

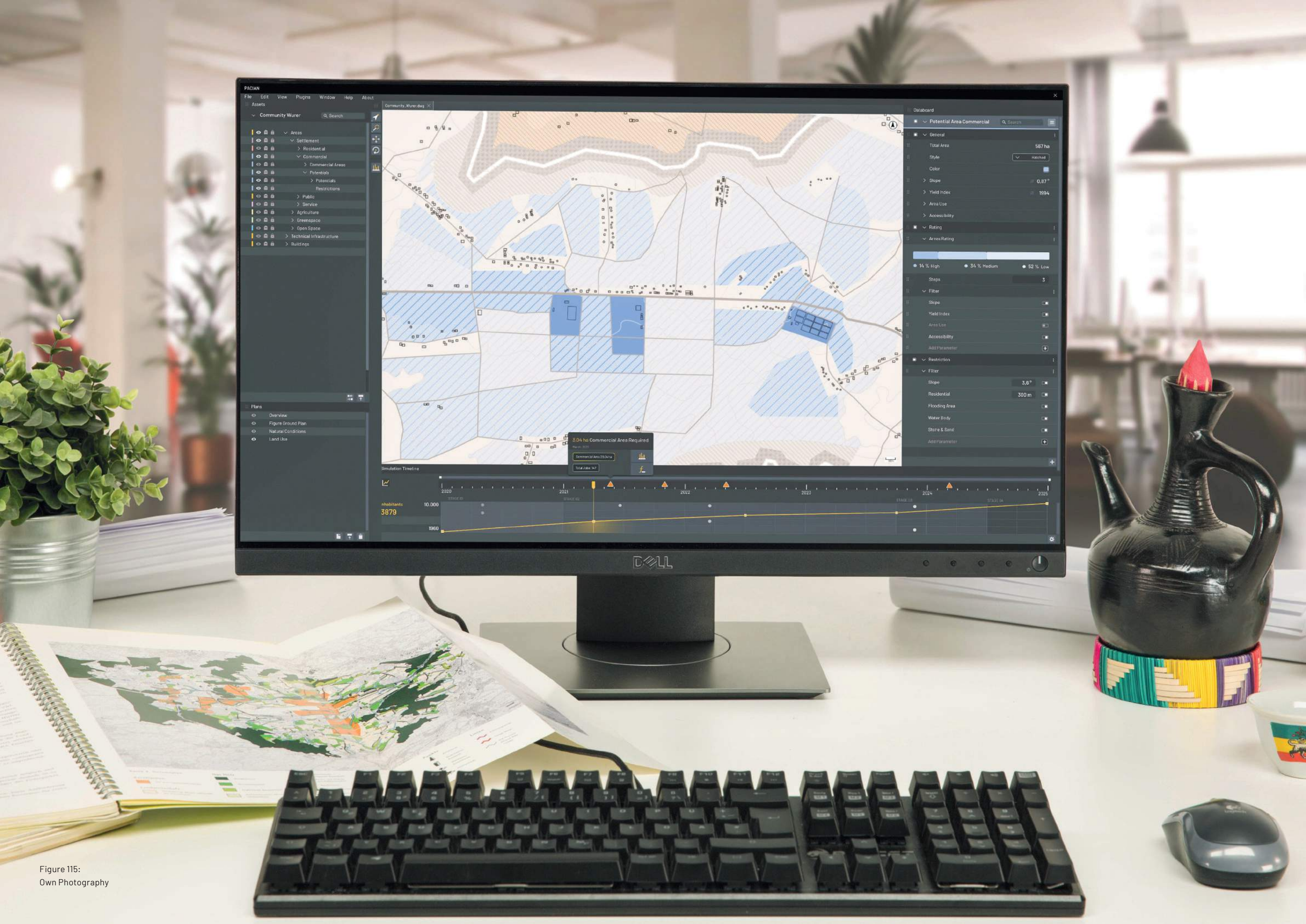


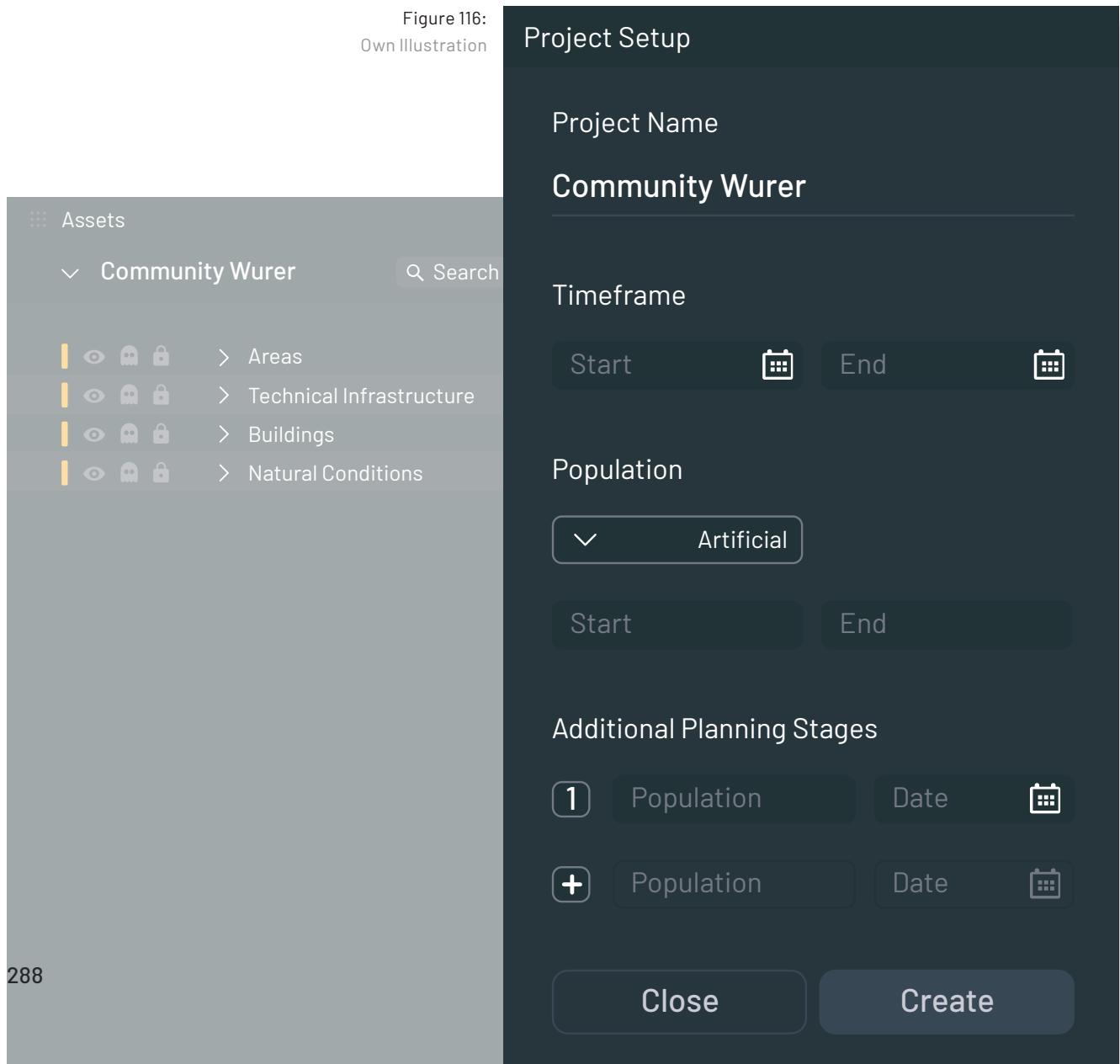
Figure 115:
Own Photography

1. Software Start

Hawi Tolosa received a DWG-File of the Kebele Wurer from the government data acquisition office. Wurer is one of 8000 Kebele proposed to be transformed into an urban town centre by the governments GTP III. Hawi Tolosa is in charge of analyzing possible conflicts that might occur during Wurer’s development to a town accommodating 10.000 inhabitants. He has to solve the conflicts by creating rough planning concepts implemented into a roadmap of all proposed planning stages.

Hawi opens the DWG-File with the parametric city analysis toolbox PACIAN, which is designed to help city planners with the analysis and simulation of GIS-Information.

Figure 116:
Own Illustration



2. Project Setup

After launching the software, Hawi Tolosa has to define certain boundary conditions for the analysis, like project name, project time frame, current population size and planned resulting population. The boundary conditions dealing with population size are crucial as they tremendously influence other parameters displayed in PACIAN. Furthermore, these boundary conditions serve as the foundation for any prediction of future developments of the community.

PACIAN automatically loads all available GIS-Information from the DWG-File in the provided Assets Panel.

3. Complete Overview

In the first step, Hawi Tolosa wants to analyze the inventory of Wurer, to be able to evaluate the given circumstances of the community.

3A.

The starting point of the analysis is the observation of the communities satellite imagery. The satellite imagery enables Hawi to get a first impression about the conditions, existing infrastructure, inventory and vegetation. He can look at the overall context of Wurer and it’s surroundings as well as adjoining Kebele.

Figure 117:
Own Illustration



3B.

In the second step, he searches for information about dynamic parameters of the community, by looking at the Community Databoard. The metadata regarding the people living in Wurer is especially important to get an overview of what demographics live in Wurer and how it is composed as well as additional information of age and work.

Besides that Ethiopia’s biosphere, geological condition and geographic circumstances are an important part of this first review of the conditions. Hawi evaluating the local climate and geological condition since they both can vary a lot within a small area. Therefore, these parameters are significant determining factors of the communities potentials and its further development.

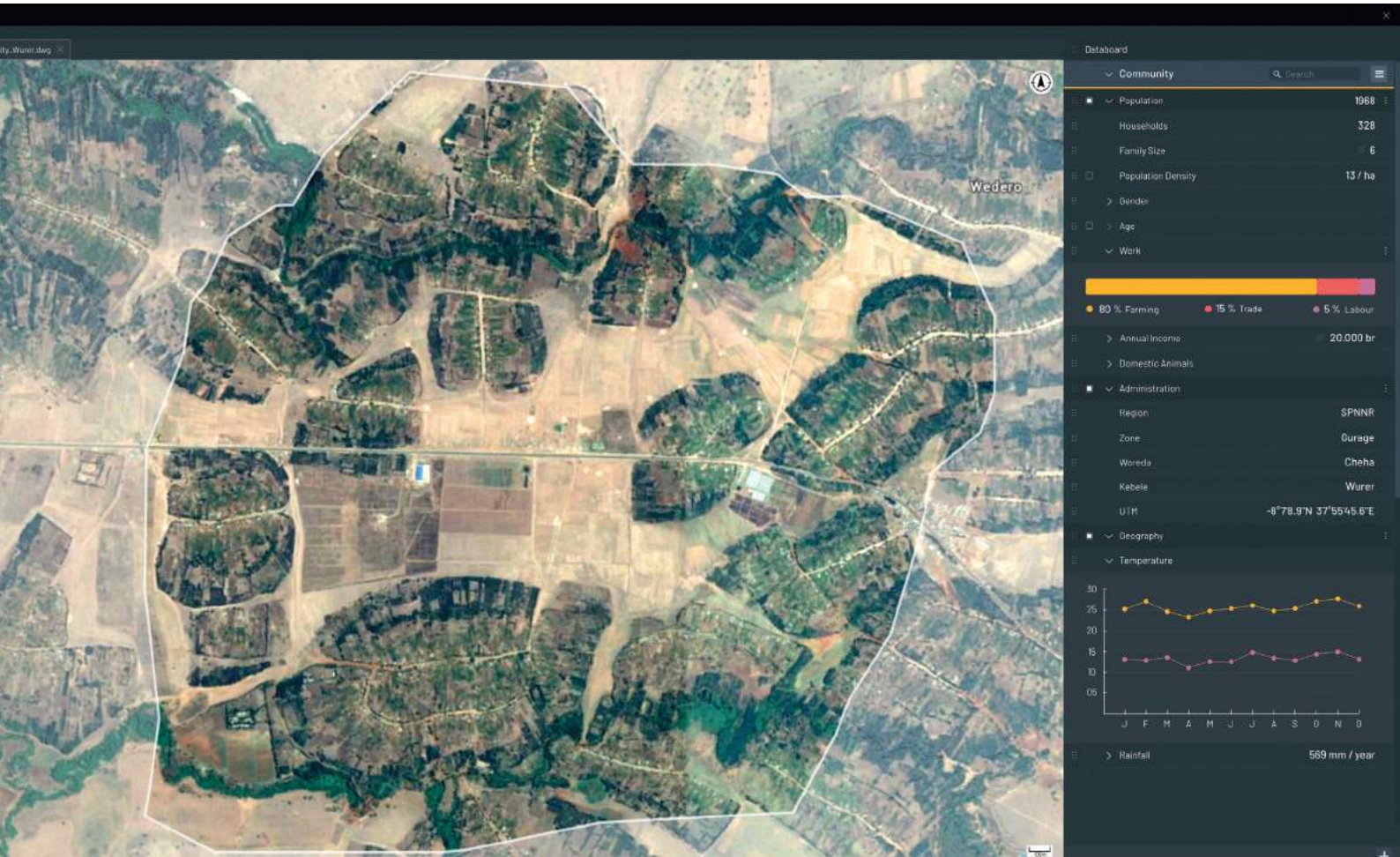


Figure 118:
Own Illustration

3C.

Before taking a closer look at the predicted conflicts in the Timeline of PA-CIAN Hawi decides to check the figure-ground plan as well as the natural conditions and the land-use plan. They are important parts of the town’s analysis and give him further insights on Wurer.

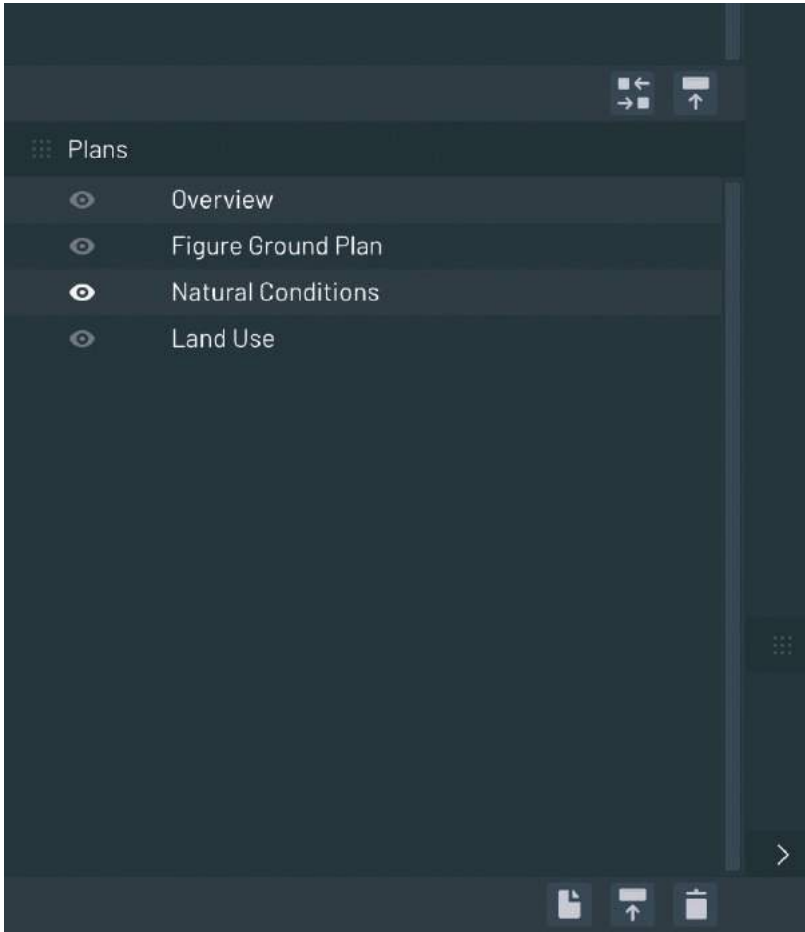
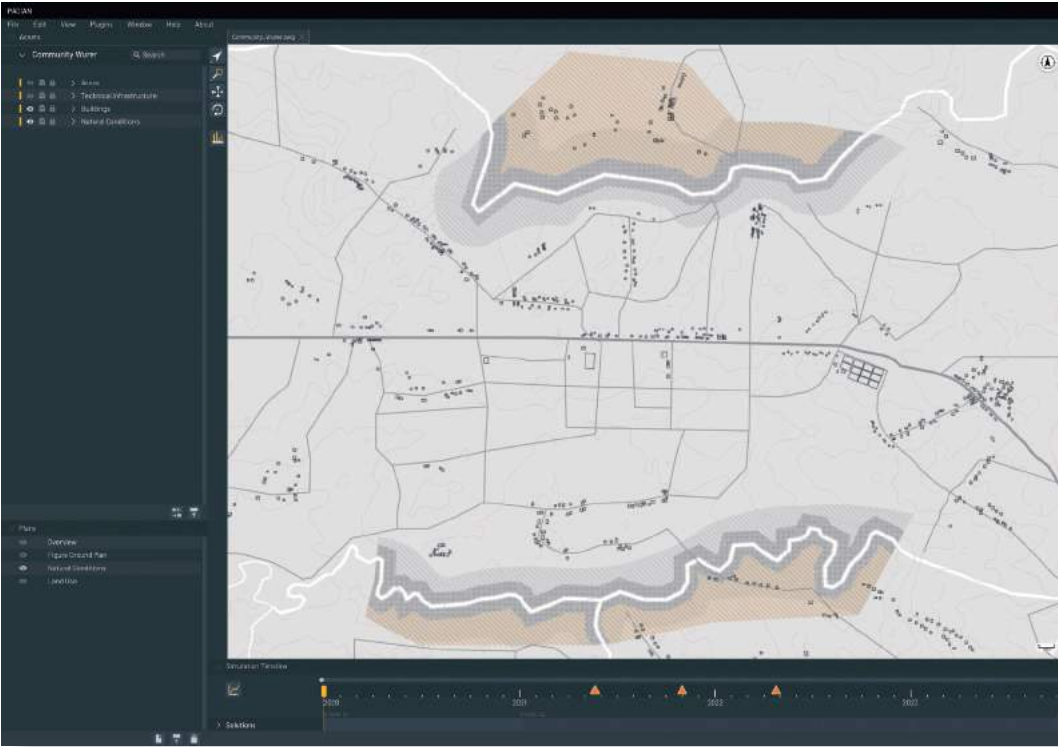


Figure 120:
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Figure 119:
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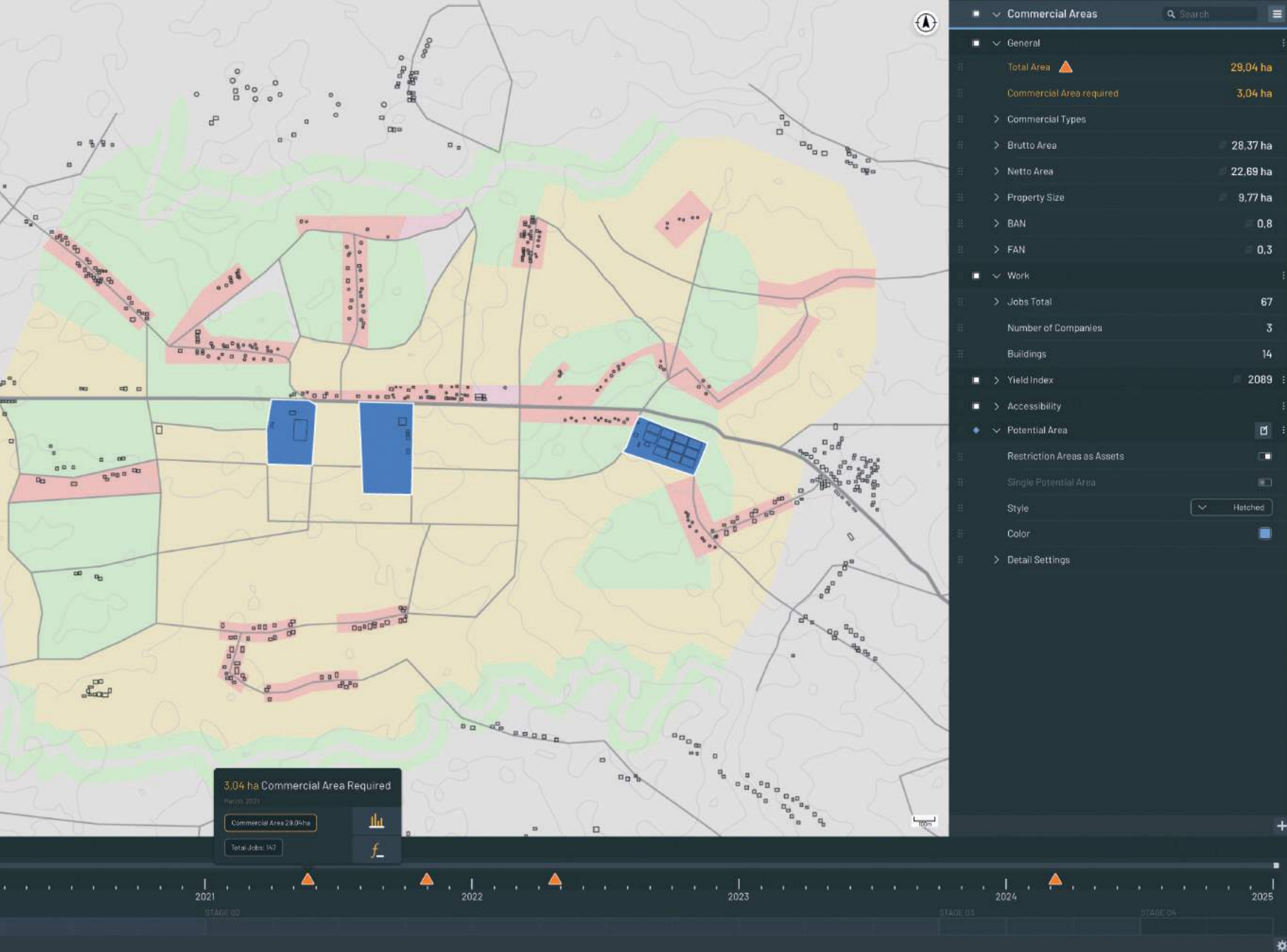


Figure 121:
Own Illustration

4. Conflict Analysis “Commercial Area required”

Hawi Tolosa is now ready to pay attention the conflicts displayed in the Timeline. The conflicts are calculated by algorithms using the existing GIS-Information database and combining them with the provided population growth. The algorithms interpolate PACIAN’s parameters to the future and represent them in a chronological order.

Hawi Tolosa uses the Timeline to recuperate insights on what planning goals are necessary and when they have to be implemented in his planning concept.

4A.

There are several conflicts shown on the Timeline. He checks the first conflict, a needed Commercial Area expansion in January 2021. The Commercial Area expansion is necessary to meet the previously set requirement of 10.000 inhabitants living in Wurer in 2025. Hawi hovers over the other conflicts and discovers that:

- In 2021, a lot of conflicts arise due to buffer overflow of areas and infrastructure. The predicted growth of Wurer’s population is too high to be compensated by the current inventory.
- In April 2021, the water infrastructure is not sufficient to supply all the people of Wurer with water.
- In November 2021, the existing settlement area is not sufficient to provide enough space for the predicted 3.500 inhabitants living in Wurer.

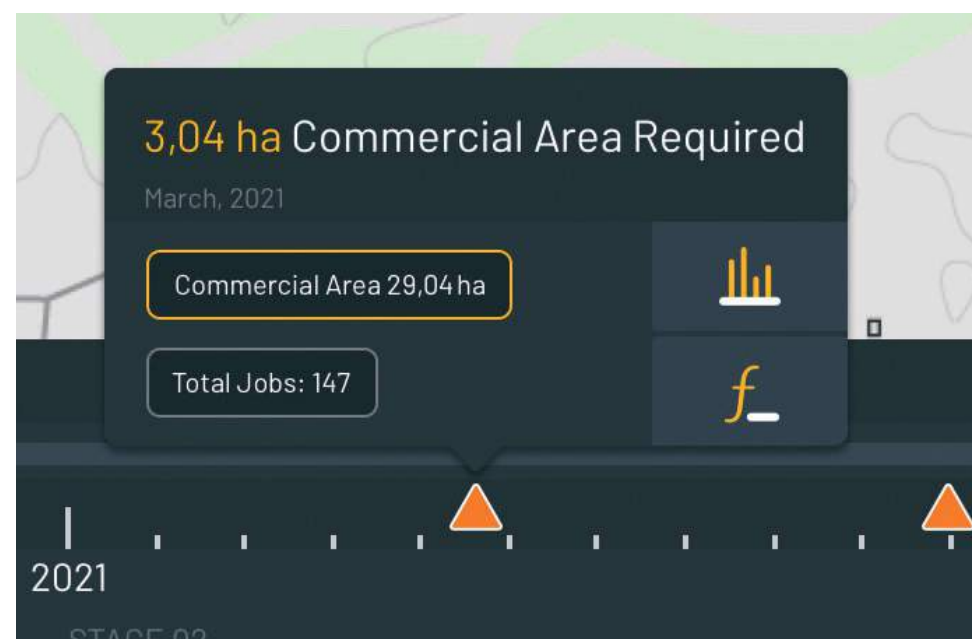


Figure 122:
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4B.

Hawi decides to solve the first conflict. By clicking on the respective conflict icon, PACIAN highlights all existing Commercial Areas. All parameters causing this conflict are represented in the Data Board, which enables Hawi to quickly analyze the situation.

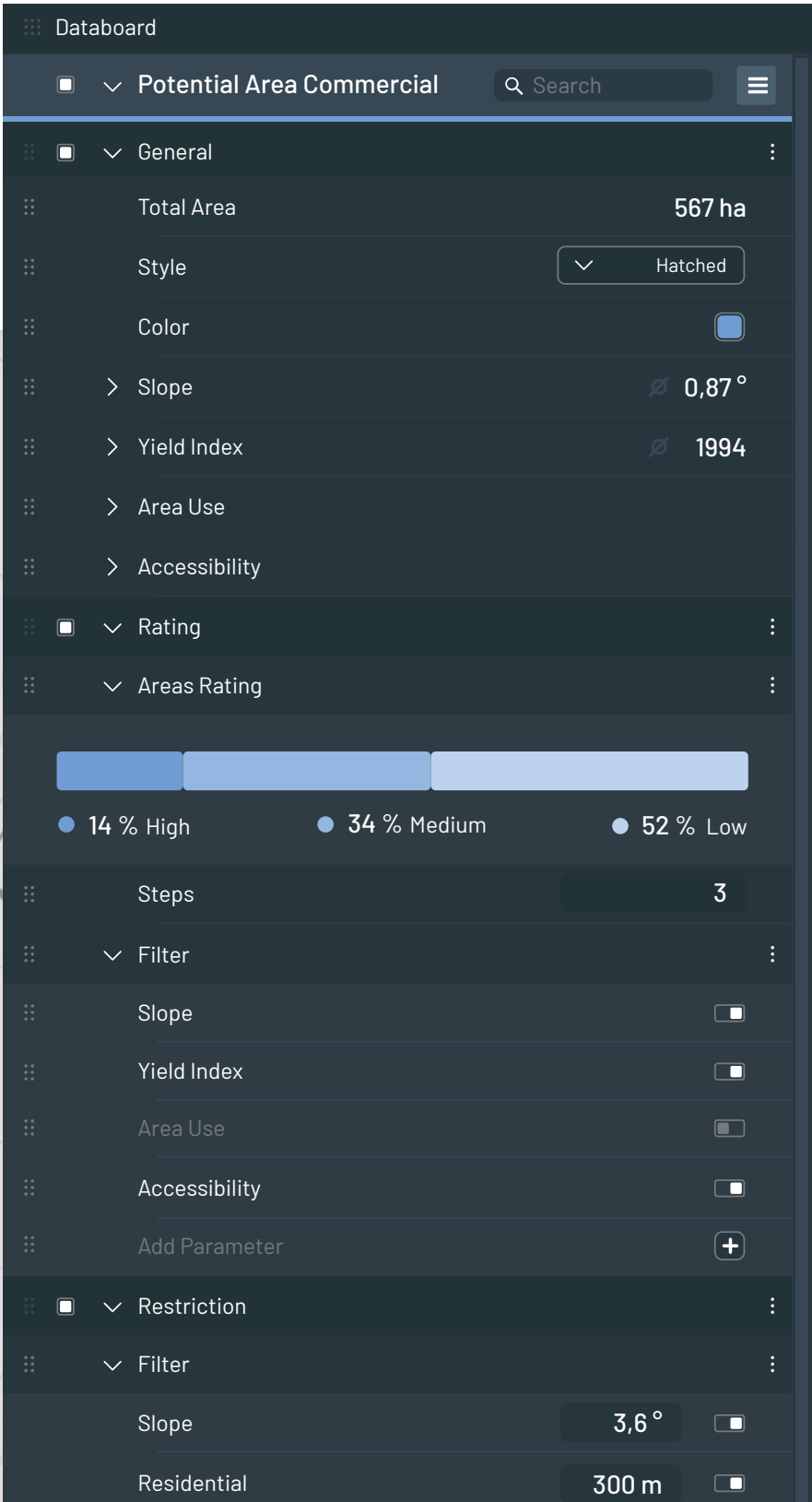
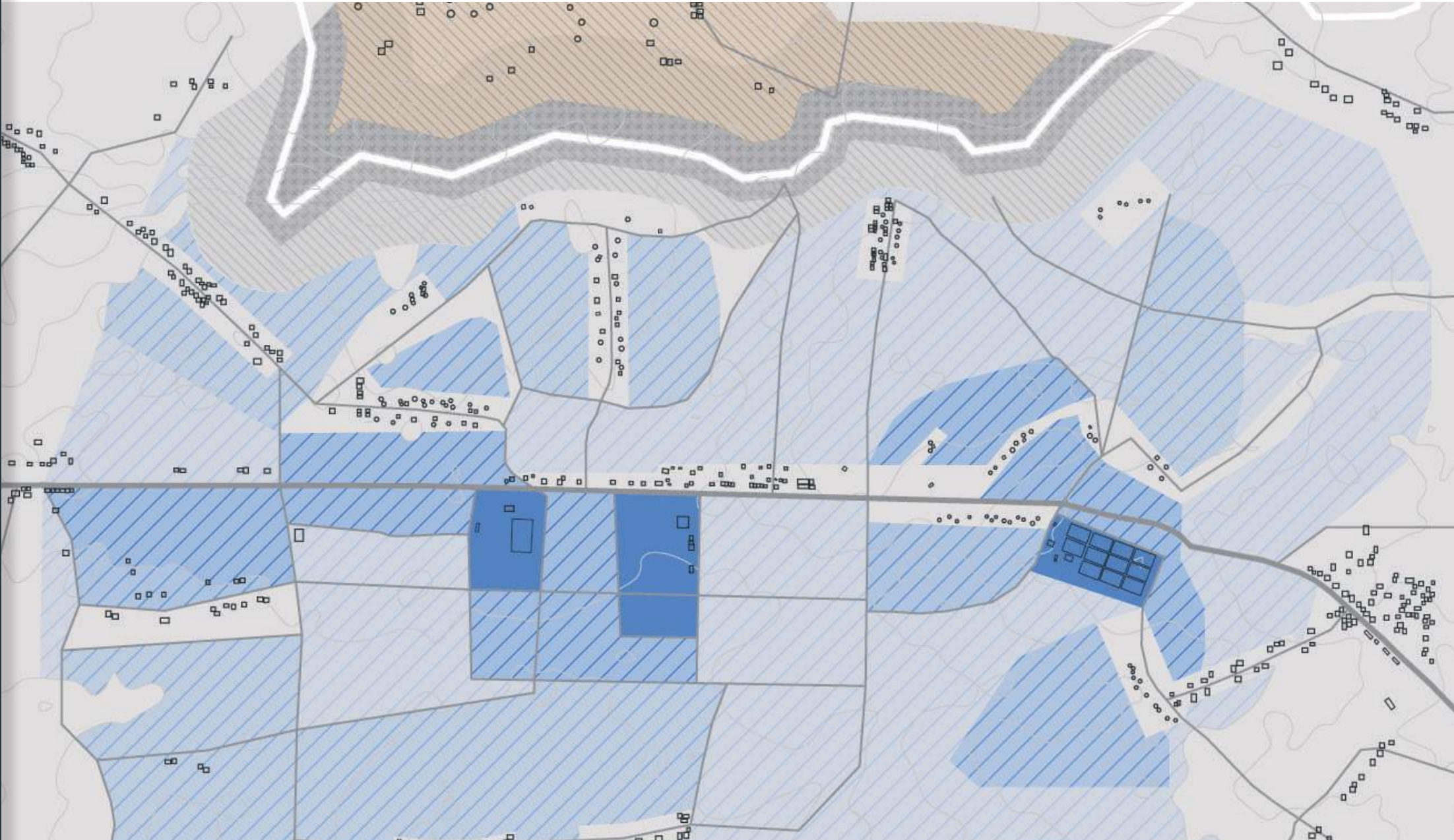


Figure 123: fi
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4C.

To ensure enough space to establish any additional Commercial Area, a conversion of the existing utilization of land is necessary. Hawi executes a Potential Analysis by using PACIAN generating a Potential Area for the new Commercial zone. The Potential Area indicates the best options for the expansion. To create a Potential Area, Hawi has to click on the respective Data Patel “Potential Areas” in the Data Board. PACIAN previews the calculated Potential Area on the map. He checks the Potential Area settings and applies the final generation. The newly created Potential Area is now listed in the Assets Panel as a child object of “Commercial Areas”. PACIAN automatically creates a new plan called “Potential Area Commercial” and turns its state to visible. At this point, both plans Potential Area Commercial and Natural Conditions are visible.

Figure 124:
Own Illustration



4D.

Subsequently, he wants to export the newly generated potential area to his CAD-Software to create the actual planning solution for the expansion of the communities Commercial Area. Clicking the “Sync-Button”, PACIAN scans the Assets List as well as the CAD-Layer List for any changes. It automatically updates the CAD-Layer List with the new Potential Area.

5. Conflict Editing “Commercial Area required” within CAD

The editing of the existing plan and the creation of the actual planning solution for Wurer’s Commercial Area expansion in done within the CAD-software.

6. Conflict Solution “Commercial Area required”

After the CAD editing, Hawi wants to reimport the CAD-Data into PACI-AN. To do so, he synchronizes the software again. PACIAN recognizes the changes made in the CAD-Software and imports them to the Assets List. Dragging the new asset in the Timeline by default, PACIAN creates a corresponding lifespan covering the time frame starting at the current set indicators location to the end of the time frame. The asset is now converted to a dynamic asset and his lifespan can be adjusted within the Timeline if needed. Hawi Tolosa has solved the conflict at the respective point in time.

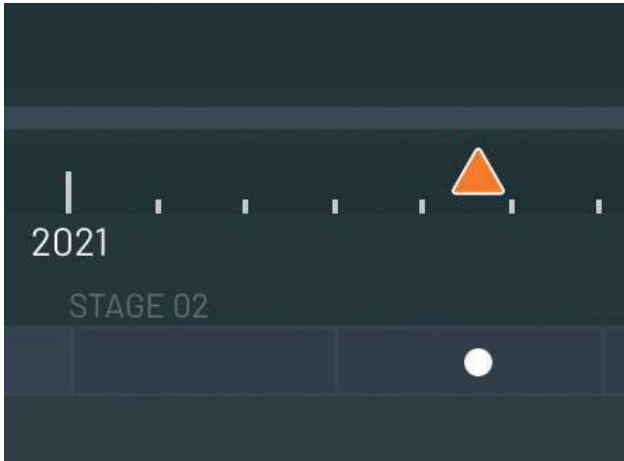


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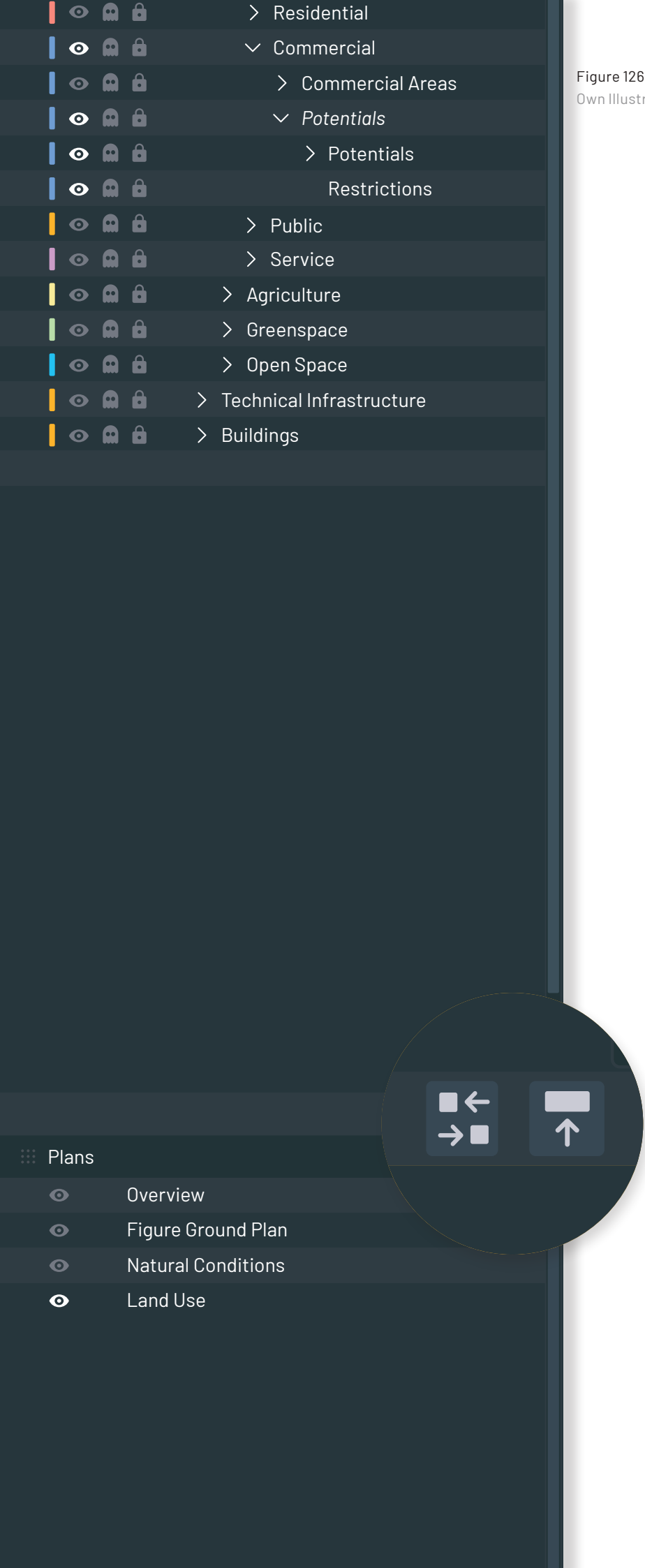


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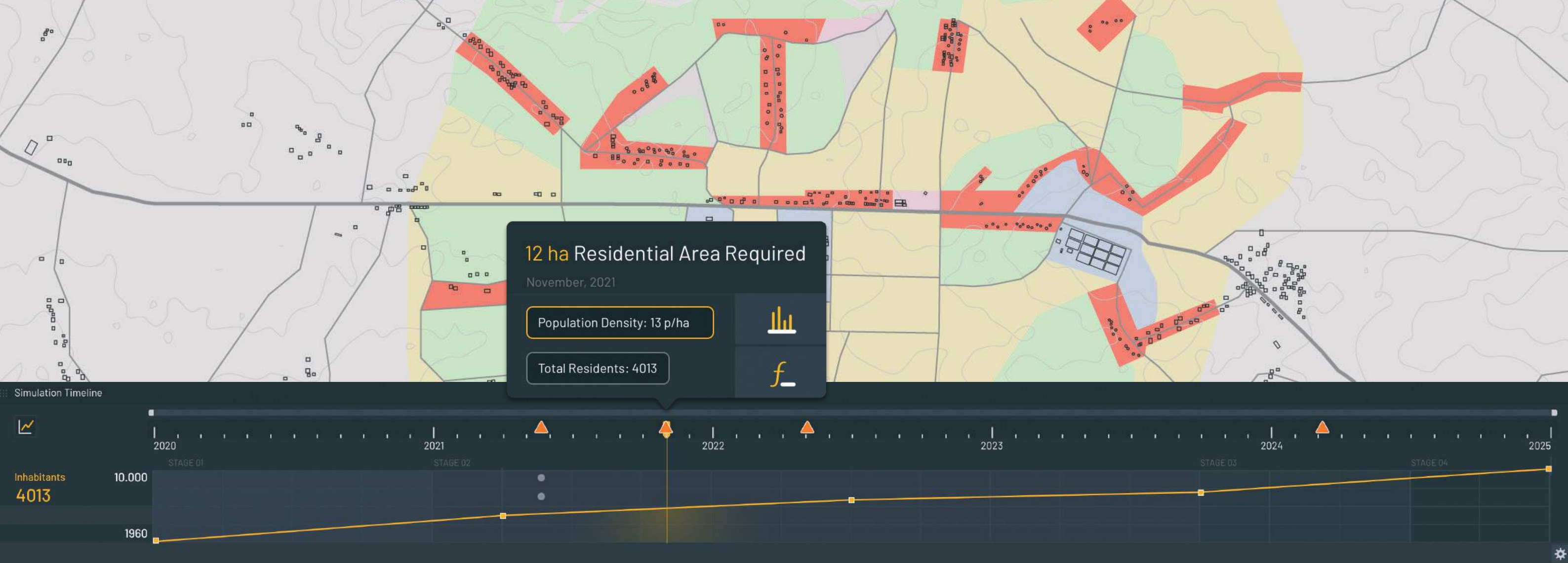


Figure 127:
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7. Conflict Analysis “Residential Area required”

Hawi consecrates himself to the next conflict. The capacities of the Residential Area are depleted. The area has to be expanded in order to provide sufficient housing for all inhabitants. Again, he has to convert existing areas to get enough space for this planning step.

7A.

Clicking the respective conflict icon it disables the visibility of the Potential Area Commercial plan as the Residential Area gets highlighted. Additionally, he wants to take a closer look at the population growth during the time the conflict occurs. He accesses the population growth graph in the Timeline via the corresponding graph button.

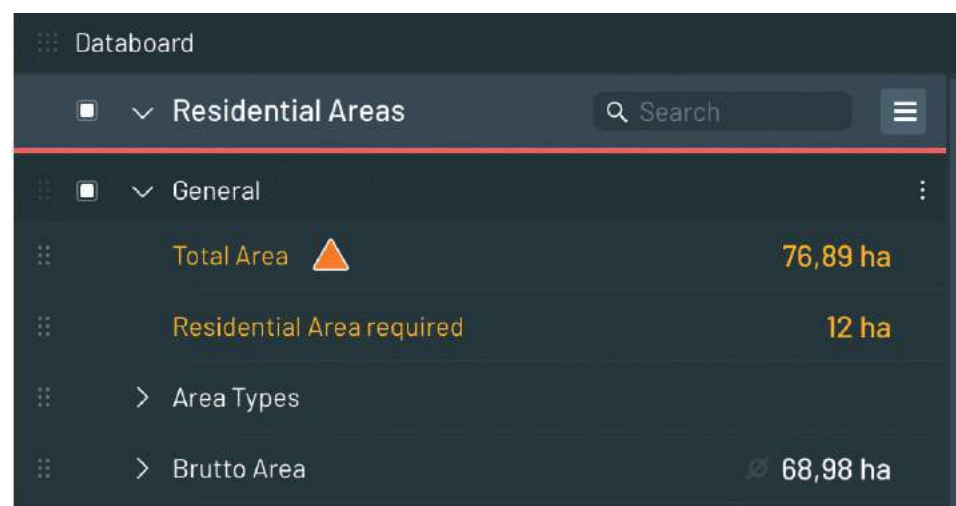


Figure 128:
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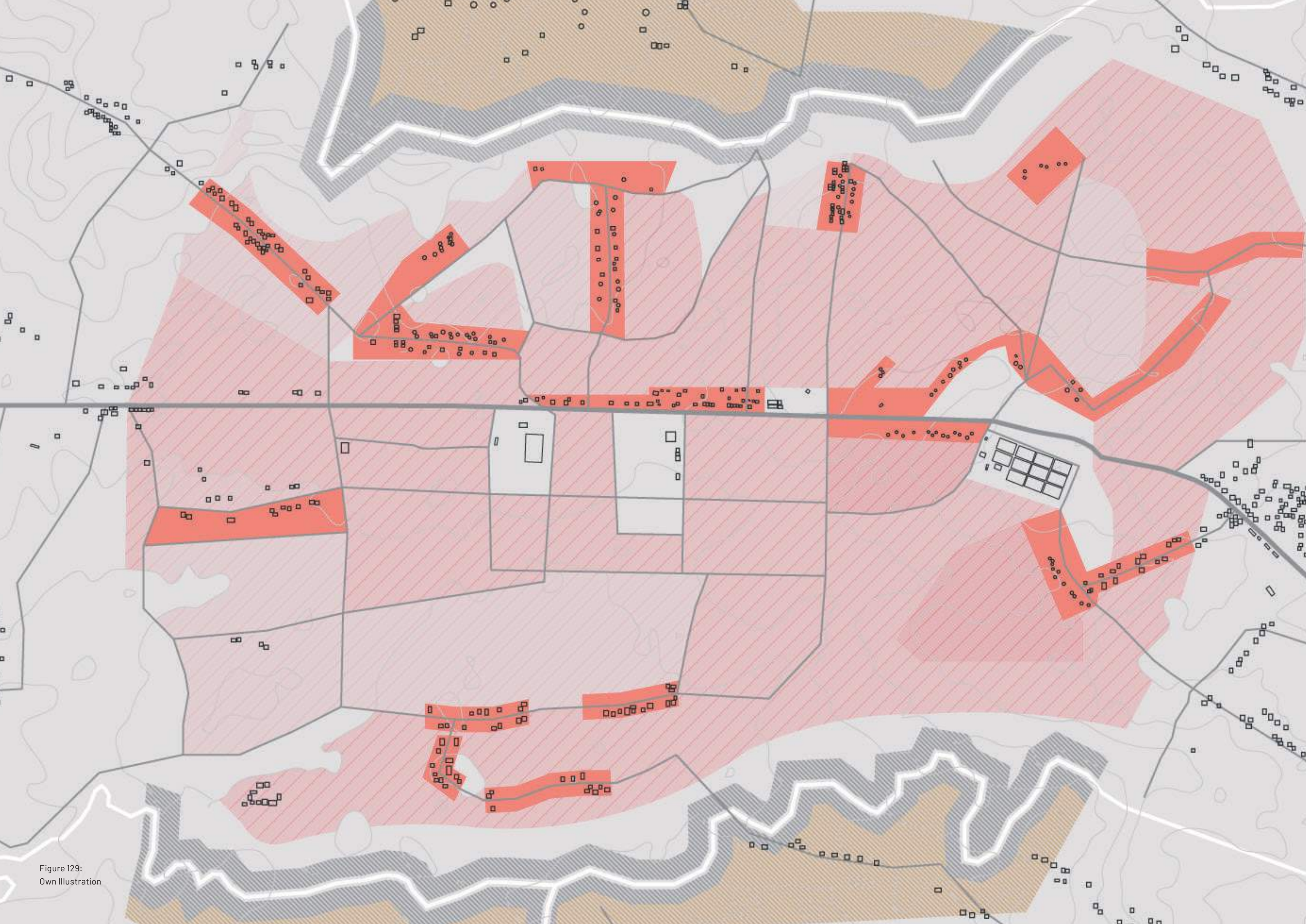
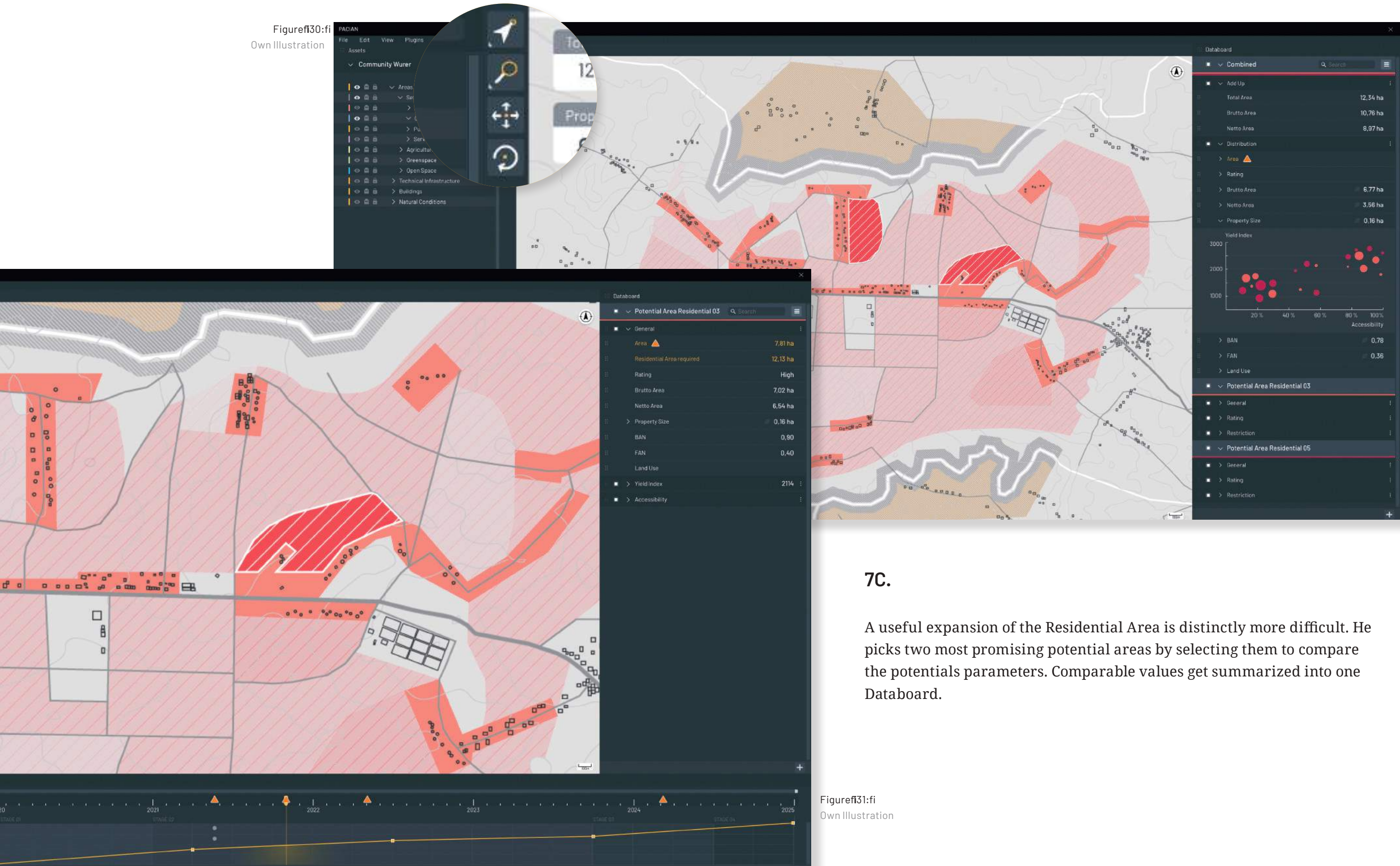


Figure 129:
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7B.

Hawoi Tolosa repeats the process of generating a Potential Area for the Residential Area.

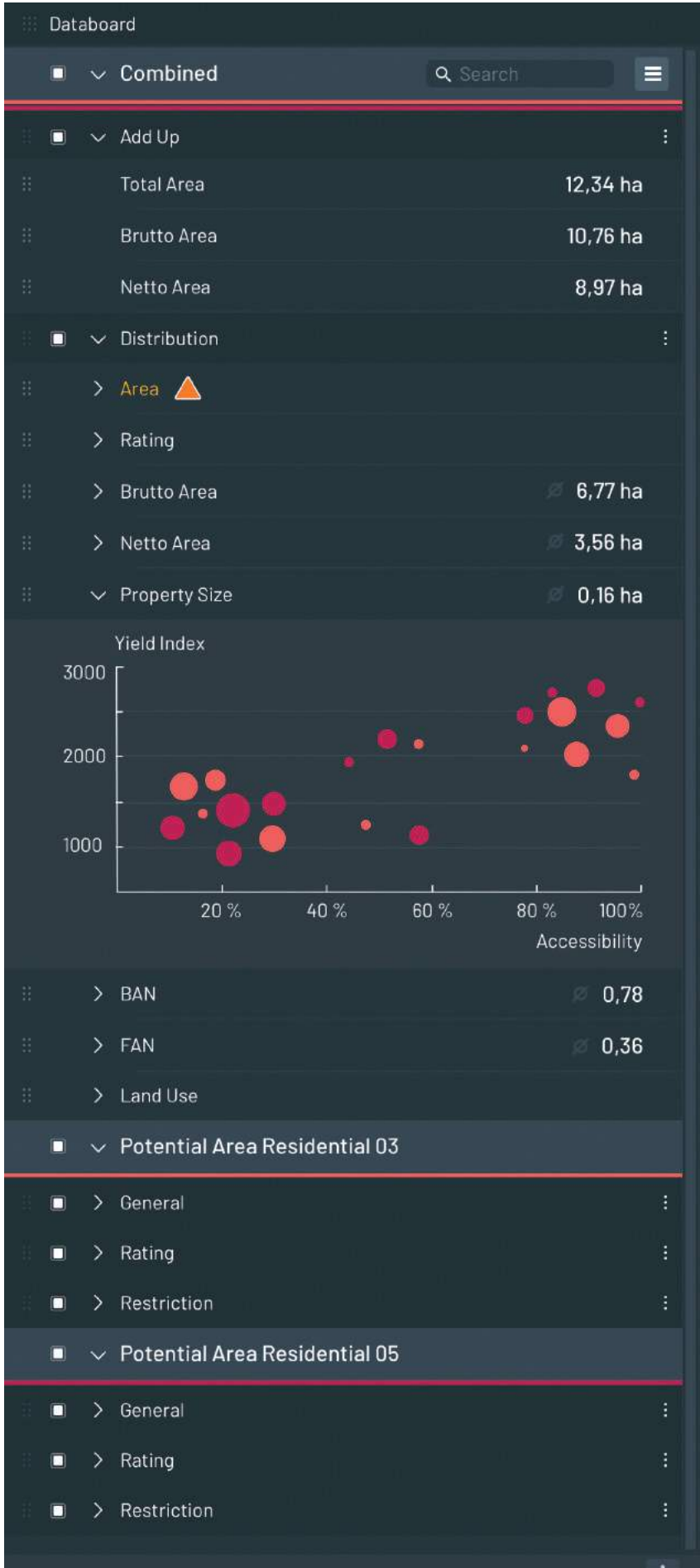
Figure 30:fi
Own Illustration



7C.

A useful expansion of the Residential Area is distinctly more difficult. He picks two most promising potential areas by selecting them to compare the potentials parameters. Comparable values get summarized into one Dashboard.

Figure 31:fi
Own Illustration



Figuref132:fi
Own Illustration

7D.

Hawi wants to consult his supervisor for advice. He drags the following Data Panels on the map:

- TotalAreaResidential
- NeededAreaResidential
- GraphffdifferentPotentialQualities

By dragging Data Panels to the map they will be pinned to the top right corner and visible at any state as long as the current plan is selected. Furthermore, the Data Panels are added to the Potential Area Residential plan.

7E.

During the further procedure, Hawi exports the current map view with its attached Data Panels as PDF to be able to print his planning concept and show it to his supervisor. He selects the plans accordingly and clicks on the Export-Button. PACIAN exports all necessary data as PDF.



Figuref133:fi
Own Illustration

Final Conclusion

The scale of GTP III is an enormous challenge for the Ethiopian Government and its urban designers. As exemplified in the Use Case, Hawi Tolosa was able to quickly analyse and generate different development solutions for the community Wurer. Simultaneously he was able to create an organic development roadmap as a good foundation for further planning. Regarding our main focus, fast decision making, we think we were able to improve this process of Urban Development. Rather than detailed and time-consuming planning processes – rough but fast, sustainable and individualized planning solutions are needed. This could enable the urban designers of Ethiopia to realize sustainable city development concepts within the short period of time defined in the GTP III plan.