



Knowledge and Technologies for Effective Wood Procurement

Deliverable 4.3

MAPPING APP - MINIMIZE SITE IMPACT THROUGH IMPROVED PLANNING AND OPERATIONS

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1 Publishable summary

Like for all environmental sciences, large quantities of information are being generated from easily accessible data sources, like aerial and satellite based LiDAR and imagery. This information can contribute significantly to improved forest management, and especially the planning and carrying out of forest operations. Of special relevance to WP4 is an improved decision basis, provided for avoiding site damage by trafficking of forest machinery. One of the biggest challenges to operationalising the data is visualisation in the field. Static maps are not practical to use in the field, and poorly represent varying soil moisture conditions. While mapping functionality is available in most CTL harvesters, it is proprietary property and useable only within the remiss of each manufacturer. In a diverse forest sector, there is a need to develop solutions that work across platforms. In addition, it cannot be expected of a machine operator or forest worker to manually edit and provide accurate feedback to operations managers in analogue format.

This demonstrator describes how an app developed by T4E partner Latschbacher GmbH provides a solution to these challenges. The 'T4E Mapping App' is a handy tool that allows field operatives access to the most recent, complete and diverse data available. The basic data includes terrain trafficability quantified through a Depth-To-Water map, woodland key habitats and other hotspots requiring special awareness, as well as terrain or slope maps. The position of the forest machine or worker using the device is always indicated in relation to other features on the map. As Web Map Service is used, any data layers from any participating country can be displayed.

A number of key functions are employed in ensuring full versatility of the tool: (1) the maps can be cached and map tiles can therefore be used offline in areas with poor network coverage. (2) The app user can annotate the map with text and vector features including polygons, lines, and points, with the option of activating a track log recording the machine or user's movements. Additionally, the user can be warned when approaching a critical area by a pushing notification. (3) The user is able to store locally or share the annotations, as well as geo-referenced photographs, with other actors via a number of technologies (FTP, OneDrive, and Dropbox). Technically, it is now possible for the user to add environmental data to the Silvismart database. This provides an innovative new approach to capturing and working with environmental considerations within the efficiency framework being developed within the TECH4EFFECT project as a whole.

2 Introduction

2.1 The need for, and specifications of a Mapping App

Despite significant improvements in forest technology and the way that operations are carried out, damage to the forest floor remains as a significant issue for the forest sector to deal with. WP4 is dedicated to the topic of *Avoiding, Reducing and Documenting site impact*, as headed in the projects proposal. The *avoidance* component is strongly based on the notion of improving access to information on site susceptibility, thereby giving the machine operator the possibility of avoiding damage to the extent possible.

Early on in the project, the Depth-To-Water (DTW) algorithm was selected as the main method for modelling terrain trafficability. This was grounded in the fact that major forestry countries, including Finland and Sweden, have created national DTW maps and that these are used in an operational setting in forest machines across those countries. Simply put, the metric DTW-index shows the depth from a particular point in the area to the nearest surface of open water. Given the known relationship between moisture content and soil strength in most soil types, it is assumed that soils with DTW class in excess of 1.00 m are not particularly susceptible. A description of the generation of DTW maps, their properties and limitations is provided in D4.1 *Terrain accessibility maps for 4 case study areas*.

The Mapping App was therefore conceived primarily as a visualisation tool for machine operators to be able see and adopt their path of travel in accordance with apparent soil strength, represented by DTW maps. The idea being that it provides information to the operations manager, the machine operator, and forest worker, both before and during any work being carried out.

A secondary motivation was to highlight the location of other areas of importance, both natural such as biodiversity hotspots or important management areas, as well as cultural heritage sites or paths and trails of importance to recreational users.

Finally, the Mapping App was considered as a potentially useful tool also for gathering information from activities in the forest, and pass this back to operations managers as well as to the TECH4EFFECT database, which would then contain operational efficiency and environmental performance data, too.

2.1.1 Design requirements

The most important design requirements put to the Mapping App development included:

- providing a terrain trafficability map indicating the position of the machine on the map,
- being able to add further thematic maps where justified,
- allowing for the user to create, store and share spatial features on the map, and
- providing map-caching functionality for off-line use.

3 User Manual

3.1.1 T4E Mapping App availability

The T4E Mapping App is exclusively available for Android OS mobile devices from the Google Play Store via this link yet:

<https://play.google.com/store/apps/details?id=com.latschbacher.t4emappingapp>

3.2 Handling

3.2.1 App Menu

To open the app menu, press the menu button at the top left of the app on the Map screen. From the app menu, the Map screen can be accessed by pressing the “Back” button of the Phone or by tapping on the narrow gap on the right side, where the map is still visible in background.

With the selector for “Basemap”, the user can choose a base map that is used in the app. Options are the Google Street/Satellite/Hybrid maps, OpenStreetMap, OpenTopoMap, TOP50-D or no map.

The “Layers” are dynamically loaded from a configuration file and can be checked and unchecked by the user. Checked layers are displayed in the map and are drawn over the base map. Source of these Layers is a Web Map Service.

Map caching can be turned on and off via the switch. When turned off, the app accesses only online resources. If the switch is turned on, data will be cached locally, so there is no connection needed when viewing the same area again. The “Create...” button will open a prompt to delete the cache.

Information about the app can be found in the “About” section.

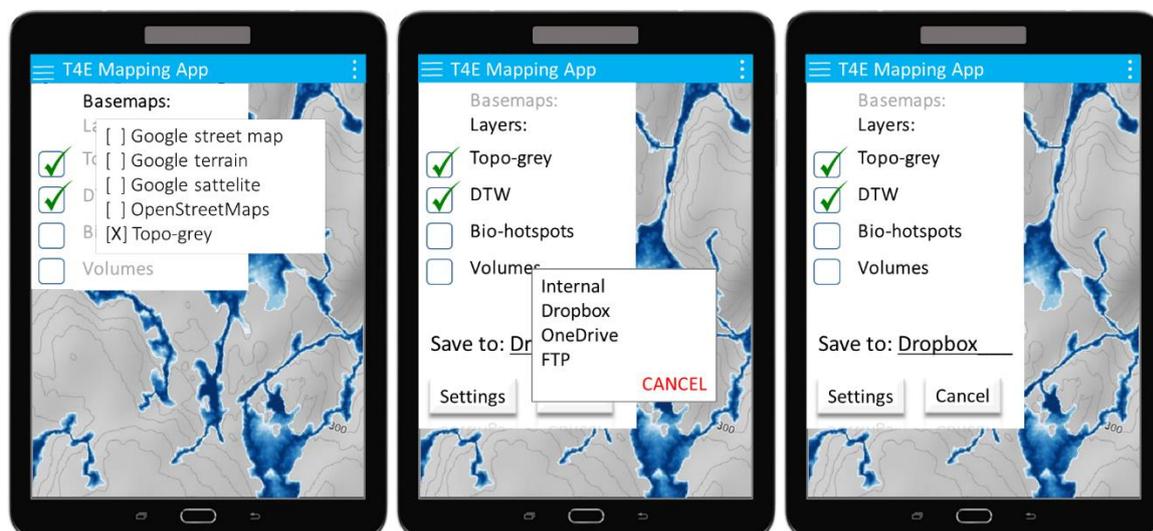


Figure 1 T4E Mapping App showing selection among multiple base maps (left), the selection of layers to display, and the selection of destination for storage of spatial features and images captured with the app.

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3.2.2 Settings

The Settings menu can be accessed via the apps menu. This is also the first screen the user will see when first starting the app. In this menu the operating language can be switched between German and English.

3.2.2.1 Save to:

The user can select internal storage, Dropbox, OneDrive or an FTP server where data should be saved. Default Storage of Tech4Effect Silvismart Portal is defined in FTP-Settings. The path and FTP server and the credentials can be set with the Settings different to default credentials. If the user chooses Dropbox or OneDrive, credentials can be entered when the user is saving data for the first time.

3.2.2.2 Master data:

Name, average load and an email address for the machine can be entered when pressing on "Machine". This data is used when adding storages, which can be landings, terminals or any other clearly distinguishable management area. Email is used to identify User for Silvismart (www.Silvismart.eu) Portal.

"Assortments" and "Units" are dynamic settings, which means that the user can add new entries for them. Each new entry consists of "Short", "Long" and "Default". Short is the value that is written when data is exported, Long will be displayed when the Data is selected, and Default will select this entry for prefilling when adding a new wood storage. Please note that only one entry can be set as default. Values will be saved in the specified storage path in Settings as an xml file.

3.2.2.3 TBD – Alerting:

With "On/Off" In the alerting section user can enable warning when GPS-position is near a critical area of depth to water layer. Additionally distance to border of depth to water layer from which alerting will be called. Alerting type "Vibration" and/or "Sound" can set what happens if alert is pushed.

3.3 Map Screen

The map can be zoomed either via pinching or panning, or with the + and – buttons on the bottom-right corner of the screen. The user can also rotate the map using the rotating two-finger gesture. To return to North-up view, touch the compass icon that appears in the top-left corner when the map is not oriented North-up. To center the map, press the center button in the top-right corner.

Pressing the tracking symbol with the red background will start the GPS tracking. When GPS tracking is active, the background of the button will change to green until the user deactivates GPS tracking. The track will be shown on the map as soon as the tracking is deactivated.

3.3.1.1 Adding items to the map

There is a variety of items available to be added to the map that is selectable via the menu on the top-right corner of the map screen. All items can be moved by long pressing on them.

Current Position: reverts the zoom level, rotation and map position to the default values.

Find location: centers the map to the entered address. This works for addresses i.e. "Hauptstraße 8, 4484 Kronstorf" which can be shortened to "Hauptstraße 8 Kronstorf", or for cities i.e. "Kronstorf".

New Point: Adds a new point or a photo to the map. To add a photo, select the Photo button that appears after pressing on "New point". The user can then choose to take a picture or select a picture

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from gallery. The item will be added after selecting a position on the map. When pressing the camera button again, the previously taken picture will be replaced by the new one.

New Line: Adds a point on the map every time the user selects a location. After pressing "OK", the points are connected in the order they were added to the map. The first and last points will not be connected. "Cancel" removes all points added to the map.

New Polygon: Adds a point to the map every time the user selects a location. After pressing "OK" the points are connected in the order they were added to the map. The first and last points will also be connected. If there are no lines crossing other lines from the polygon, the area will be colored.

New Text: The user first enters a text that can be placed on the map after pressing "OK".

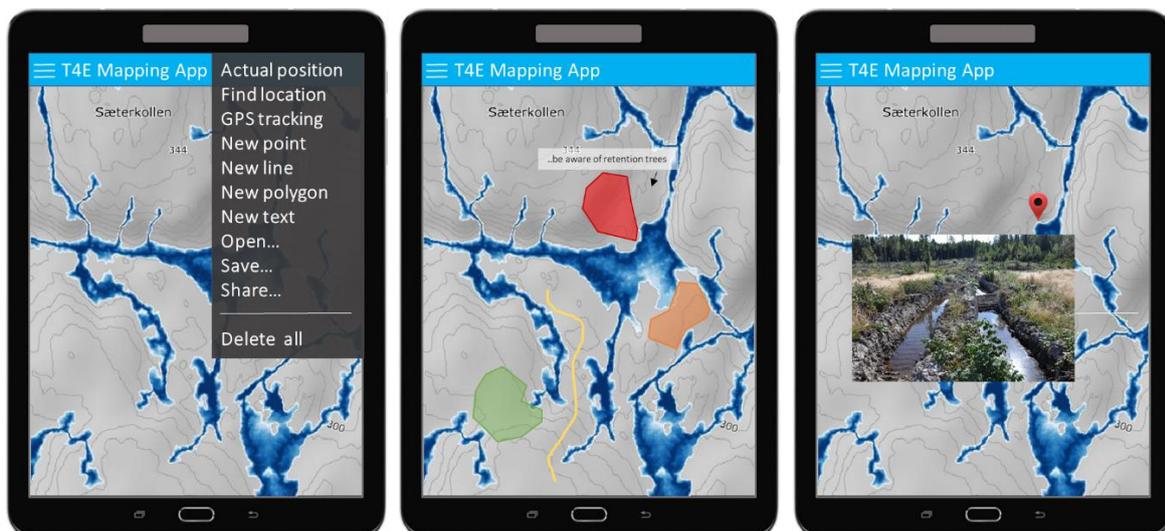


Figure 2 T4E Mapping App showing optional items, which can be added to the map (left), for example polygons, lines or annotations (middle) or geocached photographs (right).

Open: Displays a list of available KML files in the folder specified as storage path in the settings. This will remove all previously added items from the map.

Save: Saves all objects that were added to the map in a KML file in the folder specified as storage path in the settings. KML files can be opened in Google Earth.

Share: Creates a screenshot of the currently visible map and opens a prompt to select an app where the screenshot should be shared.

Delete all: Removes all items that were previously added

4 Conclusions

The T4E Mapping App has been developed and initial testing has been carried out in an operational setting. Used together with the DTW maps, the app gives the user significant information in real-time in the context of terrain trafficability in both, the immediate and wider ranging areas. Additional layers used in the Norwegian setting included areas of ecological sensitivity, special interest areas, and cultural heritage sites of varying significance. Experiences with drawing, storing and transmitting spatial features from the app to online file sharing systems were positive.

The successful development of the app has resulted in a period of use within the project of almost one year. This implies that a significant amount of testing and improvement can take place in ensuring that the app is fully functional, robust, and taken in use by a broad group well before the project terminates. Presently, each participating country has the possibility of including WMS-layers of specific importance to that country. A rolling-out of the app in each of these countries will, in keeping with the original design, strongly increase awareness of terrain trafficability in an operational context, and contribute to promoting this throughout the forestry sectors.

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