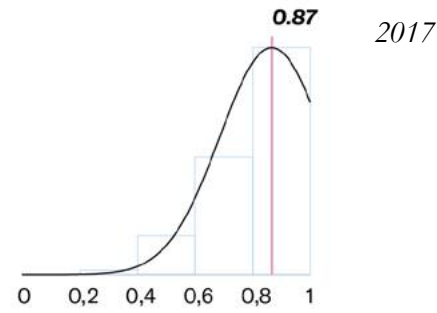

0.76 *2021*

0   0,2   0,4   0,6   0,8   1

Histograms were then used starting from the annual averages in order to understand if there is a trend on the evolution of the index. From 2017 to 2020 the average is quite the same (0.85 to 0.87) and, as in the previous case, just one year (2021) shows an exception: also in this case this does not indicate an evolution of the trend because of the non sufficient amount of images used to calculate the stagional averages. This index is very sensitive also to irrigated fields: we could then say quite accurately that the average tends to remain the same, whereas the amount of water bodies seems to be increasing with the years.
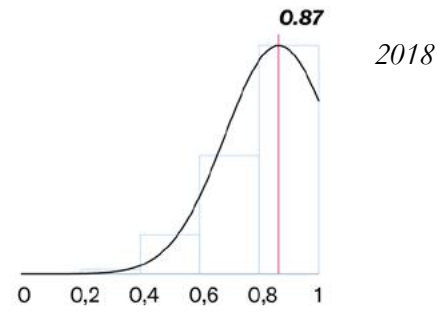
The reason is evidently the land use: whereas water bodies and canopies, as well as urban areas does not show conditions of water stress, in general agriculture fields have a deficit in their capacity of absorption of water, so the mean NDMIs remain almost the same, but in general it is quite high, as it tends to 1.

As SAR images, the final map has been obtained through the calculation of the average of the annual means.

The result shows that water stress is then lower regarding urban areas and body waters and their surroundings. Moreover, it is also less regarding areas with canopies, meaning that most of the area taken into consideration does not contain other uses than those of agriculture and farming.

water otherwise
water stress

0.83

0   0.11   0.21   0.32   0.42   0.53   0.63   0.74   0.84   0.95   1
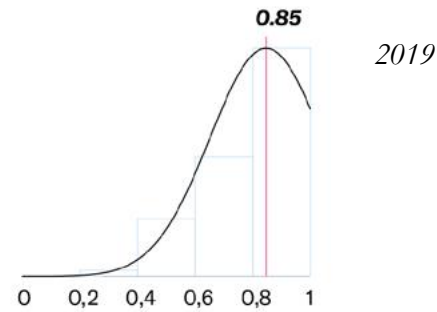
Raster calculator

("2017" + "2018" + "2019" + "2020" + "2021") / 5

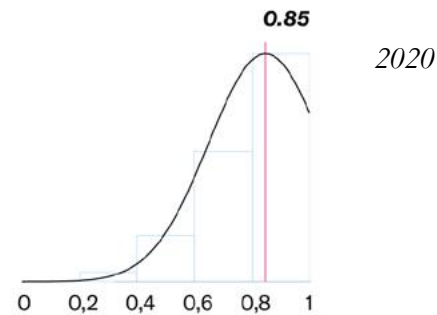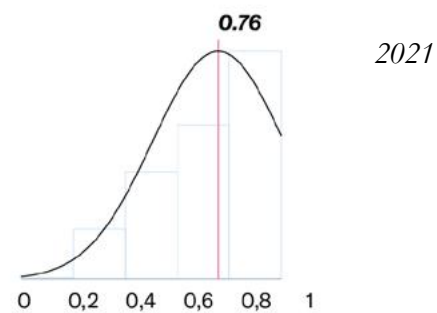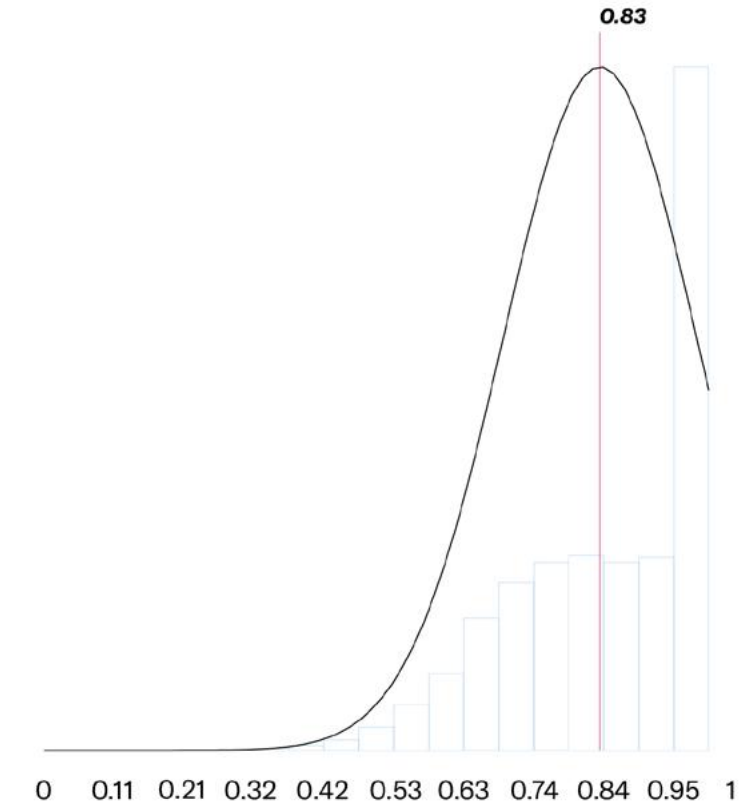*a.*

b.

minimum water stress 0

maximum water stress 1
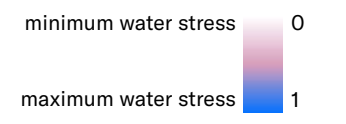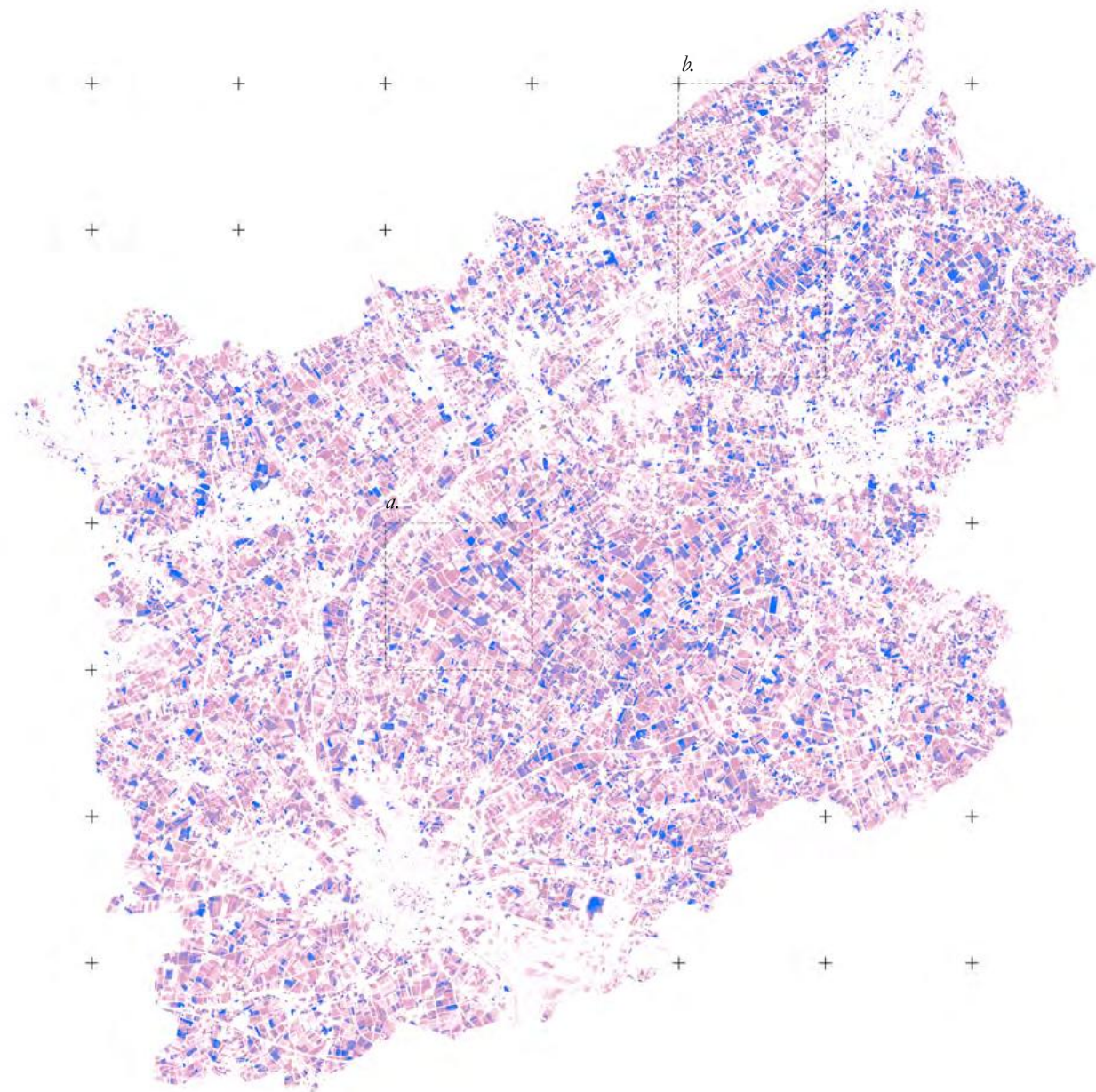
4. CONCLUSIONS

4. CONCLUSIONS

In the final chapter, conclusions are drawn about two main scenarios considered influential for the near future. The first scenario deals with the question of contemporary neoliberal Capitalism and how the question of the postnatural can fit within it; through a reflection about the role traditionally attributed to nonhuman subjects within market laws, two main directions in which the project can and could move are outlined. The first output is to continue to keep Man and Nature separate, thus still enforcing the binary system that underlies the cultural construction of the traditional project, in which Nature, in this case water, is either removed from man, retained but in a controlled manner, or Man himself is removed from it. The second output, on the other hand, is the acceptance of the relational construction of the

project, through a reflection on the subjects' capacities for reading and interpretation and the limits of these capacities, limits that are considered key points for the opening of an egalitarian and non-deterministic dialogue of a territory that asks to be heard, which can be the key to a future project in which Urbanism stands as a discipline that encompasses multiple skills that can implement the quality of dialogue with the 'other'.

Instead, the second scenario deals with Climate Change as determined by translation. In more detail, it is argued that translation as an operation of reading, selection, synthesis and interpretation may be able to leverage certain issues rather than others.

The postnatural in this case becomes a project at the moment when its relational nature becomes the motive that drives integrated human-nonhuman action and a project of a collective nature. Urbanism is thus seen as an tool for translation.

4.1.

the project
within and after
Capitalism

"Days End - Gordon Matta-Clark - 1975"

Once we have defined the postnatural as a relational subject and established possible ways of reading and interpretation, the question is: how to approach the project?

The illusion of separation

The possible exits are mainly of two kinds. One is the tendency to separate Man and Nature more, thus maintaining Cartesian dualisms. This involves the separation of human activity from nonhuman activity, which is sometimes still linked to extractive dynamics (Bélanger, 2013). The consequences are a literal detachment from human life from that of the nonhuman, which is neglected in favor of maintaining production dynamics that are now unsustainable. It is the case, for example, of the implementation of a series of engineering works that, in the case of rivers, tend to move them away from those areas where anthropogenic activity is concentrated and tend to regulate them very sharply, not allowing any kind of relationship. These are dynamics that are already happening, especially in those areas where the presence of water from being a potentiality is becoming a real risk. For example, depoldering practices are aimed at letting water in in a controlled way so that it is diverted to specific areas, so as to keep the rest of the land exploitable. Or this is the case of the MOSE, where instead water is literally held outside through an actual wall that rises when the water level exceeds a certain threshold. Still, sometimes it is the city that is pulled away from the water, as in the case of the Venetian lagoon where it is planned to raise the ground floors of buildings a few meters so that to avoid floods.

The conditions in which humans are living today and are subjugating the other species are bringing to some consequences that are damaging for all the subjects included in the system.

Nature intended as "Cheap" (Moore, 2011) means that it is completely included in the mechanisms of contemporary Capitalism: maybe it is better to replace 'Nature' with 'Postnature' in order to avoid every traditionally-influenced interpretation of it and giving space to it as a relational subject which, as well as human beings, is involved and organized in planetary patterns. What happens when postnatural dynamics start to be incoherent towards human parameters?

Speaking about the Scheldt, it has been said that being so slow makes it very affected by tides. It was also said that crops constitute most part of the land use of the watershed, and the feeding of crops strictly needs freshwater supply. Talking about Climate Change-related risks, the melting of glaciers is increasing the sea level: what happens then when salty water enters into the Scheldt's watershed and the whole water network that is exploiting the river so as to irrigate the fields?

Salinization of water is an important problem in agriculture, and there are several examples of how it has affected pieces of land which have historically being florishing making them unproductive, hence leading to their total abandon.

Is not it the case where Postnature is affecting capital? How the consequences of this small boundary shift spread onto our quotidianity as we are used to? Ecological crisis and neoliberal crisis are then strictly related, mechanisms of possession and management risk to fall when the physiological behaviour of a subject has been so widely and deeply manipulated by another one — humans — who did not and could not understand and translate its forms of expression.

On the other hand, in the sub-basin it was shown the tendency of having more superficial water while in a general condition of water stress: how these dynamics could cohabit with the general tendency of salty water to enter the watershed? Which are the consequences? We are assisting at two environmental phenomena which are coming from seawater and rainwater: floodings and salinisation. Precipitations are expected to be less but heavier, making the subsoil always poorer because dry most of the time, moreover adding the problem of salty water coming from the estuary. Engineerical solutions are already present on the territory and are managing the agricultural market of the watershed: will they be enough when these two issues will be more impactful?

The tendency is that to distinguish human-related environmental phenomena and non-human-related environmental phenomena: salinisation and floodings are considered as phenomena related to the river, hence nonhuman-related environmental phenomena. Is man really exempt from all this? The answer that this thesis gives is no, man is not exempt from all this.

First of all, humans, if considered as relational subjects as the postnatural, are equally part of this system as the Scheldt or the subsoil are. Then, since we are dealing with a geologic era in which man is the main fauthor of geological transformations, we have to admit that his role was the dominant one, without fantasize on a position that the other subjects did not have in history and still today are struggling to have. Being the dominant species, humans have exploited non-humans, meaning not only animals, but also the a-biotic sphere (the Scheldt) and those humans that were naturalized (Braidotti, 2013). Non-humans were exploited in favour of a system, which was predominantly male, white, western: neoliberal Capitalism. Hence, inside this system we find humans and non-humans. While traditionally their definition has been identitarian, this thesis proposes a shift to a nomad definition of these subjects: nomad means dynamic and not inscribed into given parameters. Dynamic means that human and non-human identities are given by their relationality, the only one that can bring to the creation of a system: and a system is the relation between two variables. Neoliberal Capitalism was defined before as a system: hence, we are dealing with the neoliberal Capitalism system that is made by the relationship between two variables, humans and non-humans. This means that non-humans are equally involved into contemporary market dynamics, whether we like it or not.

The problem comes when one of the two variables undergoes, or goes, towards a paradigm transformation: everything changes, for sure the system is not anymore balanced, but the very relationship between the two terms in the equation fails.

This has at least two consequences. The first on is the failure of the

statement that there are human-related environmental phenomena and non-human related environmental phenomena. The system is the same, and a distinction between them is obsolete because it keeps leading to a binarian system in which humans have to choose between dominating or protecting the other subjects, and this thesis asserts that these other *subjects* are not weak nor needy, for sure no more than us. The second consequence is that being equally part of a system, non-humans contribute to the dynamics of contemporary Capitalism. Hence, when the relationality of humans and non-humans fails because the system has not been balanced, also the system fails.

The humbleness of relation

This is the case where the second exit is on the table, which is the acceptance of the relationality that exists and makes such human and nonhuman subjects. Accepting relationality means accepting other languages and other modes of expression as equally capable of relating to and managing each other: the climate and ecological crisis is already showing signs of the environmental transformations that will take place. it is therefore necessary to implement our capacity for dialogue with other living species, and this can only be done by bringing into play a range of hybrid skills, ranging from architecture, engineering, sociology, geology, botany, and so on.

The absence of rainwater for long periods brought to severe droughts in the Northern Italy during the summer 2022: the Po river reduced its level compared to the level it had during other years in summer, lakes are completely dry and the first thing this condition is affecting is crops. In general the demand in the whole Northern Italy is that of, today, rationalize the amount of water being consumed as well as modify crops in a way that favors those that need less water. The next step will be to find crops that can withstand salty water, as sea water is entering the river for chilometers of its length.

This is something that will have a cost, not ethically speaking but strictly economically speaking, towards the near future, in which the harvest will be poor if non existent and the soil will be depleted, thus unable to withstand intense rainfall typical of tropical climates moving further and further north. For the Scheldt, it is only a matter of time, unless we move agritulture into total greenhouses, as it is happening in the Netherlands. Again, our role is not to defend the river and its ecosystems as fragile subjects, but to understand that the river has a very good resilient capacity to adapt: we will be the ones who will not adapt, if we maintain this kind of relationality with the environment. The proposal of the thesis, again, is to propose a paradigm shift that is, however, proactive, i.e., aimed at practical action — that can also be that which is strictly related to urban design — aware of the fact that we are a relational part of a system made up of many parts, not identitary but nomadic, which certainly do not need us to protect them but need us to let them shape and express themselves. Only in this way can we act consciously. Allowing space for others to express themselves does not mean excluding ourselves from dialogue, but not making a

monologue: so the human does not have a marginal role in all this, nor the role of protector. Through dialogue and understanding languages other than our own but equally valid, true change can be achieved. The new geographies found through remote sensing can in this way be a key to comprehend the expression forms of the territory, understanding trends and tendencies so as to manage our relationship with the non-human in a way that does not promote, but tends to undo, stressful conditions given by the fact that the non-human is in the condition of having to sacrifice itself to accompany our myth of uncontrolled growth. These new geographies give a direction in which we have to look in order to accomplish this aim, a direction that is both ethical and strictly physical. Neoliberal Capitalism is cornered under these conditions, because once the resources we have always considered free are shrinking, they obviously cannot sustain the same market demands. So what to do?

The proposal, perhaps somewhat utopian in the short term, to move away from this system of managing our relationship with the rest of the planet, however, seems to be the only way forward for a truly sustainable future, assuming that by 'sustainable' we mean a practice of living that does not subjugate other species but lives in a equal relationship with each other. Hence, a starting point could be what is the very proposal of the thesis: the idea that a subject by definition is given by relationality, and that relationality is the only key that allows progress. When we cancel relationality, progress fails and we are stick into the same condition in space and time that does not allow any kind of transformation. So, if the ecological crisis is scaring us so much — and that is because it is indeed related to a market crisis — we have to seek for transformation, and transformation is gained through a productive relationship between subjects.

Within this perspective, what is the role of Urbanism? What could it become? it has already been said that we are talking about a system, and that a system is composed of several variables. Taking into account the variables involved means improving communication and expressive skills without taking both the starting points of reflection and the results for granted. Improving communication skills therefore means bringing into play skills that are able to read and translate the variables at play: Urbanism in this case becomes Systemic Design, and Postnature becomes the project in which various disciplines come into play with other nonhuman systems within a perspective that sees us as an integral, and not dominant, part of a changing planet that has the same right to express itself and be heard as we do.

As said before, a productive relationship between subjects is not a relationship where we exploit the other, nor we victimise it, since what is scaring us is our future in a world that is changing, so if we have to look for victims, maybe we have to look at us: victims and fauthors of this ecoliberal crisis.

Page on the left:
Depoldering Noordwaard;
sources: west8.com
On the left:
Acqua alta (Venezia);
sources: mosevenezia.it
At the bottomt:
MOSE (Venezia);
sources: mosevenezia.it

4.2.

tools for translation

"Other-Selft Portrait" — Joana Ricou, 2016

Translation affects Climate Change

A project is an act of listening, reading, interpreting, and translating forms of expression that come from an 'other' subject and are received us. The postnatural in this sense can be deined as a project, as it is fundamentally a concept that helps to employ an other translation that takes into account some issues which have usually been neglected, namely the voice and the capacity for self-determination of what is the nonhuman. This means that in dealing with certain problematics, translating affects the results one can obtain: reasoning within the architectural realm, we can say with conviction that the practices of architecture and urbanism are ultimately tools for translating expressive forms from multiple subjects, with the aim of making a synthesis on the basis of a preliminary operation of selection. So it is first the translation operation and the ways in which this is done that influence the outcome of the project: speaking of Climate Change as key to the project, we can therefore say that the latter is influenced by translation. If the urgency of the ecological crisis pushes the postnatural to want to talk, it is precisely the project that may have the potential to offer a solution in this regard, thus giving the 'other' the chance and space to express itself. Hence, **the postnatural itself becomes a project, more precisely a *relational* project**. It means that it is made by the contribution of a collectivity, which is composed by both human and nonhuman subjects (Latour, 2004) who have equal right of expressing and equal capability of self-determination.

The reflection on the posthuman has been of a significant utility in order to operate a mental shift from a paradigm which is historically and traditionally consolidated in the western culture and that is keeping to be taught in today's architectural research. Landscape Urbanism practices are still working within a model that separates Nature from Human, natural from artificial, following an obsolete scheme in which the relationship between them is not something physiological, but it is almost forced because "we must include Nature in our projects in order to save the planet". This brings on one side to Nature's exploitation for humans' needs, on the other side to the will to save Nature as it was a weak subject whereas the best activists we can recognize are seen and consider themselves as heroes, almost super-human figures which bravely sacrifice their wealth in order to protect something that does not even want to be protected, but rather listened to, proactively. Landscape Architecture founds itself today in a condition of crisis, because nothing seems to be still enough to tackle the climate emergency in a proper way. May this be the reason? If the aim is to reach a transformation, but maintaining the values of the variables included in the game the same, no transformation is possible because, it is a fact, some of the variables are changing.

The contemporary market model does not fit anymore the planet's response, and delaying the moment of collapse is not, for the human species, the best solution. It is clear that we need to question the historical myth of infinite growth, when understanding that natural resources are not infinite and now the planet is acting as a response to

centuries of extraction. And we, as humans, are able to see this when we understand that natural resources are a significant part of this system. This is the postnatural.

And the postnatural is given by relationality, thanks to which it is possible to operate a dialogue, hence a transformation. As it was already stated multiple times, a dialogue needs the will and the ability of interpretation, but also translation, that in this thesis was done through GIS and remote sensing. The analysis that were undertaken are of course passible of errors, but they wanted to be more an exemplification on how humans could use advanced technical tools (Braidotti classifies as a subject also technology) in order not to speak themselves, but to let time and space of expression, to other subjects which communicate in a way that sometimes is directly invisible to us.

The Scheldt revealed itself to be a suitable case study for various reasons.

First of all, the European context in which it is included favourites a narrative that includes necessary factors, that are often forgotten by the architectural practice. These factors are about questions of ownership, management policies, actors and actant included in the processe(s) of exploiting and protecting the river: because it is an interaction between the ecological continuity of the river itself and the splitting into administrative borders, public and private domains, which are for sure affecting also the ecological continuity, and at the same time is also the ecological continuity, that is a fact, to affect the relationship between these countries, which were historically forced to find agreements in order to exploit the parts of the river and its watershed reaching as much profit as possible.

Second of all, that is also a consequence of the first one, in order to reach profit the river has been exploited and managed in a very heavy way, allowing an easy identification of some physical elements, that, together with the question of policies and ownerships, make the river a perfect postnatural machine. Locks, riverbed, canals, but also crops themselves, are a symptom that water itself can not anymore be considered as a natural element, but a mean through which something can be gained.

Without water the trace of the river could be exploited in any case to connect economically Paris and London. Without the river, water could be managed in any case to irrigate crops and being used by factories and settlements themselves. Where is water as a "natural" element in this case? Is not it really obsolete to keep distinghuishing natural and artificial?

annex 1
sources

WHERE IS WATER? pp 66-67
topobathymetry
*Airbus/USGS/NGA/NASA/NOAA/CGIAR/
GEBCO/NLS/OS/NMA/Geodatastyrelsen/GSA/
GSI/* European rivers
Hansen/UMD/Google/USGS/NASA
European coastline
EEA
urbanization
Esri
watersheds
HYDROsheds (ESRI/USGS)

canal Seine Nord p 73
graphic editing from canal-seine-nord-europe.fr

A POSTNATURAL WATERSHED? pp 82-83
topobathymetry
*Airbus/USGS/NGA/NASA/NOAA/CGIAR/
GEBCO/NLS/OS/NMA/Geodatastyrelsen/GSA/
GSI/GIS User Communit*
rivers
EEA
main watershed
HYDROsheds (ESRI/USGS)
western Scheldt
EEA

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water status / chemical state** pp 84-85
graphic editing from isc-cie.org

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calculated through Sentinel 2 [2020/05/15]

absence p 91
NDVI
calculated through Sentinel 2 [2020/05/15]

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land use
*CORINE Land Cover/Copernicus Land Monitoring
Service*

- p 101
false colour composition
obtained through Sentinel 2 [2021/06/14]

DEFORESTATION pp 58-59
topobathymetry
*Airbus/USGS/NGA/NASA/NOAA/CGIAR/
GEBCO/NLS/OS/NMA/Geodatastyrelsen/GSA/
GSI/GIS User Community*
European rivers
Hansen/UMD/Google/USGS/NASA
European coastline
EEA
deforestation
Hansen/UMD/Google/USGS/NASA

URBANIZATION pp 60-61
topobathymetry
*Airbus/USGS/NGA/NASA/NOAA/CGIAR/
GEBCO/NLS/OS/NMA/Geodatastyrelsen/GSA/
GSI/GIS User Community*
European rivers
Hansen/UMD/Google/USGS/NASA
European coastline
EEA
urbanization
Esri

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Geopunt Vlaanderen/Géoportail de la Wallonie
1777
Geopunt Vlaanderen/Géoportail de la Wallonie
1841
Geopunt Vlaanderen/Géoportail de la Wallonie

riverbank p 117-118
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Geopunt Vlaanderen/Géoportail de la Wallonie

locks p 129-134
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Geopunt Vlaanderen/Géoportail de la Wallonie
locks
Geopunt Vlaanderen/Géoportail de la Wallonie
digital terrain model
Geopunt Vlaanderen/Géoportail de la Wallonie

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Geopunt Vlaanderen/Géoportail de la Wallonie
flooding risk
Geopunt Vlaanderen/Géoportail de la Wallonie
parcels
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wooded areas
*vectorialization from NDVI — calculated through Sentinel 2
[2020/05/15]*

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digital terrain model
Geopunt Vlaanderen/Géoportail de la Wallonie
runoff axes
*calculated through digital terrain model [Geopunt Vlaande-
ren/Géoportail de la Wallonie]*

how to listen? pp 172-173
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flooding risk
Geopunt Vlaanderen/Géoportail de la Wallonie
flow direction
*calculated through digital terrain model [Geopunt Vlaande-
ren/Géoportail de la Wallonie]*

posthydrological bodies p 182-191
SAR images
*calculated through Sentinel 1 [dates specified within the
text]*

water otherwise p 192-203
*calculated through Sentinel 2 [dates specified within the
text]*

# annex 2 remote sensing and GIS

This section explores more deeply how remote sensing and GIS have been used throughout the whole production of the thesis, if not specified in the main body. In particular, it is shown every passage that has been made in those maps that are not just a superposition of layers, but when some more operations have been done in order to retrieve further informations from the starting data.
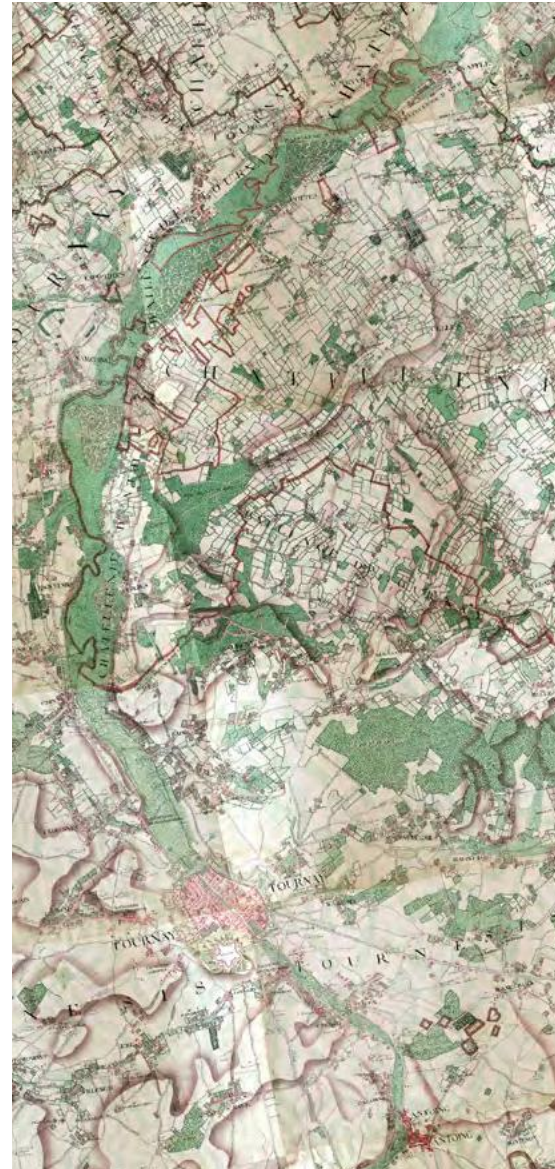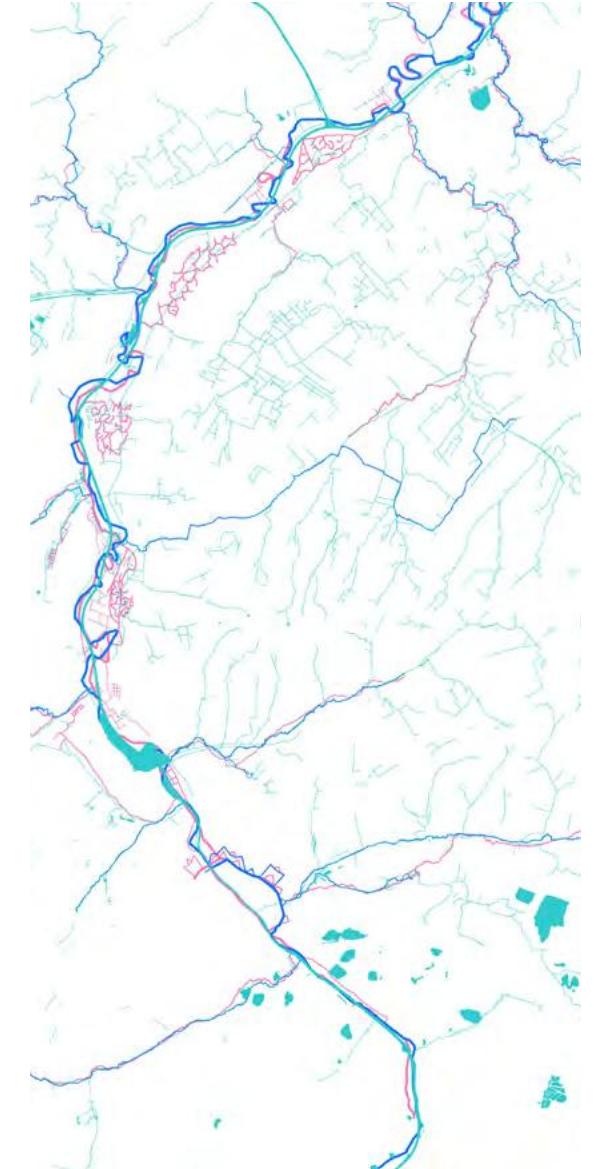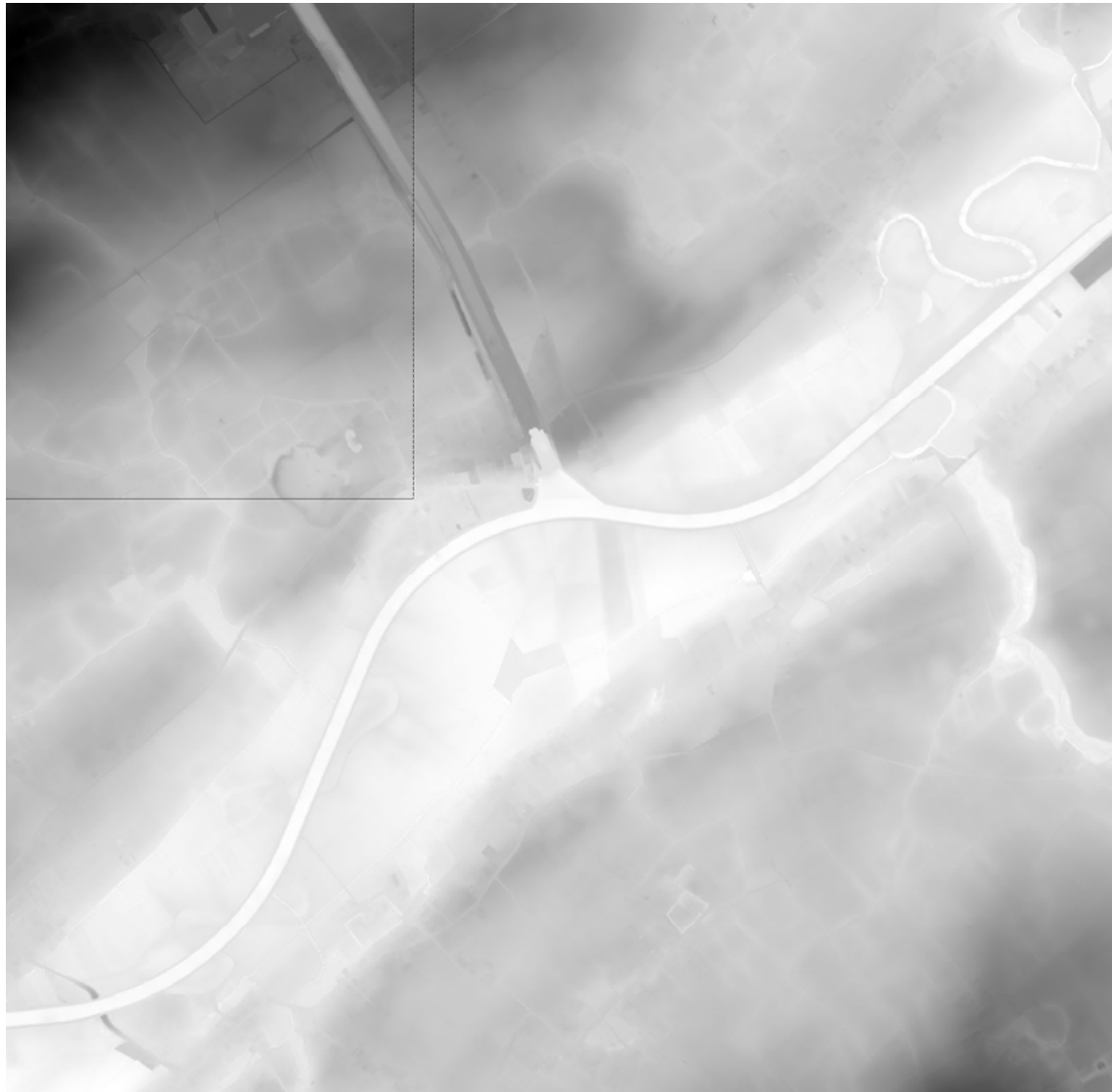
historical maps

1. downloading of the first georeferenced historical map;
2. downloading of the second georeferenced historical map;
3. manual vectorialization of the Scheldt's and its tributaries' trace and superposition of the feature layers.
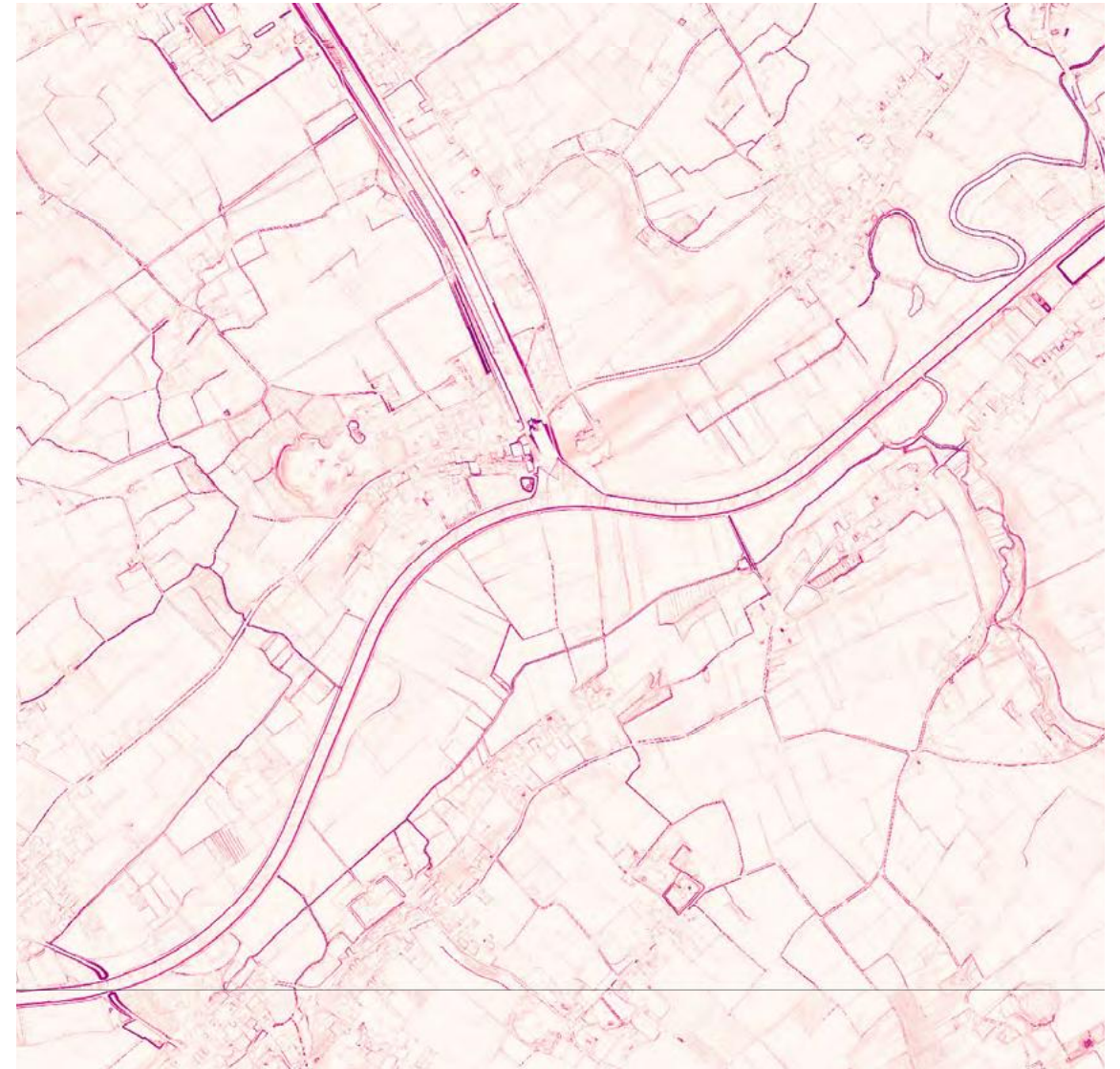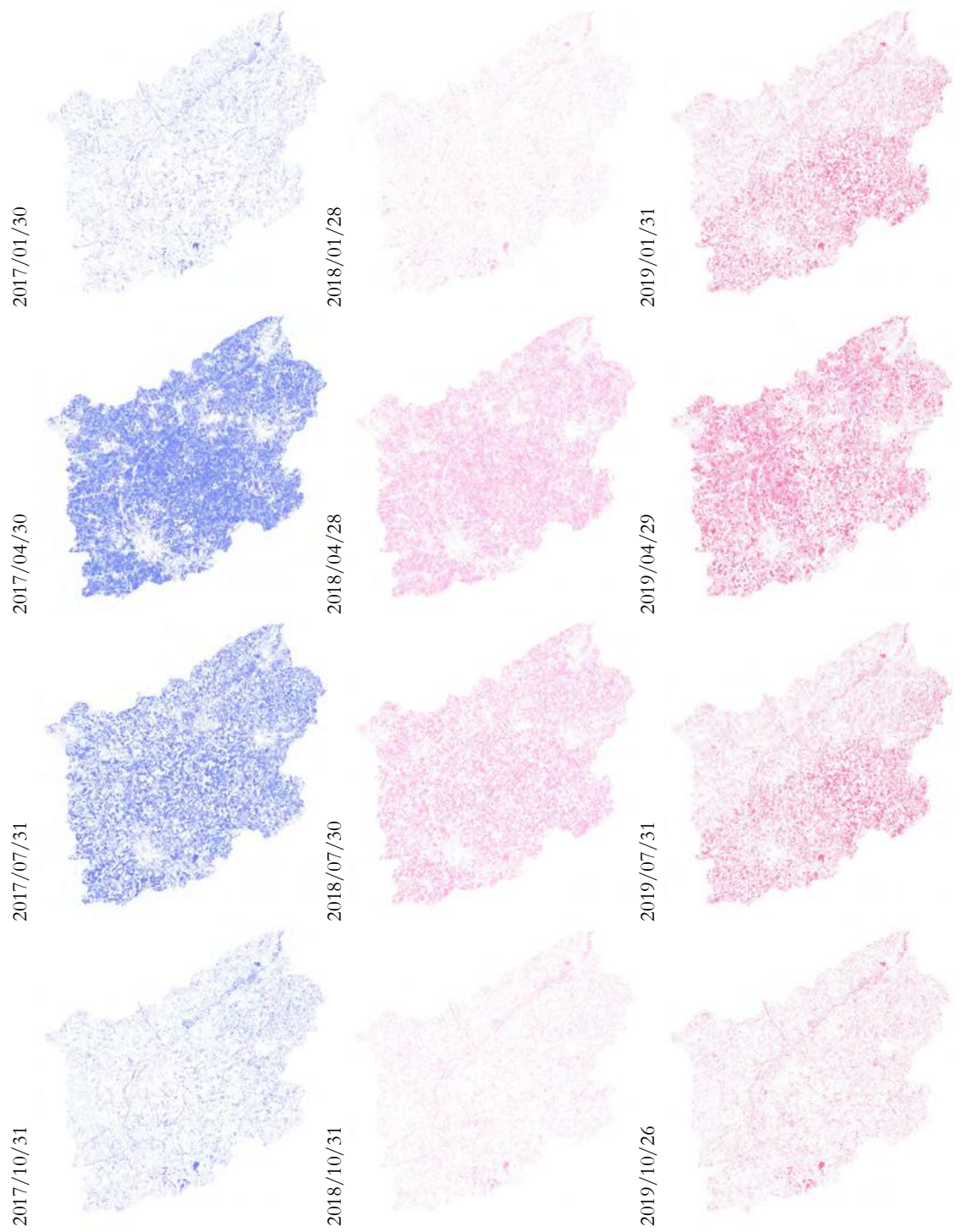

1.

2.

3.

riverbank

1.

2.

1. downloading of the
Flemish and Walloonian
Digital Terrain Model;
2. slope calculation.

new
geographies

2017/01/30

2018/01/28

2019/01/31

2020/01/30

2021/01/30

2017/04/30

2018/04/28

2019/04/29

2020/04/29

2021/04/30

2017/07/31

2018/07/30

2019/07/31

2020/07/28

2021/07/23

2017/10/31

2018/10/31

2019/10/26

2020/10/31

2021/10/27

SAR images — 2017

SAR images — 2018

SAR images — 2019
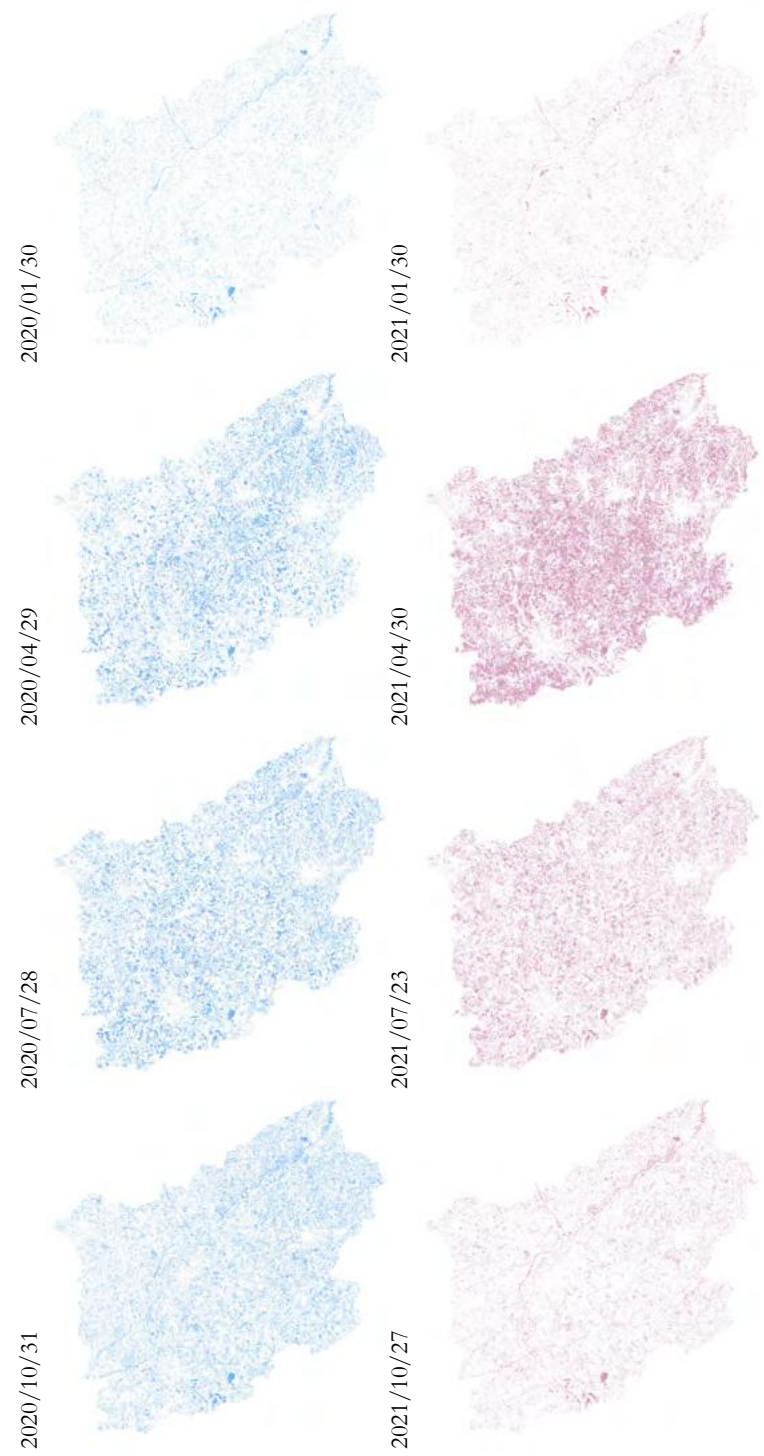
SAR images — 2020

SAR images — 2021

new
geographies

2017/02/15

2018/02/25

2019/02/25

2020/03/26

2021/04/30

2017/05/26

2018/04/21

2019/04/21

2020/06/24

2021/06/14

2017/07/05

2018/07/25

2019/07/25

2020/08/13

2021/09/21

2017/10/18

2018/11/17

2019/11/17

2020/11/06

2021/12/16

NDMI — 2017

NDMI — 2018

NDMI — 2019

NDMI — 2020

NDMI — 2021
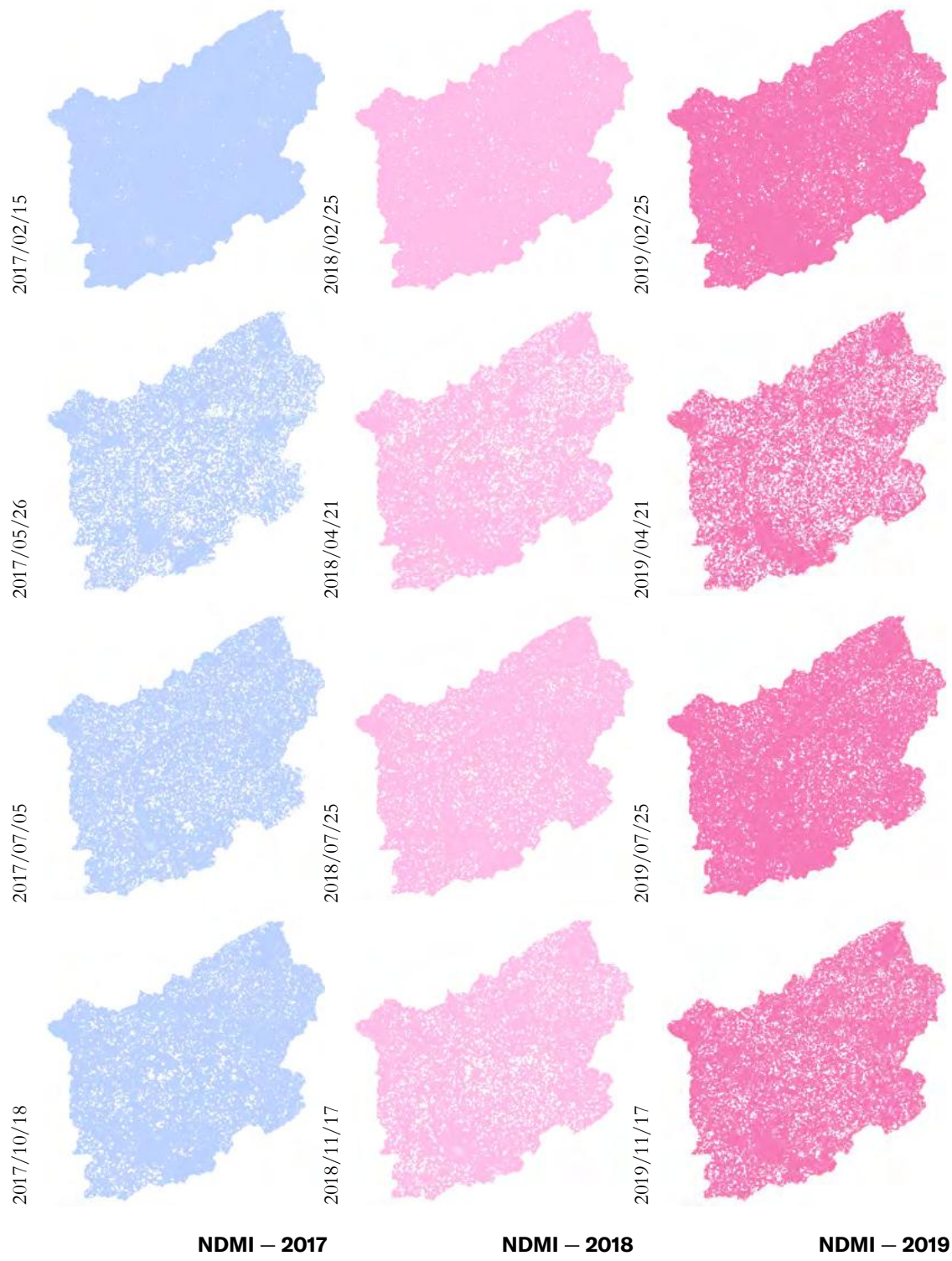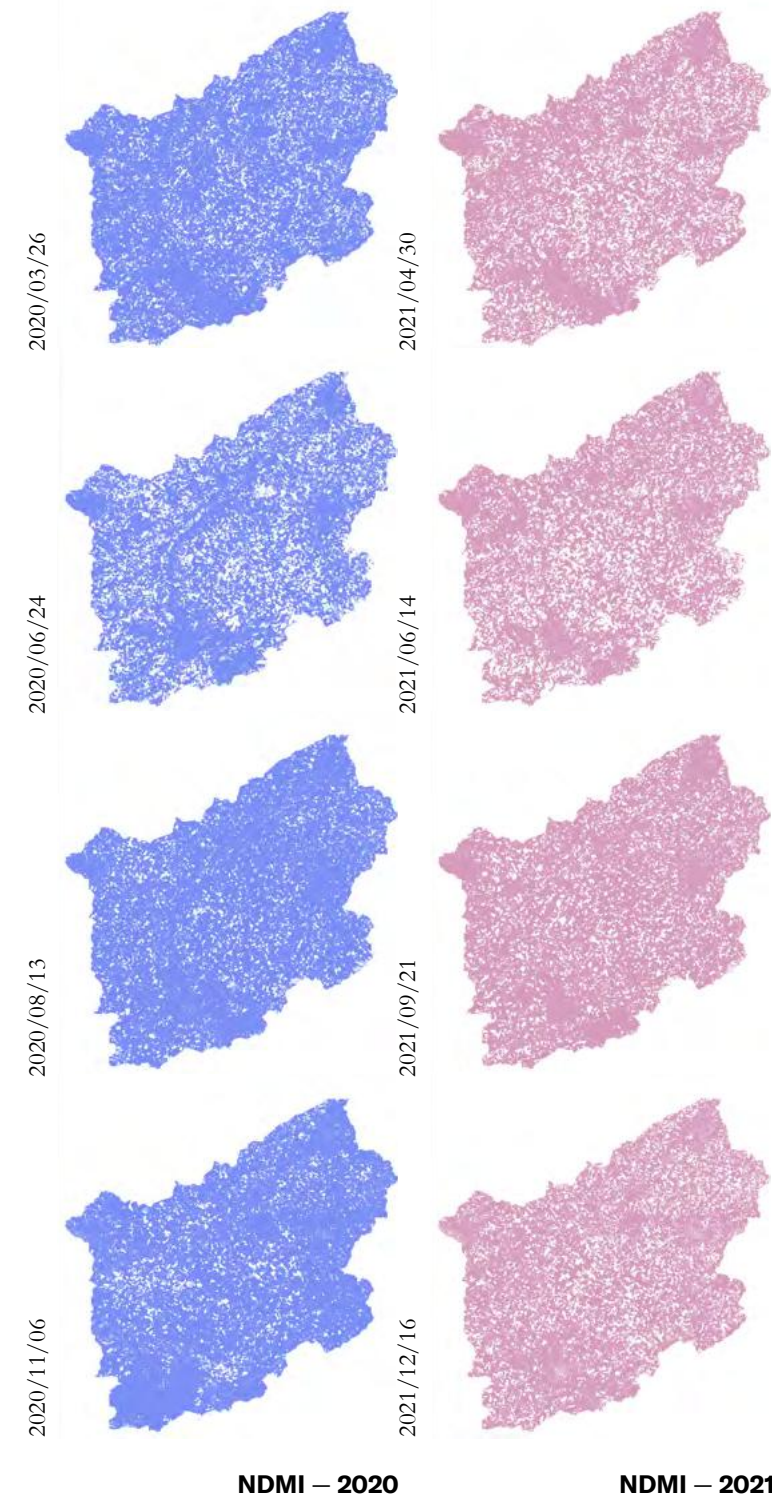
SAR images — yearly means
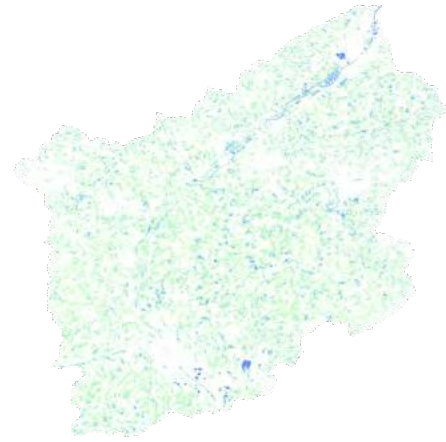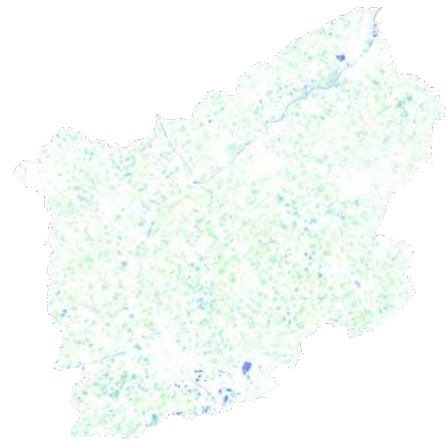
NDMI — yearly means

2017

2018

2020

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2021

2017

2018

2020

2019

2021

bibliography
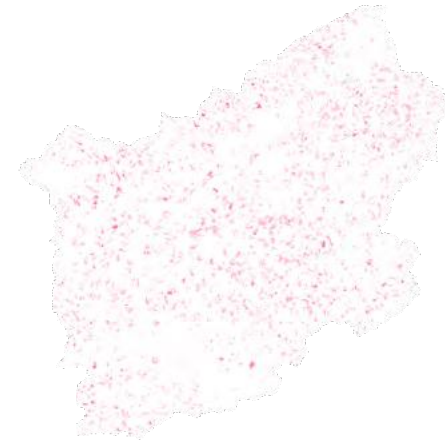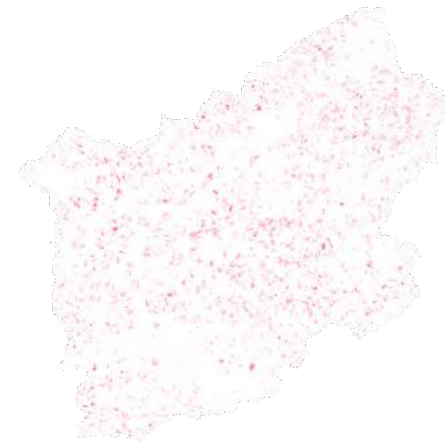
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