TREES SURVEYING – ASSIGNMENT II

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CONTENTS

1. OBJECTIVES

1. Perform tree surveying in Salzburg City.
2. Analyze the factors that can affect the data collected.
3. Discuss pros and cons of GNSS data collection methods.

2. QUESTIONS: PART A

In order to answer sections a,b,c,d, and e, an ArcGIS Dashboard was implemented (https://zgis.maps.arcgis.com/apps/dashboards/8fe555cfcfaa47b2963a4811fff97de6). Within this dashboard, the user can filter the data collected based on the editor ("*Select User*") and Tree species ("*Select Species*"). Additionally, three indicators are displayed that show the total number of records, average, and range for tree diameters and heights. All these indicators are dynamically updated based on the filters applied. Finally, the dashboard contains a heat map layer that can be enabled by the user.

2.a. Screenshot of a Map showing only your measurements

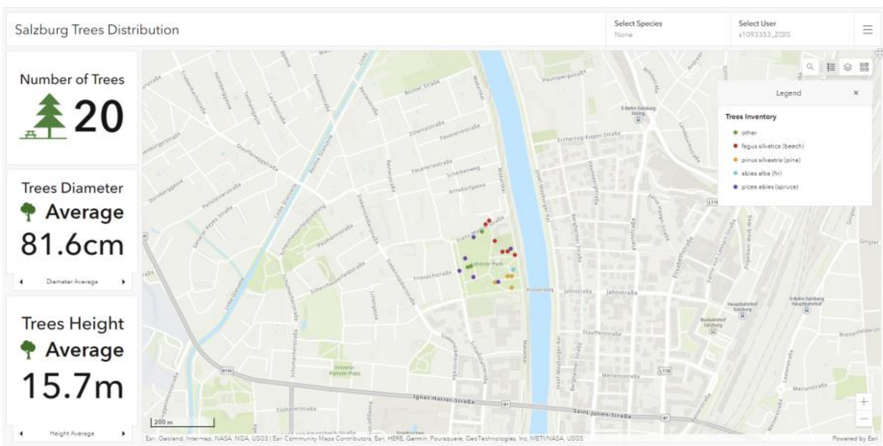

Figure 1. Salzburg Trees – Our Measurements.

2.b. Distribution of the main tree's species of Salzburg (Map Screenshot)

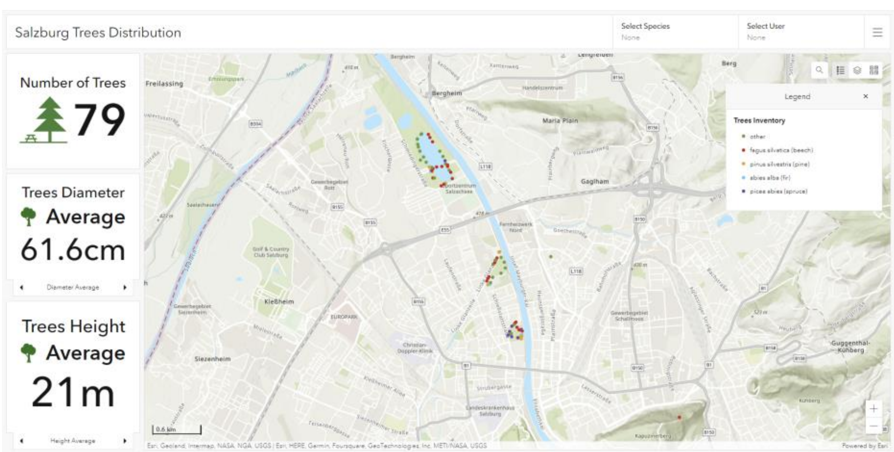

Figure 2. Salzburg Trees – All Measurements.

2.c. Average and the Range of tree diameters (per species)

The following statistics were gathered from the mentioned dashboard on April 11, 2023, having 79 trees recorded.

SPECIES	AVERAGE (Cm)	RANGE (Cm)
Abies Alba (Fir)	45,3	31 - 63
Fagus Silvatica (Beech)	54,9	14 - 108
Pices Abies (Spruce)	64,1	25 - 167
Pinus Silvestris (Pine)	101,2	44 - 311
Other	56,3	9 - 124

Table 1. Average and Range of Tree Diameters.

2.d. Average and the Range of tree heights (per species)

The following statistics were gathered from the mentioned dashboard on April 11, 2023, having 79 trees recorded.

SPECIES	AVERAGE (m)	RANGE (m)
Abies Alba (Fir)	20	14 - 31
Fagus Silvatica (Beech)	22	10 - 36
Pices Abies (Spruce)	18,1	9 - 30
Pinus Silvestris (Pine)	24,8	10 - 34
Other	19,5	7 - 48

Table 2. Average and Range of Tree Heights.

2.e. A heat map of completed surveys.

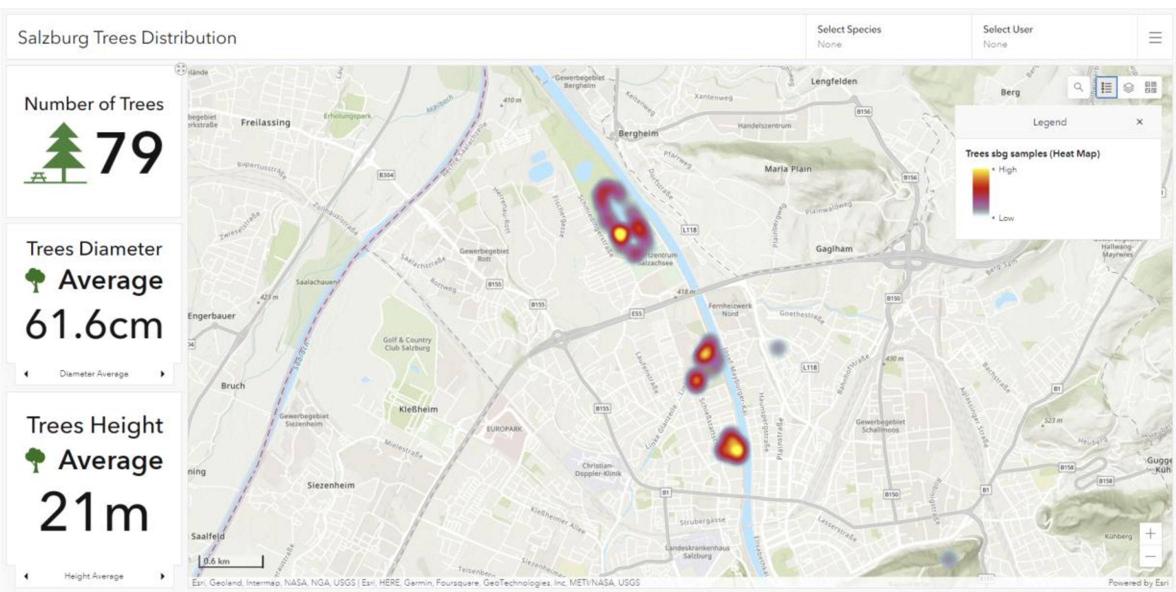

Figure 3. Heat Map layer.

2.f. Screenshot of Attribute Table showing 20 datasets

	OBJECTID *	species	height [m]	diameter [cm]	Vertical Accuracy (m)	Horizontal Accuracy (m)	Creator *	Fix Time
1	50	fagus silvatica (beech)	15	44	3,29	2,82	s1093353_ZGIS	7/04/2023 2:22:03 p. m.
2	51	fagus silvatica (beech)	14	41	2,82	2,35	s1093353_ZGIS	7/04/2023 2:24:52 p. m.
3	52	picea abies (spruce)	19	167	3,29	2,35	s1093353_ZGIS	7/04/2023 2:26:29 p. m.
4	53	fagus silvatica (beech)	14	50	2,82	2,82	s1093353_ZGIS	7/04/2023 2:33:03 p. m.
5	54	fagus silvatica (beech)	14	50	2,82	2,35	s1093353_ZGIS	7/04/2023 2:34:26 p. m.
6	55	fagus silvatica (beech)	16	63	3,29	2,82	s1093353_ZGIS	7/04/2023 2:36:25 p. m.
7	56	fagus silvatica (beech)	10	108	3,29	2,82	s1093353_ZGIS	7/04/2023 2:37:42 p. m.
8	57	other	8	44	3,29	2,82	s1093353_ZGIS	7/04/2023 2:40:00 p. m.
9	58	picea abies (spruce)	20	31	3,29	2,35	s1093353_ZGIS	7/04/2023 2:43:15 p. m.
10	59	picea abies (spruce)	18	50	2,82	2,35	s1093353_ZGIS	7/04/2023 2:51:16 p. m.
11	60	other	18	82	2,82	2,82	s1093353_ZGIS	7/04/2023 2:52:33 p. m.
12	61	other	18	95	2,82	2,35	s1093353_ZGIS	7/04/2023 2:54:40 p. m.
13	62	picea abies (spruce)	14	53	2,82	2,35	s1093353_ZGIS	7/04/2023 2:56:16 p. m.
14	63	picea abies (spruce)	17	50	<Null>	<Null>	s1093353_ZGIS	<Null>
15	64	pinus silvestris (pine)	20	106	2,82	2,35	s1093353_ZGIS	7/04/2023 3:02:13 p. m.
16	65	picea abies (spruce)	9	25	2,82	2,35	s1093353_ZGIS	7/04/2023 3:03:16 p. m.
17	66	pinus silvestris (pine)	22	181	2,82	2,35	s1093353_ZGIS	7/04/2023 3:05:06 p. m.
18	67	abies alba (fir)	14	31	2,82	2,35	s1093353_ZGIS	7/04/2023 3:07:18 p. m.
19	68	pinus silvestris (pine)	23	311	2,82	2,35	s1093353_ZGIS	7/04/2023 3:08:19 p. m.
20	69	pinus silvestris (pine)	10	50	2,82	2,35	s1093353_ZGIS	7/04/2023 3:10:35 p. m.

Figure 4. Attribute Table with our records.

2.g. URL of your shared Web Map including the (Probably empty) tree web feature service.

- Felipe Camacho Web Map: https://arcg.is/qjTjC
- Martin Dautriche Web Map: https://zgis.maps.arcgis.com/home/item.html?id=7180f4bae9ff4185829c23058b174a0a

3. QUESTIONS: PART B

3.a. What are the limitations of the devices we were measuring? What are the limitations of human interpretation and recording of the data.

The devices we used for the measurements were an Android smartphone and Trimble devices. The limitation of the smartphone was its low accuracy. For each location, the accuracy was around 5–10 m, so taking two different measurements close to each other was inaccurate. Another limitation was the connection to the satellites; the devices need many connections to be accurate. The problem is that when you are in a city with a lot of big buildings or in the middle of a dense forest, the connection could be a problem.

Concerning the human limitation, to obtain precise localization with the Trimble devices, we must keep the satellite straight and immobile for short time, but after many measurements, it’s difficult to keep the devices perfectly immobile. A second limitation is the interpretation of the data. For example, when we collect the localization of trees, we need to define the species, but it’s not really efficient if you are not a biologist.

3.b. How do scale, terrain, accessibility to the objects, fatigue, and other factors affect the data you collect.

After hours of collecting, it's difficult to keep focus, and some of the last measurements were taken faster but way less accurately. Some trees were not easy to access, and the weather had a big impact on the collection session and the accuracy of the measurement. For example, it's difficult to measure a lot of trees when it's heavily raining. The scale of the field has an impact as well on the measurement and could be time-consuming if the trees are far from each other.

3.c. How do the number and type of the data points affect the analysis you will perform on the data

The more data points we have, the better the analysis will be. Same for the type of points. It's interesting to see the paradox between the need for the analysis and the collection and measurement of the points. The more we ask for points, the more accuracy could drop. The more we ask for a large number of points, the more accuracy could drop.

3.d. Discuss the pros and cons of GNSS data collection methods we covered.

There are two ways to collect the GNSS data: the first is to correct the data in real time, and the other is to correct the data after the post-processing when you are back from the field. The first solution has the advantage of being able to see directly if the data is correct in real time. You don’t have to go to the office and check if there is an error. The problem is that you need an internet connection during all the collection, and it’s expensive to receive real-time corrections. The second solution has the advantage that you don’t need to connect to the internet during the collection, but you have to process the data when you are back in the office. The first option should be the default option. Thanks to the fact that the data is correct in real time, you can directly know if your data seems correct without error.