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Project Management

This chapter will provide an overview of the project, addressing scope, time, cost, quality, communication, project plan, sprint scrums, and sprints.

Scope

The project scope (Figure 1) is limited to developing a POC of the smart bottle. The technical focus will be on reading certain minerals from the water and enabling communication with the app. The prototype will be tested in a controlled environment and is not intended for full deployment in a real-life operating environment. In addition to the technical prototype, the project will include a full-scale report on how the bottle should look and function. The report will include recommendations for future development, deployment plans, dataset improvement, integration opportunities, and potential risks.

Project Start: 6th of March 2026 **Team Preparedness:** The team members should have the required knowledge and skills in configuring ESP32, marketing, ethics, and all the chapters mentioned in the report. Preparatory training or upskilling may be necessary if the team lacks specific expertise. **Stakeholder Communication:** Establishing effective communication channels with stakeholders, including the client and end-users, is a precondition. Clear communication protocols should be in place to gather feedback and requirements. **Risk Assessment and Mitigation Plan:** The project needs to perform a risk assessment beforehand to pinpoint potential risks and create plans to manage them. This prepares the project to handle unexpected challenges effectively. **Test Environment:** It is crucial to have a testing environment for thorough application testing before deploying it. This testing environment needs to closely resemble the final deployment environment.

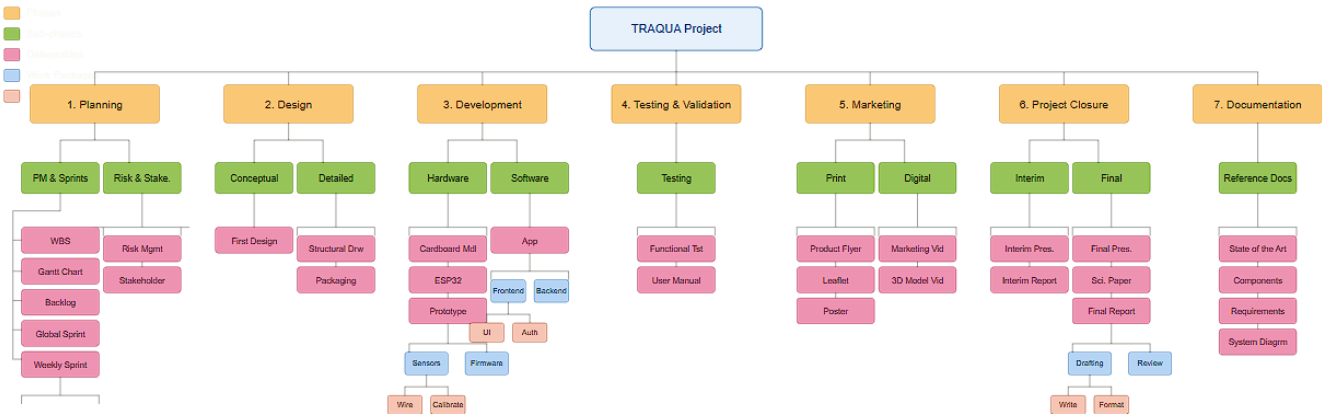


Figure 1: TRAQUA SCOPE

Time

This subchapter underlines the deadlines that must be met. Documenting key milestones and linking them to specific deadlines is crucial for clarity, accountability, and progress tracking. It ensures that teams stay aligned, allows for the early identification of potential risks, and enables timely adjustments. A well-structured timeline enhances efficiency and significantly increases the likelihood of project success.

Project Duration: 2026-02-23 → 2026-06-25 (123 days / ~17.5 weeks)

The following Table 1 shows all materials to be delivered and their respective delivery dates.

Table 1: Materials to be delivered

#	Date	Milestone	Days from start	Risk
—	2026-02-23	Project start	0	—
1	2026-02-28	Choose top 3 projects	5	Low
2	2026-03-11	Upload black box diagram and Structural Draft	16	Medium
3	2026-03-18	Upload the List of Components and Materials	23	High
4	2026-03-21	Define Project Backlog, Global Sprint Plan, Initial Sprint Plan and Release Gantt Chart	26	Medium
5	2026-03-25	Upload System Schematics & Structural Drawings + cardboard scale model	30	High
6	2026-04-12	Upload Interim Report and Presentation	48	Medium
7	2026-04-16	Interim Presentation + feedback	52	Low
8	2026-04-22	Upload 3D model video	58	Medium
9	2026-04-29	Upload final List of Materials (local providers, price, VAT, transportation)	65	High
10	2026-05-02	Upload refined Interim Report (after feedback)	68	Low
11	2026-05-13	Upload packaging solution	79	Medium
12	2026-05-27	Upload Functional Tests results	93	High
13	2026-06-13	Upload Final Report, Presentation, Video, Paper, Poster and Manual	110	High
14	2026-06-18	Final Presentation + Individual Discussion + Assessment	115	Medium
15	2026-06-23	Wiki/report/paper corrections, refined deliverables, printed poster/brochure/leaflet	120	Medium
16	2026-06-25	Prototype demonstration, submit prototype and user manual	123	High

Risk legend:

- **Low** — Well-defined task, short turnaround, low dependency on external factors.
- **Medium** — Moderate complexity or dependency on prior deliverables; recoverable if delayed.
- **High** — Blocks downstream work, depends on external factors (suppliers, hardware, feedback), or has cascading consequences if missed.

High-risk rationale:

- **List of Components (2026-03-18)** — drives all sourcing and budgeting downstream.
- **System Schematics + scale model (2026-03-25)** — physical deliverable, hardware/material dependency.
- **Final Materials List (2026-04-29)** — depends on supplier responses, pricing, VAT, shipping lead times.
- **Functional Tests (2026-05-27)** — prototype must be working; bugs/hardware failures can cascade.
- **Final deliverables bundle (2026-06-13)** — largest single upload (report, presentation, video, paper, poster, manual); coordination-heavy.

- **Prototype demonstration (2026-06-25)** — final, non-recoverable; live hardware failure = project failure.

Costs

Project Budget and Cost Management

The project budget covers the material and component costs for a single smart water bottle. The largest expenses are associated with the custom-manufactured bottle structure and the integrated electronics. Key electronic elements include the microcontroller, TDS sensor (for water quality), FSR406 pressure sensor (for water level), and LIS3DHTR accelerometer (for motion detection). Additional components such as MOSFETs and supporting circuitry are required to ensure safe and reliable operation. The mechanical structure consists of a custom aluminium inner shell, an injection-moulded plastic outer shell with an insulating air gap, the UV-C safety baffle, the activated carbon filter housed inside the cap, threading rings, and the magnets used by the reed-switch kill mechanism. Smaller items such as wires, fuses, and prototyping boards are not included in the budget, as they are available in the university laboratory.

Budget Management

The budget was carefully managed throughout the project lifecycle. Multiple Portuguese suppliers were evaluated to achieve a balance between cost, quality, and delivery time. Where possible, components were sourced from a single supplier to minimize shipping costs. A deliberate decision was made to avoid ordering from China, improving delivery reliability and lead times at the expense of slightly higher costs. In some cases, sourcing from multiple suppliers resulted in increased shipping expenses. Although lower-cost alternatives were available, the team prioritized components that best satisfied the technical requirements and overall system design. The approach focused on maintaining performance while controlling costs where feasible.

Cost Analysis

The total estimated material cost per unit is 155,25 €, exceeding the initial 100 € target by 55,25 € (approximately 50 %). This variance is mainly due to shipping costs, VAT inclusion, and slight underestimations during the planning phase. The deviation remains acceptable at this development stage. Costs will drop significantly once the product moves into mass production, as electronic components are sourced in bulk, custom mechanical parts benefit from amortized tooling, and shipping is consolidated. A reduction of at least 70 € per unit can be expected.

Conclusion

Overall, the budget was effectively controlled, with only a modest increase from the original 100 € estimate. All critical system requirements were successfully achieved. The project highlights the importance of appropriate component selection, supplier management, order consolidation, and leveraging available resources to optimize costs.

Mechanical Components (Per Bottle)

Table 2 compares and discusses the different components.

Table 2: Mechanical Components

Name	Description	Quantity	Unit Price (€)
Aluminium inner shell	Custom-formed Al 1050/3003, 0,7 mm wall, polished interior for UV-C reflectivity	1	8,00
Plastic outer shell	Injection-moulded polycarbonate, 2,0 mm wall, with magnet pockets	1	5,50
UV-C safety baffle	Polished aluminium disc, angled, with drinking-channel cutout	1	3,00
Threading rings (top + bottom)	Anodized aluminium threaded collars	2	2,50
Cap assembly	Polycarbonate cap with angled scoop opening + drink nozzle	1	4,00
Activated carbon filter	Filters chlorine & improves taste, housed in cap	1	12,40
Neodymium magnets	N35, 6 mm Ø × 3 mm, for reed-switch kill mechanism	4	0,40
Sealing gaskets / O-rings	Silicone, food-grade, for thread sealing	2	0,60
Mechanical subtotal			36,40

Electrical Components (Per Bottle)

Table 3 shows all the electronical components.

Table 3: Electrical Components

Name	Description	Link	Quantity	Unit Price (€)
TDS sensor	Measures conductivity in the water	Mausser.pt	1	20,59
MOSFET	Works as a switch for the voltage booster	Mausser.pt	1	1,14
Battery	Rechargeable, 3400 mAh, 3.7 V Li-Ion battery	Mausser.pt	3	14,60
BMS	Protects, balances and manages charging of the batteries	Mausser.pt	1	4,23
Battery holder	Holds the batteries and makes battery changing easy	Mausser.pt	3	0,65
Charging port	DC port that connects to the BMS module	Mausser.pt	1	0,92
Buck converter	Step-down for microcontroller (12 V → 5 V)	Mausser.pt	1	1,89
Magnetic reed switch	Switch for the base of the bottle	Mausser.pt	1	2,10
Fuse	Glass fuse 1 A, 5×20 slow blow	Mausser.pt	1	0,18

Fuse holder	Cylindrical fuse holder with threads	Mauser.pt	1	0,57
Breadboard	Protoboard 50×70 for the prototype circuit	Mauser.pt	1	0,95
1.1 mm wire	Wiring for UV-C light (AWG26)	Mauser.pt	1	1,70
Accelerometer	Senses movement and if the bottle is upright	Kiwi-electronics.com	1	9,53
UV-C LED module	Sterilizes the water	Fruugo.pt	1	8,95
Pressure sensor	Tracks the water amount	Fruugo.pt	1	7,95
Temperature sensor	Measures temperature and humidity	Fruugo.pt	1	7,95
Breadboard kit	Includes wires, resistors, LEDs, etc.	Joom.pt	1	11,90
Microcontroller	ESP32 DEVKIT 1, central control unit	Joom.pt	1	7,30
Charger	3S 18650 charger, 12.6 V, 2 A	Joom.pt	1	2,50

Estimated Cost per Unit

Table 4 visualises the costs per unit.

Table 4: Costs per Unit

Category	Estimated Cost (€)
Mechanical Components	36,40
Electrical Components	148,50
Total Estimated Cost per Bottle	184,90
Initial Budget	100,00
Budget Difference	+84,90

Quality

Quality Metrics & Requirements

To ensure the smart water bottle meets all functional, safety, and performance requirements, a set of measurable quality metrics has been defined. These metrics apply to both the prototype and the production design and will be used during testing and validation. Where the prototype and production specifications differ (notably in materials and wall construction), both thresholds are listed.

Metric	Description	Threshold	Review Method
Physical Dimensions	Bottle must remain practical and portable for daily use	Height 25–27 cm, outer diameter 76–78 mm	Caliper measurement
Internal Capacity	Usable water volume must meet design target	500 ml ± 5 %	Volumetric fill test

Metric	Description	Threshold	Review Method
Wall Construction (Production)	Layered shell with insulating air gap	Aluminum 0.7 mm, air gap 1.0–1.5 mm, plastic 2.0 mm	Cross-section inspection
UV-C Reflectivity (Inner Surface)	Polished aluminum interior must reflect UV-C effectively	≥ 85 % reflectance at 270 nm	Spectrophotometer or supplier certificate
Weight & Ergonomics	Bottle should remain comfortable to carry when empty or full	Empty 300–380 g, full < 900 g	Scale measurement and user handling review
Water Quality Monitoring	TDS sensor must provide stable readings	Within ± 10 % of calibrated reference	Sensor calibration and comparison
Temperature Monitoring	Temperature sensor must provide reliable readings	Within ± 2 °C of reference	Reference thermometer comparison
Water Level Detection	Pressure sensor must identify fill level states	Empty, half-full, full states detected correctly	Controlled fill testing
Motion & Orientation	Accelerometer must detect movement and orientation	Correct detection of movement and upright state	Functional testing
Magnet-Reed Switch Alignment	Reed switch must trigger reliably when bottle is assembled	Switch closes within < 1 s of base attachment, in any rotational orientation	Repeated assembly/disassembly cycle testing
Energy Efficiency	System must minimize unnecessary power draw	Idle < 100 mW, normal use < 1 W	Power consumption measurement
Battery Runtime	Battery must provide practical daily autonomy	2–7 days per charge depending on usage	Runtime testing
Charging Performance	Charging system must safely recharge battery pack	Stable charging with no overheating	Charging cycle observation
Water Resistance	Electronics housing must resist splashes and normal cleaning	No internal moisture ingress (IPX4 equivalent)	Splash and sealing inspection
UV-C Safety Control	UV-C must only activate in safe operating condition	Activation only when bottle is fully closed and assembled	Safety logic testing
UV-C Light Containment	No UV-C must escape the assembled bottle	< 0.1 $\mu\text{W}/\text{cm}^2$ external emission at 270 nm	UV-C meter measurement
Electrical Protection	Internal electronics must be protected from faults	Fuse, BMS, and regulators function correctly	Electrical inspection
Mechanical Durability	Bottle must withstand normal daily handling	No damage from 1 m drop test on three axes	Drop test and inspection
Thread Sealing	Threaded joints must remain water-tight	No leakage when inverted with full bottle	Inversion leak test
User Interface Visibility	LEDs must clearly communicate bottle status	Visible and understandable in normal lighting	Functional review
System Reliability	System must operate consistently	Stable operation over 48 h continuous use	Long-duration operation testing

Review and Validation Process

The table above defines the intended quality requirements and planned validation criteria. Once assembly is complete, all metrics will be reviewed and validated by the project team through practical testing, calibration, inspection, measurement, and functional verification. For the prototype, dimensional and material thresholds reference the prototype's plastic-bottle-with-aluminum-foil construction. For the production design, the same metrics apply to the custom aluminum inner shell with plastic outer shell and air gap, and additional checks are added for UV-C reflectivity, light containment, and magnet-reed switch alignment. The team will record measurement results, compare them with defined thresholds, and identify any deviations. Any requirement that does not meet its target value will be addressed through design improvements, software calibration, or component adjustment before final approval.

Acceptance Criteria

The smart water bottle will be considered acceptable when the project team has verified that all defined quality thresholds are achieved, no functional or safety issues remain, and the magnet-reed switch alignment functions reliably in any assembled orientation.

People & Stakeholder Management

The stakeholder analysis is meant to assist the project group to understand who has interest and power over the project. It is a way to recognise who will be affected by the final product and to be able to categorize everyone involved in order to plan how the project group will interact with them throughout the project.

Based on the Mendelow Matrix 2 will be split into four separate groups: Key Figure, Influencer, Interested and lastly, Spectator. All the stakeholders would be placed against 2 axes, representing their interests and influence. As this is an internal project, the number of stakeholders is limited.

Mendelow Matrix

- **Key Figures** (High Interest, High Influence): Clients, Lecturers / Coordinator, Project Group
- **Influencers** (Low Interest, High Influence): ISEP Board, Competitors
- **Interested** (High Interest, Low Influence): Material Providers, Future Investors
- **Spectators** (Low Interest, Low Influence): Logistic Partners

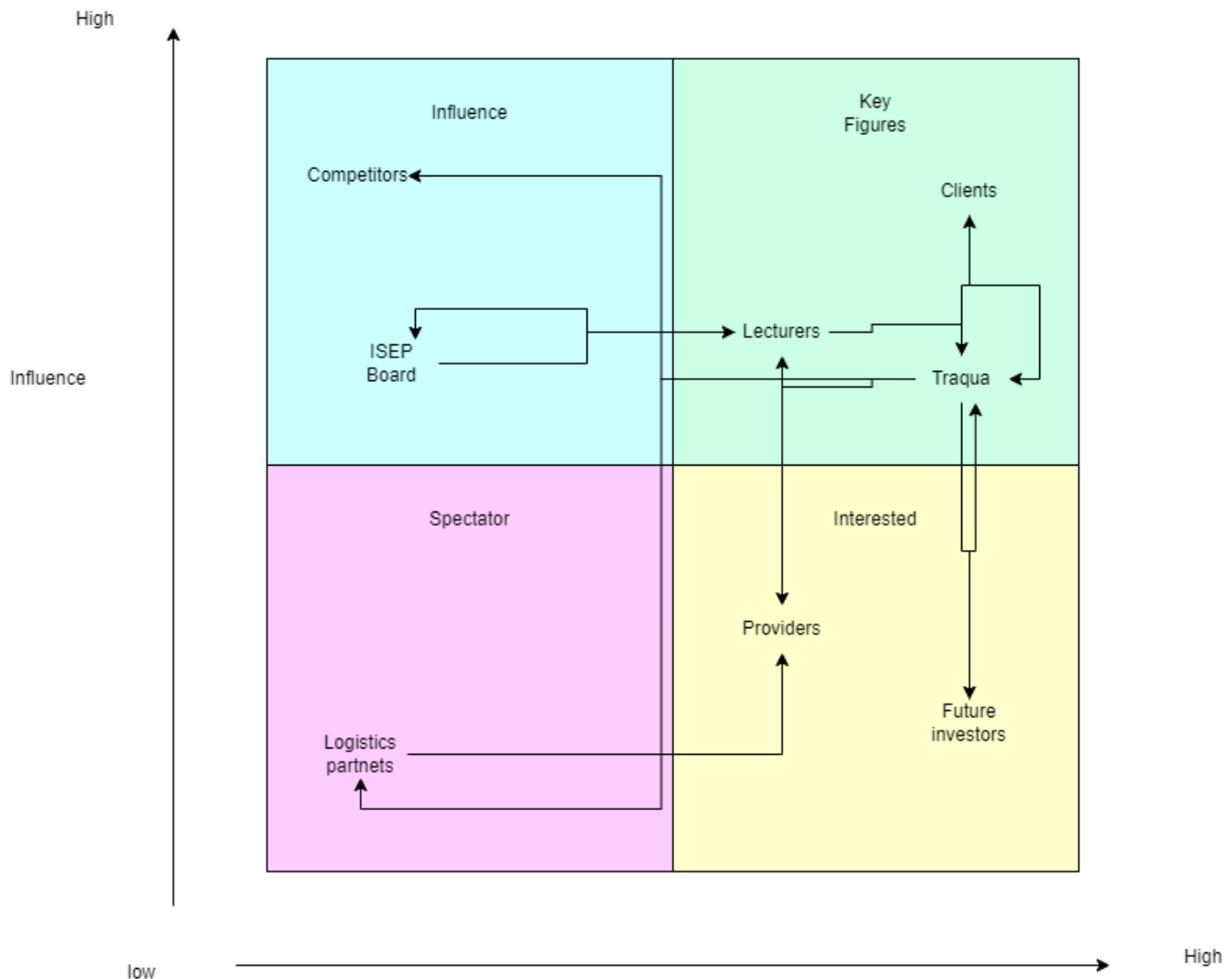


Figure 2: TRAQUA Stakeholder

Analysis of Stakeholders

Spectators — Logistics Partners: While not directly involved, they may eventually experience benefits from an improved inspection system. However, their role is passive, and they will not influence or interact with the project.

Interested:

- **Material Providers:** Supply components and materials; their pricing, availability, and lead times directly affect the project budget and timeline.
- **Future Investors:** Will potentially invest money into the product, so a close eye must be kept on their expectations.

Influencers:

- **ISEP Board:** Though not actively participating, defines academic frameworks and grading guidelines.
- **Competitors:** TRAQUA must keep a sharp eye on what competitors develop while keeping their product fresh and at a decent price.

Key Figures:

- **Clients:** Central to the project's direction and success — they define the problem and validate the solution.
- **Lecturers / Coordinator:** Advise the group, evaluate project quality, offer ongoing feedback, and determine part of the final grade.
- **Project Group:** The student developers have the most motivation to succeed and interest in creating a functional system.

Communication Strategy

Each stakeholder group requires a different communication approach based on their position in the Mendelow Matrix. The Table 5 below summarizes how the project group communicates with each party and what is expected in return.

Table 5: Communication Strategy

Stakeholder	Strategy	From us → them	From them → us	Channel	Frequency
Clients	Manage Closely	Progress updates, prototype demos, design decisions, clarification requests	Requirements, feedback, validation, priority changes	Meetings, email, demos	Bi-weekly + milestones
Lecturers / Coordinator	Manage Closely	Deliverables, reports, presentations, questions	Feedback, grading criteria, guidance, corrections	Scheduled meetings, email, Moodle/wiki uploads	Weekly + each deliverable
Project Group	Manage Closely	Task status, blockers, decisions, shared documents	Same — bidirectional	Daily standups, Discord/Teams, Git, shared drive	Daily
ISEP Board	Keep Satisfied	Final deliverables, compliance with academic standards	Academic framework, regulations, grading rules	Formal submissions via coordinator	At defined academic checkpoints
Competitors	Keep Satisfied (monitor)	No direct communication	Market info gathered via public sources (websites, patents, product releases)	Market research, web monitoring	Monthly scan
Material Providers	Keep Informed	Quotes requests, orders, specifications	Pricing, availability, lead times, VAT, shipping	Email, web forms, phone	As needed during sourcing phases
Future Investors	Keep Informed	Pitch, final presentation, poster, brochure, leaflet	Interest signals, questions, funding decisions	Final presentation, marketing materials	End of project
Logistic Partners	Monitor (minimal effort)	No active communication	Passive — potential future end-users	N/A (indirect)	None during project

Communication principles:

- **Single point of contact:** each external stakeholder is handled by one designated team member to avoid mixed messages.
- **Documentation:** all formal communication (client meetings, lecturer feedback, supplier quotes) is logged in the project wiki.
- **Escalation:** blockers are raised in the next standup; client/lecturer issues are escalated within 24 h.
- **Feedback loop:** after each milestone, feedback received is reviewed in the following sprint planning.

Communication

TRAQUA uses a structured set of communication channels, each chosen for a specific purpose: fast internal coordination, formal documentation, stakeholder alignment, and customer engagement.

Internal Team Communication

- **WhatsApp** — primary channel for day-to-day coordination, quick questions, and informal idea sharing. Fast and low-friction, ideal for immediate feedback.
- **Microsoft Teams** — used to store documents, organize files, and hold formal online meetings when in-person is not possible. Channels are structured by workstream (e.g., Hardware, Software, Documentation, Marketing).
- **Jira** — sprint backlog, task assignment, sprint retrospectives, and all sprint-related activities are documented and tracked here. Provides traceability from user story to delivered feature.
- **Git (repository)** — source code, schematics, and technical drawings are version-controlled. Commit messages reference Jira tickets for traceability.
- **Project Wiki** — central knowledge base for the report, meeting minutes, decisions, and deliverables.

Communication with Lecturers / Coordinators

Meetings with teachers are organized every **Thursday**. The team is obliged to share an agenda by **Tuesday evening** at the latest so that teachers can prepare any necessary materials. These meetings are used to show the team's progress, ask questions, and share ideas.

After each teacher meeting, the team gathers to hold a **retrospective** and discuss the upcoming sprint (Table 6). Outcomes are logged in Jira and the wiki.

Table 6: Communication with Lecturers / Coordinators

Item	Detail
Frequency	Weekly (Thursday)
Agenda deadline	Tuesday 23:59
Channel	In-person / Teams
Output	Meeting minutes in wiki, action items in Jira
Escalation	Email to coordinator for urgent issues

Communication with Clients

Clients define the problem and validate the solution, so regular structured contact is essential.

- **Bi-weekly progress meetings** — demo current state, gather feedback, confirm direction.
- **Milestone demos** — aligned with major deliverables (interim presentation, functional tests, final prototype).
- **Email** — for formal questions, requirement clarifications, and document sharing.
- **Meeting minutes** shared within 24h of each meeting to confirm understanding.

Communication with Suppliers

To maintain good contact with suppliers, regular meetings are planned every **one to two months**. This allows both the supplier and TRAQUA to gather all their information and questions and discuss everything together, instead of sending scattered emails throughout the week or month. This batching saves everyone from dealing with many small tasks.

- **Primary channel:** email for quotes, orders, and specifications.
- **Backup channel:** phone for urgent availability or lead-time issues.
- **Single point of contact:** one team member owns each supplier relationship to avoid mixed messages.
- **Documentation:** all quotes, confirmations, and delivery dates are archived in the Teams supplier folder.

Communication with Customers

Customers will have the opportunity to subscribe to a **free newsletter** that will update them on the company's goals and provide additional composting tips. The application will also include **easy access to customer support**, ensuring that all customers can reach the company easily.

- **Newsletter** — monthly, opt-in, covering company updates and composting tips.
- **In-app support** — chat / contact form for direct questions.
- **Social media** — for announcements, community engagement, and marketing.
- **Response SLA** — customer support queries answered within 48h.

Communication with Charities / Partners

To keep charities involved, the company will organize regular meetings with them to discuss relevant topics. This helps maintain strong and high-quality partnerships.

- **Frequency:** quarterly alignment meetings.
- **Purpose:** discuss joint initiatives, impact reporting, and upcoming campaigns.
- **Channel:** in-person or video call, minutes shared afterward.

Communication Tools Summary

The Table 7 below summarizes all the platforms that are used for the communication.

Table 7: Communication Tools Summary

Tool	Purpose	Audience
WhatsApp	Fast internal chat	Project Group
Microsoft Teams	File storage, formal meetings	Project Group, Lecturers
Jira	Sprint management, task tracking	Project Group
Git	Version control (code, schematics)	Project Group
Wiki	Documentation, knowledge base	Project Group, Lecturers
Email	Formal external communication	Lecturers, Clients, Suppliers
Newsletter	Customer engagement	Customers
In-app support	Customer service	Customers

Communication Principles

- **Right channel for the right message:** urgent = WhatsApp; formal = email; technical = Jira/Git; knowledge = wiki.
- **Asynchronous by default:** written communication preferred to respect everyone's schedule; meetings reserved for decisions and alignment.
- **Document everything:** every meeting produces minutes; every decision is logged.
- **Acknowledge receipt:** messages requiring action are acknowledged within 24h, even if the full answer comes later.
- **No silent blockers:** any blocker is raised in the next standup or immediately via WhatsApp if critical.

Communication Risks & Mitigation

The Table 8 below shows the communication risks and mitigations.

Table 8: Communication Risks & Mitigation

Risk	Impact	Mitigation
Message overload on WhatsApp	Important info gets lost	Use Teams/Jira for anything needing traceability; WhatsApp only for quick sync
Supplier delays in response	Sourcing timeline slips	Contact multiple suppliers in parallel; escalate after 5 business days of silence
Client unavailable for feedback	Design decisions blocked	Book meetings 2 weeks in advance; have a backup decision-maker identified
Missed lecturer agenda deadline	Meeting less productive	Recurring Tuesday reminder in team calendar
Meeting minutes not documented	Decisions forgotten / disputed	Rotating minute-taker role, published within 24h
Single point of failure on a channel	Team member unreachable	Key info duplicated in wiki; no critical info lives only in chat

Risk Management

This chapter identifies the risks that may arise during the TRAQUA project and defines how they will be prevented, monitored, and managed if they occur. Each risk is assessed on two dimensions: **likelihood** (how probable it is) and **severity** (how damaging the impact would be). The product of these two gives a **risk score**, which determines the priority for mitigation.

Risk Classification

Risks are categorized by type to make it easier to assign ownership and response strategy:

- **Project risks** — affect schedule, scope, budget, or team capacity
- **Technical risks** — affect hardware, firmware, software, or integration
- **Operational risks** — affect day-to-day execution and infrastructure
- **Safety & environmental risks** — affect user safety, health, or the environment
- **Security & data risks** — affect confidentiality, integrity, and privacy

Likelihood and Severity Scales

Table 9: Likelihood and Severity Scales

Level	Likelihood	Severity
1	Improbable	Negligible
2	Remote	Marginal
3	Possible	Moderate
4	Likely	Critical
5	Frequent	Catastrophic

Risk score = Likelihood × Severity. Scores are interpreted as:

- **1-4 Low** — accept and monitor
- **5-9 Medium** — actively mitigate
- **10-15 High** — mitigate before development milestones
- **16-25 Critical** — must be addressed before the project advances

Risk Register

The Table 10 below lists all identified risks, their assessment, the prevention strategy (applied before the risk occurs), and the response plan (applied if it does occur). Each risk has an assigned **owner** responsible for monitoring it throughout the project.

Table 10: Risk Register

ID	Risk	Category	Likelihood	Severity	Score	Prevention	Response	Owner
R01	Common illness	Project	Possible (3)	Marginal (2)	6	Good health practices; clear task documentation so work isn't siloed	Redistribute tasks temporarily; extend deadline if critical path affected	Project Manager
R02	Tasks not completed on time	Project	Possible (3)	Moderate (3)	9	Realistic planning with buffer; weekly sprint reviews; early flagging of blockers	Replan sprint; reprioritize backlog; notify supervisor	Project Manager
R03	Lack of technical knowledge	Project	Likely (4)	Moderate (3)	12	Skills gap analysis at kickoff; training time allocated; mentor/supervisor support	Pair programming; request expert help; simplify scope if blocker persists	Technical Lead
R04	Team member departure	Project	Possible (3)	Critical (4)	12	Strong communication; documented processes; cross-training on key tasks	Reassign tasks; revise scope; escalate to supervisor	Project Manager
R05	Loss of data / code	Operational	Remote (2)	Moderate (3)	6	Git version control; cloud backups (GitHub + Drive); weekly backup checks	Restore from most recent backup; document lost work	All members
R06	Insufficient testing	Technical	Remote (2)	Critical (4)	8	Written test plan; automated tests where possible; peer review of test reports	Extend testing phase; add regression tests; document known issues	Technical Lead
R07	Budget overrun	Project	Possible (3)	Moderate (3)	9	Component pricing confirmed before purchase; 15% contingency reserve	Substitute cheaper components; deprioritize non-essential features	Project Manager
R08	Data leaks	Security & data	Likely (4)	Catastrophic (5)	20	Encrypted communication (TLS); secure credential storage; input validation; access control on BLE pairing	Revoke affected keys; notify users; patch vulnerability; post-mortem review	Technical Lead
R09	Battery failure / thermal runaway	Safety	Remote (2)	Catastrophic (5)	10	Use certified Li-ion cells; include BMS protection circuit; thermal testing during prototype phase	Disconnect battery; trigger product recall procedure if shipped	Hardware Lead
R10	Application downtime	Operational	Frequent (5)	Negligible (1)	5	Cloud auto-scaling; health checks; graceful degradation on frontend	Auto-recovery; manual restart if needed; status page notification	Technical Lead

ID	Risk	Category	Likelihood	Severity	Score	Prevention	Response	Owner
R11	API downtime (third-party)	Operational	Remote (2)	Marginal (2)	4	Retry logic with exponential backoff; fallback behaviour; cache recent responses	Switch to fallback; notify users of degraded service	Technical Lead
R12	Battery chemical residue	Safety & environmental	Improbable (1)	Marginal (2)	2	Follow electronics safety protocols; use sealed battery compartments	Follow hazardous waste disposal procedure	Hardware Lead
R13	UV-C radiation exposure	Safety	Improbable (1)	Negligible (1)	1	N/A for standard operation; enclosures if UV-C modules used	Stop use immediately; consult safety documentation	Hardware Lead
R14	Short circuit	Technical	Improbable (1)	Negligible (1)	1	Circuit protection; certified components; PCB design review	Isolate affected unit; check for damage before reuse	Hardware Lead
R15	Supply chain delays (components)	Operational	Possible (3)	Moderate (3)	9	Order components early; identify 2+ suppliers per critical part	Substitute equivalent part; adjust schedule; notify supervisor	Hardware Lead
R16	Scope creep	Project	Likely (4)	Moderate (3)	12	Clearly defined backlog; change control for new requirements; supervisor sign-off	Push new requests to backlog; renegotiate scope if essential	Project Manager
R17	Sensor calibration drift	Technical	Possible (3)	Moderate (3)	9	Use calibrated reference solutions; periodic recalibration; temperature compensation	Recalibrate; flag readings; document drift pattern	Technical Lead
R18	Poor team communication	Project	Possible (3)	Moderate (3)	9	Weekly standup; shared tools (Slack/Discord, Trello); written meeting notes	Address in retrospective; adjust communication rhythm	Project Manager

Risk Matrix

The risk matrix below [3](#) plots each risk by likelihood (y-axis) and severity (x-axis). Risks in the top-right corner are the highest priority.

Severity				
	Catastrophic 4	Critical 3	Marginal 2	Negligible 1
Frequent 4				Application downtime
Probable 3	Data leaks			
Remote 2	Battery exploding		API DOWNTIME	
Improbable 1			Batterical residue in materials	UV-C radiation Short circuit

Figure 3: Risk matrix — likelihood vs. severity

Risk Monitoring and Review

Identifying risks once is not enough — they must be tracked throughout the project. The following monitoring process will be applied:

- **Weekly risk check** during sprint reviews: the team reviews the register and flags any change in likelihood or impact.
- **Milestone reassessment**: before each major milestone (design review, prototype, interim report, final delivery), the full register is re-evaluated.
- **New risk intake**: any team member can propose a new risk at any time; the Project Manager assesses it and adds it to the register.
- **Closed risks**: once a risk is no longer relevant (e.g., a phase is completed), it is marked closed but kept in the register for traceability.

Detailed Risk Descriptions

R08 — Data leaks (score 20, Critical)

The system processes sensitive data — water-quality measurements tied to user accounts and potentially location information. Unauthorized access could affect all users, cause reputational damage, trigger legal liability under GDPR, and erode trust in the product. Likelihood is high because malicious actors routinely target IoT endpoints and mobile APIs, and attack surface grows with user count. Prevention focuses on encryption in transit and at rest, strict access control on BLE pairing, and input validation. If a breach occurs, the response is to revoke affected credentials immediately, notify affected users within the GDPR 72-hour window, patch the vulnerability, and conduct a post-mortem.

R09 — Battery failure (score 10, High)

The TRAQUA device uses a rechargeable Li-ion battery. While rare in modern hardware, thermal runaway can cause physical harm or property damage — making severity catastrophic despite low likelihood. Prevention relies on certified cells with an integrated Battery Management System (BMS),

thermal testing during prototyping, and sealed battery compartments. Response: immediate disconnection, and if shipped units are affected, a recall procedure in coordination with the supervisor.

R03 — Lack of technical knowledge (score 12, High)

The project combines electronics, firmware (ESP32), mobile app development, and sensor calibration — a broad stack that no single team member fully masters at the start. Prevention is done through a skills gap analysis at kickoff, allocated training time in the first sprints, and proactive use of the supervisor and external mentors. If a specific blocker arises during development, the response is pair programming, requesting expert help, or simplifying scope on the affected feature rather than letting it block the critical path.

R16 — Scope creep (score 12, High)

As the project progresses, stakeholders or team members may propose new features that seem small individually but collectively derail the schedule. Prevention is a clearly defined backlog with supervisor-approved scope, and a change-control rule: any new requirement is added to the backlog, not to the current sprint. Response: if a new request is genuinely essential, an existing item is removed to make room, keeping total scope constant.

R04 — Team member departure (score 12, High)

If a team member drops out mid-project, remaining members absorb their workload, which can cascade into further delays. Prevention relies on documentation (so no knowledge is locked in one person's head), cross-training on critical tasks, and early warning signs picked up in weekly retrospectives. Response: immediate task reassignment, scope revision if needed, and escalation to the supervisor.

Procurement

Procurement Management Strategy

The procurement strategy was designed to ensure that all required components are available on time and that the project can progress without delays. The main focus was on selecting components that are reliable, compatible, and easy to obtain within the project timeframe.

Each component was reviewed before ordering to confirm that it meets the system requirements and can be integrated without issues. This reduced the risk of delays caused by incorrect or incompatible parts and helped keep the procurement process organized.

Make vs Buy Decisions

Most components were purchased, especially electronic parts such as sensors, the microcontroller,

and the display. These components require precise manufacturing and are not practical to produce within the project.

Some mechanical aspects, such as the internal mounting and positioning of components inside the bottle, were designed and assembled by the team. This allowed flexibility during prototyping and made it easier to adjust the design when needed.

Suppliers and Procurement Planning

Suppliers were selected based on availability, delivery time, and reliability. Multiple suppliers were used to ensure that all required components could be sourced without delays. Preference was given to suppliers that provide clear specifications and consistent stock levels.

Procurement was carried out in phases. Components needed for early testing were ordered first, allowing development and prototyping to begin as soon as possible. Less critical components were ordered later, once the design was more finalized. This approach reduced the risk of ordering unnecessary or incompatible parts.

Risk Management

To reduce procurement risks, alternative components and backup suppliers were identified for critical parts. Datasheets were carefully reviewed before ordering to ensure compatibility. Procurement was started early to allow enough time to handle delays, missing parts, or specification issues.

This structured approach ensured a smooth procurement process and supported steady project progress.

Procurement Table

The procurement is shown in Table 11.

Table 11: Procurement Table

Item	Supplier	Backup Supplier	Manufacturer	Quantity	Lead Time (Days)	Notes
TDS Sensor (SEN0244)	Mauser	DigiKey	TPXCKZ	1	2-4	Water quality measurement
MOSFET (IRLZ44N)	Mauser	DigiKey	Infineon	1	1-3	Switching component
Battery (NCR18650B)	Mauser	Grandado	Panasonic	3	2-4	3S pack power supply
BMS (3S)	Mauser	DigiKey	Generic	1	2-4	Battery protection and balancing

Item	Supplier	Backup Supplier	Manufacturer	Quantity	Lead Time (Days)	Notes
Battery Holder (1×18650)	Mauser	Farnell	Generic	3	2–4	Cell mounting
Charging Port (DC connector)	Mauser	DigiKey	Generic	1	2–4	External charger input
Buck Converter (LM2596)	Mauser	Grandado	Generic	1	2–4	12 V → 5 V regulation
Magnetic Reed Switch (SPST-NO)	Mauser	Farnell	Generic	1	2–4	Circuit-killer at bottle base
Fuse (1 A, 5×20 slow blow)	Mauser	DigiKey	Eska	1	1–3	Overcurrent protection
Fuse Holder (5×20)	Mauser	Farnell	Generic	1	1–3	Fuse mounting
Breadboard (Protoboard 50×70)	Mauser	DigiKey	Generic	1	1–3	Prototype circuit board
1.1 mm Wire (AWG26)	Mauser	DigiKey	Goobay	1	1–3	UV-C light wiring
Accelerometer (LIS3DHTR)	Kiwi Electronics	Farnell	STMicroelectronics	1	3–6	Motion and orientation detection
UV-C LED Module	Fruugo	DigiKey	Generic	1	5–8	Water sterilisation
Pressure Sensor (FSR406)	Fruugo	Fruugo	JETTING	1	5–8	Water level measurement
Temperature Sensor (KY-015 DHT)	Fruugo	Fruugo	AOKIN	1	5–8	Temperature and humidity sensing
Breadboard Kit	Joom	Fruugo	Generic	1	5–10	Wires, resistors, LEDs, etc.
Activated Carbon Filter	Joom	Fruugo	Generic	1	5–10	Improves taste
Microcontroller (ESP32 DevKit V1)	Joom	Fruugo	Espressif	1	5–10	Main controller
Charger (3S 12.6 V / 2 A)	Joom	Worten	Generic	1	5–10	External battery pack charger
Total Components	-	-	-	22 items	-	All required parts

Project Plan

The project was structured across eight sprints, preceded by a pre-work phase dedicated to topic selection and initial setup. Each sprint spans approximately one week, running from early March to late June 2026. Project management was handled in Jira, where all tasks were tracked and assigned across the team. The Gantt chart provides a visual overview of the planned timeline, grouping activities by sprint and category.

The pre-work phase covered foundational Scrum activities — stand-ups, retrospectives, and sprint demos — as well as general activities including role assignment. Sprint 1 focused on initial research, documentation, and structural work. Subsequent sprints progressively addressed design, prototyping, coding, and testing. The final sprints are dedicated to the interim and final reports, functional tests, packaging solutions, and multimedia deliverables such as the video, flyer, and poster. This iterative approach allowed the team to review progress regularly through retrospectives and adapt the backlog accordingly, ensuring continuous alignment with project goals.

Figure 4 shows the timeline and backlog with epics in Jira. Some timeline start and end dates are not visible, as the corresponding user stories have either not started yet or have already been completed. Dates in Jira were aligned with the deliverable deadlines defined in the Time chapter.

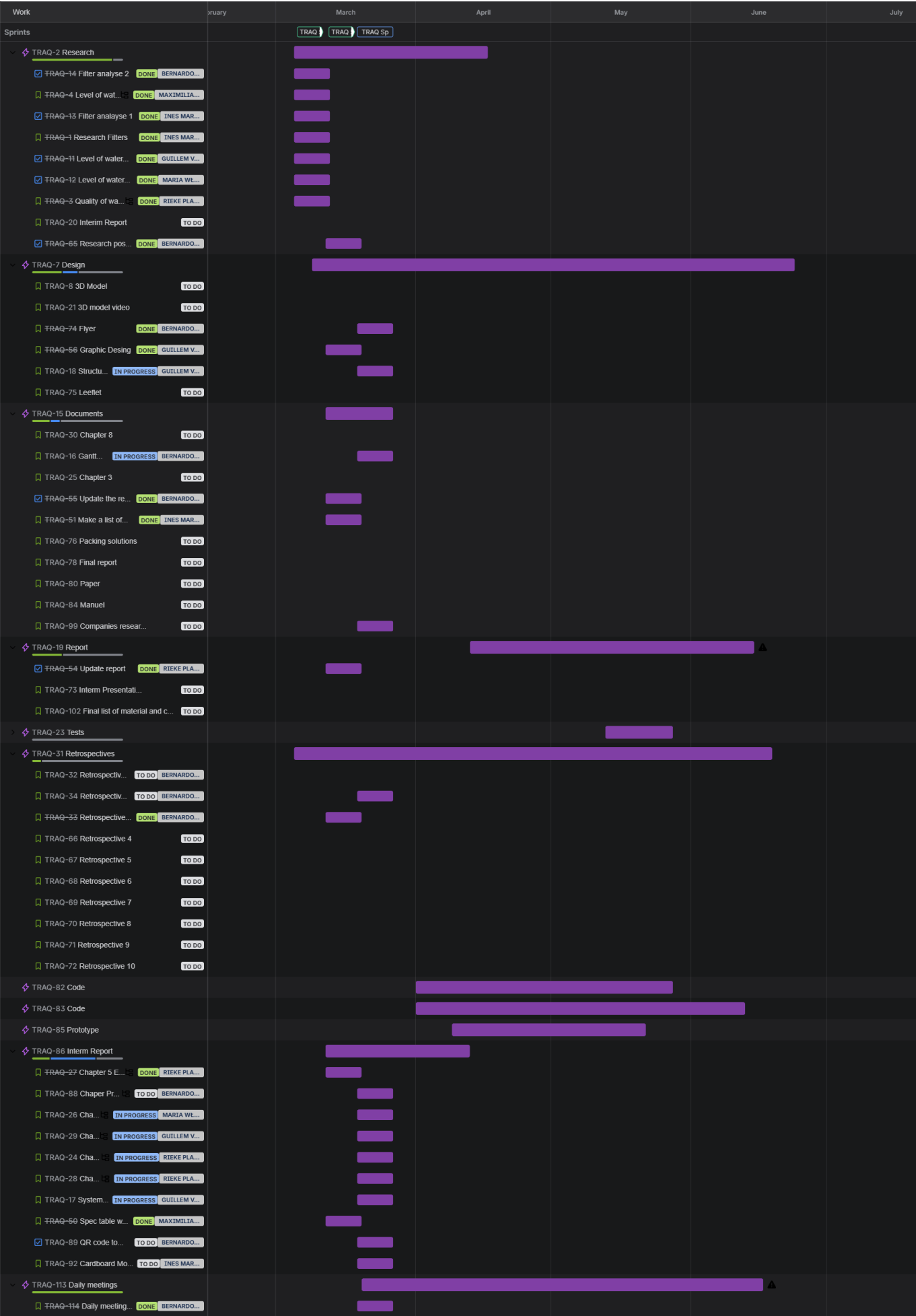


Figure 4: Jira Timeline

Figures 5 and 6 present the same schedule as a Gantt chart produced in Excel, offering an alternative view to the Jira timeline.

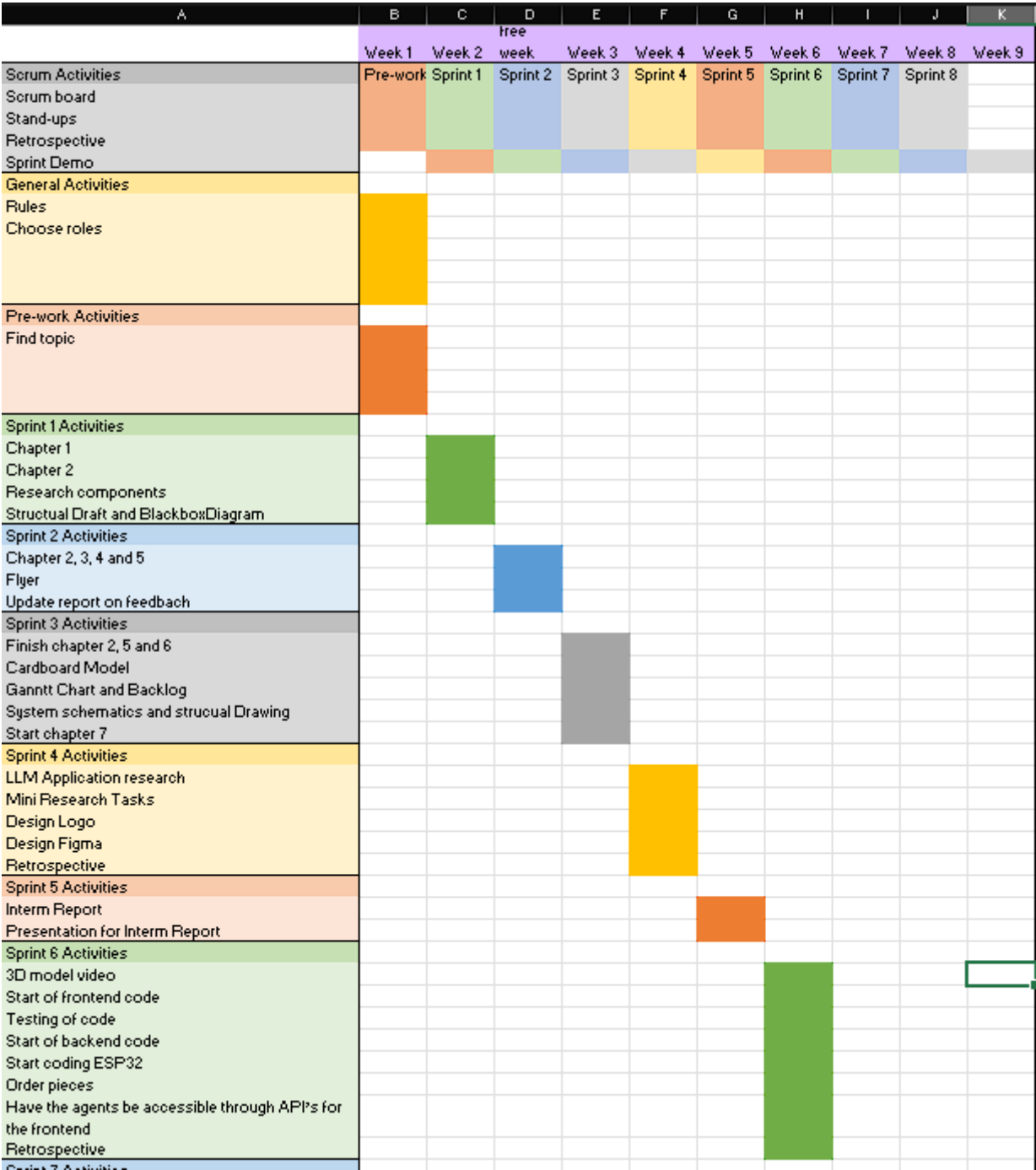


Figure 5: Gantt chart part 1

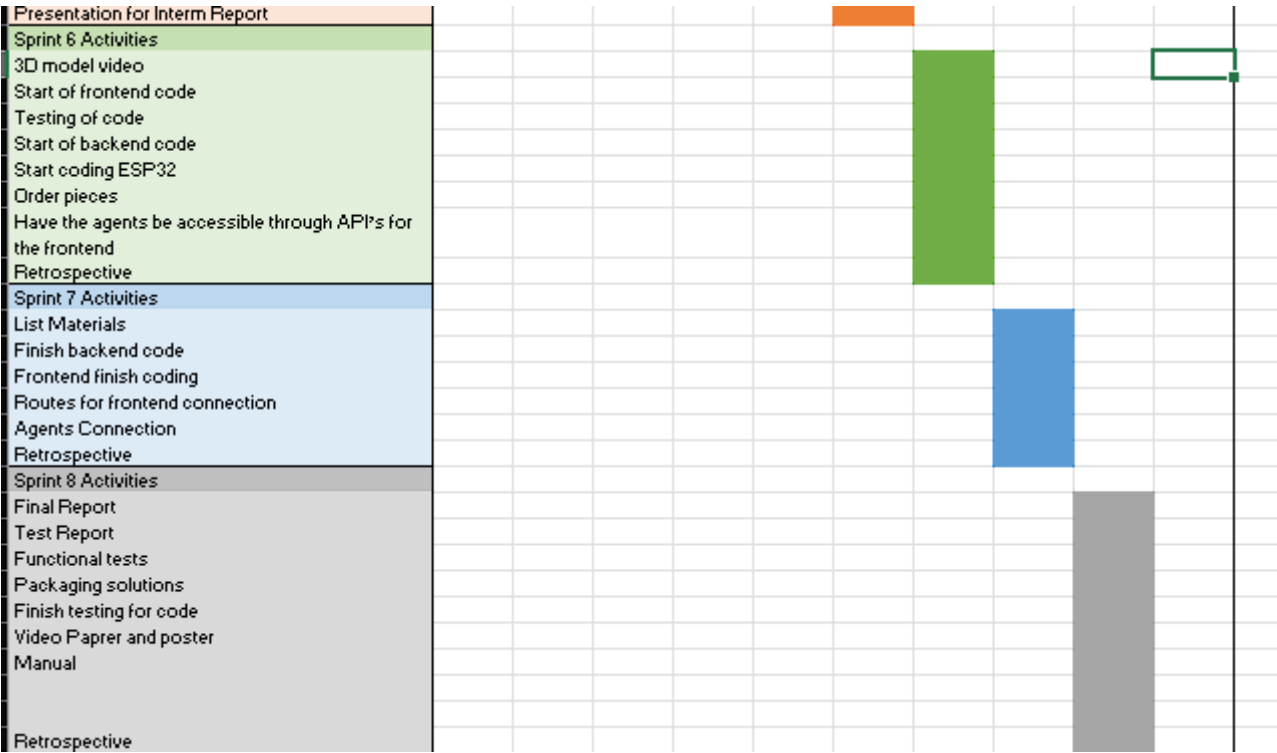


Figure 6: Gantt chart part 2

Gantt Chart and Key Project Phases

The project timeline spans from late February 2026 to late June 2026, structured across eight iterative sprints plus a pre-work phase. The Gantt chart illustrates the full schedule, with tasks grouped by sprint and color-coded by category. The project was divided into five key phases:

- **Pre-work and Setup (Feb 23 - Mar 5):** project selection, initial Scrum setup, role assignment, and backlog definition. Milestone: top-3 project proposals submitted by February 28.
- **Research and Documentation (Sprint 1-2, Mar 5-19):** research on water quality and filtration, black box system diagram and structural drafts (milestone: March 11), and the initial list of components and materials (milestone: March 18).
- **Design and Intermediate Deliverables (Sprint 3-4, Mar 19 - Apr 16):** detailed system schematics, structural drawings, cardboard modelling (milestone: March 25), Gantt chart and sprint plan publication (milestone: March 21), Interim Report and Presentation submission (milestone: April 12), and the Interim Presentation event (milestone: April 16).
- **Prototyping and Development (Sprint 5-6, Apr 16 - May 27):** 3D model video (milestone: April 22), final materials list (milestone: April 29), refined interim report (milestone: May 2), backend and frontend coding, ESP32 integration, agent connectivity, and packaging solutions (milestone: May 13). Functional tests concluded and uploaded by May 27.
- **Final Deliverables and Presentation (Sprint 7-8, Jun 1-25):** final report, paper, video, poster, and manual (milestone: June 13), final presentation and individual assessment (milestone: June 18), corrected and refined deliverables (milestone: June 23), and prototype demonstration to the client (milestone: June 25).

Mapping the Plan to Iterative Sprints

The project was managed using an agile Scrum framework, with each week constituting a new sprint.

Each sprint followed a consistent structure: a planning session at the start, daily stand-ups throughout, and a retrospective and sprint demo at the end. This iterative approach allowed the team to regularly assess progress, incorporate teacher and peer feedback, and adjust priorities accordingly.

The product backlog was defined during the pre-work phase and broken down into sprint backlogs at the start of each sprint. Each sprint had a clear goal aligned with the upcoming milestone deadlines.

Backlog Management

The backlog was managed exclusively in Jira. At the beginning of each sprint, the team held a planning session to select tasks based on priority and the upcoming milestones. Each task was assigned to a team member and tagged with its parent epic (e.g., Research, Design, Documents, Code, Prototype, Tests, Interim Report).

During the sprint, tasks moved through four states: To Do, In Progress, In Review, and Done. Tasks not completed by the end of a sprint were reviewed in the retrospective and either carried over to the following sprint or re-prioritized in the backlog.

Prioritization

Prioritization was driven primarily by milestone deadlines defined in the Time chapter. Tasks blocking an upcoming deliverable (e.g., the Interim Report on April 12) were assigned the highest priority, regardless of their epic. Within a single sprint, the team applied a simple MoSCoW-style logic:

- **Must have:** tasks on the critical path to the next milestone.
- **Should have:** tasks improving deliverable quality but not blocking submission.
- **Could have:** nice-to-have improvements deferred if capacity ran short.
- **Won't have (this sprint):** items pushed to a later sprint or the backlog.

External dependencies (component delivery times, supplier responses, lecturer feedback) were also considered, with dependent tasks scheduled only after their inputs were confirmed available.

Estimation

Tasks were estimated in story points during sprint planning, with the team converging on a value through brief discussion rather than formal planning poker. The total points committed per sprint ranged from roughly 30 to 50, depending on team availability and the complexity of upcoming deliverables.

Two main challenges emerged with estimation. First, the team's mixed academic backgrounds made it difficult to estimate cross-disciplinary tasks consistently — a task that seemed small to one member could be substantial for another. This was addressed by having the assigned member propose the initial estimate and the rest of the team challenge it only when there was strong reason to.

Second, in early sprints the team noticed that story points were marked as burned down before all sub-tasks of a parent story were closed, which distorted burndown charts. Following Sprint 3, the Definition of Done was updated to require all sub-tasks to be closed before the parent story could be moved to Done, restoring burndown accuracy in subsequent sprints.

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Prioritization and estimation are described in detail in the Project Plan section above.

Sprint Overviews

Sprint 1: Foundation & Research

Period: March 5, 2026 – March 12, 2026

Sprint 1 [7](#) was characterized by a heavy “Discovery” phase. The team focused on setting up the technical environment (TRAQ-43) and conducting deep-dive research into water quality and filtration systems. Because this was the inaugural sprint, a significant amount of time was spent refining the backlog and defining the complexity of the Interim Report. The team considered a total of 40 story points. The team assigned a total of 43 Story points. Its the first week of discovery, so the main goal here was to discuss and gather as much information as possible about the possible topic and come up with the top 3 topic we would like to work on.

Key work streams Environmental Setup: Establishing the Scrum framework and project architecture. Technical Research: Analyzing water levels and filtration logic (TRAQ-11 through 14). Documentation: Initial drafting of the Background and Related Work sections for the interim report.

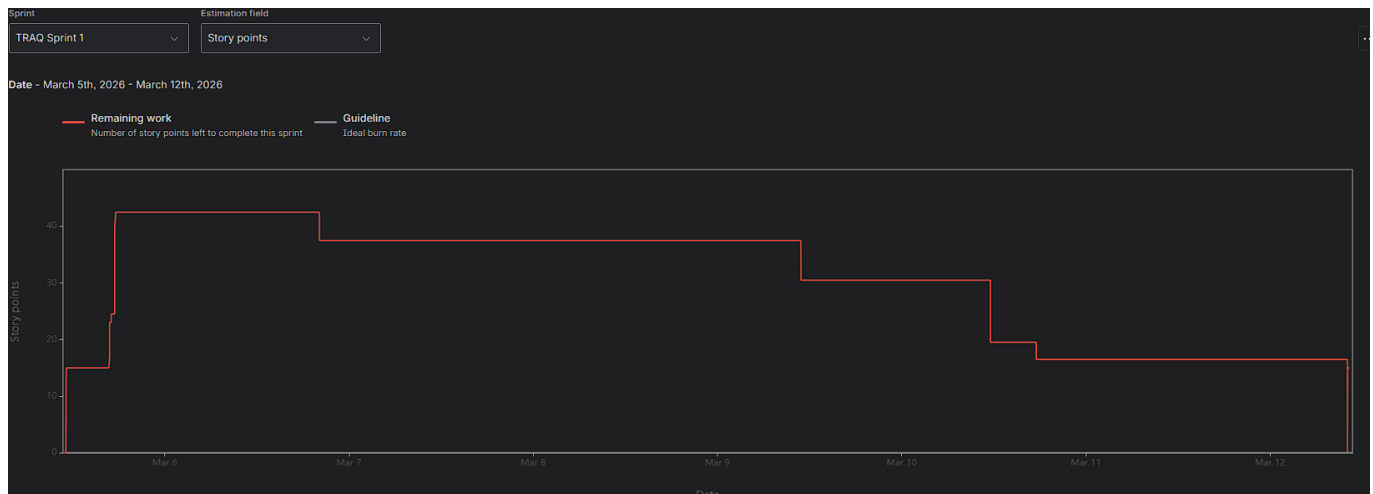


Figure 7: Sprint 1 burndown chart

Sprint 2: Core Development and Reporting

Period: Thursday, March 12th – Wednesday, March 19th, 2026 Sprint 2 [8](#) followed a Thursday-to-Wednesday cycle. This schedule proved challenging due to a school trip on Friday followed immediately by the weekend, which created an unavoidable “stagnation period” at the very start of the sprint where no points could be burned down. The story point total rose to 50 this sprint. This was because we had now chosen our topic and needed to research how and what exactly we wanted to apply, and how we wanted to execute it. Toward the end of the sprint the chart rises again. This was caused by a misunderstanding about how to close a story when not all of its sub-stories were finished.

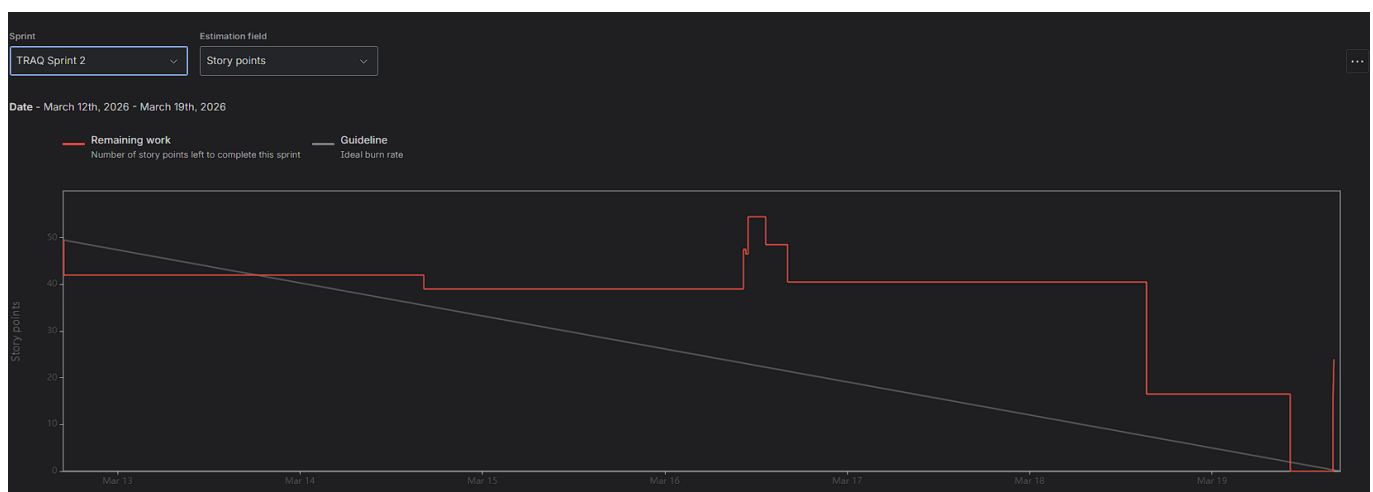


Figure 8: Sprint 2 topic chosen burndown chart

Sprint 3 Strategic Completiong & Prototyping

Period: March 19th, 2026 – March 26th, 2026

Narrative Summary Sprint 3 [9](#) marked a transition from theoretical research to tangible outputs. The team successfully cleared the “documentation backlog” by finalizing heavy-weight chapters of the Interim Report. Simultaneously, the project moved into the design and physical modeling phase, with the creation of structural drawings and a physical cardboard model to validate the system's dimensions.

Technical Learning Point The team identified a discrepancy in how Story points are calculated when

sub-tasks remain open. Moving forward, the Definition of Done (DoD) has been updated to ensure all granular tasks are closed before the parent Story is moved to “Done” to maintain burndown accuracy.

Story points went up to 58.5. The team started to incorporate daily meetings each meeting gets 0.5 story points. Also we were able to increase the workload because we had less classes. Our objective is to work more in the beginning and less at the end. Start with full power and then be more relaxed at the end. This sprint also had a lot of story points, as there were a lot of deliverables to be handed in.

Date - 19 mars 2026 - 26 mars 2026

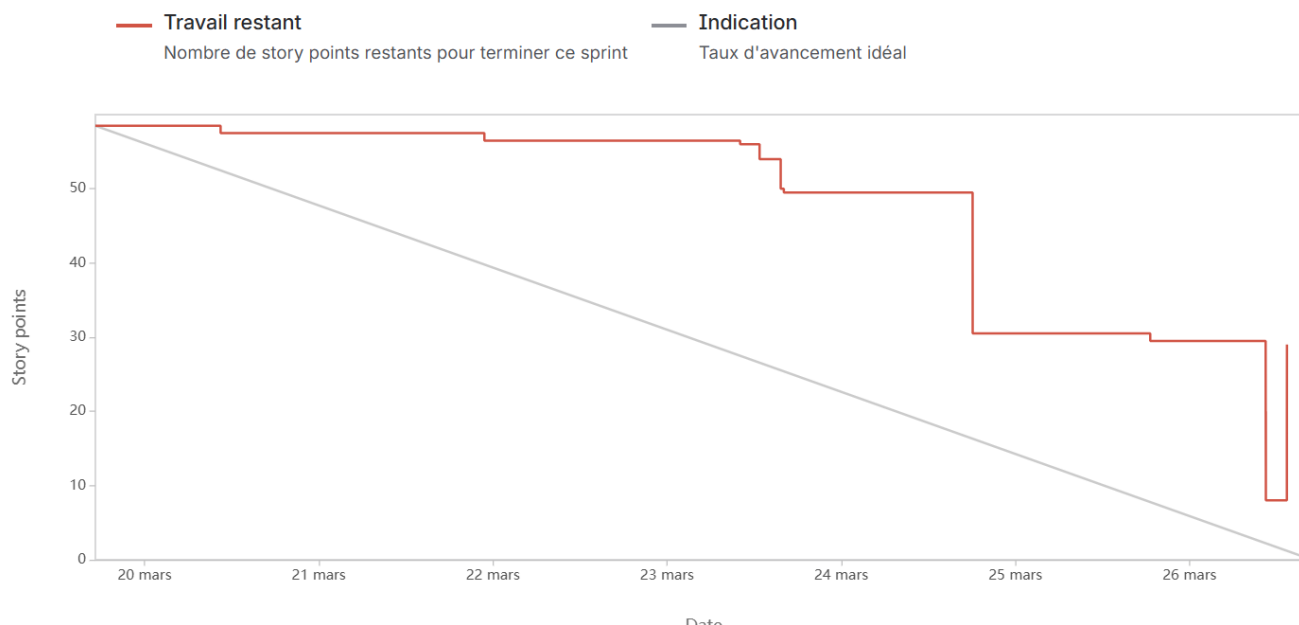


Figure 9: Sprint 3 first deliverables

Sprint 4: Interim Presentation and Interim Report

Period: **March 26th, 2026 - April 1st, 2026**

Sprint Goal: Finish up the Interim Report.

Sprint 4 [10](#) was the final push toward a major project milestone. The team's efforts were almost entirely dedicated to consolidating research and development into the Interim Presentation and finalizing the core technical chapters of the report. This sprint confirmed the total unviability of the “Thursday-start” schedule, as the pressure to deliver high-point items was concentrated entirely into the final two days of the cycle.

Story point stats consistent with 53.5. Nothing major to add here. One thing to point out is that each sprint task gets finished up “later” because we start sprints on Thursday, meaning we have a straight-away weekend on our hands, followed by 3 working days.

Date - 26 mars 2026 - 1 avril 2026

Objectif du sprint - Finish up the intermin report

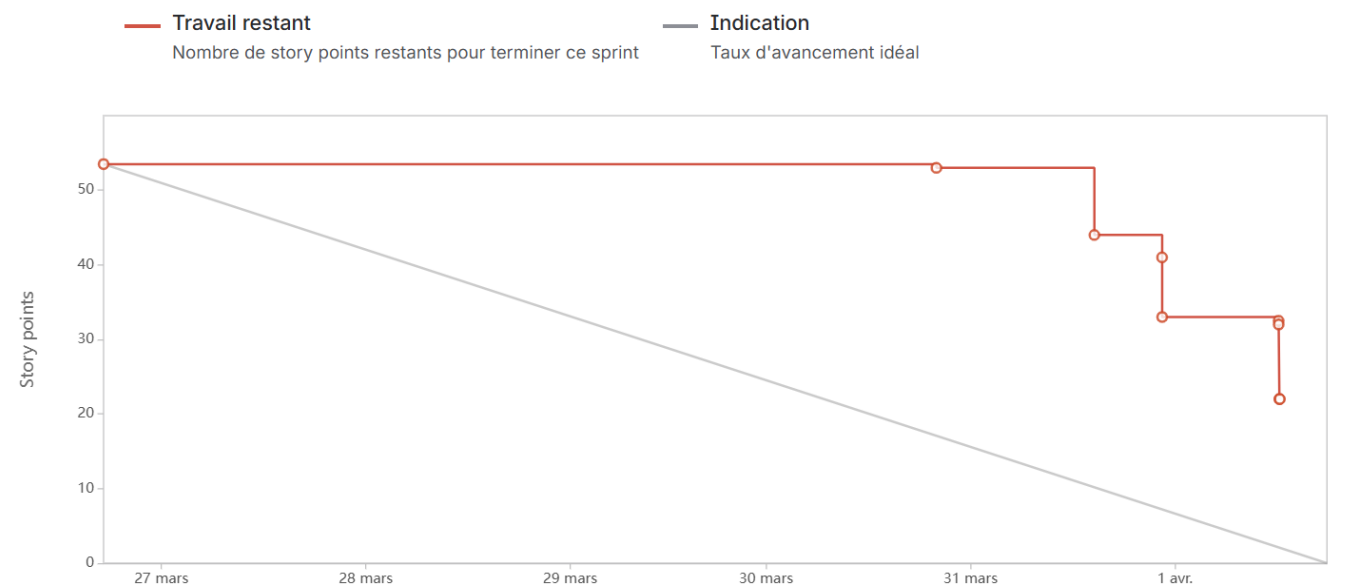


Figure 10: Sprint 4 Burndown Chart showing the “Late-Crunch” pattern.

Sprint 5: Interim Report Hand-in and Presentation Prep

Period: **April 1st, 2026 - April 13th, 2026** Sprint Goal: Hand in the Interim Report. Sprint 5 11 was originally scheduled to end earlier, but the team extended it by two days for two reasons: a vacation period fell near the original end date, and the new end date was aligned with the scheduled meeting with the teachers, giving the team additional time to prepare for the Interim Report presentation. The sprint started with a commitment of 32 story points, which grew to 33.5 after TRAQ-164 (“Table of power budget”, 1.5 pts) was added to scope on the first day. The team closed out 21.5 points across 7 work items, including the report hand-in itself (TRAQ-155), the Interim Report (TRAQ-20, 10 pts), Schematics Version 3, the Website, the Application Prototype, and Retrospective 5. TRAQ-88 (“Chapter Project Management”, 12 pts) remained in progress and carried over to Sprint 6. The burndown tracked below the ideal guideline through most of the sprint, with the steepest drop between April 8–10 as the interim report deliverables were finalized.

Date - 1 avril 2026 - 13 avril 2026

Objectif du sprint - Hand in report

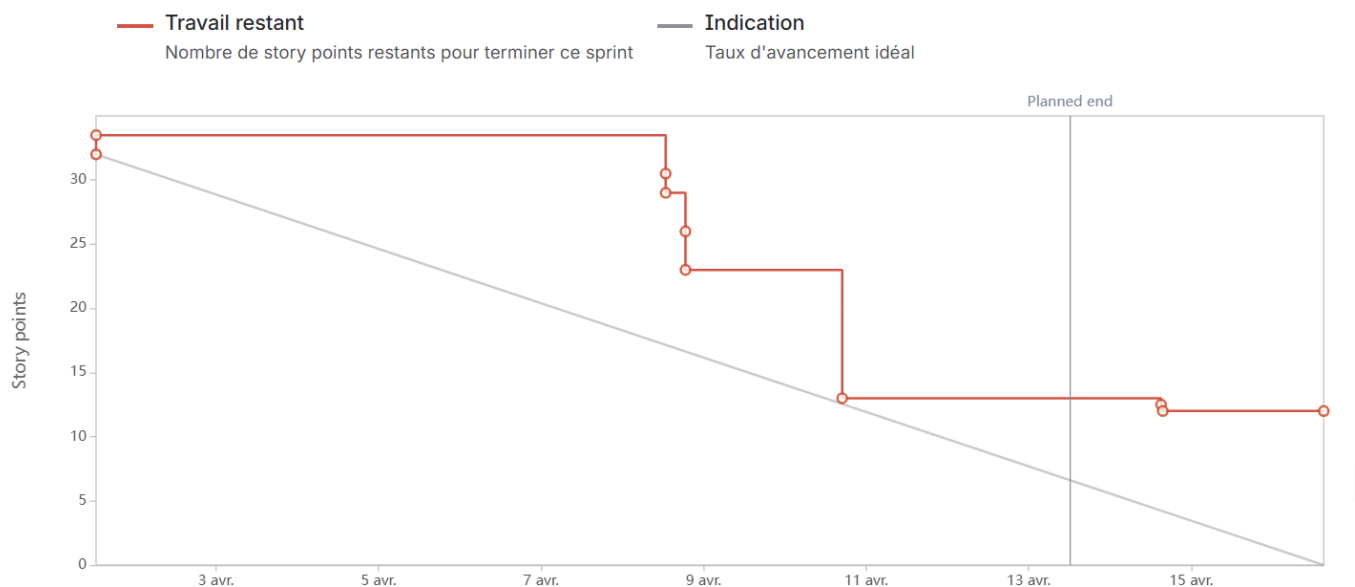


Figure 11: Sprint 5 Burndown Chart showing scope addition on day 1 and steady progress toward the extended end date.

Sprint 6: Post-Interim Recovery and Final Push Preparation

Period: **April 16th, 2026 - April 28th, 2026**

Sprint Goal: Address feedback from the Interim Report and prepare deliverables for the final stretch.

Sprint 12 displayed the most extreme “late-crunch” pattern of the project so far. The remaining work stayed flat at the initial commitment of 40 story points until April 20th, with the entire burndown collapsing into a 2-day window between April 22nd and April 24th. The team closed 24.5 points across 9 work items, including the 3D model video (TRAQ-21, 8 pts), the report fixes following interim feedback (TRAQ-168, 8 pts), the leaflet, the poster, the smart system schematics review, the video addition, the lab parts check, three daily meetings, and Retrospective 6. TRAQ-88 (“Chapter Project Management”, 12 pts) remained in progress as expected — this item is intentionally kept open across sprints since new content is added to it on every cycle, and it will only be closed at the end of the project. The flat-then-cliff burndown shape reflects the team prioritizing deep work on the larger report and design items before logging completions in a single batch near the end of the sprint, rather than a true delivery delay.

The burndown opened at roughly 40 story points and stayed flat until April 20. Almost all progress was logged in a single batch around April 23, dropping the remaining work to about 15 points — meaning the team closed roughly 25 points but finished above the ideal guideline, with the rest (chiefly TRAQ-88) carried into the next sprint.

Date - 16 avril 2026 - 28 avril 2026

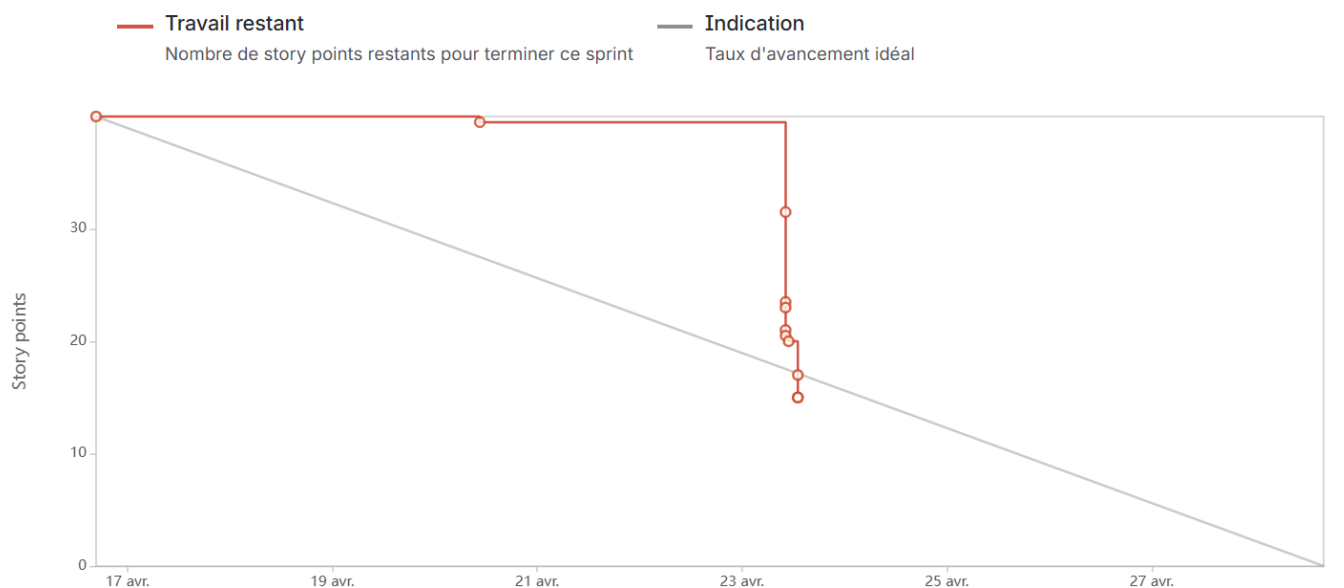


Figure 12: Sprint 6 Burndown Chart showing the flat-line followed by sharp drop “late-crunch” pattern.

Sprint 7: Mid-Project Deliverables

Period: **April 23rd, 2026 - April 30th, 2026**

Sprint Goal: Continue progress on project deliverables following the interim milestone.

The Sprint that is shown in figure 13 was the shortest sprint so far at one week, a tighter cadence following the interim report milestone. The sprint started with a commitment of approximately 23 story points. The burndown once again exhibited the team's characteristic “late-crunch” pattern: remaining work stayed flat from April 23rd through April 27th, dropped by a small amount on April 27th, then plateaued again before the bulk of completions were logged on the final day, April 30th. By the end of the sprint window shown, roughly 9 points had been burned down, leaving approximately 14 points still in progress at the time of capture. As in previous sprints, TRAQ-88 (“Chapter Project Management”) is expected to remain open by design, since content continues to be added to it across every sprint and will only close at the end of the project.

With an increase in classes, the team's total workload dropped to 23.5. This is also because the team focused on smaller tasks like Paper etc.

Date - 23 avril 2026 - 30 avril 2026

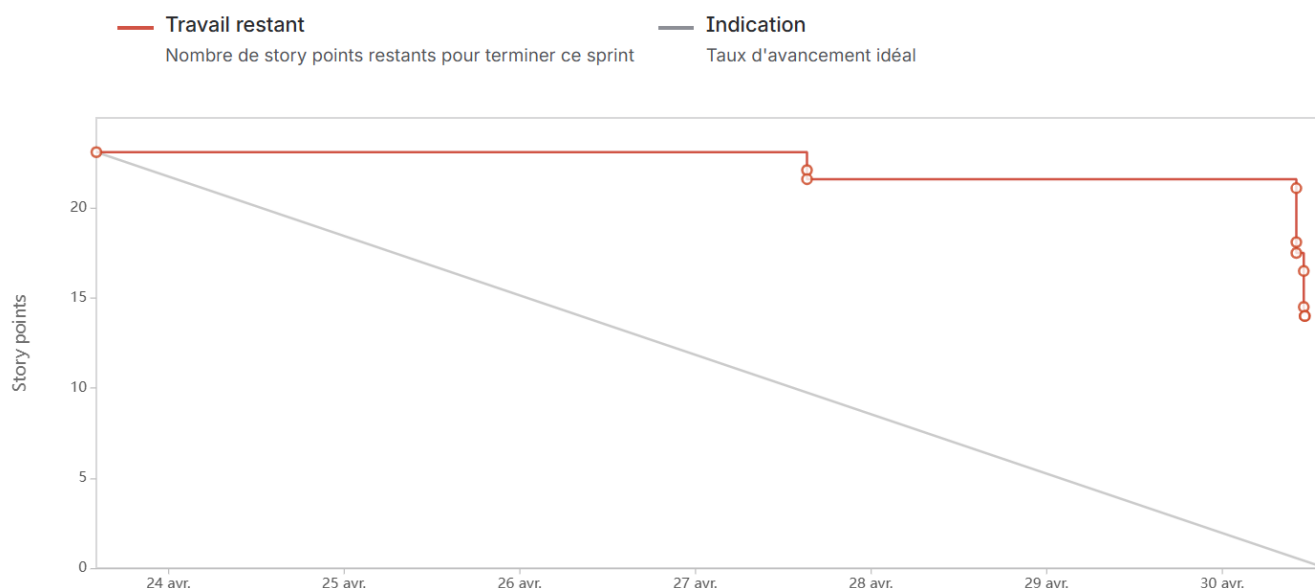


Figure 13: Sprint 7 Burndown Chart showing the persistent late-completion pattern continuing into the post-interim phase.

Sprint 8

Sprint 8 in figure 14 covered the period from April 30th to May 14th, 2026, with an initial workload of approximately 61 story points. The burndown chart showed a typical late-crunch pattern: after a small reduction at the start of the sprint, progress stayed mostly flat until May 12th, when most tasks were completed. By the end of the sprint, the remaining workload had decreased to around 23 story points, showing significant progress despite work being completed mainly at the end of the sprint.

Major deadlines this week, so the workload increased to 60. Meet Sprint, a bug came up hence, the chart is going back up.

Date - 30 avril 2026 - 14 mai 2026

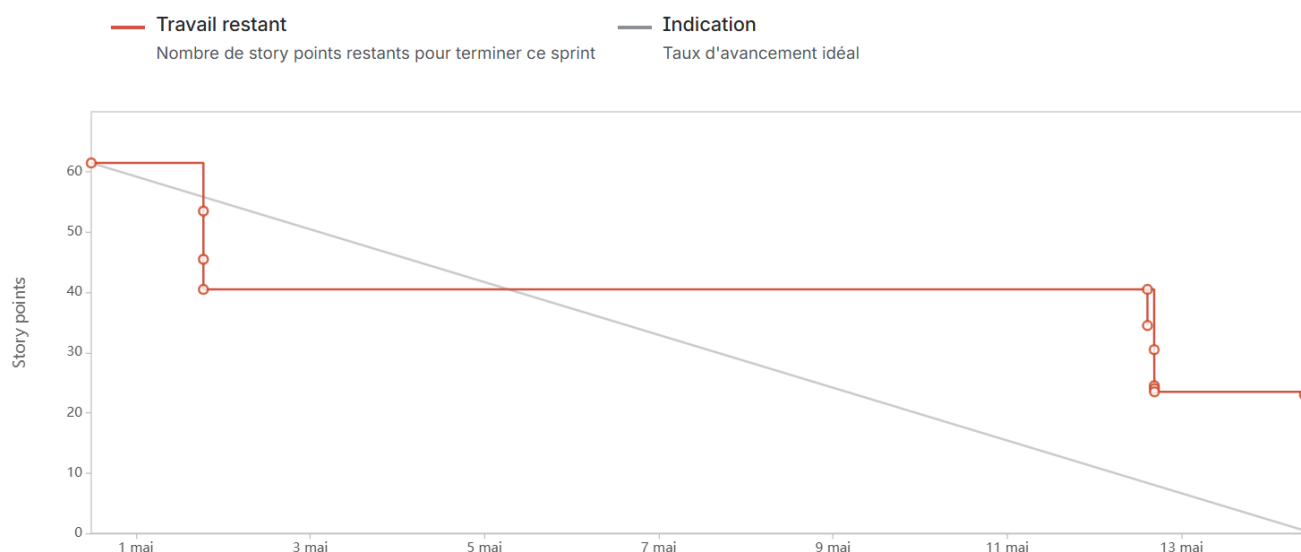


Figure 14: Sprint 8 Burndown Chart

Sprint 9

Sprint 9 in figure 15 covered the period from May 14th to May 21st, 2026, with an initial workload of approximately 55 story points. The burndown chart showed very limited progress during most of the sprint, with only small reductions in remaining work occurring near the end of the sprint period. By the end of the sprint, the workload had decreased to around 43 story points, indicating that only a small portion of tasks was completed during this sprint. The burndown remained far above the ideal progression line throughout the sprint, suggesting that several tasks were still ongoing at the time of capture.

Back to the regular ~50 sprint points. The task that never gets finished is Project Management, as each week we need to add more to it. The teachers also asked us to add more to the app and paper, which is why there is such a big gap in the sprint backlog

Date - 14 mai 2026 - 21 mai 2026

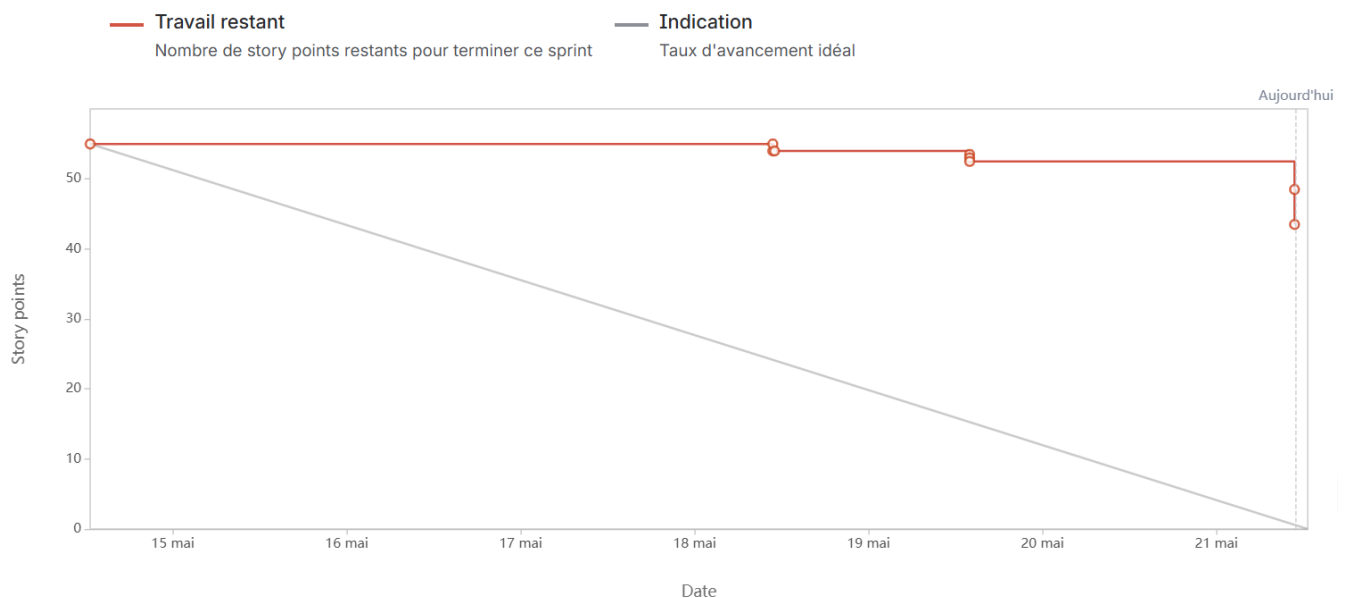


Figure 15: Sprint 9 Burndown Chart showing the persistent late-completion pattern continuing into the post-interim phase.

Sprint 10

Sprint 10 in Figure 16 covered the period from May 21st to May 28th, 2026, with an initial workload of approximately 45 story points. Unlike previous sprints, progress was more evenly distributed throughout the week, with several reductions in remaining work occurring at different points rather than only at the end of the sprint. The workload gradually decreased from 45 to approximately 3 story points by the end of the sprint, indicating that almost all planned tasks were completed. The final sharp drop suggests that the last remaining deliverables were closed just before the sprint ended, leaving only a minimal amount of work still in progress.

Date - 21 mai 2026 - 28 mai 2026

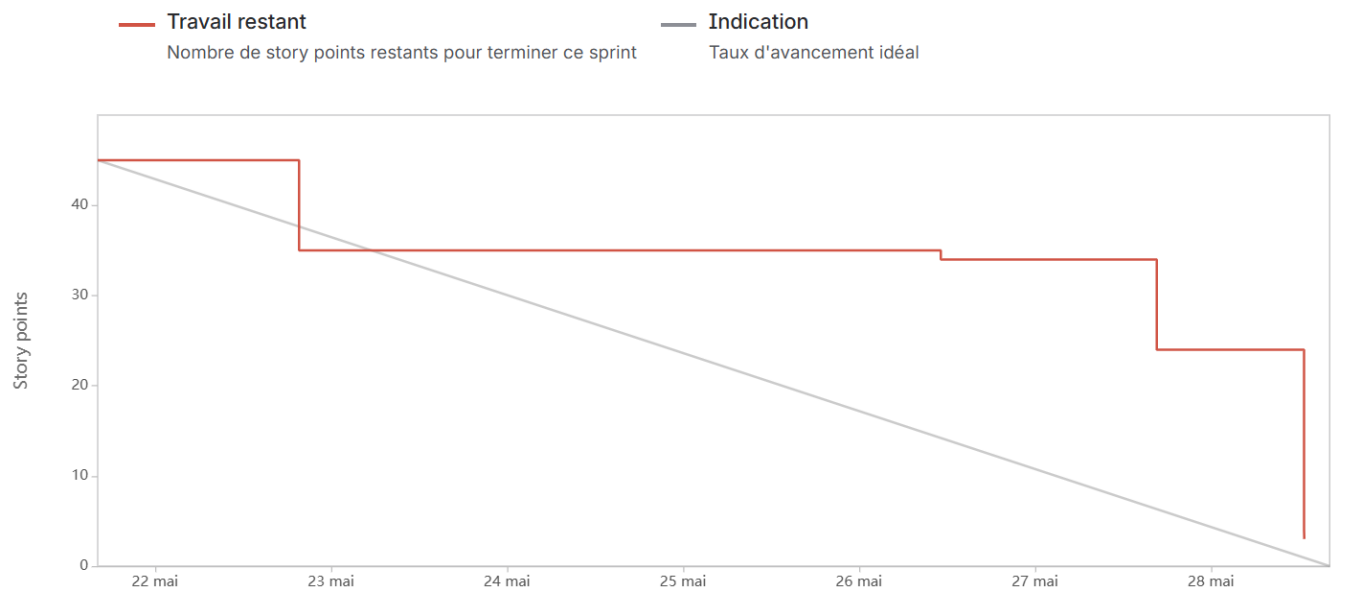


Figure 16: Sprint 10

Sprint 11

Sprint 11 in Figure 17 covered the period from May 28th to June 4th, 2026, with an initial workload of approximately 50 story points. The burndown chart showed little progress during the first half of the sprint, followed by several significant reductions in remaining work between June 2nd and June 4th. By the end of the sprint, the workload had decreased to approximately 8 story points, indicating that most of the remaining tasks were completed. As in several previous sprints, a large portion of the work was finalized near the end of the sprint, resulting in a burndown pattern that remained above the ideal progression line until the final days.

Date - 28 mai 2026 - 4 juin 2026

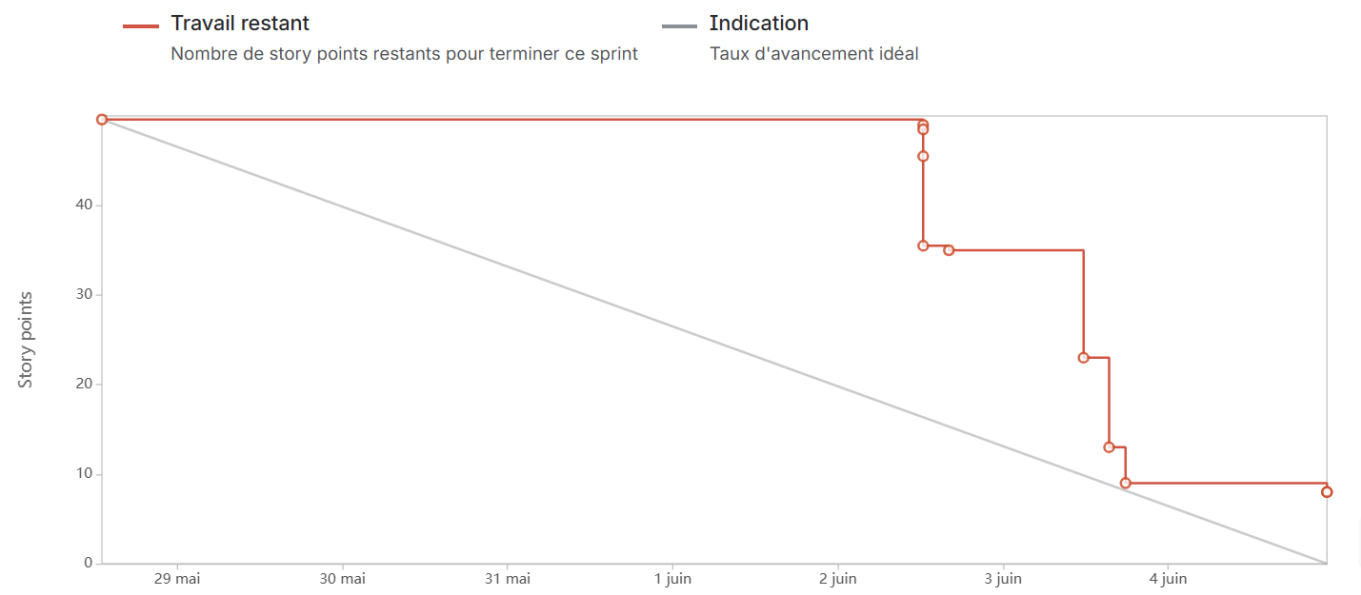


Figure 17: Sprint 11

Sprint 12

Sprint 12 in Figure 18 covered the period from June 4th to June 11th, 2026, with an initial workload of approximately 31 story points. The burndown chart showed steady progress throughout the sprint, with several small reductions in remaining work occurring at regular intervals rather than being concentrated on the final day. By the end of the sprint, the remaining workload had decreased to approximately 14 story points. Although the team did not fully reach the ideal burndown line, the sprint demonstrated a more consistent completion of tasks compared to earlier sprints, reflecting a gradual closing of the remaining project activities.

A major drop in time as the team project is coming up to an end. Small tasks are remaining.

Date - 4 juin 2026 - 11 juin 2026

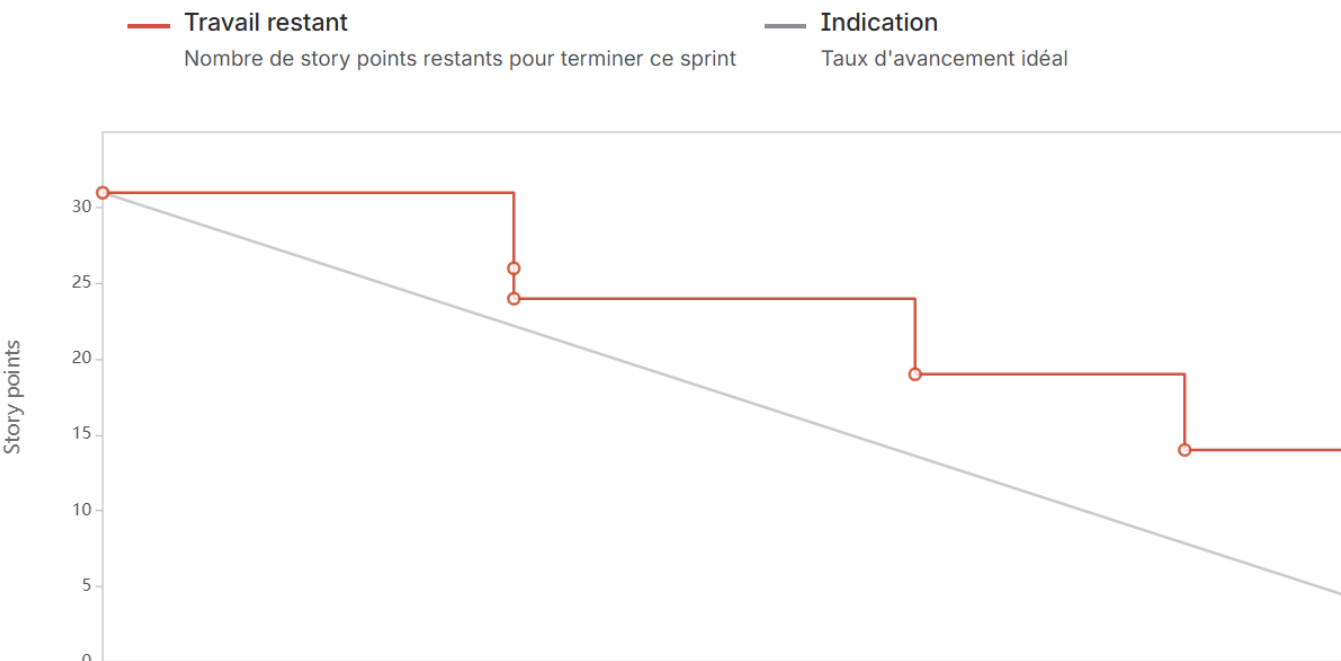


Figure 18: Sprint 12

Sprint Outcomes

Sprint 1

This subchapter documents the outcome of sprint 1.

The following Table 12 shows the outcome of sprint 1.

Table 12: Sprint 1 Overview

Sprint	Task	Duration	Responsible	Involved
23/02/2026 - 04/03/2026				
1	Set up the Scrum environment		Bernardo Josué Corr.	Everyone
1	Chapter 2 Background and Related Work		Rieke Platthaus	Everyone
1	Filter analyse 2		Bernardo Josué Corr.	Everyone
1	Filter analyse 1		Ines Margand	Everyone

1	Level of water analyse 2		Maria Włodarczyk	Everyone
1	Level of water analyse 1		Guillem Vázquez Rol.	Everyone
1	Structural Draft		Guillem Vázquez Rol.	Everyone
1	BlackBox Diagram		Maximilian Salmi	Everyone
1	Level of water		Maximilian Salmi	Everyone
1	Quality of water research		Rieke Platthaus	Everyone
1	Research Filters		Ines Margand	Everyone

Sprint 1 Summary:

Main Achievements:

- Set up the Scrum environment and established the project foundation.
- Completed initial research on water filters, water quality, and water level analysis.
- Produced the Structural Draft and BlackBox Diagram, and drafted the Background/Related Work chapter.

Progress Check: 100% of the planned work for this sprint is finished.

Effort Breakdown:

- **Tasks Planned:** 11
- **Tasks Finished:** 11

Sprint 2

This subchapter documents the outcome of sprint 2.

The following Table 13 shows the outcome of sprint 2.

Table 13: Sprint 2 Overview

Sprint	Task	Duration	Responsible	Involved
05/03/2026 - 11/03/2026				
2	Research possible solutions for UV-C protection		Bernardo Josué Corr.	Everyone
2	Graphic Design		Guillem Vázquez Rol.	Everyone
2	Update the report with feedback		Bernardo Josué Corr.	Everyone
2	Update report		Rieke Platthaus	Everyone
2	Make a list of materials		Ines Margand	Everyone
2	Spec table with different information		Maximilian Salmi	Everyone
2	Retrospectives 2		Bernardo Josué Corr.	Everyone
2	Chapter 7 Project Development		Guillem Vázquez Rol.	Everyone
2	Chapter 6 Ethical and Deontological Concerns		Rieke Platthaus	Everyone
2	Chapter 5 Eco-efficiency Measures for Sustainability		Rieke Platthaus	Everyone
2	Chapter 4 Marketing Strategy Development		Maria Włodarczyk	Everyone
2	Chapter 2 Background and Related Work		Rieke Platthaus	Everyone

Sprint 2 Summary:

Main Achievements:

- Researched UV-C protection solutions and produced the materials list and specification table.
- Updated the report based on feedback and developed multiple report chapters (Marketing Strategy, Eco-efficiency, Ethical Concerns, Project Development).
- Completed graphic design work and conducted Retrospective 2.

Progress Check: 100% of the planned work for this

Sprint 3

This subchapter documents the outcome of sprint 3.

The following Table 14 shows the outcome of sprint 3.

Table 14: Sprint 3 Overview

Sprint	Task	Duration	Responsible	Involved
12/03/2026 - 18/03/2026				
3	Daily meeting 25/03/2026		Bernardo Josué Corr.	Everyone
3	Daily meeting 23/03/2026		Bernardo Josué Corr.	Everyone
3	Daily meeting 20/03/2026		Bernardo Josué Corr.	Everyone
3	Companies research		Unassigned	Everyone
3	Update background materials research		Ines Margand	Everyone
3	Cardboard Model		Ines Margand	Everyone
3	Practical solution for 3d system		Maximilian Salmi	Everyone
3	QR code to Wiki		Bernardo Josué Corr.	Everyone
3	Chapter Project Management		Ines Margand	Everyone
3	Flyer		Bernardo Josué Corr.	Everyone
3	Retrospective 3		Bernardo Josué Corr.	Everyone
3	Chapter 7 Project Development		Guillem Vázquez Rol.	Everyone
3	Chapter 6 Ethical and Deontological Concerns		Rieke Platthaus	Everyone
3	Chapter 4 Marketing Strategy Development		Maria Włodarczyk	Everyone
3	Chapter 2 Background and Related Work		Rieke Platthaus	Everyone
3	Structural Drawings		Guillem Vázquez Rol.	Everyone

Sprint 3 Summary:

Main Achievements:

- Built the Cardboard Model and developed the practical solution for the 3D system.
- Conducted companies research, updated background materials research, and produced the Flyer and Structural Drawings.
- Added the QR code to the Wiki, advanced multiple report chapters, and held daily stand-ups and Retrospective 3.

Progress Check: 100% of the planned work for this sprint is finished.

Effort Breakdown:

- **Tasks Planned:** 16
- **Tasks Finished:** 16

Sprint 4

This subchapter documents the outcome of sprint 4.

The following Table 15 shows the outcome of sprint 4.

Table 15: Sprint 4 Overview

Sprint	Task	Duration	Responsible	Involved
19/03/2026 - 25/03/2026				
4	Chapter Project Management	12	IM	Everyone
4	Interim Report	10	RP	Everyone
4	Chapter 7 Project Development	8	GR	Everyone
4	Chapter 2 Background and Related Work	9	RP	Everyone
4	Retrospective 4	0.5	BA	Everyone
4	Interim Presentation	10	BA	Everyone
4	Daily meeting 30/03/2026	0.5	MS	Everyone
4	Daily meeting 31/03/2026	0.5	MW	Everyone
4	Schematics Version 2	3	MS	Everyone

Sprint 4 Summary:

Main Achievements:

- Completed the Interim Report and Interim Presentation, including the Background/Related Work and Project Development chapters.
- Finalized Schematics Version 2 and conducted Retrospective 4.
- Held daily stand-up meetings to track progress.

Progress Check: ~89% of the planned work for this week is finished; the Chapter Project Management item remains in progress.

Effort Breakdown:

- **Tasks Planned:** 9
- **Tasks Finished:** 8

Sprint 5

This subchapter documents the outcome of sprint 5.

The following Table 16 shows the outcome of sprint 5.

Table 16: Sprint 5 Overview

Sprint	Task	Duration	Responsible	Involved
26/03/2026 - 01/04/2026				
5	Chapter Project Management	12	IM	Everyone
5	Interim Report	10	RP	Everyone
5	Schematics Version 3	3	GR	Everyone
5	HAND IN REPORT	0.5	BA	Everyone
5	Retrospective 5	0.5	MW	Everyone
5	Website	3	BA	Everyone
5	Application Prototype	3	BA	Everyone
5	Table of power budget	1.5	MS	Everyone

Sprint 5 Summary:

Main Achievements:

- Finalized and handed in the Interim Report and produced Schematics Version 3.
- Built the Website and Application Prototype, and created the power budget table.
- Conducted Retrospective 5; the Chapter Project Management item remains in progress.

Progress Check: ~89% of the planned work for this sprint is finished; Chapter Project Management is still in progress.

Effort Breakdown:

- **Tasks Planned:** 8
- **Tasks Finished:** 7

Scope Changes: TRAQ-164 (Table of power budget) was added after sprint start, increasing commitment by 1.5 story points (total 33.5).

Sprint 6

This subchapter documents the outcome of sprint 6.

The following Table 17 shows the outcome of sprint 6.

Table 17: Sprint 6 Overview

Sprint	Task	Duration	Responsible	Involved
16/04/2026 - 22/04/2026				
6	Chapter Project Management	12	IM	Everyone
6	Video add	2	MW	Everyone
6	Check lab for pieces	1	MS	Everyone
6	3D model video	8	GR	Everyone

6	Retrospective 6	0.5	RP	Everyone
6	Daily Meeting 22/04/2026	0.5	GR	Everyone
6	Daily Meeting 21/04/2026	0.5	MS	Everyone
6	Daily meeting 20/04/2026	0.5	MW	Everyone
6	Fix report after Interim report	8	RP	Everyone
6	Leaflet	3	MW	Everyone
6	Review Smart system schematics	2	MS	Everyone
6	Poster	2	IM	Everyone

Sprint 6 Summary:

Main Achievements:

- Produced the 3D model video, Leaflet, and Poster, and fixed the report after the interim feedback.
- Reviewed the Smart System schematics, added the video, and checked the lab for pieces.
- Held daily stand-ups and Retrospective 6; Chapter Project Management remains in progress.

Progress Check: ~92% of the planned work for this sprint is finished; Chapter Project Management is still in progress.

Effort Breakdown:

- **Tasks Planned:** 12
- **Tasks Finished:** 11

Sprint 7

This subchapter documents the outcome of sprint 7.

The following Table 18 shows the outcome of sprint 7.

Table 18: Sprint 7 Overview

Sprint	Task	Duration	Responsible	Involved
23/04/2026 - 29/04/2026				
7	Chapter Project Management	3	IM	Everyone
7	Packing solutions	6	IM	Everyone
7	Paper	5	RP	Everyone
7	Check lab for pieces	1	MS	Everyone
7	Video add	3	MW	Everyone
7	Final list of material and components	2	MS	Everyone
7	Retrospective 7	0.5	IM	Everyone
7	Daily Meeting 24/04/2026	0.5	IM	Everyone
7	Daily Meeting 28/04/2026	0.5	GR	Everyone
7	Daily Meeting 29/04/2026	0.6	MS	Everyone
7	Add small details for 3d Video	1	BA	Everyone

Sprint 7 Summary:

Main Achievements:

- Developed packing solutions and finalized the list of materials and components.
- Advanced the Paper, refined the 3D video with additional details, and completed the video add.
- Held daily stand-ups and Retrospective 7; Chapter Project Management remains in progress.

Progress Check: ~73% of the planned work for this sprint is finished; Chapter Project Management, Packing solutions, and Paper remained open at sprint close.

Effort Breakdown:

- **Tasks Planned:** 11
- **Tasks Finished:** 8

Sprint 8

This subchapter documents the outcome of sprint 8.

The following Table 19 shows the outcome of sprint 8.

Table 19: Sprint 8 Overview

Sprint	Task	Duration	Responsible	Involved
07/05/2026 - 13/05/2026				
8	Chapter Project Management	3	IM	Everyone
8	Paper	20	RP	Everyone
8	Packing solutions	6	IM	Everyone
8	Retrospective 8	-	RP	Everyone
8	Establish the costs for the aluminum bottle and plastic	8	BA	Everyone
8	3D Model	10	GR	Everyone
8	Reviews the excel lists	5	MS	Everyone
8	Daily meeting 12/05/2026	0.5	MW	Everyone
8	Daily meeting 13/05/2026	0.5	GR	Everyone
8	Daily meeting 11/05/2026	0.5	MS	Everyone
8	Deliver interm report after feedback	8	MW	Everyone

Sprint 8 Summary:

Main Achievements:

- Built the 3D Model and established costs for the aluminum bottle and plastic.
- Delivered the interim report after feedback, reviewed the Excel lists, and progressed the Paper and packing solutions.
- Held daily stand-ups and Retrospective 8; Chapter Project Management remains in progress.

Progress Check: ~82% of the planned work for this sprint is finished; Chapter Project Management and Paper remained open at sprint close.

Effort Breakdown:

- **Tasks Planned:** 11
- **Tasks Finished:** 9

Sprint 9

This subchapter documents the outcome of sprint 9.

The following Table 20 shows the outcome of sprint 9.

Table 20: Sprint 9 Overview

Sprint	Task	Duration	Responsible	Involved
14/05/2026 - 20/05/2026				
9	Chapter Project Management	3	IM	Everyone
9	Paper	20	RP	Everyone
9	App	10	BA	Everyone
9	Manuel	4	MW	Everyone
9	Retrospective 9	0.5	MS	Everyone
9	3D Printing	5	GR	Everyone
9	Fix packing Poster	1	IM	Everyone
9	Hardware configuration	10	MS	Everyone
9	Daily meetings 15/05/2026	0.5	BA	Everyone
9	Daily meeting 18/05/2026	0.5	RP	Everyone
9	Daily meeting 19/05/2026	0.5	GR	Everyone

Sprint 9 Summary:**Main Achievements:**

- Completed 3D printing, hardware configuration, and the user Manual.
- Fixed the packing poster and progressed the Paper and App.
- Held daily stand-ups and Retrospective 9; Chapter Project Management remains in progress.

Progress Check: ~82% of the planned work for this sprint is finished; Chapter Project Management, Paper, and App remained open at sprint close.

Effort Breakdown:

- **Tasks Planned:** 11
- **Tasks Finished:** 8

Sprint 10

This subchapter documents the outcome of sprint 10.

The following Table 21 shows the outcome of sprint 10.

Table 21: Sprint 10 Overview

Sprint	Task	Duration	Responsible	Involved
21/05/2026 - 27/05/2026				
10	Chapter Project Management	3	IM	Everyone
10	Paper	20	RP	Everyone
10	App	10	BA	Everyone
10	Retrospective 10	1	IM	Everyone
10	Stress test	5	GR	Everyone
10	Test of components	5	MS	Everyone
10	Soldering	1	MS	Everyone
10	Overview Paper hand in	-	MW	Everyone

Sprint 10 Summary:**Main Achievements:**

- Conducted the stress test and test of components, and completed soldering work.
- Handed in the paper overview and finalized the App and Paper.
- Held Retrospective 10; Chapter Project Management remains in progress.

Progress Check: ~88% of the planned work for this sprint is finished; Chapter Project Management is still in progress.

Effort Breakdown:

- **Tasks Planned:** 8
- **Tasks Finished:** 7

Sprint 11

This subchapter documents the outcome of sprint 11.

The following Table 22 shows the outcome of sprint 11.

Table 22: Sprint 11 Overview

Sprint	Task	Duration	Responsible	Involved
28/05/2026 - 03/06/2026				
11	Chapter Project Management	3	IM	Everyone
11	UV-C Light	5	BA	Everyone
11	Review the Feedback on the paper	10	RP	Everyone
11	Daily meeting 29/05/2026	0.5	GR	Everyone
11	Daily meeting 01/06/2026	0.6	GR	Everyone
11	Daily meeting 02/06/2026	0.5	MW	Everyone
11	Retrospective 11	1	MW	Everyone
11	Simulation	12	GR	Everyone
11	Power supply adjustment	4	MS	Everyone

11	Polish up report	10	MW	Everyone
11	Fix typos in test report and plan	3	IM	Everyone

Sprint 11 Summary:

Main Achievements:

- Ran the Simulation and completed the power supply adjustment and UV-C Light work.
- Reviewed paper feedback, polished the report, and fixed typos in the test report and plan.
- Held daily stand-ups and Retrospective 11; Chapter Project Management remains in progress.

Progress Check: ~91% of the planned work for this sprint is finished; Chapter Project Management is still in progress.

Effort Breakdown:

- **Tasks Planned:** 11
- **Tasks Finished:** 10

Sprint 12

This subchapter documents the outcome of sprint 12.

The following Table 23 shows the outcome of sprint 12.

Table 23: Sprint 12 Overview

Sprint	Task	Duration	Responsible	Involved
04/06/2026 - 10/06/2026				
12	Chapter Project Management	3	IM	Everyone
12	UV-C Light	5	BA	Everyone
12	Final Presentation	6	MW	Everyone
12	Summary of report	2	MW	Everyone
12	Conclusion of each chapter	5	GR	Everyone
12	Work on comments of the report	5	RP	Everyone
12	Mount UV-c light assist testing	5	MS	Everyone
12	Retrospective	-	BA	Everyone

Sprint 12 Summary:

Main Achievements:

- Prepared the Final Presentation, report summary, and per-chapter conclusions.
- Mounted the UV-C light for assisted testing and addressed report comments.
- Held the Retrospective; Chapter Project Management remains in progress.

Progress Check: ~88% of the planned work for this sprint is finished; Chapter Project Management is still in progress.

Effort Breakdown:

- **Tasks Planned:** 8
- **Tasks Finished:** 7

Scope Changes: TRAQ-220 (Retrospective) was added after sprint start.

Sprint Evaluations

This section evaluates the effectiveness of each sprint by reflecting on what went well and what could be improved. It includes insights into challenges faced, team performance, and lessons learned to optimize future sprints.

The teams' first retrospective in Figure 19 showed the teams' different education backgrounds and speed, the teams' general workload, and the main idea being lost. To fix this the team decided to book a 1-hour meeting where everyone spoke for 5 min and said where they think the project should head. This helped us find common ground. Other conclusions regarding speed and workload: the team decided to meet more often to spread the workload fairly through the team.

Retrospective 1



Description

Bernardo:

What went well: Good overall team progress the team worked good on research and a lot of tasks were completed.

What didn't go well: As some team members background is different some like to work faster then others. An adjustment on my part needs to be taken into consideration to adjust to this.

What could be improved:

Rieke:

What went well: We had a lot of progress this week and answered many questions concerning our project, our problem statement and the discussion about sensors.

What didn't go well: Sometimes we work at on different contents because there's not enough communication about our individual work. That's why we kept discussing the problem statement after we had all agreed to it.

What could be improved: We should split the workflow better and give ourselves updates about our individual work regularly. This way, we always avoid discussing the same questions after everyone agreed beforehand. We should also let each other finish speaking.

Maria:

What went well: Significant progress was made in sensor and chip research.

What didn't go well: nah

What could be improved: Workload distribution could be better optimized. Additionally, implementing regular progress updates would improve team alignment..

Inês:

what went well : we are progressing really quickly

What didn't go well: i think we forget that's the main idea of our project

What could be improved: more focus on what we need to do and and try not to want to go too fast to not go astray

Max:

What went well this sprint:

We made good progress on the project. We now have a clear idea of how the bottle will be built, what hardware we will use, and which sensors we plan to include. The group meetings went well, and we planned the work together with input from everyone on the team.

What went wrong this sprint:

We initially chose a pressure sensor designed for deep water applications. After receiving feedback from our teacher, we decided to switch to a piezoresistive film sensor instead. Apart from that, things went smoothly. We could have had a clearer vision of the final product from the start, but as the sprint progressed we developed more ideas and refined the project.

Guillem

What went well: Everyone one was involved in the project and I think we are ina good way and more advanced than oher groups.

What didnt go well: Maybe the organisation or the taking of decisions was a bit caotic, but I think it's normal when we are in the beggining and everything is so open and abstract.

What could be improved: I don't know

Figure 19: First retrospective

The teams' second retrospective (Figure 20) underlines less issues then the first sprint. The team also wrote what they will be improving inside the retrospective.

Retrospectives 2

+

Description

Guillem:

What went well: again everyone was involved and I think we are a balanced group and quite advanced.

What didn't go well: nothing to say.

What could be improved: maybe trying to get involved all team to make decisions.

Inès:

What went well : I think we have distributed the workload better and everyone is more involved

What didn't go Well : nan

What could be improved : trust more the other on their task

Rieke:

What went well: We had a lot of progress this week, we split tasks fairly and well, we improved our communication in the group (all agreed on every discussion)

What didn't go well: -

What could be improved: reading and checking the work from others after finishing work e.g. reading report or checking teams, upload files in the order in teams

Max:

What went well:

This week, we clarified the product design and aligned as a team on its final functionality. We also developed a logo and slogan, and defined a clear target audience for the product.

What didn't go well:

We could have planned our tasks more thoroughly, especially by considering dependencies and potential follow-up work. As a result, we had to take on unplanned tasks when initial activities revealed additional challenges.

Maria:

What went well: Progress in material selection, and task division between the group's members.

What didn't go well: none

What could be improved: none

Bernardo:

What went well: Good progress, the team selected a logo together. A lot of back and forth discusses. I feel like the team contributed together into make a good solution for the problems we had this week.

What didn't go well: Feel like we could take on more work.

What could be improved: Give more workload.

Action:

One person to review documents.

Keep one time slot open to changes that can occur

Figure 20: Second retrospective

Retrospective 3 in Figure 21 mentions 3 main issues: sometimes it can be hard to define an equal amount of work for the team, some members being late, and lastly, some members still not being exactly familiar with the Scrum environment. The team decided to arrange a meeting where they would go over Scrum again and also to have longer sprint planning to properly define workload. General progress is still going good.

Retrospective 3



Description

Rieke:

What went well: We made progress this week, we improved our communication in the group, I like the meetings to stay in contact with the work from the others

What didn't go well: we can be more punctual for meetings

What could be improved: we can split the tasks and responsibilities better

Guillem:

What went well: I think all team was involved and we are doing good job, in good timings and I feel we are in good path.

What didn't go well: maybe sometimes it's hard to have equivalent work for every team member.

What could be improved: nothing to say.

Max:

Good: The team performed well this week. We created a clear plan at the beginning of the week and successfully followed it.

Bad: We could have developed the three-piece bottle system design earlier in the process. No major issues were encountered this week.

Bernardo:

What went well: The team finished the report ahead of time. Team bonding is better than ever and we are sticking together. The team also had 3 standups.

What could be improved: Some members are still not familiar with scrum workload.

Inès:

What went well : everyone didn't do their own task so it was for me easier to work

What didn't go well : nan

What could be improved : maybe the workload should be more shared

Maria:

What went well: Marketing chapter finished:

What went wrong : Budget analysis chapter issues

What could be improved: Ask question to the teachers earlier.

Figure 21: Third retrospective

Retrospective 4 in Figure 22 was before the Easter break. The team now is getting ready for their interim report. No major issues faces the team will contact directly teachers regarding certain documents.

Retrospective 4



Description

Rieke:

What went well: We improved our presentation layout and the design of the bottle

What could be improved: Every team member should make sure to do the sprint task (e.g. reading report, putting stuff in the presentation) so that there is no need to be remembered; we should make sure that everyone uses the same headlines and formal aspects in report and presentation and that we describe the content of pictures and tables in a text

Bernardo:

What went well: The team accomplished the interim presentation and report. The teacher seemed generally happy with progress, the website, and the application finished.

What could be improved: small minor adjustments to be done in the report. Mostly conventional issues.

What didn't go well: NAN

Max:

Good: This week, we made solid progress in developing our final schematics and completing the budget table. We also finalized a well-structured three-piece system design for the bottle. We also distributed well the tasks for each team member.

Bad: We should have sought technical advice directly from LUL instead of saving it for the weekly meeting. Additionally, some team members were absent this week.

While this did not significantly impact progress, it is still a negative factor for the project.

Guillem:

What went well: We are quite advanced and still in a good path.

What didn't go well: maybe we struggled a bit with sole absence because everyone was not here but I think we managed.

What could be improved: no comments.

Inès and Maria absent

Figure 22: Fourth retrospective

Retrospective 5 (Figure 23) took place after the interim report hand-in and presentation, with Max absent. The team agreed that the sprint went well overall: the interim report, the presentation, and all related deliverables were finished on time, and communication remained good throughout the Easter break despite the team not meeting in person due to the vacation. The main concern raised was workload distribution — the team relied heavily on Bernardo to finish tasks that were originally assigned to other members, and the conclusion was that every team member should take responsibility for completing their own tasks on time. No major blockers were identified, and the team felt ready going into the next sprint.

Description

Max and maria absent:

Rieke:

What went well: we finished interim report, presentation and deliver everything

What didn't went well: we all trust bernado who had to finish task of others although he was not responsible to deliver.

What could be improved: every team member should make sure to finish their tasks.

Guillem:

What went well: We had everything on time and I think we are ready for the interim presentation.

What didn't go well: Because of the vacation, we were not meeting in real life, so it was more complicated for the comunication.

What could be improved: no comments.

Bernardo:

What went well: the interim report done, all chapters finished apart from the prototype. and presentation finished.

Whqt didnt go well; NAN

What could be improved: some memebbers to finish task on time

Ines:

that went well : good communication in the group even in the easter break

Figure 23: Fifth retrospective

Retrospective 6 (Figure 24) was held after the interim presentation, with Maria absent. The team reported strong overall progress: the schematics were finalized, the mistakes identified during the interim presentation were addressed, and the report was fixed based on teacher feedback. Task distribution was praised, with the team noting they had even managed to get a head start on upcoming work. Two recurring issues were raised: slow response times from teachers on Teams and email — particularly regarding lab equipment access — which had blocked progress in previous sprints as well, and inconsistent task updates on Jira from some members, making it harder for the team to track who was working on what. As an improvement point, the team suggested starting to think concretely about the prototype design and build, and committed to keeping each other better updated on task progress.

Description

Maria: Absent

Max:

Good:

This week, we finalized our schematics after the interim presentation and worked on improving the mistakes we identified in our presentation. The whole team did solid work.

Bad:

Our teachers have been slow to respond on Teams and by email, so we are still waiting for an answer about the lab equipment.

Guillem:

What went well: Everyone had a task and we are working well. Also we had this meeting with the teacher so we can definitely close the schematics.

What didn't go well: No comments.

What could be improved: Maybe we could try to start thinking about the specific design and how are we going to build the prototype

Inès:

what went well : good repartition of the tasks and we even get a head start

Rieke:

What went well: we had a sucessful interim presentation, a lot of progress

What didn't went well: -

What could be improved: we should update us about our task

Bernardo:

What went well: Report fixed after feedback from teacher. Schematics also.

What didnt go well: some membes dont update their taks on jira. Also late feedback from certain teachers on certain stuff.

What could be improved nana.

Figure 24: Sixth retrospective

Retrospective 7 in Figure 25 was held with Inès absent. The team reported continued strong progress: tasks were being completed on schedule, the teachers were happy with the project's direction, and components were being ordered. The sprint also covered planning for the physical assembly of the bottle and early ideas for product packaging. Several improvement points were raised: task distribution and coordination could still be better, communication around absences and progress updates needed to improve — with some members announcing absences too late or not updating the team on their work — and component links should be checked and verified before weekly meetings to avoid delays. The team also noted that since lessons are now less frequent, internal progress updates need to happen more regularly to compensate. The packaging strategy was identified as the next area to focus on.

Description

Guillem:

What went well: We've done all the tasks and we are in a good way.

What didn't go well: I had to spend some days in Barcelona, so I was not as involved as I would like to.

What could be improved: No comments.

Rieke

What went well:I like that almost everyone in our group took responsibility for specific deliverables throughout the project.

What didn't go well:Task distribution and coordination could have been better.

What could be improved:We need to focus more on the packaging strategy and improve communication, especially regarding which tasks have already been completed.

Bernardo:

What went well: The team progresed well again. Teachers are happy with progress and parts are getting ordered

What didnt go well: Some team members communicate their absence to late and dont update us on the progres.

What could be imporved: better communication:

Inès not present

Max:

Good:This week, we planned the physical assembly of the bottle and developed some unique ideas for how to package our product.

Bad:The component links should have been checked and verified before our weekly meeting.

Maria:

What went well: We accomplished most of the tasks we were supposed to do.

What went wrong: Nothing specific.

Improvements: Since lessons are less frequent than they used to be, the team should provide more regular progress updates.

Figure 25: Seventh retrospective

Restrospective 8 in Figure was held with Inès absent. The team reported good overall progress: tasks were completed on schedule, the teachers were satisfied with the project's direction, and most parts of the report had already been approved. Several improvement points were identified.

Communication was weaker during the holiday break, and the team agreed that more regular progress updates are needed. Some inconsistencies in poster designs were also noted, highlighting the need for a more unified visual style. In addition, tasks and deliverables for the rest of the semester should be divided more clearly so everyone knows their responsibilities. Delays with STL files and issues with materials provided by the teachers were also mentioned as challenges during the sprint.

Description

Inês absent

Bernardo:

What went well: Paper started nice, most of the report is ok and given the good by the teacher

What didn't go well: we have sometimes different designs in different posters

What could be improved: Keep one design.

Maria:

What went well: We accomplished every task we were supposed to complete.

What went wrong: Communication was weaker due to the holiday break.

Improvements: No specific improvements.

Rieke:

What went well:

A lot of progress.

What didn't go well: Nan

What could be improved:

We should talk more about what we did during the week. We can split all the tasks and deliverables which we have to do till the end of the semester. now, so everyone knows exactly what to do

Guillem:

What went well: The teachers are happy with how are we going.

What didn't go well: I haven't done the STL files on time, I was working in other stuff.

What could be improved: From my part, try to have things on time

Max:

Good:

We were on schedule and we have done everything that we can so far.

Bad:

We didn't get a answer from the teacher about the materials we needed and they provided us with some wrong products as well.

Figure 26: Eighth retrospective

Retrospective 9 in Figure 27 was held with Maria absent. The team reported strong technical progress during the sprint: the prototype advanced significantly, the application was successfully connected to the hardware, most sensors were functioning, and the 3D design was completed and ready for printing. The team also received the project components and was finally able to begin working with the physical sensors. Teachers were satisfied with the project's direction and overall progress. Several challenges were also identified. Some incorrect components were delivered, which affected the initial electrical system design, and the approaching prototype deadline created additional pressure on the team. Workload distribution was mentioned multiple times as an area for improvement, with some members experiencing a heavy workload depending on their technical background. The team also agreed that communication about weekly progress should improve further.

Maria absent

Rieke:

What went well:

progress, prototype

What didn't go well:

What could be improved: We should talk more about what we did during the week.

Guillem:

What went well: We are in really good path and I think the teachers are happy with us.

What didn't go well: I think we need to hurry a bit, in 10 days we need to have the proto.

What could be improved: No comments.

Max:

Good: This week we got our components and the 3d printing design. The whole team did a good work and we got to finally work with our physical sensors.

Bad: We got wrong components which compromises our initial electrical system but we'll manage.

Ines:

what went well : everyone is working in a really good way

what can be improve : maybe the workload is not well enough distributed, but that depends on our different backgrounds

Bernardo:

What went well: App is connected to hardware most of the system sensors are already working. 3d design done and ready to be printed

What didn't go well: i had a big workload

what could be improved: workload distribution.

Figure 27: Ninth retrospective

Retrospective 10 in Figure 28 highlighted strong overall progress, with the team completing the planned tasks for the week and advancing significantly on both the prototype and the project documentation. Most hardware components were connected to the application, extensive testing of individual components was carried out, and the paper and manual were nearly finished. The team also noted that, compared to other groups, a large number of tasks had already been completed, and the teachers remained satisfied with the project's direction. Several improvement points were discussed. Communication between team members could still be improved, especially regarding updates on completed work and explaining individual tasks to the rest of the group. Delays in 3D printing and ongoing testing of the UV-C system slowed down the assembly of the prototype, which was not yet completed as originally planned. Workload distribution remained uneven due to different technical backgrounds and areas of expertise. As a result, the team agreed to focus strongly on completing and assembling the prototype during the next sprint.

Description

Ines:

What went well: We are starting to accomplish and complete quite a lot of things, which shows good progress on the project.

What could be improved: The workload is still not very well balanced, but this is mainly due to our different skill sets and areas of expertise.

Maria:

What went well: Progress, we accomplished all tasks designed for this week.

What went wrong: none

Improvements: we should inform each other when and what work is done

Rieke:

what went well: progress, everyone works according to their abilities, compared to other groups we finished many tasks,

what didn't go well:

what could be improved: since everyone is focussed on the own task we should talk more about our work and explain it to the others

Max:

Good:

This week we completed extensive testing of the individual components and made good progress on the paper for our product.

Bad:

The bottle has not yet been fully assembled, even though our initial plan was to have it completed by now. In addition, testing of the UV-C light system is still ongoing.

Guillem:

What went well: We are in really good path and I think the teachers are happy with us.

What didn't go well: Maybe I answered too late the mail of the teacher and the 3D pieces will be printed too late.

What could be improved: We have to hurry up in the construction of the prototype.

Bernardo:

What went well: Paper finished all pieces connected to the app. Manuel also done

What didnt go well: delay in 3d printing. Issues with PSF

What could be improved: we will have to hurry in assembling the prototype.

Outcome: The team will sharp focus on working in the prototype

Figure 28: Tenth retrospective

Retrospective 11 in Figure 29 showed that the project was close to completion, with most tasks already finished and strong progress made on the prototype assembly. The team successfully mounted the bottle base, installed the hardware components, and documented component measurements and testing values in the project wiki. Teamwork remained positive, the planned tasks for the week were completed, and the teachers continued to be satisfied with the project’s progress. Some challenges were still identified. Testing of the UV-C light remained delayed due to safety concerns, limited equipment, and the lack of a suitable laboratory environment. The limited 12 V power supply also created constraints for battery usage during testing. Delays in final prototype validation highlighted the need for a clearer testing procedure for the UV-C system. Additionally, presentation skills and communication remained personal improvement points for some team members.

Description

Max:
Good:
This week, we mounted the base of our bottle and installed the hardware components. We also measured each component and documented the corresponding value readings for our functional testing in the project wiki.
Bad:
The power supply provided to our team was only 12 V. As a result, we need to be careful with battery usage to avoid running out of power. Testing of the UV-C light is still unclear, as it is potentially hazardous and the team has not been provided with the proper testing equipment or a suitable laboratory environment to conduct the tests safely.

Ines:
What went well : we still have a good team work
What went wrong : I really need to improve my presentation skills

Maria:
what went well: We accomplished tasks.
what went wrong: Nothing specific.
improvements: none.

Bernardo:
What went well: I would say 95% of the task are finsiehd looks liek we will finishe ahead of time
what went wrong: Delay in UV-C Testing
Imrovement: CLearer way to test the UV-c light

Figure 29: Eleventh retrospective

Summary

This chapter described how the TRAQUA project was planned, organised, and managed from start to finish. Using an agile Scrum framework with weekly sprints, the team structured its work around a Jira backlog, milestone-driven prioritisation, and regular ceremonies — planning, stand-ups, retrospectives, and demos — that kept progress aligned with the deliverable deadlines defined in the project plan.



Figure 30: TRAQUA Velocity report

The twelve sprints reveal a clear evolution in the team's process. Early sprints showed a recurring “late-crunch” pattern, where most work was completed in a short window near the end of each cycle, and commitment regularly exceeded the work actually delivered. As shown in the velocity chart (30), the gap between committed and completed story points was widest in the middle sprints but narrowed considerably toward the end of the project: in the final sprints the completed work closely matched the commitment, indicating that the team's estimation and planning matured over time. The team settled at an average velocity of roughly 29 story points per sprint.

The retrospectives were central to this improvement. Recurring issues — uneven workload distribution stemming from the team's mixed technical backgrounds, late absence notices, inconsistent Jira updates, and slow external feedback — were identified and acted upon, including a revised Definition of Done that restored burndown accuracy after Sprint 3. Risk management and procurement were handled proactively, with early ordering and backup suppliers limiting the impact of component delays.

Overall, the project was delivered on schedule and met its milestones, and the team finished with a markedly more predictable and disciplined process than it began with. With the product developed and the project successfully managed, the next chapter turns to the marketing plan, examining how TRAQUA could be positioned and brought to market.

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