

# Cross-scale drawings of hidden landscape dynamics

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## **Abstract**

The question of how to show processes that are by definition time-based has been one of the more intriguing ones in the field of landscape representation. With ever-greater importance being given to values of space that can be measured, we ask if new approaches to the drawing of space are needed to unveil these measured, sometimes hidden landscapes. With this in mind, students in the Department of Landscape Architecture at the University of Ljubljana undertaking the Visual Communication course were tasked with developing new techniques of data visualization focusing on (1) the spatial dynamics of landscapes and (2) on the multiscalarity of the representations.

The paper comprises a general description and discussion of the topic, accompanied by seven sets of drawings where the two above-mentioned aspects are briefly discussed in the drawings' captions. The drawings presented here push and question the boundaries of drawing conventions and consequently elicit uncertainty and encourage further enquiry. Exploring new drawing approaches is an important part of revealing contemporary landscapes.

## **Keywords**

Cross-scale drawing, Capturing dynamics and time, Drawing as a diagram, Prediction of development

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## Introduction

The question of how to show processes that are by definition time-based has been one of the more intriguing ones in the representation of landscapes. Starting with McHarg's *Design with Nature* (1969), where different landscape processes are used to define landscape values, the process-oriented approaches in landscape architecture have developed ever-new ways of representing time. Recently, under the loose term of 'landscape urbanism', we can follow various design-related disciplines that experiment with drawing spatial processes and time. From explicit Gantt chart-like representations of habitat phasing in Field Operations' Freshkills Park (James Corner in Mc'Closkey & VanDerSys 2017, p. 13), to more abstract and implicit representations of surfaces that can carry different meanings in competition drawings for Parc de la Villette by OMA (Waldheim 2006, p. 36). Can these representations be developed even further or are they already testing the limits of visual expression?

With ever-greater importance being given to values of space that can be measured, new professions are emerging that challenge the authority of the classical design-related disciplines in drawing space and time. Data scientists and graphical designers are creating new visualization sensibilities that are graphically pleasing. Such a one is the famous 'Mapping Facebook pairs of friends' by Paul Butler where myriad Facebook friend links create an outline of the urban areas in countries where Facebook is not prohibited. Yet these new representations focus on visual appeal rather than advancement of the drawing discourse. The latter should reveal, for example, new and hidden dynamics that govern such a phenomenon rather than only show the fact that different nodes are connected. Therefore, it is essential to deepen the investigation of visual / geometrical data representation by developing new methods of drawing and visual representation. These explorations need to shed new light on the representation of space and enable better interpretation rather than being an end in themselves (Hughes 2013).

With this in mind, students in the Department of Landscape Architecture at the University of Ljubljana undertaking the Visual Communication course were tasked with developing new techniques of data visualization. The goal was to create drawings that can (1) show the spatial dynamics of landscapes, and (2) focus on multiscalarity of the representations. Just as dynamics is hard to represent on a fixed sheet of paper, so different scales are hard to combine. In terms of spatial dynamics, the students focused on different types of processes that usually require time to be described and are therefore difficult to draw in a static frame. They range from more obvious ones, such as the yearly dynamics of ice movement in the Antarctic (Fig. 2) or the spread of invasive species along the Krka River (Fig. 5), to less obvious ones such as the transformation of a housing typology (Fig. 3). Here dynamics refers to the transformation of a housing type subject to seasonal cycles. In terms of multiscalarity, the drawings were presented as A1 physical posters where observing the entire drawing gives the viewer one type of information. Observing and examining details reveals a deeper understanding or additional topics. In other words, the drawings show time-based processes on different scales where the drawing medium and the detail of the drawing creates a dynamic representation revealing different understandings that are dependent on the distance / scale at which the drawing is viewed. Drawing is turned into an 'abstract machine' (van Berkel & Bos 2010, p. 227) that through its visual representation conveys an understanding that a written text cannot. Visual representation shows sizes, geometries and their relations. It shows the visual quality of a phenomenon, its shape, patterns and how they fit together. A drawing is a visual representation of complex spatial relations that are communicated to the observer instantaneously, something akin to the concepts described in Gestalt psychology where geometric patterns and configurations are understood as a complex indivisible whole.

The visual essay consists of seven sets of drawings where these two aspects, representation of dynamics and representation of the multiscalarity of a process, are briefly discussed in the captions.

Since the size of the drawings is crucial to the multiscale, each set of drawings consists of a scaled-down version of the complete A1 drawing, a detail of the drawing, and a legend.

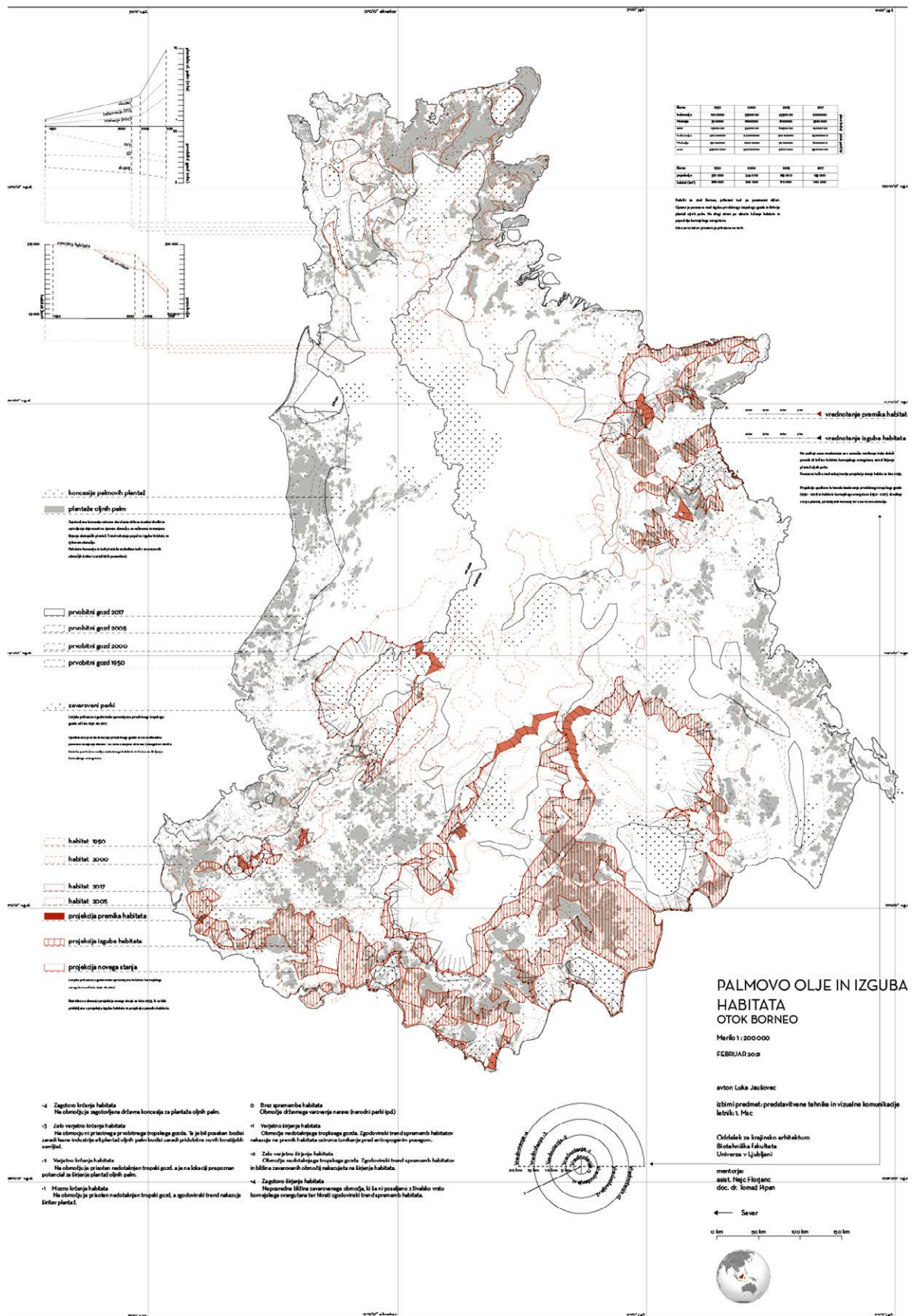
In reference to drawing spatial dynamics and time, the drawings presented here achieve this with a varying level of success. The most common approach is to represent time through successive outlines of areas representing change as in Figure 2 of ice movements and penguin migration in Antarctica. However, some drawings that embody dynamics yet are not directly drawing time should not be omitted. One such is the drawing of the Bovec house typology (Fig. 3) with its interpretation of what dynamics mean, or on the other hand the drawings of orangutan habitat (Fig. 1) and bee grazing (Fig. 6) that deal with drawing prediction procedures. Time can be drawn in obvious ways using different line qualities such as isochrons and changes of area. However, it can also be expressed in less obvious ways, as when it is used as a function of dynamic predictions where time is not directly expressed in the drawing. In terms of multiscale, the drawings manage to embody the concept to varying degrees. Some use the different scales to portray different facets of the story and use it as a narrative instrument (Fig. 7: Origin and spread of non-native species in the Adriatic Sea), others use different scales to portray different understandings of the same process, as in the drawing of invasive species along the Krka River (Fig. 5). However, some drawings, such as the above-mentioned Antarctic drawing, do not show any significant change via the scales. In general, the 'emergence' of deeper understanding for the author comes from the process of drawing each data set and detail. In addition, this creates a kind of palimpsest that, observed from afar, displays an abstracted quality and in detail a more 'nitty-gritty' understanding of the individual segment of the drawing. The drawings push and question the boundaries of drawing conventions and consequently elicit uncertainty and encourage further enquiry. If anything, they show that the limits of drawing representation have not been reached and that drawing is still an important approach to rendering and revealing contemporary landscapes. We should not be content with fanciful representations if they do not reveal any deeper meaning.

FIGURE 1

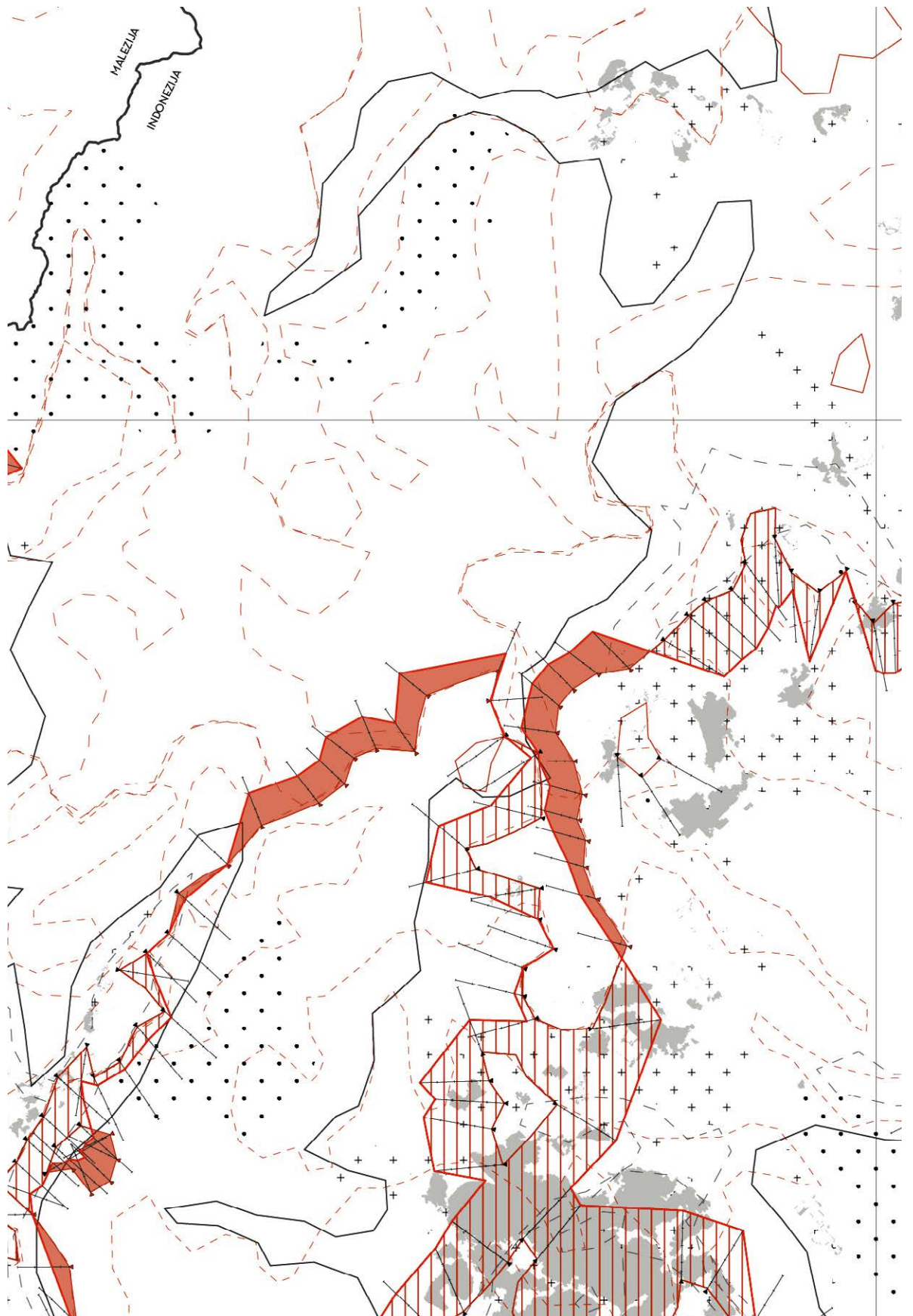
**Shrinking of orangutan habitat due to deforestation of Borneo island.**

(Luka Jaušovec, 2021)

The drawing includes graphical analysis of processes: oil plantation expansion, primary forest shrinkage and orangutan habitat shrinkage and shift. The act of drawing and overlaying these different processes enables the student to understand the dynamics between these processes. The drawing additionally shows the prediction of future habitat shrinkage. In terms of the dynamics, the drawing overlays several available data sets on orangutan habitat (from 1950 to 2017) and the current area of oil palm plantations. Based on the shrinkage of forests a drawing method was created that helps predict further habitat shrinkage and oil plantation expansion. In terms of multiscalarity, the drawing is simple as there is no differentiation of the topic addressed at different scales. The larger scale gives a general idea of retention of habitat whereas on the detailed scale the individual progression of the changes can be examined..







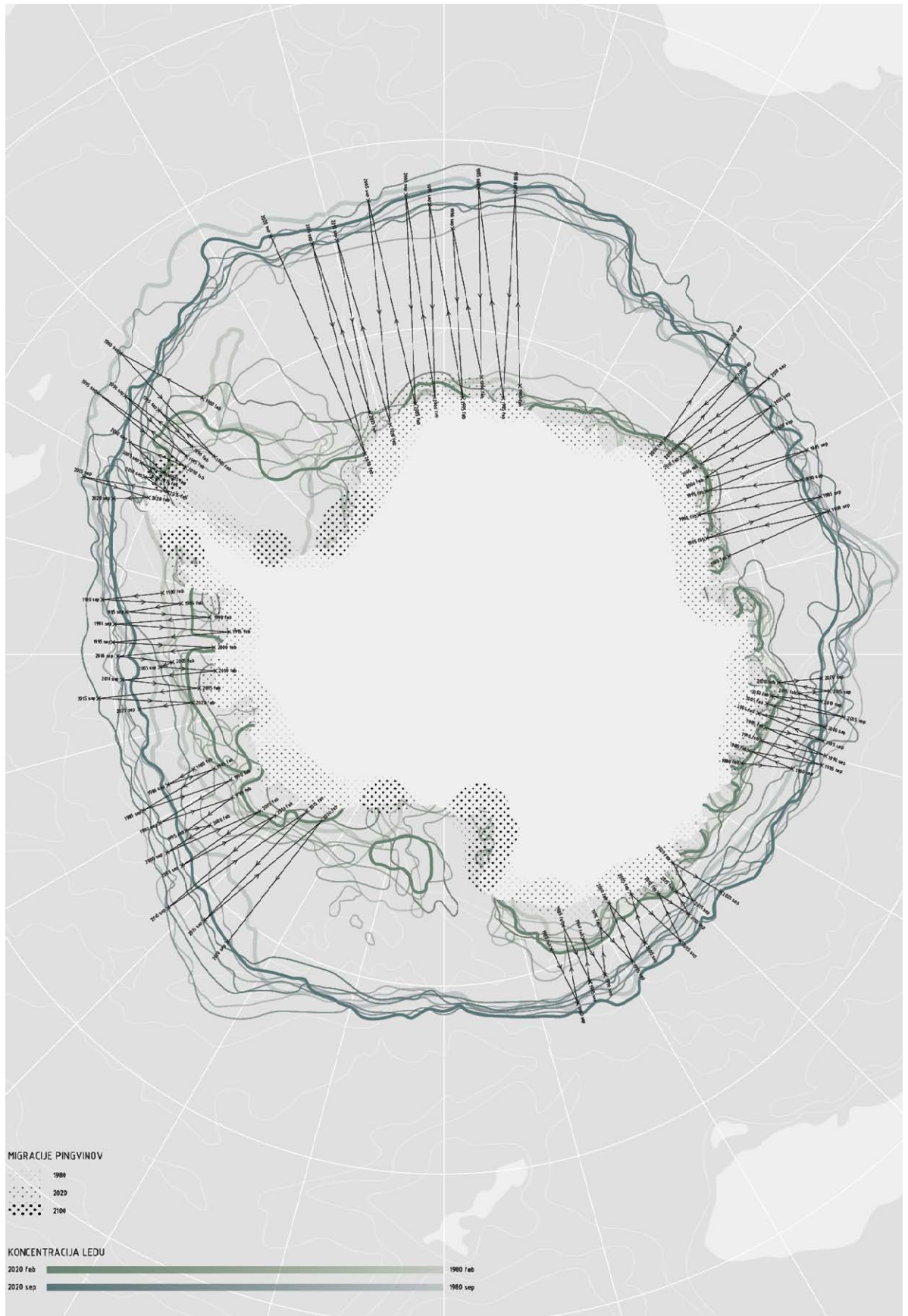
Detail

FIGURE 2

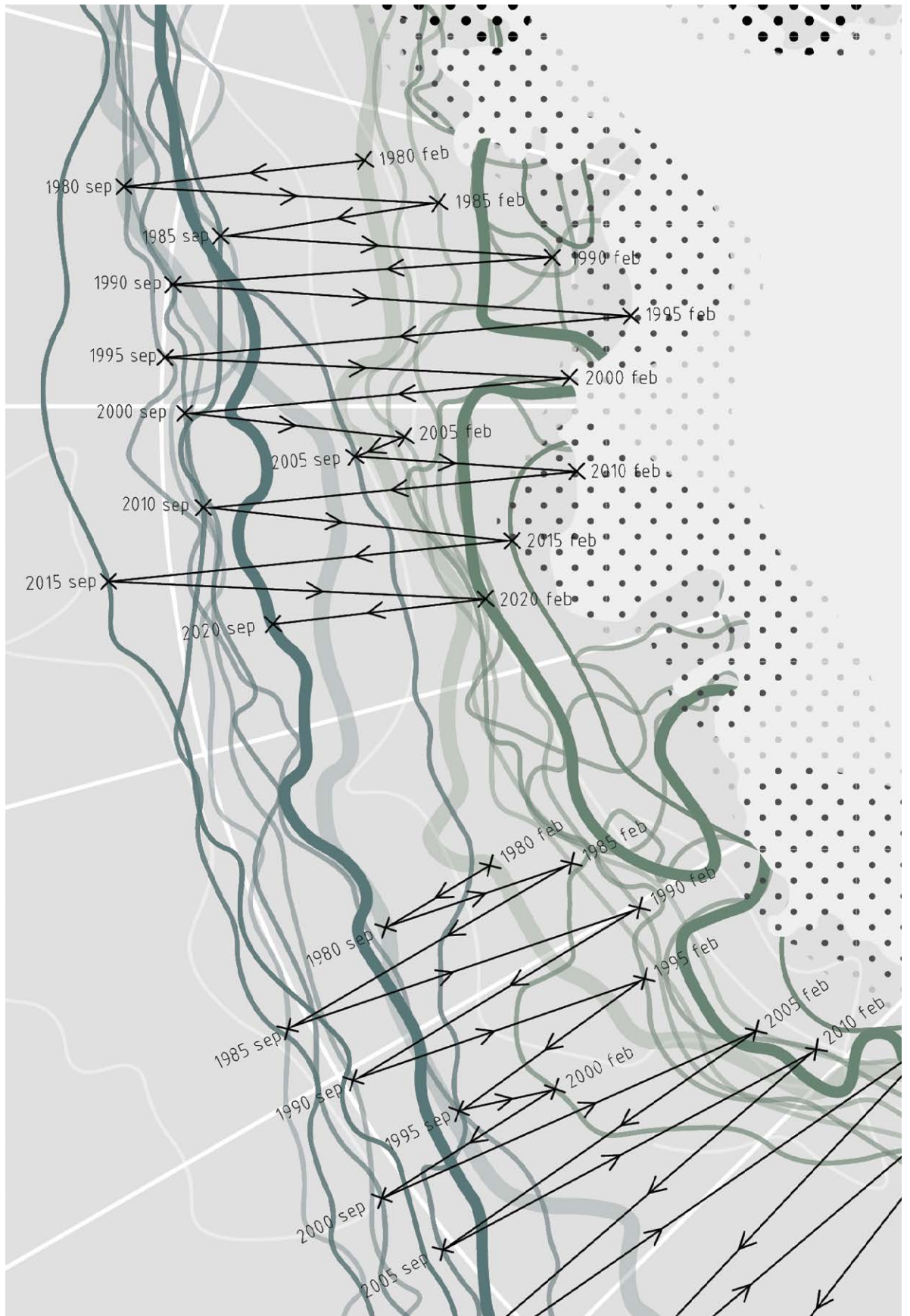
**Ice movements and penguin migration in Antarctica.**

(Magda Merhar, 2021)

The drawing deals with data correlation. The process of ice movement and its yearly fluctuation over several consecutive years is compared to the migration of penguins in Antarctica. The maximums (blue lines) and the minimums (green lines) of ice coverage from 1980 to 2010 are differentiated in time based on their transparency (less visible is older). The dynamics of its oscillation is additionally represented with jagged black lines following winter and summer peaks. The measurement areas display fairly even oscillation. The penguin migration throughout the chosen time segment is represented with thinner (1980) and thicker (2010) dots. The thickest dots represent a guestimate of possible migration. In terms of the dynamics, the drawing succeeds well, showing how the yearly ice oscillation happens and how the shifts of penguins occurred; however, the correlation between the two sets of data is hard to establish. More detailed data would be needed to start drawing any conclusions. In terms of the multiscalarity the drawing on the large scale shows the totality of the effect whereas at the detailed scale individual shifts can be observed.







**Detail**



FIGURE 3

**Transformation of traditional Bovec (Slovenia) housing typology based on micro-location.**

(Ana Benedik, 2019)

The student devised a drawing method (a series of drawings steps) to re-examine the traditional typology of the Bovec house (Slovenia). The building's width is determined by the width of the alluvial terrace and the orientation along the river. Additionally, varying the roof pitch (ostrešje) and the roof overhang length (napušč) to create appropriate shadowing of the facade at the summer and the winter solstice, produces sections that can be evaluated against regional Bovec typology. The drawing does not draw time as such; however, it understands an architectural type as a function of seasonal cycles, evaluated against the extremes of the summer and the winter solstice. In terms of multiscalarity, the larger scale drawing shows the topography, prevailing winds and the natural resources on which the building of the Bovec house is dependent. On a smaller (architectural) scale, the drawing tests the transformation of the type and evaluates it. This is not an explicit correlation of the scales as the two different scales address different topics; however, it does give a narrative power to the drawing.

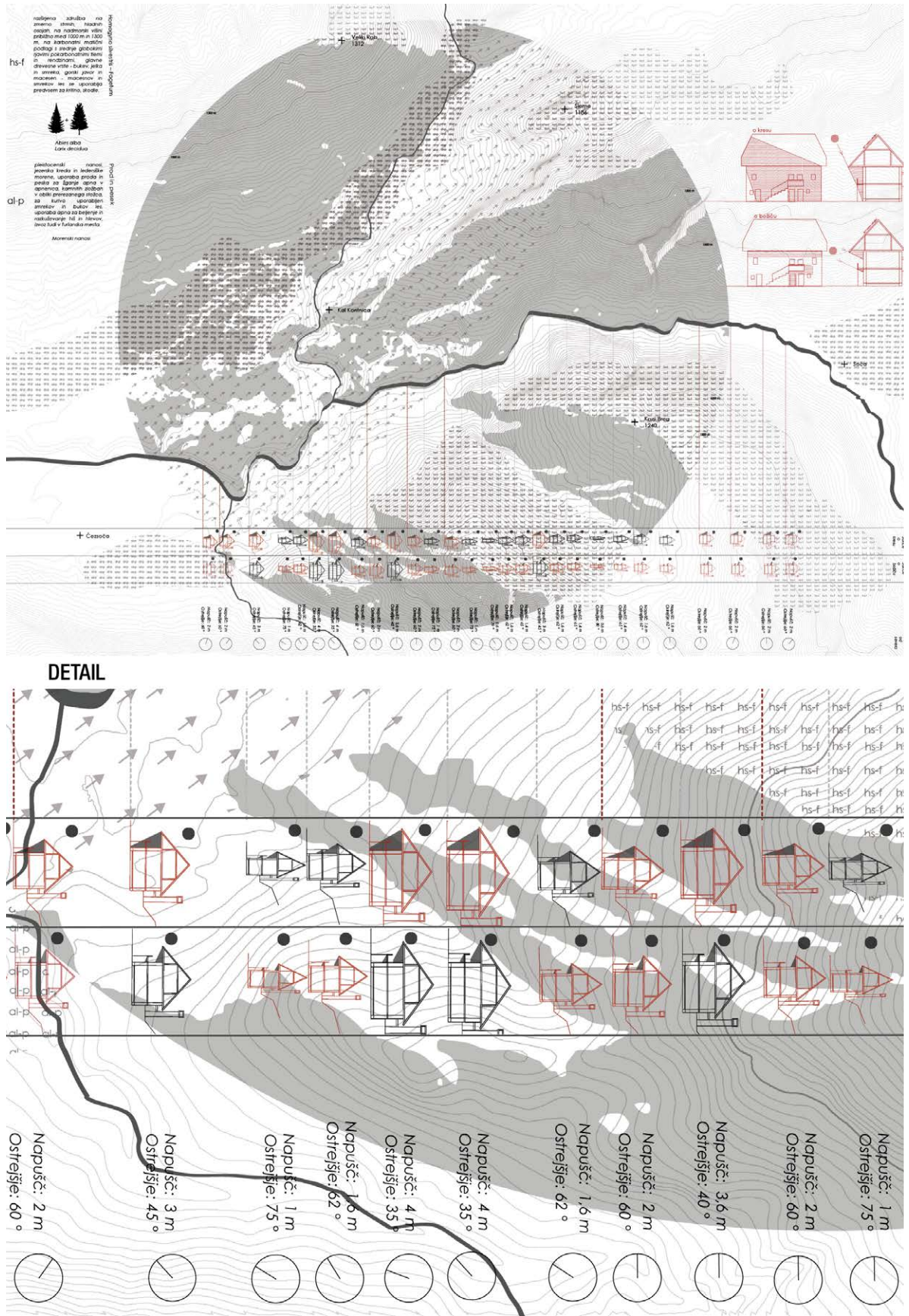




FIGURE 4

**Pressures of summer tourism in the upper Soča Valley and neighbouring mountains (Slovenia).**

(Meta Zgonec, 2019)

The drawing transforms the number of touristic overnight stays in the upper Soča River area (Slovenia) into a visual representation of spatial pressures, shown by the number of parallel lines. This is based on an assessment of the accessibility of local points of interest such as white-water rafting stops, difficulty and distance of neighbouring peak hikes, and the popularity of natural or cultural heritage spots. The resulting image shows how crowded certain areas in the Soča valley are. In terms of the multiscale, on the larger scale the drawing shows a more focused linear pressure along the valley and a more even, network pressure across the mountains. It also shows a dense cluster in the upper right corner due to the interaction between the geomorphology and the road. On a more detailed scale, the drawing reveals which points of interest are less frequented and could be better utilized to disperse the current pressures on overburdened areas. The drawing is less successful in representing dynamics and time, as it shows a static condition of cumulative summer stays. However, it does represent dynamics in reference to location, as the thickness and number of parallel lines change showing touristic 'load' throughout the landscape. For example, the river segment close to the town of Bovec is most heavily loaded due to a concentration of easier white-water rafting sections.

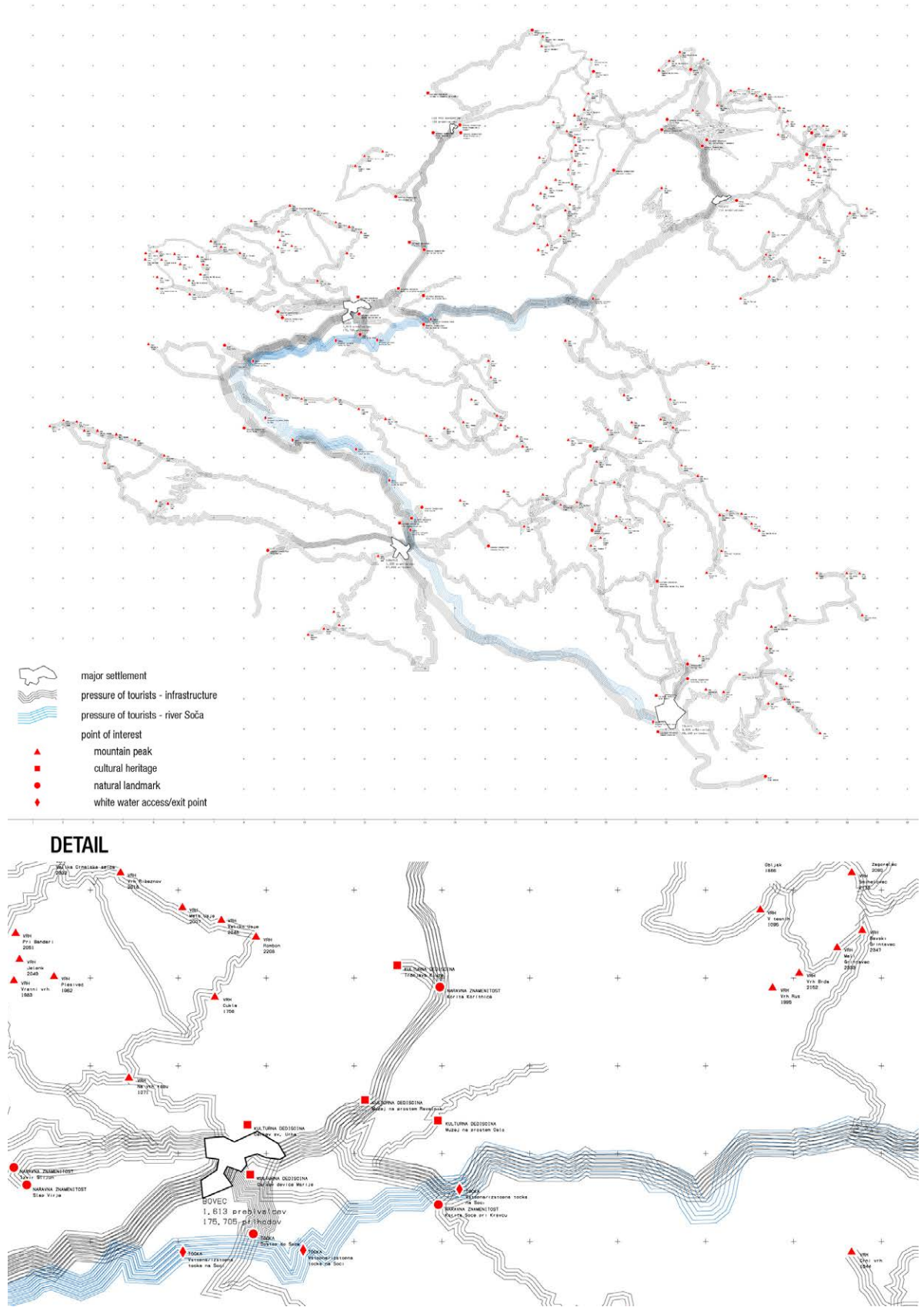


FIGURE 5

**Globalization of the River Krka (Slovenia) – spread of invasive plant species and their origin.**

(Filipa Valenčić, 2019)

The drawing investigates invasive plant species along the Krka river (Slovenia). In terms of the dynamics and drawing time, the drawing shows the possible spread of ten invasive plant species based on their habitat, modes and radius of seed dispersion. Based on the available data on species type and location, the thickness of the lines shows which species is more likely to be succeeding. The radii indicate the possible direction and distance of the spread. Since the scale of the river drawing and that of the spread radii are of different orders, the spread was multiplied (the radii are scaled up roughly 6 times). This shows how difficult it is to correlate different scales and remain consistent. The larger radii can be understood as the cumulative effect over many years of growth. In terms of multiscale, the detailed scale shows spread dynamics of individual plant species, while the larger scale represents spatial consequences of invasive plants dispersion over (roughly) 10 years. The global scale shows the origin of the species and their main characteristics. on the large scale shows the totality of the effect whereas at the detailed scale individual shifts can be observed.



**DETAIL**

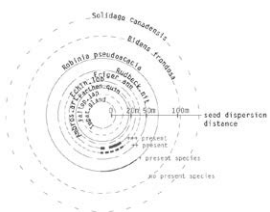
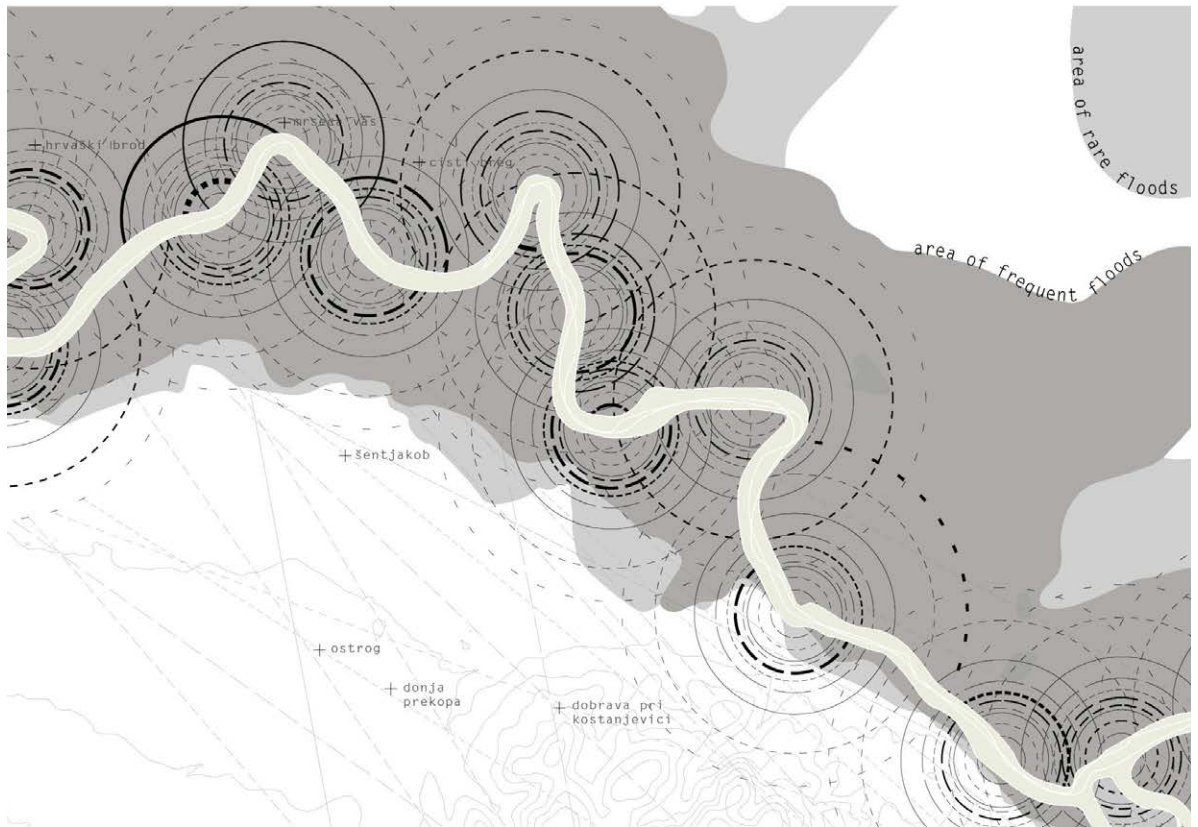


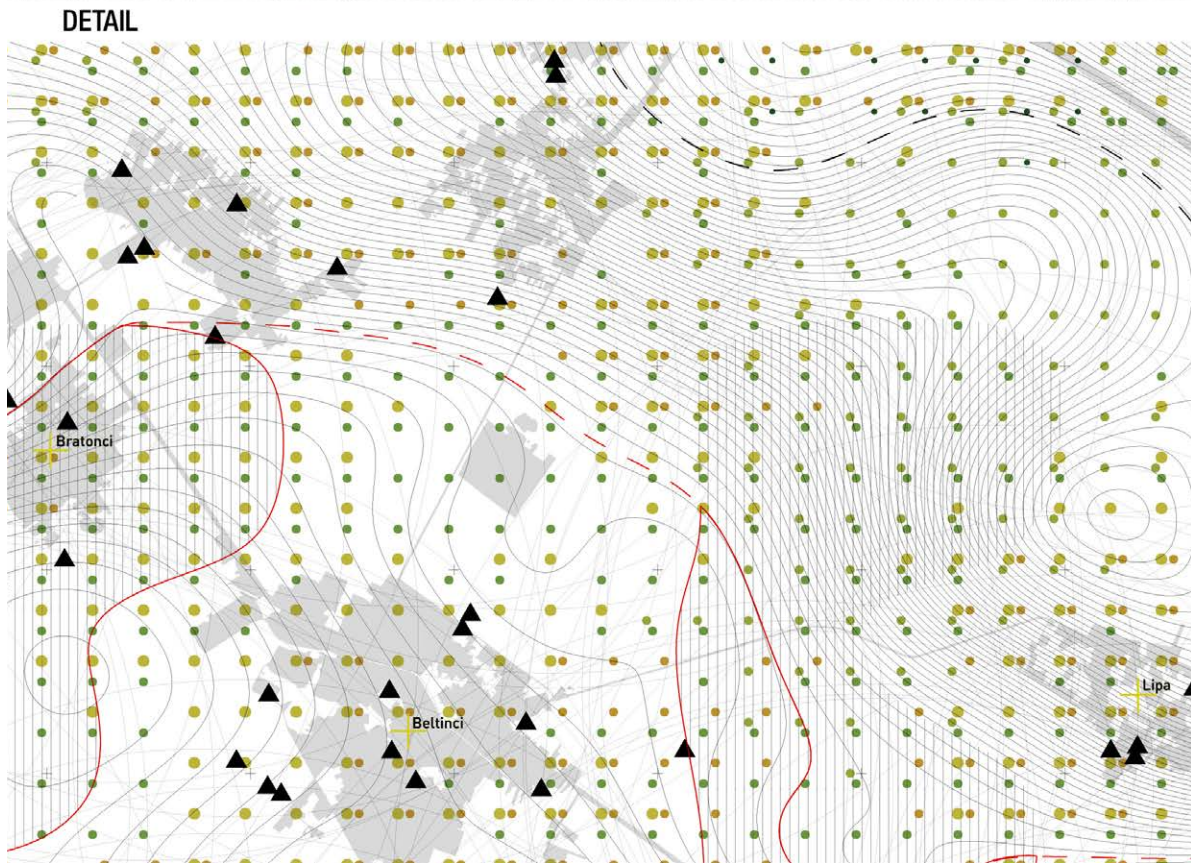
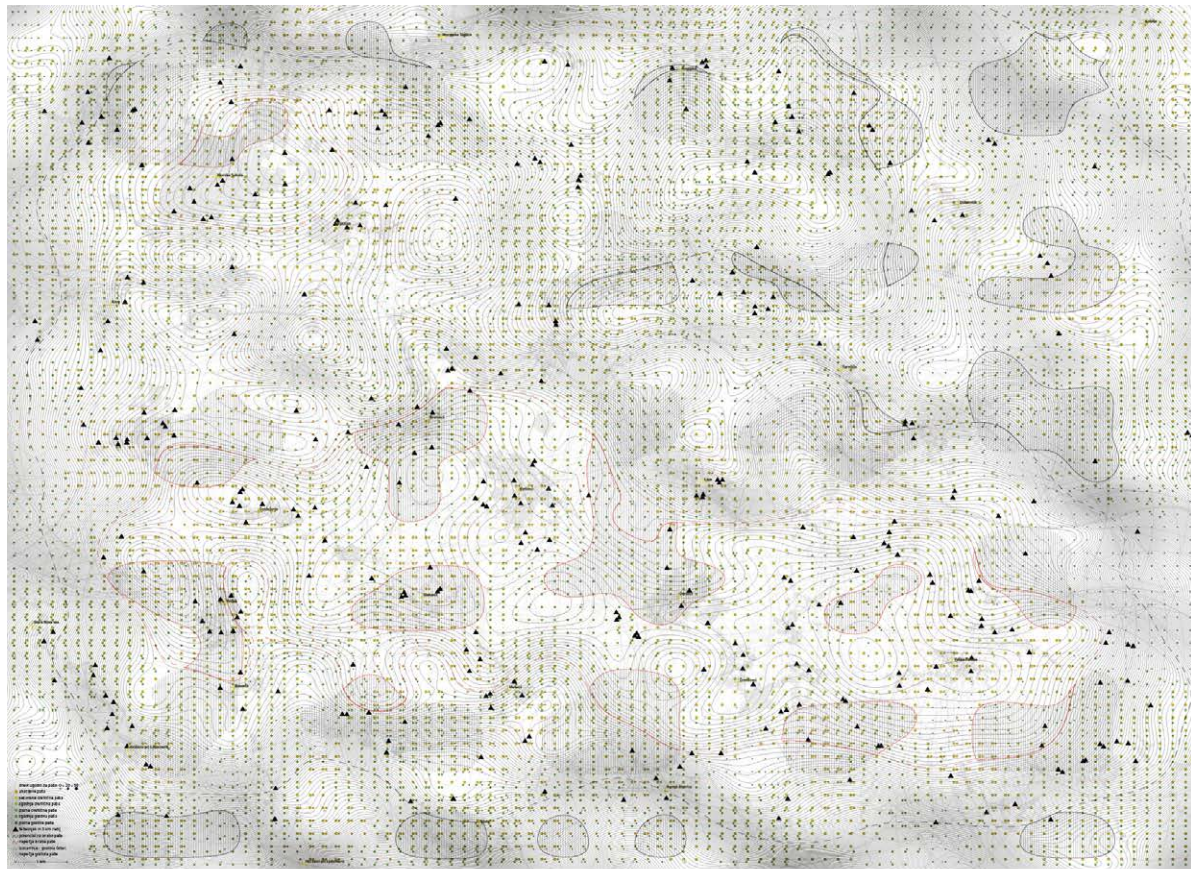


FIGURE 6

**Bee grazing potential and beehive locations in Prekmurje (Slovenia).**

(Kristina Oražem, 2021)

Graphical representation and analysis of several data layers allows the author to index bee pasture dynamics that are dependent on bee density (represented as contour lines) on the one hand and seasonal availability of pasture, volume and type of pasture (size, colour and number of dots in each grid cell) on the other. The author devised a drawing method to identify the most grazed (red-outlined) and the least grazed (black-outlined) areas. Knowledge so obtained can be used for new beehive locations and pasture planting to expand the seasonality of honey. In terms of dynamics, the drawing is very rich. It shows seasonal dynamics of pasture with dots and dynamics of the bee density with contour lines. In terms of multiscalarity, the overall regional scale gives an idea of the main overgrazed and undergrazed areas, whereas the more detailed scale can be used to review each area in detail to pinpoint possible new beehive locations or possibilities for pasture planting. The amount of data represented creates a less readable drawing. It is more of an expert's 'tool' than a communication device for a wider audience.



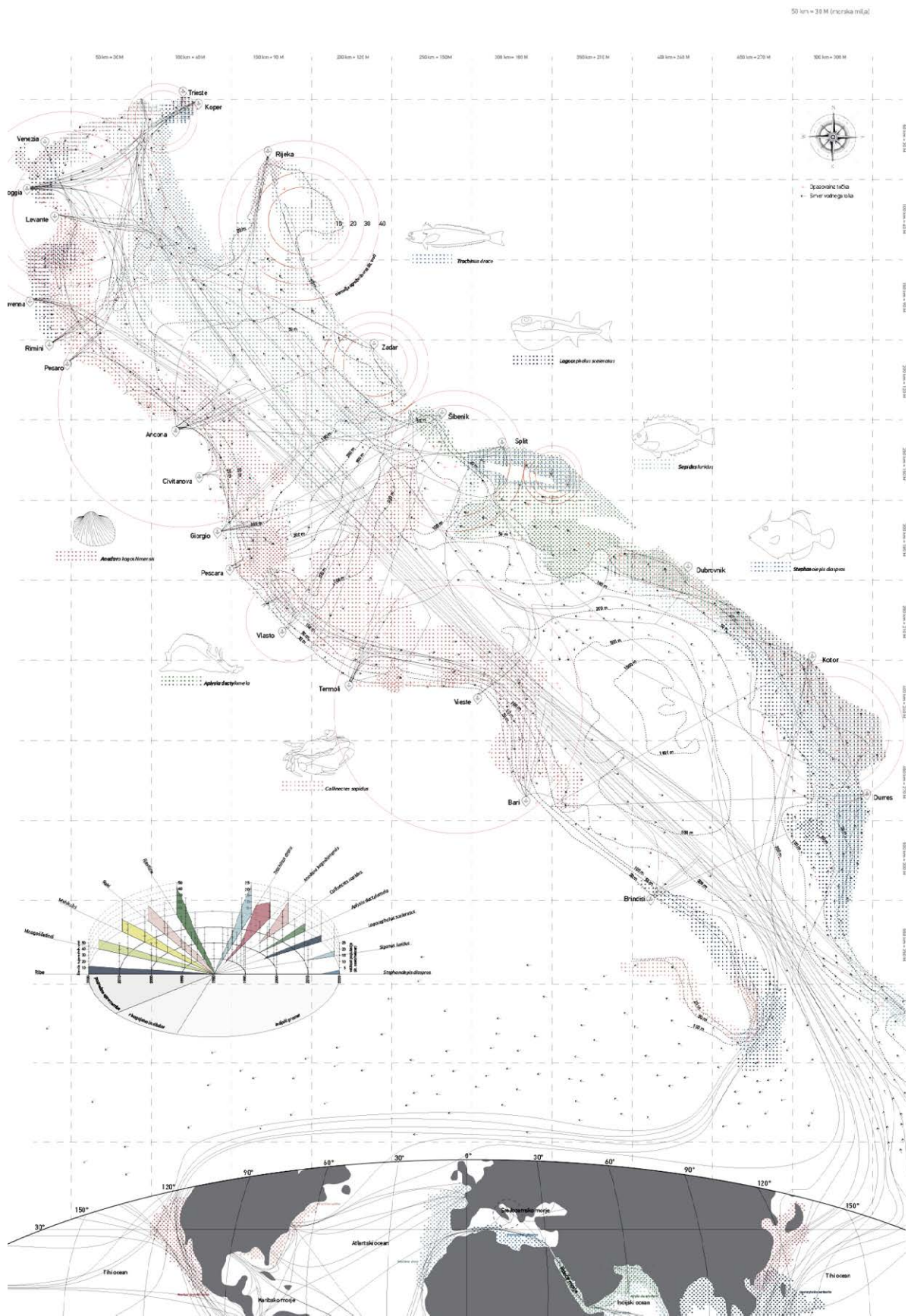
- 0 < 20 < 50 days of bee pasture
- acacia pasture
- flower pasture - seasonal
- flower pasture - early season
- flower pasture - late season
- forest pasture - early season
- forest pasture - late season
- ▲ beehive with 3 km radius
- ~ potential for bee pasture
- ~ maximum utilization of bee pasture
- ~ isoapis - concentration of bees
- ||||| maximum concentration of bee pasture



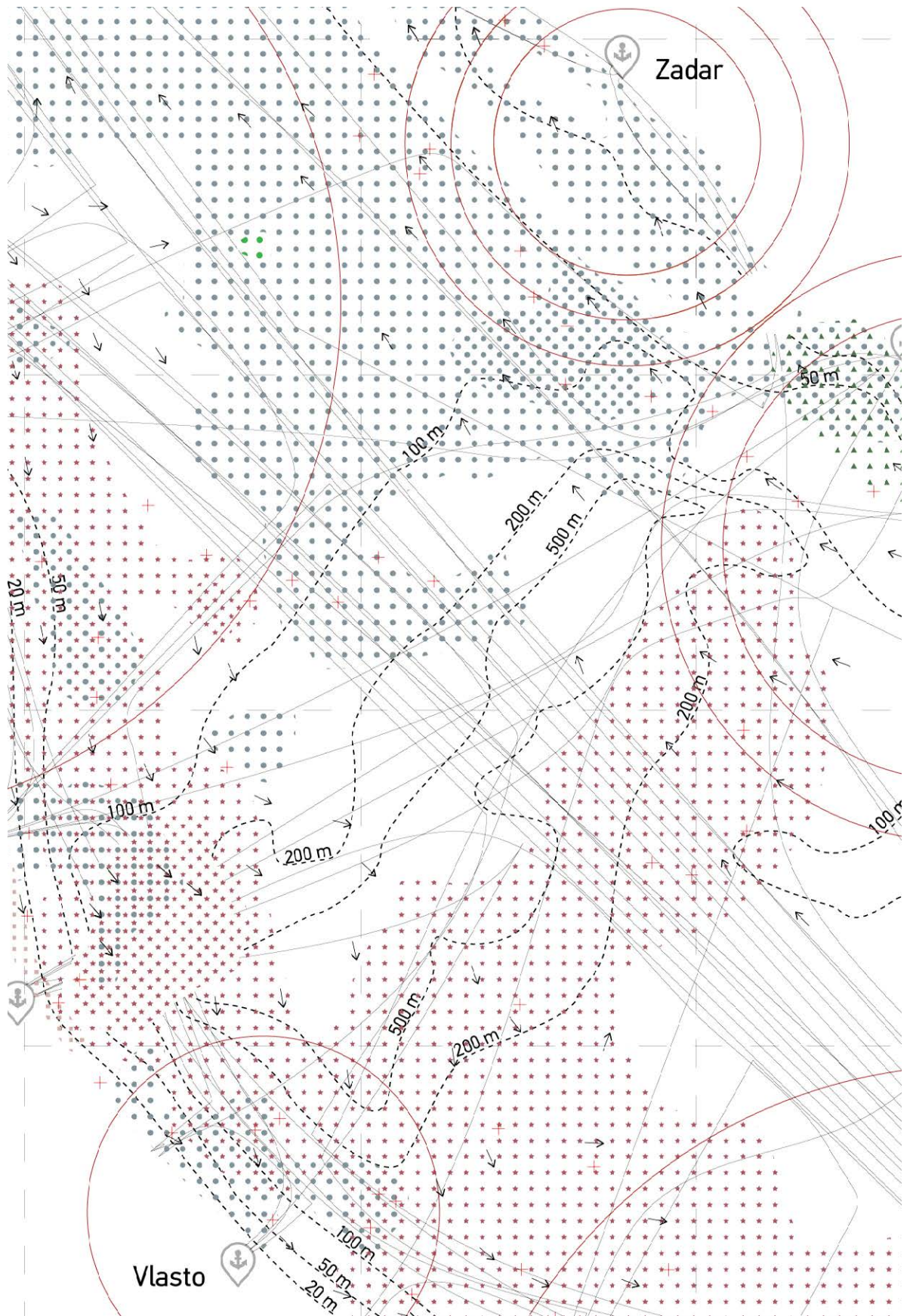
**FIGURE 7 Origin and spread of non-native species in the Adriatic Sea due to global trade routes.**

(Tilen Tamše, 2019)

The drawing overlays several different data sets pertaining to the spread of seven non-native species in the Adriatic Sea. Cargo vessel trade routes, predominant sea currents, location of international ports and sea depth are overlapped with the recorded areas of non-native species. In terms of the multiscalarity, the image on the global scale tells a story of where the species originate. On the regional scale the spread of these species and the direction of the spread based on the sea currents can be observed. On the detailed level of the drawing the individual regions and correlation to the endangered native species can be examined. In terms of dynamics, the drawing correlates the dynamics of trade and current to the spread of the non-native species – the species are more pronounced along the sea current directions, emanating from the port locations.







Detail

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