Teacher manual for the e-module on Urban Green Spaces

Nina Schwarz & Louise Willemen

Welcome!

Licensing Information

1) Describe green space in urban setting

2) Problems & trends in urban areas

3) Benefits of urban green spaces

4) Urban green planning terms

5) Urban management considerations

6) Measuring urban green space benefits for management support

7) Evaluate impact of urban change scenarios

To conclude

Consulted Literature

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Welcome!

Welcome to the e-module on Urban Green Spaces!

We invite you to get started by watching this introduction video.

About the e-module

The module will address seven topics. Each topic starts with a 10-minute micro-lecture video which introduces the topic, highlights the most important aspects, and guides the reading and exercise. After this video, you will read material and test your gained knowledge with a quiz. The reading materials provided are short and are meant to show the key concepts and elements. Each reading part can have one to three recommended in-depth reading suggestions (adding 5h of reading time per learning outcome). All suggested reading material is open access and made available. For some topics, you are asked to do an exercise and you can self-assess your results through guided model answers. Each topic follows the same structure of teaching format, so you quickly get used to the learning environment. In the Index of this course you find an overview of all topics and concepts that will be addressed.

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1 Introduction

Welcome to this e-module on urban ecosystem services!

The University of Twente's Faculty of Geo-Information Science and Earth Observation ITC together with Tropenbos Suriname have developed a teaching module on urban green spaces during their UTSN Twinning project "Towards a green and more liveable Paramaribo".

Who is the **target audience**? This teaching module is designed to be used in existing higher education curricula (e.g. programme on Natural Resources Management, Spatial Planning, Environmental Sciences) in two ways: i) the module, as-is, could be used *within* a course, introducing students to the subject of urban green benefits and management. ii), the module can be used as a *stand-alone* short course. If used as a short course, we provide teachers options to guide students to more in-depth activities, such as additional reading and a suggestion for practical work. Also, the e-module can be used for training public and private sector professionals interested in the topic.

What does the **e-module contain**? The e-module on urban ecosystem services can be considered an e-book including video-recordings of micro-lectures, reading materials, quizzes, exercises and optional activities. All teaching material is provided **digitally without the need for an internet connection** to access videos or documents. The only exception is additional, free software students need to work on the practical exercise in learning outcome 6 as the software's license does not allow sharing the software itself.

In this **teacher manual**, you will find:

1. An overview on the course contents (Section 2): What are the intended learning outcomes, suggested activities and the materials provided? How is assessment organised?
2. Technical tips and tricks (Section 3): How can you as a teacher work with the material, use only a part of it or update it? What about licensing and how to provide feedback?
3. Required GIS skills (Section 4): Which skills are needed and how could you teach them?
4. Optional additional activities (Section 5): Which additional classroom and fieldwork activities could be offered next to the self-study?

2 Overview on the course contents

The study material aims at an overview on the role of nature in the context of urban planning challenges worldwide, with a special focus on the tropics. For learning outcomes 6 and 7, the case study students work on is Paramaribo, the capital of Suriname in South America. For these exercises, students make use of data collected within the UTSN Twinning project .

In the e-module we included an 'Index' of all key terms and topics addressed in this module.

2.1 Intended learning outcomes
The course addresses seven intended learning outcomes:

1. Describe green spaces in urban setting
2. Remember problems & trends in urban areas
3. Understand benefits of green space in urban setting
4. Explain urban green planning terms

5. Understand urban management considerations
6. Select options of measurement of urban green space benefits for management support
7. Evaluate impact urban change scenarios

2.2   Suggested activities and materials provided

Study materials and activities are organised along the seven intended learning outcomes. Each intended learning outcome starts with a short (max. 10 minutes) **micro lecture** video which introduces the topic, highlights the most important aspects, and guides the reading and exercise. After this video, students will **read core material** in which the topics introduced in the video are clarified and specified. After that, students test their gained knowledge with a **quiz**. The core reading materials provided are short and are meant to show the key concepts and elements. Each reading part has one to three recommended **in-depth reading** suggestions. The in-depth reading materials provide a wider or deeper view on the topic. For some intended learning outcomes, students are asked to do an **exercise** and can **self-assess** their results through guided **model answers**. Each intended learning outcomes follows the same structure of teaching format, so students quickly get used to the learning environment.

The module is entirely self-study. However, in this teacher-manual, you can also find **optional additional classroom and fieldwork activities** (Section 5) to complement the self-study.

The following Table 1 provides an overview on the intended learning outcomes and the materials and activities provided. It also gives an overview of the **expected workload** covering the micro-lectures, core reading and exercises. Additional time for in-depth reading and optional activities needs to be taken into account if you incorporate these in your course. The workload will have to be adapted also depending on students existing knowledge and skills. For instance, if students first need to learn how to operate a GIS (Section 4), more time will be required.

Table 1: Intended learning outcomes of the module and the materials and activities provided

Learning outcome	Material provided	Workload*
All	*Micro-lecture*: Welcome, course format, expectations; introduction of the teachers giving the micro-lectures.	10min
1) Describe green spaces in urban setting	*Micro-lecture*: Urban green space characteristics and how urban green spaces can be described with size, ecological information, ownership etc. *Core reading* on micro-lecture topics. *Quiz* about core reading. *In depth* reading (optional)	2 hours
2) Remember problems and trends in urban areas	*Micro-lecture:* Problems and trends in urban areas such as ongoing urbanisation, urban heat island effect, exploitation of natural resources etc. *Core reading* on micro-lecture topics. *Quiz* about core reading. *In-depth* reading (optional)	2 hours
3) Understand benefits of green space in urban setting	*Micro-lecture:* Ecosystem service concept and examples of urban ecosystem services (e.g., heat island mitigation, recreation) and who benefits. *Core reading* on micro-lecture topics. Exercise: Which characteristics should an urban green space have to foster selected ecosystem services? Who profits? *Quiz* about core reading. *Optional activity*: field trip, group discussion, design *In-depth reading* (optional)	3 hours

4) Explain urban green planning terms	Micro-lecture: Urban green planning terms (ecosystem services vs. nature-based solutions vs green infrastructure). *Core reading* on micro-lecture topics. *Quiz* about core reading. *In-depth reading* (optional)	2 hours
5) Understand urban management considerations	Micro-lecture: Management considerations as challenges: knowledge base, legitimacy, environmental equity and justice, institutional capacity etc. *Core reading* on micro-lecture topics. *Exercise:* Which governance challenges are mentioned in a report about a case study in Lima, Peru? *Quiz* about core reading. *Optional activity*: Role-play to deepen understanding on different stakeholder views and how governance challenges are related to them *In-depth reading* (optional)	4 hours
6) Select options of measurement of urban green space benefits for management support	*Micro-lecture:* Showcase and reflect on measurement options: direct measurements (e.g. questionnaires), indirect measurements (e.g. remote sensing) and modelling to support management decisions. *Core reading* on micro-lecture topics. *Exercise*: What is the local climate regulation provided by urban green in the city of Paramaribo, Suriname? *Quiz* about core reading. *Optional activity*: Use the online database to check the cooling effect of urban green spaces. *In-depth reading* (optional)	10 hours
7) Evaluate impact urban change scenarios	*Micro-lecture*: How can we evaluate different impacts scenarios on urban ecosystem services as synergy, trade-off and win-lose? *Core reading* on micro-lecture topics. *Exercise*: How can we evaluate different scenarios for the future development of Paramaribo, Suriname? *Quiz* about core reading. *Optional activity*: Classroom reflection and discussion the different future scenarios student could opt for in the Exercise. *In-depth reading* (optional)	10 hours

* Excluding optional activities and in-depth reading, estimates can differ per student group.

2.3   Assessment

To allow for a flexible use of the module in different study programmes, no summative assessment (graded) is provided in the e-module itself. Quizzes are meant as formative assessment (learning) and focus on the core reading only. Correct answers are also provided for self-testing.

It is up to the teachers who incorporate this course in their programme to decide if and how a summative assessment will take place. The following ideas can be used to set up an appropriate summative test / tests for the respective course:

Written exam. Multiple choice questions on content of the micro-lectures, core reading and in-depth reading (if used), formulated as true/false statements, find matching definitions, or selections of key characteristics of a urban planning or green space phenomenon. Open-ended questions could, for example, ask students to reflect on the governance challenges introduced in learning outcome 5 for a new case study. A brief case study description could provide information which students should then recognise as challenges. As their answer, students could name the challenges they found and briefly explain them. Such open-ended questions could also be discussed in an **oral exam**.

Finally, students could also hand in a portfolio of the exercises in learning outcomes 6 and 7 to as a **written report**. Teachers should describe which elements should be present in such a portfolio (e.g. a map of the heat mitigation index in Paramaribo (learning outcome 6) and the answers to the questions posed in exercise 7. Note that the model answers currently included in exercise 7 then would need to be taken out and can serve as model answers.

3 Technical tips and tricks

3.1   How to use the existing course material?

To start this e-module for the first time, you first need to unzip the zip-archive and locate the file named **index.html** in the GreenSpace folder. Double-click to open it. The index.html file is your starting point for the whole module, and you can navigate all content, watch the videos etc. through this file. The module will open in your default browser (e.g. Firefox, Chrome). To select a different browser, simply right-click on the file index.html and select "Open with", then choose your preferred browser.

To easily start the module a next time on Windows, right-click on the "index.html' file, click 'Send To', click 'Desktop (create shortcut)' (*Figure 1*). An icon of your browser will appear on your desktop. We suggest you rename this to 'Urban Green Space module' for easy navigation. Now you are all set!

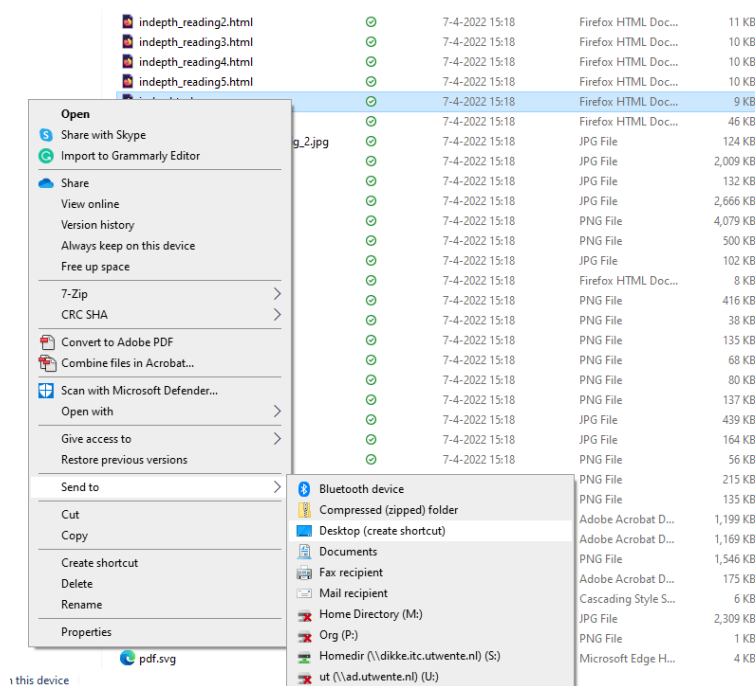*Figure 1: Creating a shortcut to start the e-module in an easy way.*

3.2   How to update the course material?

The e-module was constructed with eXeLearning, an open source software with its code available to the public on GitHub. A full guide covering how to use eXeLearning to modify and create educational content is available on their website exelearning.net. The guide is available in English, and further

resources in [Spanish](). Erasmus Plus also recommends the [WikiEducator manual,]() which is available in English, Spanish, French, German, Czech, Catalan, Greek, Hungarian, and Portuguese.

The published format of this eXeLearning project is the file available at the DOI in Section 3.3. If you find that a link is no longer working, or you would like to modify the content in some way, please contact [twinningparamaribo@gmail.com]().

3.3   Licensing and Citation

The e-module is provided free of charge under the [Creative Commons Attribution 4.0 International]().

Users can share (copy and redistribute the material in any medium or format) and adapt (remix, transform, and build upon the material) under the following terms: Attribution: You must give appropriate credit (see citation below), provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use. NonCommercial: You may not use the material for commercial purposes. ShareAlike: If you remix, transform, or build upon the material, you **mus**t distribute your contributions under the same license as the original, namely CC BY-NC-SA 4.0.

Cite as: Schwarz. N. and Willemen L., 2021. E-learning module Urban Green Spaces: product of 'Naar een groen en leefbaarder Paramaribo' by Tropenbos Suriname and University of Twente-ITC. DOI: [https://doi.org/10.5281/zenodo.6405983]().

3.4   Feedback!

We like to hear from you! If have any suggestions for improvement of this e-module, please send those to [twinningparamaribo@gmail.com](). On this email account we also would love to hear how you used the e-module, what you as a teacher liked, and what students thought of this course. That context will help us to learn and improve.

4 Required GIS skills

For the exercise in learning outcome 6, students need basic GIS skills. In case they do not yet have them, we have provided guidance on which basic tutorials to follow to execute the required tasks. If students shall investigate possibilities of GIS with the help of GIS more for urban contexts, the following open access textbook could be useful:

van Maarseveen, M., Martinez, J., Flacke, J. (2019): GIS in Sustainable Urban Planning and Management. Taylor and Francis. [http://library.oapen.org/handle/20.500.12657/27516]()

Several chapters are accompanied by guided exercises including data and tasks to follow: [https://www.itc.nl/urbangis/]()

5 Optional activities

5.1 Learning outcome 3: Urban green spaces and ecosystem services

The following optional activities can be incorporated for learning outcome 3:

- Discuss the exercise in a classroom session.
- Do a field trip to visit urban green spaces in the vicinity and discuss a) which urban ecosystem services are provided and b) who may benefit from them.
- Ask students to design an urban green space that is optimal for each of the four ecosystem services discussed in the micro lecture.
- Discuss the winning designs of the urban green space contest (see below): which urban ecosystem services could be provided following these designs?

Design contest on urban green spaces in Paramaribo

In 2021, students in Paramaribo participated in a design contest to redesign urban green spaces in Paramaribo, Suriname. The three best places plus an extra price were awarded to the following designs (Figures 2 to 5).

Figure 2: 1st Shrada Patandin's redesign of the Boulevard at the Anton Drachtenweg (https://www.groenparamaribo.org/media/1332/shrada-patandin-boulevard.pdf)

Figure 3: 2nd Riswand Narain's redesign of "Wi Kontren".
https://www.groenparamaribo.org/media/1337/riswand-narain-wi-kontren-compressed.pdf

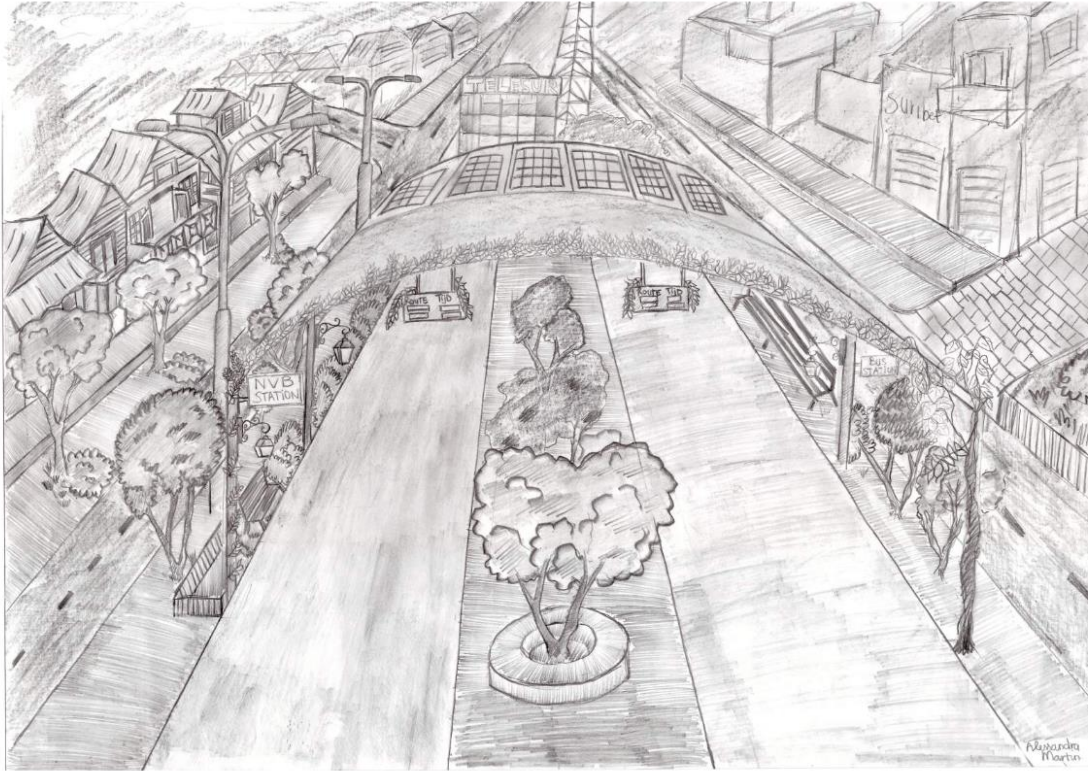*Figure 4: 3rd Alonso Wagino's redesign of the Boulevard at Anton Drachtenweg.*
https://www.groenparamaribo.org/media/1335/alonso-wagino-boulevard.pdf

Figure 5: Extra price Alessandra Martin's redesign of the bus stop at Heiligeweg.
https://www.groenparamaribo.org/media/1336/alessandra-converted-compressed.pdf

5.2   Learning outcome 5: Urban management considerations

For this learning outcome 5, you could use a role-play in class. Here, you find some ideas to get started including one example case.

Aim of the role-play: to formulate arguments regarding urban management decisions from the views of at least three different stakeholders

Classroom setting: Students will discuss in small groups and in the plenary. One large classroom with tables and chairs arranged in a café setting (4 chairs per table, 1 chair to the side) or several additional small rooms are required. For online education, this can be facilitated with breakout rooms and a joint conference room. In very large groups, the setting can be modified into a fishbowl. Each chair is dedicated to one specific role of the case, and students can take turns to bring in their arguments.

Material: Each student needs the description of their case and their individual role either as a printout or in digital format. For a face-to-face session, some tape and pens to use as name tags are helpful.

Time: 1.5 to 2 hours.

Step-by-step guidance

- Students form groups of four to five to discuss one use case (see below).
- Each student receives one of the roles described for the use case (*Table 2*)
- Approximately 15 minutes preparation time:

- Students familiarise themselves with their role.
- They note down at least three arguments for their viewpoint.
- They put their role on a name tag.
- Groups convene at café tables / in breakout rooms and mimic a public hearing on the topic (about 30 to 45 min). The observer takes notes.
- All students gather in the plenary and the observers report back. Group discusses lessons learnt (30 min to 1 hour)

Example case

Description for all participants of this use case:

City A faces a serious shortage of housing. Real estate prices have increased for more than a decade now, and population projections suggest that the influx of new residents from the surrounding areas will also continue in the future. There is a broad consensus in the city that housing shortage needs to be tackled. The Department for Housing of the municipality wants to create more housing and has, therefore, brought up the idea of selling a 5 ha forest fragment in a middle-income neighbourhood and allow for residential development on this site. This area is owned by the municipality at this moment. The forest fragment is used by local residents for recreation, e.g. neighbours walk their dogs and have barbecues. Others have used a part of the site for illegal waste disposal.

Table 2: Role descriptions for the optional activity in Learning Outcome 5

Role	Description - only to be shared with the individual participant
Housing department of the municipality	Your aim is to create more housing in the city to accommodate the increase in residents. The recent increase in housing prices worries you a lot, as you are concerned also with the increasingly difficult situation of low-income households. Your department does not have the financial means to buy land or build housing, so you need to use planning instruments like zoning and the properties the city already owns.
Representative of the neighbourhood to which this vacant area belongs	Your neighbourhood is divided about this plan. Some residents use the forest fragment a lot and do not want constructions in front of their doors. Others are concerned with illegal waste dumping and worry about potential criminals using the site at night. Your aim for this discussion is to understand exactly what is going on and to make the concerns brought up by the neighbours heard. You are also wondering whether the new housing project could incorporate green elements.
Real estate company	Your aim is to secure another housing project for your company. You have already developed other housing projects in city A in the past and have collaborated with the housing department there. So far, you have not paid special attention to urban green in your housing projects. Your aim is to create as many lots as possible on that piece of land to maximise profit.
Non-governmental organisation "Save the trees!"	You are outraged by the plan of the municipality to sell off this land. This forest fragment is one of the few unmanaged green areas in the city. You have done biodiversity assessments on other forest fragments and found that these house many species. However, there has not been a biodiversity assessment yet for this specific forest fragment, so you do not know exactly which species would lose their habitat should the plan get through. With voluntary work, you have cleaned the site in the past from illegal waste deposited there since the municipality has not done so.
Observer	You do not participate in the discussion but will take notes during the discussion and briefly report back in the plenary afterwards. Note down which arguments were used, and organise them according to the nine challenges introduced in the lecture: 1. Knowledge base 2. Legitimacy 3. Environmental equity and justice 4. Institutional capacity 5. Competing urban priorities 6. Scale mismatches 7. Trade-offs 8. Collaboration 9. Governance failures

5.3   Learning outcome 6: Measuring urban green

In this learning outcomes students will use InVEST to assess the cooling effect of urban green spaces. This assessment is based on a *model*. To check if this pattern is observed in *reality*, students can use the Groen Paramaribo project dashboard that shows the actual hourly measured temperatures in Paramaribo in vegetated and built-up areas. In this optional additional exercise students would:

- Visit the website: https://www.groenparamaribo.org/kaarten/
- Look up locations of the temperature sensors in the green and built-up areas (*Figure 6*)
- Visually compare the temperature difference at green and built-up sites using the comparison panels (*Figure 7*).
- Discuss their finding in the classroom.
- Additionally, data for each sensor can be downloaded (with the 'load data'' button) for a quantitative analysis.
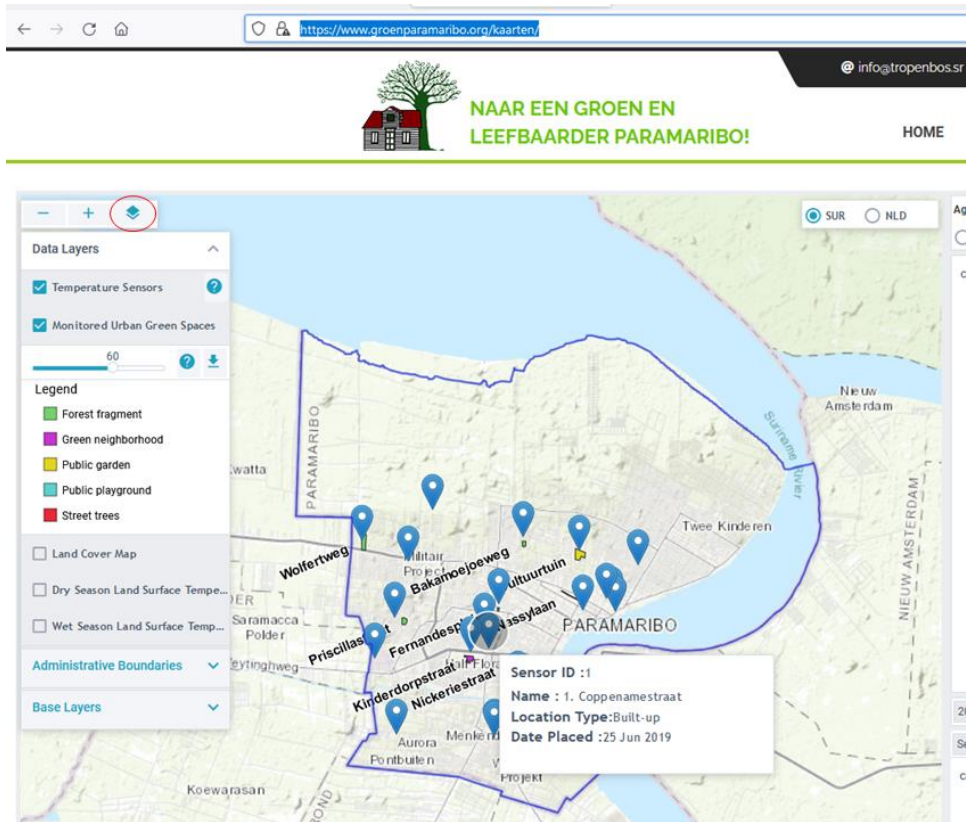

Figure 6: Locations of the temperature sensor in Paramaribo (blue pins), hovering over the pin provides information on is this sensor is placed in a green or built-up area. Clicking on the 'layer icon' (circled in red), additional layer, including land cover can be shown.
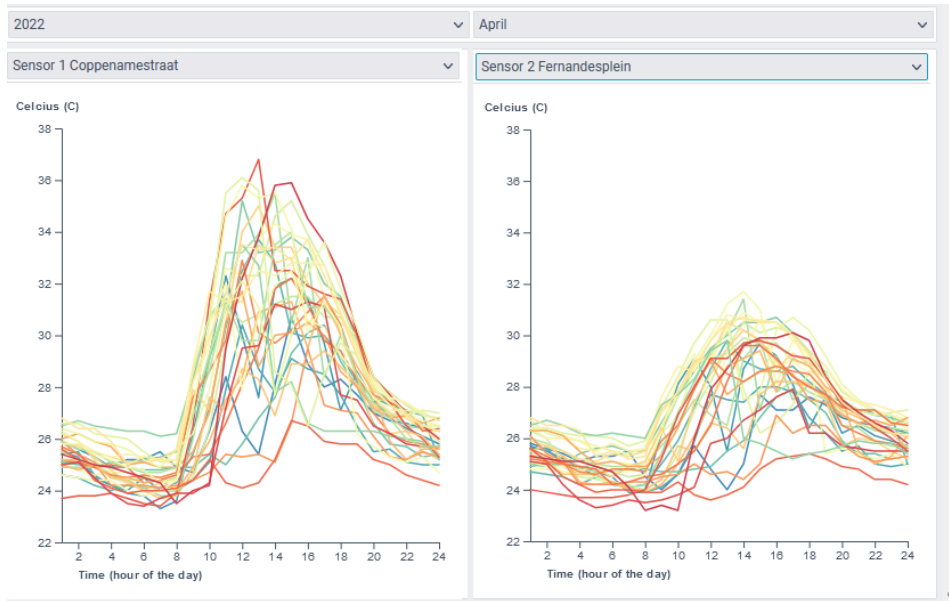
Figure 7 Temperature fluctuations over a day (24h) for two selected sites (classified as green and built-up), for the selected month, April 2022 in this case.

5.4   Learning outcome 7: Evaluate impact

In this learning outcome students will explore the future of the city of Paramaribo. Different policies will have different outcomes. What is most desired and why?

In Step 3 of the Exercise of students are asked to reflect on these possible outcomes and opt for a scenario for the city. The recommended optional exercise for this learning outcome is to discuss these reflections in the classroom.

- How did each student come to a 'preferred' future?
- Did all students select the same future scenario, or was there a considerable spread in choice, why?
- What kind of adaptions or changes to the scenarios did students suggest and why?

The discussion could be concluded with a statement that clarifying the role of urban green spaces at different locations, for different people, at different moments helps to make more informed decisions. There is not one 'right' scenario or decision (some will call urban green planning a 'wicked problem' there is no one solution to it), however by making trade-offs explicit, processes of mitigating or compensating could be explored.