

# 4TU. RESPONSIBLE SUSTAINABILITY CHALLENGE

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Track Syllabus  
2022-2023

# 1 Course Description and Learning Goals

This syllabus is intended for the 4TU.Responsible Sustainability Challenge (4TU.RSC). This track is aimed at motivated and ambitious Master's students from the technical universities of Delft, Eindhoven and Twente. It is an initiative of the 4TU.Centres Energy, High-Tech Materials and Ethics & Technology to provide students with the opportunity to gain a broad set of transversal skills, such as professional skills, such as multi-disciplinary team working; intercultural competences; challenge-based thinking and research; and various communicative and leadership skills. This syllabus is complemented by the [Canvas page](#) of this programme.

The shared part of this track (organised by the universities of Delft, Eindhoven and Twente) runs from the **14th of November 2022** until the end of **June 2023**. The entire programme encompasses a study load of 15 ECTS (roughly 5 ECTS per quartile), to be followed extracurricular to the 'regular' study programme of its participating master students.

This programme requires a Bachelor's (BA or BSc) degree to participate. Students applying for the programme are selected based on their motivation, CV and (possibly) an interview. For this programme, no fee is charged to its participating students.

## 2 Learning outcomes

After completing the track, the student...

1. is able to reformulate ill-structured research/design problems, taking into account the system boundaries in this and is able to integrate the new interpretation of involved parties;
2. chooses the appropriate level of abstraction in problem (re)formulation, given the process stage of the research/design;
3. is able and has the attitude to, where necessary, draw upon other disciplines than their own in their research/design;
4. has a systematic approach, characterised by the development and integration of theories, models and interpretations from different disciplines;
5. is able to analyse, communicate and discuss, both verbally and in writing, about research, solutions to problems and societal consequences (e.g. economic, social, cultural) with colleagues, non-colleagues and other involved parties across disciplines;
6. is able to perform challenge-based work on so-called 'wicked' problems, is pragmatic and has a sense of responsibility, is able to deal with limited sources, is able to deal with risks, and is able to compromise.
7. is able to work within a multidisciplinary team;
8. is able to analyse and discuss the ethical and the normative aspects of the consequences and assumptions of scientific thinking and acting with colleagues and non-colleagues (both in research and in design) and integrates these ethical and normative aspects into scientific work.

### 3 Programme Contents

This 4TU.RSC track follows a 'Challenge-Based Learning' (CBL) methodology outlined further below. This methodology uses a central challenge (based on a real-life 'case') on which students work throughout the programme, with additional educational activities supporting the challenge. The method makes the students responsible for their own progress and learning journey, which requires leadership, responsibility and good communication from the students. This also provides the freedom and support to execute the challenge to the vision of the team. Aside from the challenge, there are several supporting components to help you structure your work as you complete your challenge.

#### Challenge-Based Learning methodology

The CBL methodology consists of the following phases, which help you to structurally build towards the project outcome.

##### A. Phase 1 - *Finding your challenge*:

1. Formulating your own challenge within the 'Big Idea' of the European Union Green Deal which is relevant for your challenge stakeholder. The 'Big Idea' is the central theme you wish to work on, with your challenge being a specific issue that relates to this overarching theme. Keep in mind that, while your challenge stakeholder already has a specific topic for you to work on, it is up to you to evaluate the context and to analyse what the actual issue at hand is.
2. Formulate the essential questions you need to answer to understand your challenge and to get to a (more specific/better formulated) design or research question. Within this step, you investigate the challenge topic to understand the context, stakeholders and other influences and to determine what information is needed to formulate a clear design or research question.
3. Formulate the actionable challenge that you will focus on. This is the design or research question that you will address within the continuation of your challenge and should be well-motivated and clearly formulated.

##### B. Phase 2 - *Analysing the context*:

1. Formulate guiding questions to structure the continued search for information needed to complete your challenge. In this phase, you try to understand the issue better by formulating those questions which will help you address the actionable challenge (e.g. what information is needed and which stakeholders/experts should be involved? How can we get this information and how do we make sure the information is valid?).
2. Gather the learning resources to gain the information and skills you need to address the actionable challenge. The learning resources can be your own information sources (from literature or invited experts), the workshops provided within this track and any others you may find useful (e.g. micro-modules, MOOCs, books). Make sure that in this step you integrate academic knowledge with societal knowledge (i.e. information you can receive from/through your challenge stakeholder) to avoid a too theoretical outcome of your challenge.
3. Analyse the research completed within this phase. This analysis integrates all the tools that you need to address your actionable challenge and reflects on their quality (e.g. is there information that cannot be known? Are there many different perspectives to consider?). This final step structures and evaluates the information from this phase to determine which considerations are important (e.g. economic, social, cultural) and how each fit together to form one coherent story.

### C. Phase 3 - *Formulating the outcome*:

1. Determine the outcome of the challenge. This may be a solution to the presented actionable challenge, or it may be a structured assessment of the resulting state of the challenge that can promote further work. Make sure that your final outcome properly integrates the different scientific disciplines you have been analysing. The resulting outcome should be formulated and communicated in a way that fits with your challenge stakeholders (e.g. a formal report, academic paper, promotional campaign).

## The core challenge

The core challenge is based on the CBL methodology described above. For the core challenge, you will complete the first two CBL phases (the 'Engage' and 'Investigate' phases) fully, as well as the first step of the 'Act' phase (i.e. we complete the 'Determining the outcome of the challenge' as the final step). The project, therefore, concludes with a full overview and presentation of the outcome of the challenge. This outcome should also be presented and defended to the stakeholders, track assessors and your fellow students during the final session of this module.

The challenge is provided by a 'challenge stakeholder', a representative of the organisation with whom you co-create and execute the challenge. The organisation, and the challenge stakeholder, are your partners in the team and provide the context of your challenge. However, while the organisation provides a general topic, it is part of the CBL process to identify the underlying actionable challenge.

The challenge is executed within groups of students from different educational backgrounds and universities. Your team is joined by your challenge stakeholder. The stakeholder works with you to first define the challenge at hand and then move towards a suitable outcome. Within the dynamics of your team, it is important to consider your stakeholder (as well as the coach described further below) as equal partners within your team. The stakeholder and coach will not have the time to participate as much in the challenge as the students, but they are an integrated part of the team.

Aside from a challenge stakeholder, an academic stakeholder joins your team to provide a more theoretical perspective. This academic stakeholder has an academic background which is related to the challenge topic and can provide additional depth to the research. Similar to the challenge stakeholder and the coach, the academic stakeholder becomes a full member of the team and shares their perspectives with the entire team on a regular basis.

Groups are created during an initial stakeholder matching event on the **19th of November**, during which all students can individually orientate themselves on the different general organisations that are involved in the programme. Students can then select those challenges that seem most interesting to them, based on which groups will be formed by the organisation. For group creation, students will be mixed between universities and educational backgrounds. After matching, **please make sure to appoint one team member to be the point of contact with the stakeholder**, as the students will be in charge of maintaining regular contact.

Throughout the track, students should work to include the perspective of their stakeholders to allow the stakeholder to become an integrated member of the team who can provide answers and new viewpoints. The frequency of meetings with the stakeholder may depend on the availability of the team and the stakeholder, but (certainly at the beginning of the track), a high frequency of meetings is advised (at the beginning, bi-weekly meetings are recommended). The entire team is responsible for initiating structured meetings (and planning them timely). Further internal contact (with the stakeholder) should be discussed.

## Workshops

Within the course, workshops will be offered to provide you with the knowledge and tools needed to bring your challenge forward. These workshops will be organised, where possible, outside of office hours to avoid interference with your studies. The workshops will be hosted online, to accommodate the students at each location to participate. These workshops require your *active* participation, so make sure to join each session with your camera and microphone *enabled*. The workshops are connected to the different phases of the challenge. The planning of the workshops per phase can be found on the [Canvas page](#). *Please make sure to check this page regularly and at least before the start of each new quarter to find the upcoming workshops!*

Aside from the required set of workshops offered by the programme, students may request topics of their interest or which are relevant to their challenge. The course teachers will try to accommodate your needs where possible and put you in contact with relevant experts or organise team-based experts to which other teams may be invited. Students may also be asked to host sessions with invited experts for their fellow students on topics related to their challenges and from which other students may also benefit.

While the majority of workshops will be offered online, meet-ups at each location will be organised to help you get to know your group members and the other members of your track. On-site meetings will be planned far in advance to help accommodate schedules. Additional sessions per university may be hosted for convenience or for track-based networking.

## Coaching activities

Aside from the content-based workshops that guide you through your challenge, your team will also be coached to further stimulate your teamwork and increase your efficiency. At the start of the track, your team will be connected to your coach. As is the challenges for the stakeholders, **please appoint one team member to be the main contact with your coach**. This may be the same person as for your stakeholder. Your team should plan your meetings with your coach ahead of time. Per quarter, the coaching moments will be discussed and planned with your coach depending on the needs of the team and the availability of the coach.

The coaching sessions of your team are centred around its dynamics and group work. With your coach, you can discuss your process with the challenge and your project management. Your coach may provide insights regarding the contents of the challenge (e.g. where to look for information), but is primarily focused on the process of the challenge. Process-based questions (e.g. regarding the planning of workshops or on-site events) can be asked to the instructors of the course; content-related aspects of the challenge are to be discussed with the stakeholder (e.g. when pertaining directly to the challenge) or with the instructors (e.g. when specific knowledge is needed). The coach takes on the role of 'socratic grandmother' in the team, by challenging what your team is doing and the structure that you have chosen, while all the same making sure that everything is going well and no issues occur.

## Reflection and peer feedback

Two key elements of this module are the individual reflections and the peer feedback sessions. First, the individual reflections allow students to work on their personal development by setting goals for their work on the challenge and within the team. The reflection assignments are meant to support students in considering their personal learning goals and determining how they will (continue to) address them. Within the reflections, the process is structured with targeted questions or elements to be addressed by the student. The reflection process is guided by a coach, who can use the outcomes of the assignments to further structure the coaching sessions.

Second, the peer feedback concerns the group work of the teams. As the module can be very group-centred, peer feedback can help the teams to step outside of their own project and switch up their work process by gaining the perspectives of their peer groups. The feedback sessions also allow students to get familiar with the work, organisation and team dynamics of the other teams. During the peer feedback sessions, the two teams present their progress to another team. Afterwards, the teacher or coach will guide a discussion on the presentations to let the students provide feedback.

One specific moment of peer feedback is the 'project switch weeks' event during the second phase (after gathering the learning resources). During these two weeks, each group is taken from their own project and switches with another. Beforehand, the two groups meet to discuss their current process and settle on what the group can take over within the two weeks of the switch. This agreement is documented and, upon completion of the project switch weeks, handed in together with a reflection of the work that was done. During the project switch weeks, student groups may offer a fresh perspective or take over a part of the research of their peers and further it. This can involve evaluating the richness of the gathered learning resources or providing new insights that were not yet included. It is not, however, intended that the project switch weeks are used as a 'proofreading session' of any drafts. During these two weeks, the stakeholders do not play a role. Rather, the two teams are each others' stakeholders for the weeks, as they provide context whenever it is lacking. The two teams, therefore, have to communicate closely about what issues they are facing and how they have addressed it so far. It is also advised that teams plan towards the project switch weeks to make sure they can give their switching group a clear task to provide new insights for.

## 4 Milestones and Deliverables

The following milestones and deliverables are required for the separate phases of this programme. For each deliverable, an assignment will be created on the [Canvas page](#) along with its criteria and deadline.

### Individual reflections - logbook

Within each phase, students are asked to complete short reflections on their work within their team, as well as the workshops and other events in which they participated. These reflections will be structured with targeted questions/topics, but may also include additional topics from the student. The individual reflections have the form of diary entries or blog posts that help students to keep on track with their own development and allow them to read back from previous phases. Important for these assignments is for the student to evaluate their individual behaviours and to reflect on their personal development, as well as providing clear goals that the coach can further integrate within the coaching sessions. This includes their work within their team and on their chosen challenge (e.g. their role in the team, the team dynamics and the team's progress during the coaching sessions) as well as their personal development throughout their time within the track (e.g. skills learned and personal development goals). Make sure to consider the learning objectives (see [2](#)) in the reflections to structure your learning. The reflections form entries into a logbook which the student hands in at the end of each phase. This allows the students to write entries at key moments throughout the phase and reflect on their growth throughout the entire course.

### Group deliverables - Phase 1

The first phase consists of creating a well-motivated and precisely formulated actionable challenge that forms the core of your continued work.

#### Group deliverable 1: Challenge proposal

Write a proposal that motivates the actionable challenge you have chosen (within the 'Big Idea' and the context of your topic) and how you plan to address this challenge within the timeframe of the track. Please include the following aspects (max. 5 pages).

- Overview of your team members (educational background, expertise in the team, role). This includes both the student members as well as the coach and stakeholder.
- Background/context of your actionable challenge within the organisation.
- Clear description and motivation for the actionable challenge in the form of a motivated research or design question.
- An overview of any additional stakeholders that may be involved with your project (excluding your main challenge stakeholder).
- Proposed strategy and planning for the subsequent phases.

### Group deliverables - Phase 2

The second phase consists of formulating guiding questions; gathering learning resources and analysing the outcomes of the phase.

#### Group deliverable 2: Reflections on the project switch weeks

Hand in the agreements made before the project switch weeks and the reflection on the subsequent execution of the other group's challenge. Include a reflection on the work of the experience of the project switch weeks (i.e. what did you learn from the process and the work structure of the opposite team; what can your team take

with you to your own project?). Write a separate document with clear feedback for the other team to further improve their work. The latter reflections will also be shared with the other team and will be assessed for its feedback quality. You will also receive a workshop on structuring peer feedback of this kind. Write max. 3 pages for the reflections and 2 pages for the feedback to the other team. *Please note that the feedback to the other team is not the 'only' outcome you should have from the project switch weeks. During these two weeks you will further the work of the other team, the assignment is merely a reflection on this process.*

### **Group deliverable 3: Analysis of challenge research**

Provide an analysis of the entire research conducted within this phase. Make sure to include the following aspects (max. 7 pages).

- Summarise the outcomes of the first phase (specifically the 'actionable challenge', how it fits within the context of the organisation and how it relates to the Big Idea) and indicate whether any adaptations were made compared to the first deliverable.
- Describe and evaluate your approach within the second phase, including the guiding questions you formulated, learning resources you utilised, why you chose these resources (and not others), and your overall process.
- Describe the outcomes of the second phase. Highlight discrepancies, common themes or noteworthy elements moving forward. Make sure to answer all your formulated guiding questions and provide academic validation for your work.
- Provide your approach for the final phase to move towards a clear outcome and a suitable presentation of this outcome. What is needed for you to complete this challenge and how will you achieve it (please note that only a written - albeit thorough - explanation of the outcome is asked within the final phase, the solution does not need to be implemented at the organisation).
- Include a team reflection on your work within the first two phases and the division of tasks/roles. Reflect on whether this division was productive or whether you will make changes for the final phase. You can base this reflection on outcomes of a guided Buddycheck evaluation.

### **Group deliverables - Phase 3**

The final phase for this project consists of determining the outcome of the overall challenge analysis and execution.

### **Group deliverable 4: Final report of challenge**

Within the final group report, the entire process of your challenge should be incorporated. Make sure to write an academic report with consistent citations (APA reference is preferred but not required) and suitable headers. Include the following elements (max. 10 pages).

- Introduce the topic, organisation and context in which your challenge is centred, including any relevant stakeholders.
- Summarise your actionable challenge as a research and/or design brief.
- Summarise the challenge analysis done in the second phase and its main outcomes as background to your final work.
- Provide a detailed description of your proposed solution to your actionable challenge, taking the context of the organisation (and other relevant stakeholders) into account. Ensure that your outcome has a transdisciplinary character and integrates the different elements related to your challenge.



**Group deliverable 5: Presentation and defence of challenge outcome**

At the end of the track, the group gives a 15-minute **group** presentation and 15-minute defence during a closing conference to present the outcomes they found within their challenge. The outcome of your challenge should be presented in such a way that both your challenge as academic stakeholder(s) can utilise the outcomes in their continued work on the topic. The presentation session is further meant to let all teams come together to discuss each other's projects and outcomes. Within the defence of your work, other teams and the course teachers can ask questions to evaluate the practicality and logic of the proposed outcome. For this purpose, a highly interactive session can be held, mimicking a real (poster/video) session on-site. The presentations can be held in any format and way that matches with the challenge and the stakeholder's organisation. The use of interactive and creative formats is encouraged. The presentation will be peer-reviewed during the session by members from other teams to determine the most innovative or impactful outcome. Furthermore, an assessment committee with (expert) representatives judge the different outcomes and give insightful feedback to the teams.

## 5 Assessment

The assessment of the track consists of four components, see also Table 1. The entire track has a pass/fail structure. Students should pass all components to pass the entire track. If the student fails a component, a repair may be offered. For each assessment, the assignment information (e.g. rubric, deadline or contents) communicated on Canvas are leading.

Table 1: Overview of the total track assessment.

Assessment	Elaboration	Related learning outcome
Group deliverable 1: Challenge proposal	<ul style="list-style-type: none"> <li>• Clarity of actionable challenge.</li> <li>• Motivation of the actionable challenge and connection to the organisation context and Big Idea.</li> <li>• Completeness of the proposed strategy and planning.</li> </ul>	Learning outcomes 1, 2 and 7.
Group deliverable 2: Reflections on the project switch weeks	<ul style="list-style-type: none"> <li>• Shared demarcation of tasks with the peer team.</li> <li>• Approach of the project switch weeks.</li> <li>• Quality of feedback to the peer team.</li> </ul>	Learning outcomes 5, 7 and 8.
Group deliverable 3: Analysis of challenge research	<ul style="list-style-type: none"> <li>• Clarity of the summarised actionable challenge.</li> <li>• Approach of the research/design study in the second phase.</li> <li>• Integration of multidisciplinary elements of the analysis.</li> <li>• Depth of team reflection.</li> </ul>	Learning outcomes 2, 3, 4, 6, 7 and 8.

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Assessment	Elaboration	Related learning outcome
Group deliverable 4: Final report of challenge	<ul style="list-style-type: none"> <li>• Academic quality.</li> <li>• Motivation of choices made.</li> <li>• Originality of the proposed outcome.</li> <li>• Depth of outcome description.</li> <li>• Logical structure and argumentation of outcome.</li> <li>• Feasibility of the proposed outcome (if applicable).</li> <li>• Input used from stakeholders, workshops, coaching meetings and other sources.</li> </ul>	Learning outcomes 1-8.
Group deliverable 5: Presentation and defence of challenge outcome	<ul style="list-style-type: none"> <li>• Effective presentation medium.</li> <li>• Clear pitch and answers.</li> <li>• Chosen presentation medium and style, fitting with the stakeholder.</li> </ul>	Learning outcomes 5 and 7.
Individual reflections - logbook	<ul style="list-style-type: none"> <li>• Clarity.</li> <li>• Depth of the analysis.</li> <li>• Use of personal examples.</li> </ul>	Learning outcomes 1-8.
Attendance and active participation in the following components: <ul style="list-style-type: none"> <li>• Mandatory workshops;</li> <li>• On-site track events;</li> <li>• Coaching sessions;</li> <li>• Team meetings;</li> </ul>	General presence check, signing off on (active) participation.	-

## 6 Useful Information and Links

Contact information for the course instructors.

- **TU Delft:** Shoshan Abrahami ([s.t.abrahami@tudelft.nl](mailto:s.t.abrahami@tudelft.nl); university contact page [here](#)).
- **TU/Eindhoven:** Maja Rücker ([m.rucker@tue.nl](mailto:m.rucker@tue.nl); university contact page [here](#)).
- **University of Twente:** Mina Shahi ([m.shahi@utwente.nl](mailto:m.shahi@utwente.nl); university contact page [here](#)).

Useful links.

- Course [Canvas](#) page.
- 4TU.HTM [webpage](#).
- European Union [Green Deal](#) webpage.