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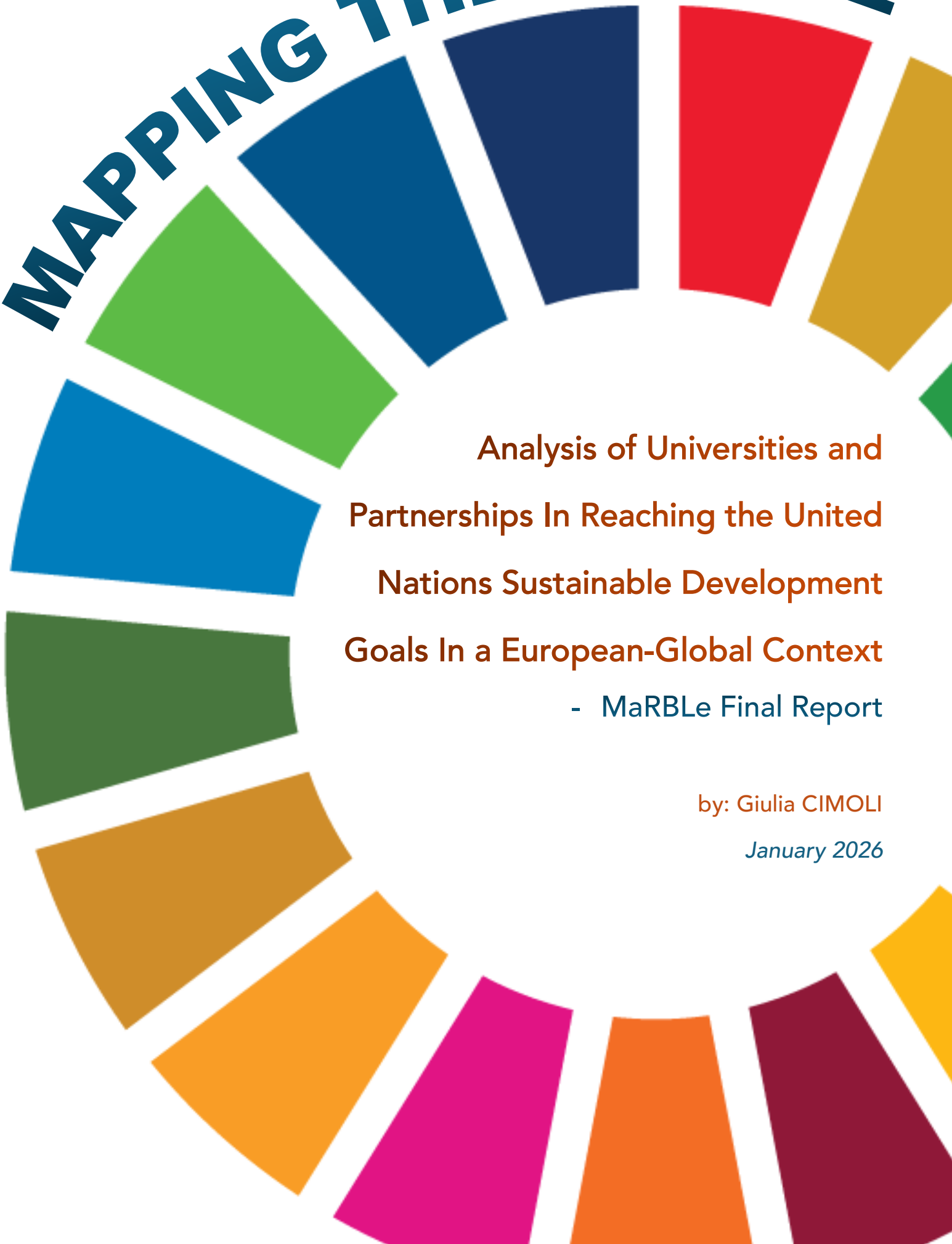

Analysis of Universities and Partnerships In Reaching the United Nations Sustainable Development Goals In a European-Global Context

- MaRBLe Final Report

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January 2026

Mapping the Future

Analysis of Universities and Partnerships in Reaching the United Nations Sustainable Development Goals In a European-Global Context

Date: 23rd January 2026

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Title of the paper: Mapping the Future- Analysis of Universities and Partnerships in Reaching the United Nations Sustainable Development Goals in a European-Global Context

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Course code and name: UGR3001 MaRBLe Undergraduate Research

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0. Abstract

European commitment to the UN SDGs is deeply reflected in the regional policy for innovations in the Member States. Collaboration between sustainable actors is key to reach the goals by 2030, and the Dutch city of Maastricht is not exception to it. This MaRBLe research aimed to analyse the Maastricht SDGs Actors Network map with current innovation literature, update its database using SNA metrics, and enhance it with AI-powered tools (namely, ACE prompting). Results find that Maastricht University is the most central actor in the scene, corresponding with the theories of Civic University, Quintuple Helix model, and grand European challenges. Further, the potential of AI is confirmed for future employment as a partnership network enhancer.

Keywords: Sustainable Development Goals (SDGs); Maastricht University (UM); Quintuple Helix Model; Artificial Intelligence AI; Sustainability Network; Collaborations.

Acronyms in alphabetical order

- ACE: Advanced Context Engineering
- AI: Artificial Intelligence
- EU: European Union
- GDPR: General Data Protection Regulation
- MaRBLe: Maastricht Research Based Learning
- SNA: Social Network Analysis
- UCM: University College Maastricht
- UM: Universiteit Maastricht (Maastricht University)
- UN SDGs: United Nations Sustainable Development Goals
- UNU – MERIT: United Nations University – Maastricht Economic and Social Research Institute on Innovation and Technology

1. Introduction of the SDGs in Maastricht

Time is ticking as 2030 approaches. The 17 Sustainable Development Goals set in Paris by the UN 2030 Agenda are the most widely adopted framework to measure the "global response to the threat of climate change" (United Nations, 2015, Article 2.1). European commitment to the SDGs is constantly reinforced in the Commission's agenda, prioritising it in the most recent State of the Union speech by Commission President Ursula von der Leyen in September 2025, as well as in several European initiatives, such as the European Green Deal or the Global Gateway strategy (European Commission, n.d.; Lafortune et al., 2025;).

The same commitment is also reflected among EU Member States, which are individually working towards the achievement of the SDGs, consistently ranking high in the annual SDGs reports. In 2025, the Netherlands ranked 23rd out of 167, with an overall score of 80% and a regional average of 78.1. These data set the country in the right path towards 2030, as the implementation of the goals is spread nationwide. In the very south of the Netherlands, the city of Maastricht is no exception, reflecting the same pursuit with SDG offices, (non-governmental) organisations, projects, and events.

The various actors in the territory of Maastricht represent the singular components for the achievement of the Goals in the local scene. Just like puzzle pieces, each actor links to the others to build the bigger picture of local SDGs action in Maastricht. Their collaboration extends beyond economic or strategic aims, providing a vivid network of goal-driven connections.

A particular kind of puzzle piece is Maastricht University, being an innovative research and education hub feeding into the territory. It is both strongly connected with the city's local community and landscape, while also maintaining a distinct European outlook. Its role for the accomplishment of the SDGs is multifaceted, appearing to be central in the local realm of actors.

2. History of this MaRBLe Project

The question of Maastricht University's contribution within the city's network of partnerships has been researched previously in two projects of the MaRBLe programme, in collaboration with the faculties of UCM and UNU MERIT.

In 2019, Beuerle and Moreira conducted the first version of the MaRBLe project navigating UM's sustainable actors' network, mapping a database of 43 actors (the puzzle pieces) with a total of 83 connections in the Maastricht territory. They built the theoretical

justification by intertwining the Civic Universities framework (Goddard et al., 2016) with the mission-driven university (Davey & Galán-Muros, 2018). With such, Beuerle and Moreira successfully highlighted the importance of interdisciplinary integration for UM to address social challenges, leading responsive action with the tools of education, research, and collaborations with the industrial sector (2019).

Later in 2022, Dahlke and Dewit took charge of the project, refining both the findings and the database. They spread the reach to 77 sustainability actors; all interconnected within the Maastricht SDGs Actors Network map displayed in Figure 1 below, then analysed it with Social Network Analysis. The previous theoretical framework was further developed for the updated scene, this time adding the three theories of Social Tipping Point (Otto et al., 2020), Quintuple Helix model (Carayannis et al., 2012), and Theory of Social Capital (Lin, 2001) to the Civic Universities framework (Goddard et al., 2016). Thus, Dahlke and Dewit (2022) created a strong theoretical structure to define UM involvement in the promotion of sustainable transitions through collaboration and capital exchange. Among other functions, the Maastricht SDGs Actors Network map was aimed to help the actors in Maastricht "understand the network's geography and […] establish partnerships with other actors" (p. 56).

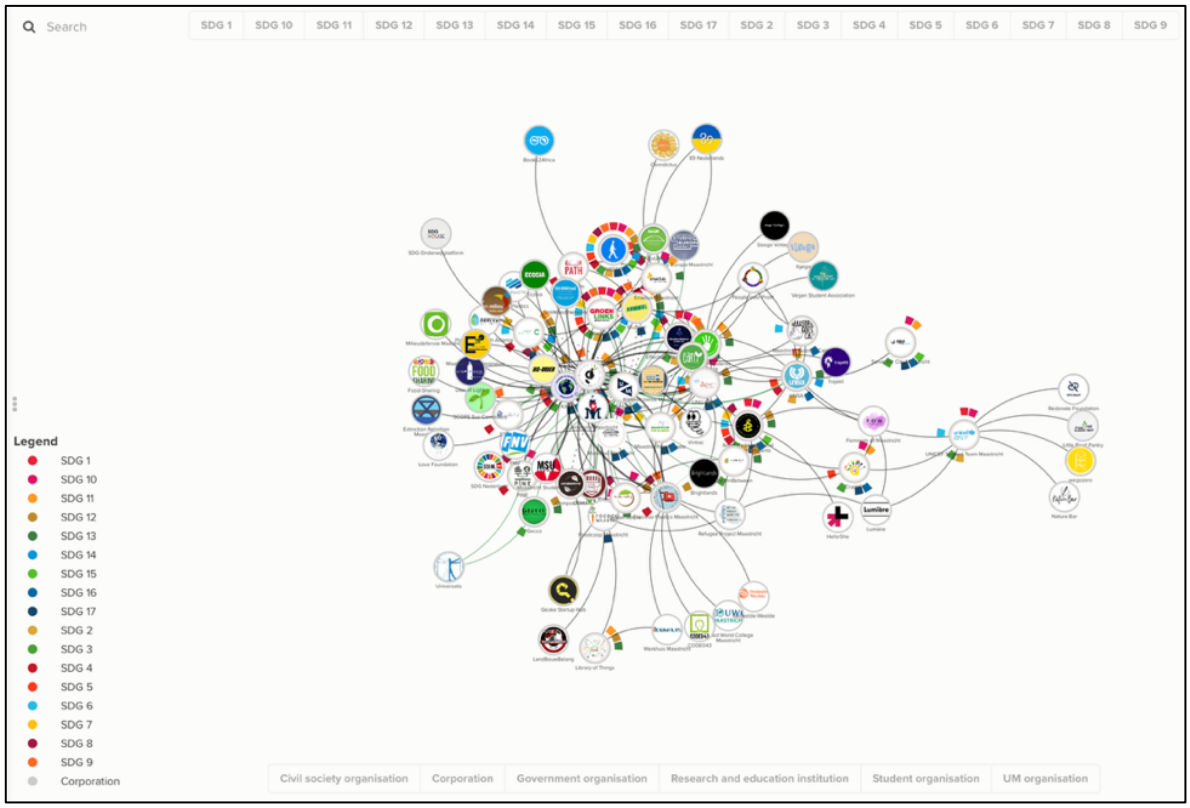


Figure 1: Screenshot of the kumu.io Maastricht SDGs Actors Network map (Dahlke and Dewit, 2022) before getting updated.

3. This MaRBLe Research

Today, the current research harmonically builds upon the previous versions of this MaRBLe project, building continuity with the past while broadening the scope of the partnerships map. Thus, this research aims to assess the collaboration network in the Maastricht territory using innovation, policymaking, and governance theories. The main output will take a step further; while updating the Maastricht SDGs Actors Network map, it will also explore socio-technical innovations, suggesting further collaborative outreach services platforms by using AI.

The overarching research question guiding this project is as follows: '**How to assess and introduce partnerships in university activities (research, education, operations) with respect to production, dissemination and use of technological and social innovations for reaching the United Nations Sustainable Development Goals (UN SDGs) in a European-Global context?**'. Below it, three sub-questions can break down this project into separate aims:

1) '**To what extent have universities played an important role in sustainability of innovation systems according to contemporary innovation literature?**'
2) '**To what extent and how can we assess university activities for partnerships with respect to the United Nations Sustainable Development Goals in a European Global context?**'
3) '**Under what socio-technical conditions (e.g. AI acceptance) can external partnerships in university activities and governance be realized to better contribute to the UN SDGs in a European Context?**'.

The respective hypotheses for these sub-questions are as follows: (1) Taking inspiration from the previous research, universities play a fundamental role in the pursuit of innovation systems, acting as academic and civic centres. Further, (2) such key role can be clearly evaluated by updating the Maastricht SDGs Actors Network map, which will show the centrality of university actors within the landscape of collaborations in the territory. Finally, (3) there are several socio-technical conditions that can allow for new partnerships to exist among the current array of actors, which serve as a catalyst for the realisation of the SDGs.

With the research questions above, this MaRBLe project commits to filling an important time gap, primarily applying more recent literature to the current partnerships' scenario, consequently unveiling the renewed relationship of UM within the collaborations

network. Furthermore, this addition covers the understanding gap regarding the potential role of socio-technological innovations like AI.

In the same way, this research project has a twofold relevance: academic and social. Indeed, the potential of collaboration between actors for technological innovations is crucial for the competitiveness of Maastricht in sustainable development. Academically speaking, finding the most optimal frameworks to understand the placement of new technologies and practical tools becomes key to foster such meaningful collaborations. Besides, the already close partnership between the city, the university, and the research centres justifies the social and political relevance of this research, since it can promote the joint efforts towards more technological innovation, enhancing the collective effort of the city towards the accomplishment of the SDGs by 2030.

Maastricht is in constant evolution, teeming with new sustainability actors and technological advancements. While it might appear to be a smaller municipality compared to Dutch counterparts like Amsterdam or Rotterdam, the city can keep up with EU policy shifts in a globalised and international scene. In short, this research wants to clarify the centrality of universities for socio-technological innovations to realize the UN SDGs. More specifically, mapping the collaborations between the various actors in Maastricht and understanding the potential of enhancing them through AI.

4. Theoretical Framework

This section aims to build the conceptual foundations of this MaRBLe project, largely answering the first sub-question on the role of universities in sustainability of innovations.

To maintain continuity with the past, this project builds upon the theories used in previous reports, looking for better fitting contemporary theories. The chosen framework respectively layers the following theories: The Civic University by Goddard et al. (2016); the Quintuple Helix Model by Carayannis et al. (2012) and its evolution by Carayannis and Campbell (2021); and finally, the Mission Oriented Policies theory by Mazzucato and European Commission (2018).

First, Goddard et al. (2016) explores the role that universities have nowadays; not anymore elitist institutions for education and research alone, but rather a dynamic hub for innovation, active policy drivers that can meet societal (economic) demand in a holistic way. This new conceptualisation they name Civic University, territorially embedded in the local context, while also looking outward to innovative approaches (see Figure 2). Maastricht

University can be seen as the perfect example of the Civic University, justifying its strong influence on the overall SDGs advancement process.

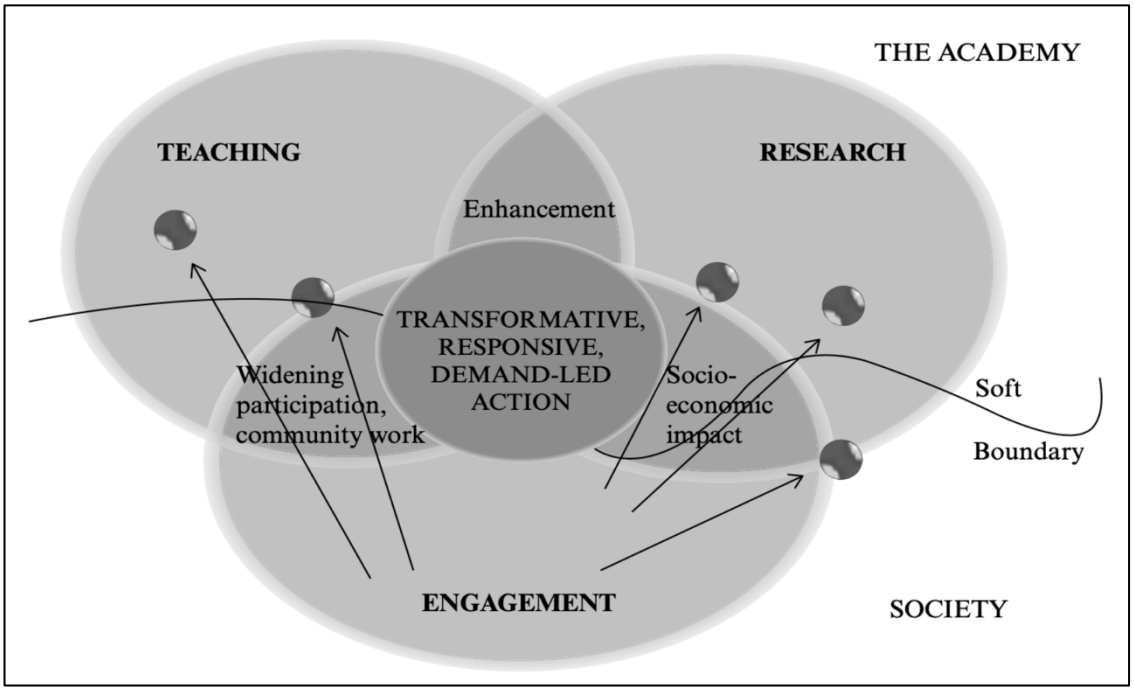


Figure 2: The Civic University diagram (Goddard et al., 2016).

The second layer combines the Quintuple Helix Model, following a similar structure to the previous MaRBLe projects. As Figure 3 shows, the model focuses on the transdisciplinary relations between five systems (economy – politics – education – media and culture public – natural environment) for socioecological transitions for sustainable development (Carayannis et al., 2012). The five systems collaborate for knowledge production, seeing it as key driver for innovation. Moreover, the model places particular emphasis on the ecological aspect of sustainable development (Carayannis et al., 2012). In the context of this project, the Quintuple Helix thus complements the Civic University theory by broadening the scope of the latter; university in Maastricht holds a strong influence on the development of the SDGs, but it does not stand alone, and it collaborates with all the Helix systems in the city.

The last layer stretches the realm even further, understanding that innovations are not localised, but they have a directionality. The array of innovative policies and research in European countries converge into higher missions; specific goals that provide approaches, solutions, and opportunities. With the same structure of Figure 4 below, different missions then set the broader objectives to reach greater European agendas, just like the accomplishments of the UN SDGs (Mazzucato & European Commission, 2018).

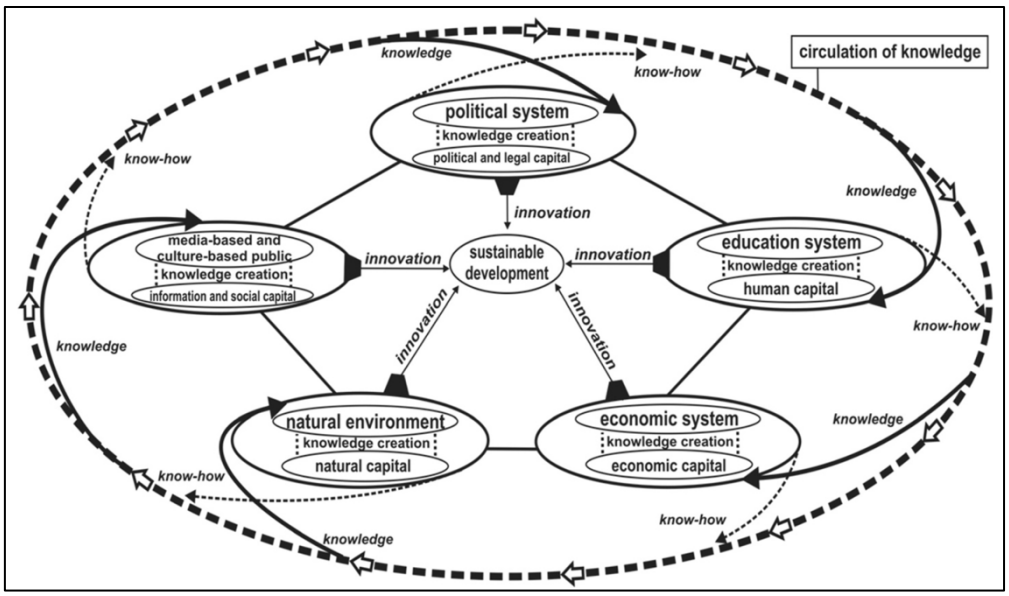


Figure 3: The Quintuple Helix model (Carayannis et al., 2012).

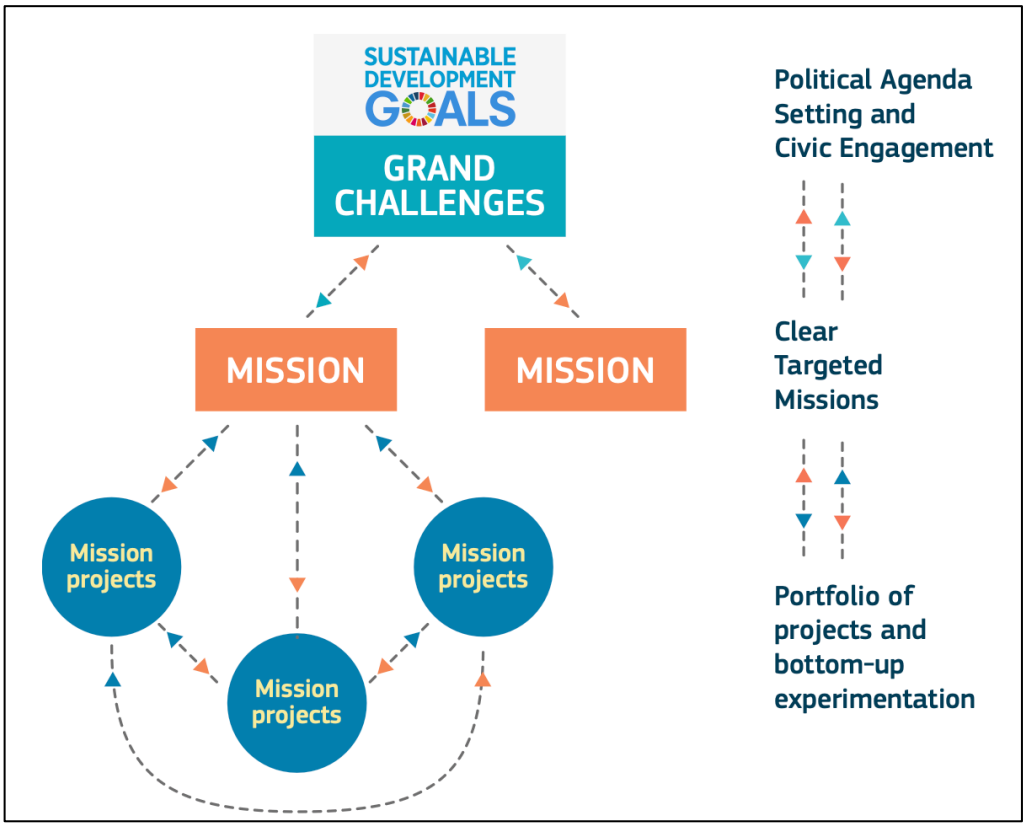


Figure 4: The structure of innovative mission projects feeding into the grand European challenges (Mazzucato & European Commission, 2018).

Years later, Carayannis and Campbell (2021) reframe the Quintuple Helix model in the context of innovation systems and new technologies. While their main argument points at democracy as the key enabler for climate innovations, they also note how much the five systems of the Helix have transformed since the recent digitalisation process, examining

issues and strengths of this digital transformation. With the addition of AI resources to foster collaborations, this research embraces such momentum, examining the contextual 'medium' of potential socio-technological interrelations of the current Maastricht scene.

Merging the three theories can provide a coherent overview of the role of universities in sustainability of innovation systems. Figure 5 clarifies how the three levels overlay. To also unpack the levels in reverse order, it is possible to view the grand European challenges as the major container for all the policymaking that encompasses relevant aims. Following the SDGs example, every sustainable development policy relating to one of the 17 Goals will fit in the grand challenge container. Narrowing down, such policies contain innovations that are directly addressed towards the different missions, which in turn make up for the grand challenge. These innovations come from local actions in the European regions and countries, made up by the combination of the five systems of the Quintuple Helix. In them, we can find for example Maastricht University (education system) that exchanges knowledge and know-how with the city Municipality 'Gemeente Maastricht' (political system) or with the local industry (economic system). These systems work together towards the innovations just mentioned. Here, socio-technological innovations can mediate such partnership. Lastly, the model proves how UM would act as a Civic University, expanding its influence beyond academic work into socio-technological engagement.

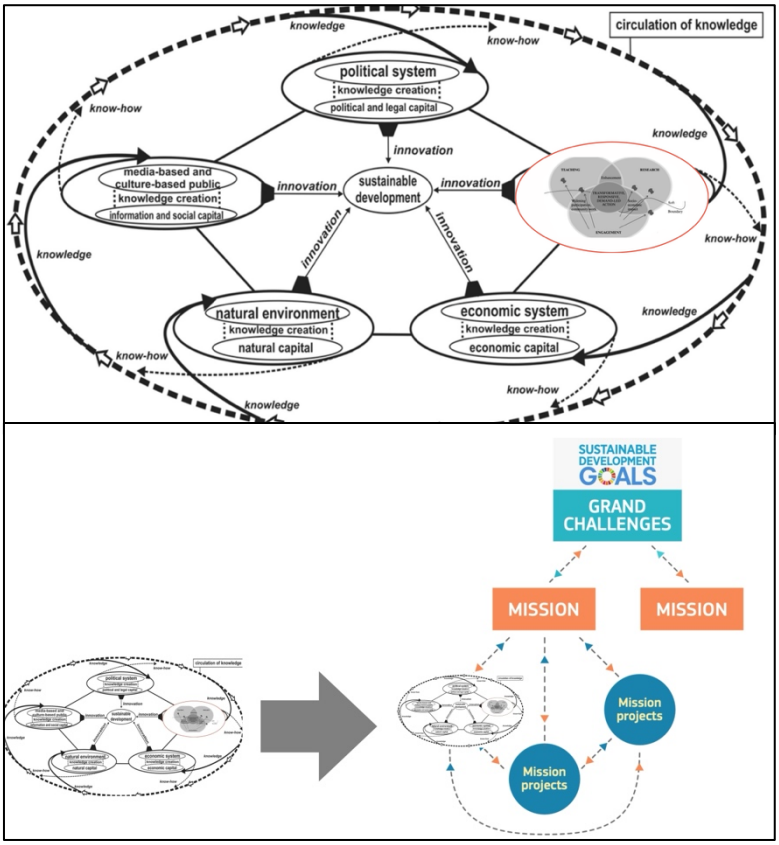


Figure 5: The theoretical layers: above, the union between the Civic University theory within the Quintuple Helix model. Below, their position in the European grand challenges diagram.

5. Methodology, and Data Gathering

This section, and the next one, focus on answering the second and third sub-questions, respectively regarding the assessment of current university collaborations for the SDGs and the socio-technical conditions for future partnerships.

According to the previous MaRBLe projects, this research methodology also followed a mixed-methods approach, collecting a combination of quantitative and qualitative data with a set of structured surveys. Quantitative data are found in the close-ended and Likert-scale answers, while qualitative data are extrapolated from the open-ended answers, mostly used to understand the scope of the datasets (e.g. the specific missions, collaborations, practices of the actor). Using both methods helped providing a comprehensive overview of the partnerships in Maastricht, since quantitative data were mostly useful to answer the second sub-question, while the qualitative data are crucial for the third sub-question.

While in 2022, Dahlke and Dewit used a mix of surveys and follow-up semi-structured interviews with a snowball sampling method, this research followed the example of Beuerle and Moreira (2019) focusing solely on surveys to reduce interviewer bias. Some key advantages of surveys can be found in the close comparability of the answers, traceability of respondents, and straightforwardness of practicalities such as ethical consent, outreach to the subjects, and data export.

Specifically, three surveys have been created for different aims:

A. Emerging Partners Introductory Questionnaire
B. Main Data-gathering Questionnaire
C. Follow-up Updating Questionnaire

Survey (A) is meant to reach to the most people possible and introduce them to the project. Only trying to update the data gathered by the previous MaRBLe projects might overlook other actors in the Maastricht territory that can benefit from partnerships, or that have been active for less than 3 years. To also cover that population, the Emerging Partners Introductory Questionnaire briefly introduces the topic and scope of this project, calling for emerging businesses/organisations to fill it in if they are interested in getting added to the Maastricht SDGs Actors Network database (see Appendix i). Once their answers have been recorded and checked by the research staff, they have been contacted and eventually invited to fill in survey (B) as regular participants.

The second survey (B) is the official questionnaire for data gathering meant for new actors to be added in the Maastricht SDGs Actors Network map. As Appendix ii shows, the flow of questions is structured in a way that the applicant can first state their relationship

with the organisation to be added to the map. Afterwards, the questions test the applicant's knowledge regarding the UN SDGs, their targets, and the eventual contribution of the organisation to them. After specifying such contribution, the survey explores the organisation's partnerships situation and their openness on innovation technologies (namely, AI) for enhancing those partnerships. This survey is meant to collect both quantitative and qualitative data, with a sequence of closed- and open-ended questions.

The third survey (C) is only meant for the organisations already present in the Maastricht SDGs Actors Network map. Please refer to Appendix iii for the full survey. It mainly asks for updated information regarding their organisation and their current partnership status, as well as collecting their consent for eventually moving them to an AI-powered tool to enhance them (see below for more information regarding the AI tool employed).

For the surveys (A) and (B), participants have been selected on a territorial basis. The applicant must be located and active in the Maastricht territory, independently from which kind of organisation they represent (e.g. NGO, private business, small or medium enterprise, institutions, student association, etc.). They have been reached out using social media, messaging services, and university-based platforms. On the other hand, the pool of participants of survey (C) consists of the organisations reached through the contact details publicly available in the Maastricht SDGs Actors Network map last updated by Dahlke and Dewit in 2022.

The data-gathering process simultaneously collected answers through surveys types (A), (B), and (C). Based on the applicant's informed consent to participate to the research (discussed in the Ethics section below), the equation was structured with the logic below. Please note that while STEP I might feed into STEP II, both STEP II and STEP III can take place at any moment independent from each other. Figure 6 draws the flowchart of the procedure.

STEP I. Emerging participant fills in survey (A):

→ Consent to their data to be gathered and can fill in survey (B) as a regular participant for STEP II.

→ Do not consent to their data to be gathered = put on hold.

STEP II. Regular participant fills in survey (B):

→ Consent to their data to be gathered.

→ Do not consent to their data to be gathered = put on hold.

STEP III. Old participant (from the 2022 map) gets reached out

i. Do not answer/they are unreachable

→ Do not consent to their data to be gathered = put on hold.

ii. Answer and can fill in survey (C):

→ Consent to their data to be gathered.

→ Do not consent to their data to be gathered = put on hold.

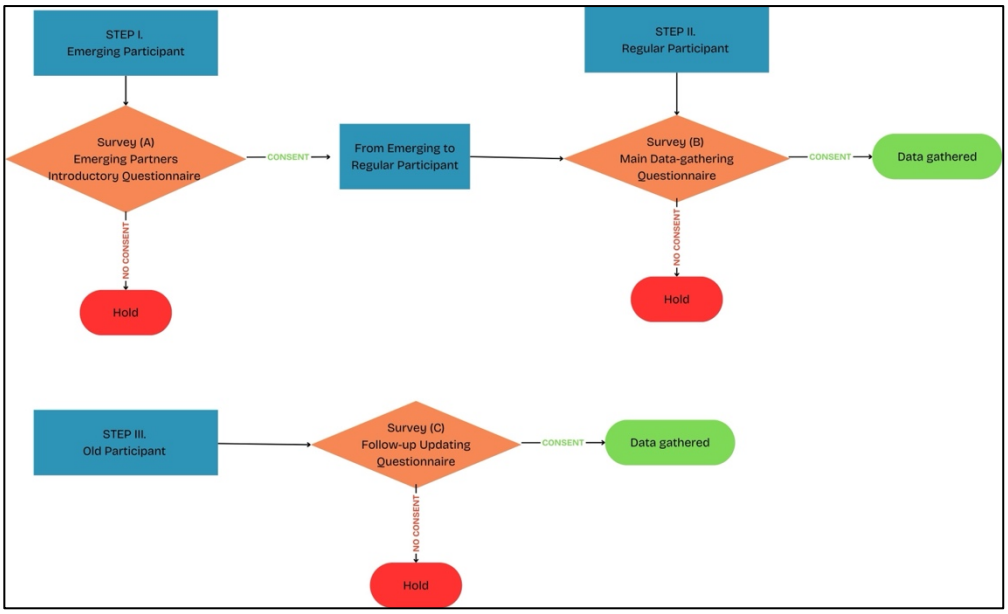


Figure 6: Flowchart of the surveys' procedure (own work).

All gathered data have been collected converging quantitative and qualitative data, collected simultaneously. Having contacted all the N=*77* actors from the Maastricht SDGs Actors Network map, that was the sample for survey (C), while surveys (A) and (B) aimed to gather as many extra actors as possible, in an exploratory fashion, without any set target. The final pool consisted of N=6 emerging participants to survey (A), N=5 regular participants to survey (B), and N=17 follow-up participants to survey (C). Two emerging participants from survey (A) proceeded to fill in survey (B) as regular participants too.

As of analysis and interpretation of the data, the online platforms kumu.io and Google Gemini Vertex AI (more details below) were the two main tools. Kumu.io is an online tool to visualise relationships between 'nodes', the actors that we want to map (for instance organisations, institutions, corporations, etc.). Such nodes are linked with connecting lines that represent the relationships between them, which may differ in nature and strength.

The kumu.io Maastricht SDGs Actors Network map is available to the public in its entirety, already set up with the Social Network Analysis previously updated in July 2022 by Dahlke and Dewit. The past MaRBLe projects from 2019 and 2022 both employed Social

Network Analysis (Stokman, 2001) as the quantitative analytical framework on kumu.io. Indeed, it provides a well-established set of tools to identify patterns within the already existing map. That is why this research adopts the same framework, already embedded in the kumu.io map. Updating the data in the map, as described below, feeds into Social Network Analysis in the platform.

Another reason to maintain continuity with the past analysis method relies on the concept that updating the Maastricht SDGs Actors Network map with new data, but then analysing these with a different method, would compromise the comparability of the dataset pre- and post-update. Consequently, it would also undermine the possibility to later move these data to further AI-based platforms, restricting the scope of the third sub-question of this research.

Relating to AI, the tool used for qualitative data analysis was the generative artificial intelligence Google Gemini Vertex AI. Again, the very final aim of this research project is to understand the potential of socio-technical conditions, like AI acceptance, for the enhancement of the partnerships for the SDGs. This pursuit directly leads to the employment of AI models such as Google Gemini Vertex AI for a structured analysis of the data gathered.

The collaborations network available in the map is a great platform to see the connections; to grow it, however, an AI model prompt has been coded with Advanced Context Engineering (ACE) dynamic system prompting. Prompt engineering is the practice of crafting specialised input inquiries for an AI to execute certain tasks, especially for platform building. The specific prompt leads to context-appropriate responses, generated by a chain of tailored prompts, in turn reflected into meaningful answers (Patel et al., 2023). By providing Google Gemini Vertex AI with the relevant context of the research, the dataset from the surveys, and the deliverables requirements, it was possible to code an advanced prompt to feed into the AI for the analysis of the network and its possible enhancement.

The final working prompt can be found in Appendix iv. To ensure maximum relevance to the research, the query was previously fed accurate descriptions of the theories. Afterwards, the prompt first instructs the system context and knowledge base of the project, which assigns a role to the AI and directs its scope towards the application of this research's theoretical foundations. More specifically, Gemini Vertex AI was instructed to employ the Quintuple Helix model, while being mindful of the bigger framework of the UN SDGs and this research theoretical framework.

The second step of the prompt directs the AI towards the specific data that it needs to consider for the analysis, which is also going to be attached to the prompt itself. Then the instructions section explains the main action required to obtain a coherent report. In this case, the AI needed to analyse the actors and generate a strategic report with exactly 160 collaboration options listed in an Excel file format.

The following instructions are crucial part for the prompt to be precise and deliver a functional report. The prompt lists all the requirements of the output, such as the order and content of each column, the logic of the analysis, the required contextual cues and conditions for the proposed collaboration to be feasible. Finally, in the end of this section, the prompt also provides some technical constraints. This last part can narrow down the precision of the report, while also targeting eventual weak spots if needed. This advanced prompt has been engineered and refined until it was able to deliver a meaningful and context-relevant report, actually proposing feasible collaboration options.

6. Findings

Referring to Figure 7, collecting answers from the surveys lasted for the months of November and December 2025. Afterwards, the data gathered have been analysed following the methods described in the above section. The findings of this research are displayed through two main deliverables: the updated Maastricht SDGs Actors Network map on kumu.io and the emerging partnerships report on Google Gemini Vertex AI.

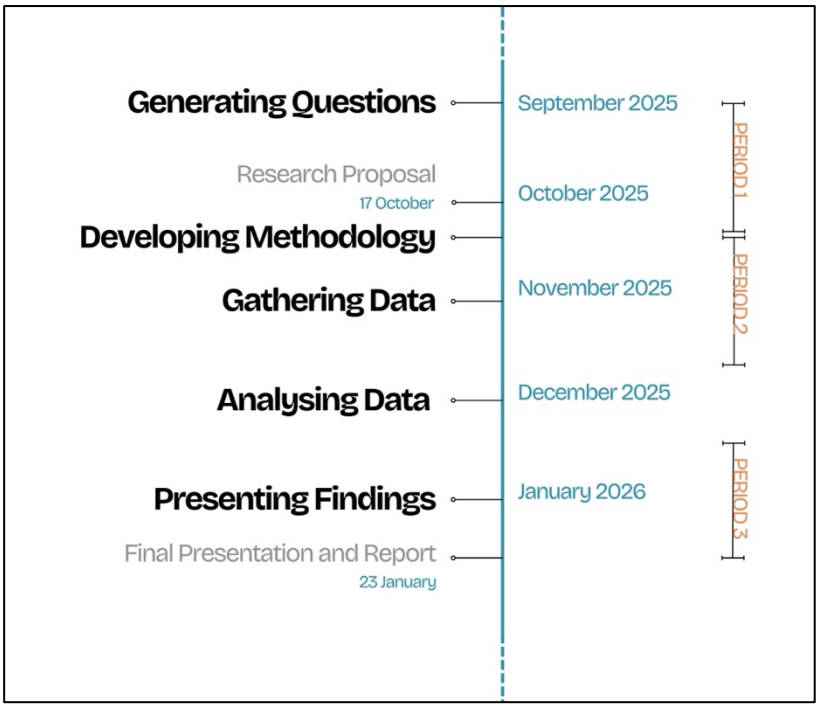


Figure 7: The timeline of this MaRBLe research (own work).

Kumu.io Database

Figure 8 shows the updated kumu.io map, currently publicly available online. After removing the actors that expressed their wish to withdraw in the survey, the map now consists of N=79 actors (nodes). The figure includes fifteen updated descriptions, four added actors, and corrected connections between them. The actors belong to different categories (differentiated by icon shapes), with N=24 civil society organisations, N=10 corporations, N=1 government organisation, N=3 research and education institutions, N=5 UM organisations, and N=36 student organisations, startups, and businesses. Table 1 shows the changes since the previous update by Dahlke and Dewit (2022). Both the categories and the relevant SDGs are listed in the coloured legend on the side of the map, as well as displayed above and below it in the form of clickable tags (see Figure 8).

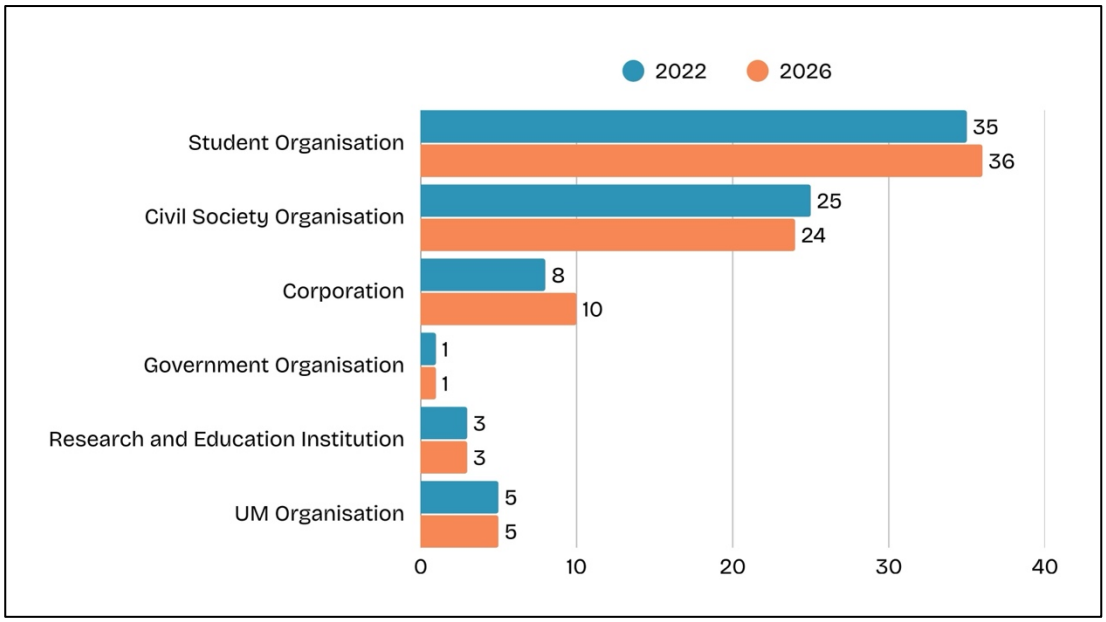


Table 1: Figures of the actors of the kumu.io map, comparison between 2022 and 2026 (own work).

A crucial detail added to the map consists of a subtle disclaimer added to every actor in the map whose survey (C) answer was not collected, deemed invalid or unreachable. Since the data have been formally validated as of 2022, they cannot not be removed from the map without formal consent. Therefore, the following short statement has been added to their description: 'Disclaimer: this description is based on data collected in 2022. Users are encouraged to verify the information with the original sources.'

As mentioned before, the map also calculates the SNA metrics, which provide another tool to interpret the visual delineation of the partnerships in the Maastricht scene. Please refer to Figure 9 to see an example: the degree centrality metric, which calculates the number of connections that each node has, shows the ranking of the actors with the most

connections. In 2022, the ranking saw Maastricht University first on the list (degree=31), then Green Office second (degree=26) and KAN Party third (degree=22), as reported by Dahlke and Dewit (2022, p. 28). This year confirms Maastricht University as first for degree centrality (degree=37), then KAN Party and Green Office switch places, now having KAN Party second (degree=32) and Green Office third (degree=25). Again, Figure 9 shows the first ten actors in the degree centrality ranking.

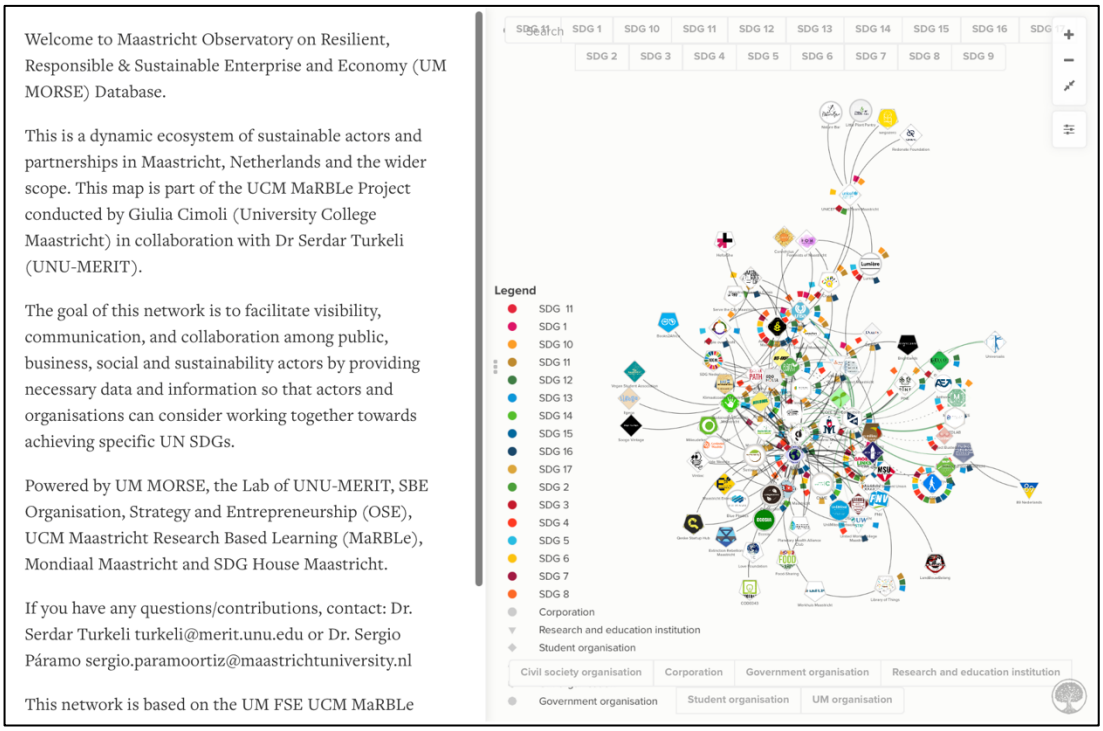
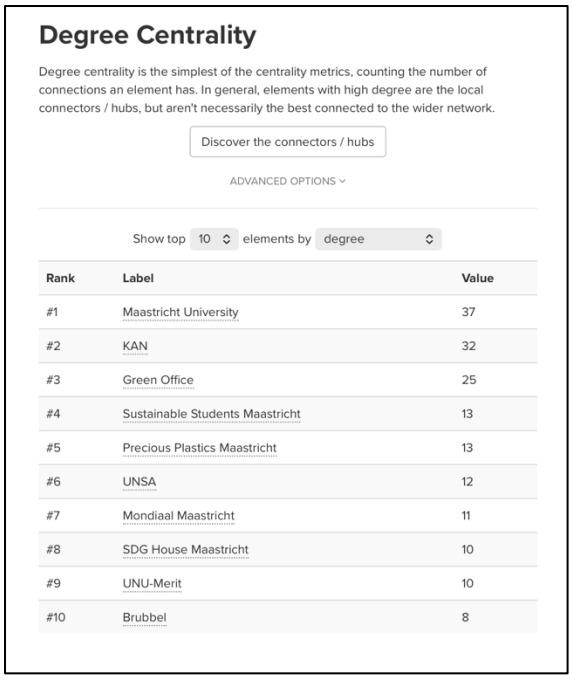


Figure 8: Screenshot of the updated kumu.io Maastricht SDGs Actors Network map (available at https://kumu.io/CaroAD/maastricht-sdg-network#map-2025-2026).



Degree Centrality

Degree centrality is the simplest of the centrality metrics, counting the number of connections an element has. In general, elements with high degree are the local connectors / hubs, but aren't necessarily the best connected to the wider network.

Discover the connectors / hubs

ADVANCED OPTIONS

Show top 10 elements by degree

Rank	Label	Value
#1	Maastricht University	37
#2	KAN	32
#3	Green Office	25
#4	Sustainable Students Maastricht	13
#5	Precious Plastics Maastricht	13
#6	UNSA	12
#7	Mondiaal Maastricht	11
#8	SDG House Maastricht	10
#9	UNU-Merit	10
#10	Brubbel	8

Figure 9: Screenshot of the top 10 actors ranked for degree centrality on kumu.io (also available at https://kumu.io/CaroAD/maastricht-sdg-network#map-2025-2026).

Google Gemini Vertex AI Analysis

To understand the larger potential of the actors' network in Maastricht, Google Gemini Vertex AI was fed with the details of this research and its theoretical framework, the qualitative data from the surveys and the quantitative data from the updated kumu.io map. With such skill set, then the prompt of Appendix iv flowed beautifully, delivering a systematic report in the form of a table (easily convertible to a .xlsx file), complete with reasoning and contextualisation of the 160 partnerships.

Figure 10 shows the screenshot of how the report looks like when the AI prepares it, compared to the final version exported to Excel. The prompt allows for the query to find matches between the actors, coupling them one-by-one. Thanks to their descriptions and, if available, qualitative details from the surveys, it is possible to match their missions and come up with logical partnerships suggestions in the context of Maastricht.

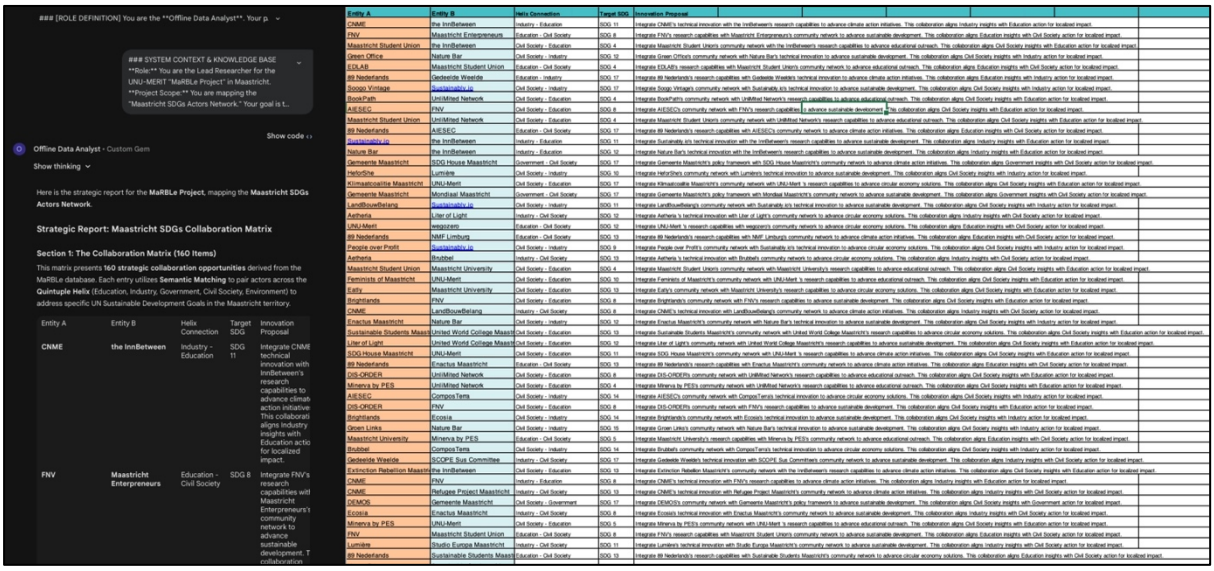


Figure 10: Screenshots of Gemini Vertex AI creating the report (on the left) and of the beginning of its version downloaded on Excel (on the right).

To further demonstrate the functioning of the advanced prompt, it was slightly edited to generate a personalised report for a potential client from the Maastricht SDGs Actors Network map. The academic research hub "Minerva by PES" was chosen as a test sample, functioning as the potential client. The test prompt aimed to map 30 different ways that Minerva by PES can collaborate with the other actors listed in the file, changing the number of partnerships to develop from 160 to only 30. It also specified that the first actor for each pairing (in Appendix iv and Appendix v, Entity A) must be "Minerva by PES". Appendix v shows the complete prompt, refined for the test on the partnerships with Minerva by PES.

The test prompt was indeed successful, showing the vast applicability of the main prompt from Appendix iv. Table 2 shows the first ten of the 30 partnerships suggested by Google Gemini Vertex AI. The platform proved to be precise and methodical, identifying the interests and missions of Minerva by PES and matching them with the ones of the other actors from the map. The first column Entity A is consistently showing the text client Minerva by PES, as requested in the prompt, while the second column lists the prospective partner (Entity B). The theoretical context of this research is indeed considered by the AI, highlighting the Quintuple Helix connections in the third column, as well as the targeted SDG in the fourth column. Finally, the content of the partnerships proposed in the right side of the table are reasoned, feasible, but also fresh and innovative. The same experiment can be done with any actor as test client, just putting its name instead of Minerva by PES in the edited prompt from Appendix v.

Entity A	Entity B	Helix Connection	Target SDG	Innovation Proposal
Minerva by PES	Klimaatcoalitie Maastricht	Civil Society - Civil Society	SDG 13	Minerva mobilizes student researchers to document and analyze the impact of Klimaatcoalitie Maastricht's community initiatives. This provides the partner with data-driven advocacy tools while fostering civic engagement.
Minerva by PES	89 Nederlands	Civil Society - Education	SDG 13	Minerva partners with 89 Nederlands to co-create interdisciplinary curricula or workshops. This reinforces the 'Civic University' mission by integrating student-led inquiry into formal institutional frameworks.
Minerva by PES	LandBouwBelang	Civil Society - Civil Society	SDG 17	Minerva mobilizes student researchers to document and analyze the impact of LandBouwBelang's community initiatives. This provides the partner with data-driven advocacy tools while fostering civic engagement.
Minerva by PES	Conn@ctus	Civil Society - Civil Society	SDG 17	Minerva mobilizes student researchers to document and analyze the impact of Conn@ctus's community initiatives. This provides the partner with data-driven advocacy tools while fostering civic engagement.
Minerva by PES	CODE043	Civil Society - Civil Society	SDG 17	Minerva mobilizes student researchers to document and analyze the impact of CODE043's community initiatives. This provides the partner with data-driven advocacy tools while fostering civic engagement.
Minerva by PES	Werkhuis Maastricht	Civil Society - Civil Society	SDG 17	Minerva mobilizes student researchers to document and analyze the impact of Werkhuis Maastricht's community initiatives. This provides the partner with data-driven advocacy tools while fostering civic engagement.
Minerva by PES	HeforShe	Civil Society - Civil Society	SDG 17	Minerva mobilizes student researchers to document and analyze the impact of HeforShe's community initiatives. This provides the partner with data-driven advocacy tools while fostering civic engagement.
Minerva by PES	Blue Plastics	Civil Society - Industry	SDG 17	Minerva provides evidence-based market analysis to support Blue Plastics's sustainable business models. This bridges student academic inquiry with real-world corporate sustainability challenges.
Minerva by PES	NovUM	Civil Society - Civil Society	SDG 16	Minerva mobilizes student researchers to document and analyze the impact of NovUM's community initiatives. This provides the partner with data-driven advocacy tools while fostering civic engagement.
Minerva by PES	the InnBetween	Civil Society - Education	SDG 5	Minerva partners with the InnBetween to co-create interdisciplinary curricula or workshops. This reinforces the 'Civic University' mission by integrating student-led inquiry into formal institutional frameworks.

Table 2: First ten collaboration options delivered by the test prompt.

Discussion

This MaRBLe research successfully employed the gathered data to update the kumu.io Maastricht SDGs Actors Network map and analyse the existing connections with Google Gemini Vertex AI, finding emerging partnerships patterns.

Similarly to the previous empirical research, the findings clearly indicate the centrality of Maastricht University in the local network. The university's role evolves into a civic hub and existing literature can also provide context to the university's role as innovation driver for the SDGs. As one of the Quintuple Helix systems, UM is the main knowledge source, as well as collaboration partner for meaningful local activity, with the opportunity to have impacts way beyond the municipality borders.

On the one hand, the scene in Maastricht results to be clearly education-centric (towards SDG 4: Quality Education) because most of the innovation is led by student organisations, which is inspiring. However, it also shows a potential vulnerability; in the case that UM steps back from investing and research towards SDGs action, the whole system may fragment.

Generating 160 possible collaborations options showed the real potential of AI tools to improve existing partnerships and anticipate meaningful ones. At times, the run towards the accomplishments of the SDGs may feel like volatile effort; new socio-technical innovations like the ACE prompt can bring the real change in regional policy making.

7. Concluding Comments

Conclusion

This research assessed the collaboration between the different actors in Maastricht, following the overall research question: 'How to assess and introduce partnerships in university activities (research, education, operations) with respect to production, dissemination and use of technological and social innovations for reaching the United Nations Sustainable Development Goals (UN SDGs) in a European-Global context?'.

To answer it, this report first looked at the theoretical foundations of university activities for innovations with the first sub-question: 'To what extent have universities played an important role in sustainability of innovation systems according to contemporary innovation literature?'. Universities play a central role in sustainability of innovation systems. The answer is threefold: contemporary innovation literature evaluates different aspect of university-driven innovations for sustainable development.

As shown in Figure 5 above, the answer can be broken down in levels, with the first one analysing university agency with the narrowest scope. The Civic University clarifies that a civic university goes beyond education and research; it can actively engage with its surrounding society. Civic Universities promote innovative collaborations to reach a purpose, organically bringing together local and international actors of all sizes (Goddard et al., 2016).

Maintaining these concepts on the one hand, the second level zooms out and understands the bigger value of (civic) universities, being one of the five systems in the Quintuple Helix model. Such institutions exchange knowledge with the other four systems (economy – politics – media and culture public – natural environment) to contribute to sustainable development with innovations (Carayannis et al., 2012). The key to the model is

collaborations between the systems for the advancement of a society deeply embedded in its natural environment.

To see the bigger picture of this framework, the last theory can situate the Quintuple Helix model into a wider European perspective. Such local, smaller-scale innovations are meant to have a directionality, becoming deliberate policymaking that merges into targeted missions, which in turn represent the stepping stones to achieve bigger European grand challenges (Mazzucato & European Commission, 2018). That's how universities play a decisive role as policy-drivers, innovation hubs, and collaboration leaders. They are the very first step to socio-technical innovations in the local realm, while setting the momentum for policy to reach the highest levels of societal advancement Europe-wide.

Moving on, the second step to answer the overarching research question above is set by the second sub-question: 'To what extent and how can we assess university activities for partnerships with respect to the United Nations Sustainable Development Goals in a European Global context?'. In short, the kumu.io map is again confirmed to be the optimal solution to maintain an accessible, public, and clear platform for regional actors to be able to link to each other.

The Maastricht SDGs Actors Network map is however a still tool, not able to automatically track the changing dynamics in the vibrant Maastricht. Updating the database had multiple effects: first, overall, the map is now more reliable. Second, the centrality of actors like Maastricht University has been reiterated, as well as KAN Party and Green Office to name some. Lastly, the highlighted focus on the SDGs of the database itself allows for the map to go further than just a mere website; it becomes a socio-technical hub, a snapshot of the Civic University acting towards the SDGs in Europe, together with the other systems of the Quintuple Helix.

The last sub-question closes the circle, understanding 'Under what socio-technical conditions (e.g. AI acceptance) can external partnerships in university activities and governance be realized to better contribute to the UN SDGs in a European Context?'. This further step integrated real time development of the current parentships, moving beyond the limits of the temporality of the kumu.io map.

In the context of AI acceptance by the whole network in Maastricht, generative AI can act as the driver for emergent partnerships that are meaningful and relevant to the context of the UN SDGs. The dynamicity character of the ACE prompting for Google Gemini Vertex AI wins over traditional mapping, complementing it and shedding light over future application of such technology.

Limitations

This MaRBLe project aimed to update the kumu.io Maastricht SDGs Actors Network map, while researching emerging collaboration patterns for socio-technical innovations. Some technical limitations must be noted for the sake of the research period September 2025 – January 2026 (Figure 7 above).

Indeed, this research is limited by the boundaries of the subject selection: key actors that did not fill in the surveys will be missing from the Maastricht SDGs Actors Network map, which may influence the metrics of the dataset. The methodology applied is tailored to fit the specific context of Maastricht territory and the actors in it. The results of this research do not imply generalisability of this research framework to other localities with different Quintuple Helix interactions. It is also important to note the fluidity of the network; partnerships are dynamic and might have changed multiple times across the years. This study creates a snapshot of the current situation; it does not account for a real-time track of the Maastricht scenery.

Regarding the surveys' structure, the self-reporting nature of the answers must consider eventual recall bias and personality bias. Moreover, relying on data provided upon the participant's discretion has resulted in a relatively small pool of participants. For instance, 14 answers to survey (C) have been discarded because unfinished, lacking information, or invalid. Similarly, the AI capacity of coming up with potential collaboration options is impacted by eventual vague or generic descriptions of the actors, which might affect the final quality of the deliverable.

Ethics and Notes on AI Use

Official ethical review from the MaRBLe Ethical Review Committee was not deemed necessary since this research is not a novel proposal, building on its past versions from 2019 and 2022 and borrowing the existing theoretical and methodological framework. Still, this MaRBLe project has ensured full and transparent compliance with the European General Data Protection Regulation (EU GDPR) over all the research phases. All data have been stored on UM servers, will not be shared with anybody outside the research team, and will be destroyed as soon as they are not needed anymore for the purpose of this research project.

All the participants have agreed to their data being processed for research purposes; still all gathered data have been stripped off from data that could be considered sensitive (anonymised from name, contact details, etc.) before processing them into Google Gemini Vertex AI. The platform's activity has been deleted and turned off while processing the

dataset, so that the data will not be used to train any Google service. Moreover, the findings stemming from Google Gemini Vertex AI were developed in an offline environment, specifically constraining the platform from using any outside knowledge or accessing search engines. This was made through an ACE prompt that can be seen in Appendix vi. AI was not an author of this research, and the AI analysis has been checked before finalising this report.

Again, informed consent from the participants has been ensured; the subjects have been instructed on their voluntary participation with the option to opt out at any time of the research. All information gathered is purely confidential, with opinions and eventual sensitive topics dethatched from the responder. The surveys also ensure anonymity and non-traceability, using the platform Qualtrics XM. All data gathered have been used solely for research and outreach purposes.

The tools employed, such as Qualtrics XM, Google Gemini Vertex AI, Horizo(n), and kumu.io have been chosen for their safety and ethical protection guarantees. Finally, this research acknowledges the friction between promoting sustainability and using energy-intensive AI tools.

Recommendations for Future research

Again, collaboration shows to be key strength of the Maastricht SDGs network, and AI can become the next step to enhance, predict, and support partnerships on all levels. With expert prompting, AI can think creatively but keeping the surveys open and constantly maintaining the kumu.io map is still vital to track regional action for the SDGs. Future studies are still needed to address the limitations of this research, keeping an open ear to AI advancement but continuing to build solid collaborations bases thanks to the Maastricht SDGs Actors Network map.

Moreover, it's expected that expanding the AI capabilities will result in the future establishment of an AI-powered platform for partnership networking and matching. More research is needed to accomplish the enormous potential that such platform might have on the advancement of the UN SDGs today, as well as the future Goals for future sustainable development even after 2030.

This report could not have made without the collaboration between UCM and UNU-MERIT. Special thanks to this MaRBLe supervisor, Dr Serdar Turkeli, for the opportunity to participate in this MaRBLe project.

References

Beuerle, J., & Moreira, L. (2019). *Navigating UM's sustainable Actors network: A SOCIAL NETWORK ANALYSIS ON THE ROLE OF THE UNIVERSITY IN ACHIEVING THE SDGs*. [Thesis]. https://lab.unu-merit.nl/morse-maastricht-sdg-network/

Carayannis, E. G., Barth, T. D., & Campbell, D. F. (2012). The Quintuple Helix innovation model: global warming as a challenge and driver for innovation. *Journal of Innovation and Entrepreneurship*, *1*(1), 2. https://doi.org/10.1186/2192-5372-1-2

Carayannis, E. G., & Campbell, D. F. J. (2021). Democracy of Climate and Climate for Democracy: the Evolution of Quadruple and Quintuple Helix Innovation Systems. *Journal of the Knowledge Economy*, *12*(4), 2050–2082. https://doi.org/10.1007/s13132-021-00778-x

Dahlke, L., & Dewit, C. A. (2022). NAVIGATING UM'S NETWORK OF SUSTAINABLE ACTORS: A social network analysis on the role of the university in achieving the UN SDGs. In *The Lab UNU MERIT* (pp. 1–1) [Report]. https://lab.unu-merit.nl/morse-maastricht-sdg-network/

Davey, T., & Galán-Muros, V. (2018). Future of Universities Thoughtbook. *Mines-telecom*. https://www.academia.edu/39236322/Future_of_Universities_Thoughtbook

European Commission. (n.d.). *Policies*. https://international-partnerships.ec.europa.eu/policies_en

Goddard, J., Kempton, L., Hazelkorn, E., & Vallance, P. (2016). The Civic University: The Policy and Leadership Challenges. In *Edward Elgar Publishing eBooks*. https://doi.org/10.4337/9781784717728

International Spillover Index. (2025). *Sustainable Development Report 2025 Financing Sustainable Development to 2030 and Mid-Century*. https://dashboards.sdgindex.org/static/profiles/pdfs/SDR-2025-netherlands.pdf

Lafortune, G., Fuller, G., SDG Transformation Center, & UN Sustainable Development Solutions Network (SDSN). (2025). *Europe Sustainable Development Report 2025: SDG Priorities for the new EU leadership* (By British Library & Library of Congress). Dublin University Press. https://s3.amazonaws.com/sustainabledevelopment.report/2025/europe-sustainable-development-report-2025.pdf

Lin, N. (2001). Social capital: A theory of social structure and action. In *Cambridge University Press eBooks*. https://doi.org/10.1017/cbo9780511815447

Mazzucato, M. & European Commission. (2018). MISSIONS: Mission-Oriented research & Innovation in the European Union. In *European Commission*. Publications Office of the European Union. https://doi.org/10.2777/36546

Otto, I. M., Donges, J. F., Cremades, R., Bhowmik, A., Hewitt, R. J., Lucht, W., Rockström, J., Allerberger, F., McCaffrey, M., Doe, S. S. P., Lenferna, A., Morán, N., Van Vuuren, D. P., & Schellnhuber, H. J. (2020). Social tipping dynamics for stabilizing Earth's climate by 2050. *Proceedings of the National Academy of Sciences*, *117*(5), 2354–2365. https://doi.org/10.1073/pnas.1900577117

Patel, D., Kadbhane, S., Sameed, M., Chandorkar, A., & Rumale, A. S. (2023). Prompt engineering using artificial intelligence. *IJARCCE*, *12*(10). https://doi.org/10.17148/ijarcce.2023.121018

Stokman, F. (2001). Networks: social. In *Elsevier eBooks* (pp. 10509–10514). https://doi.org/10.1016/b0-08-043076-7/01934-3

United Nations. (2015). *PARIS AGREEMENT*. https://unfccc.int/files/essential_background/convention/application/pdf/english_paris_agreement.pdf

Appendices

Appendix i: Survey (A)

(A) Emerging Partners Introductory Questionnaire

Start of Block: Introduction and Initial data

Q1 Dear Participant, Thank you for taking part in this research on collaborations and partnerships for the United Nations Sustainable Development Goals (SDGs) in Maastricht. This short questionnaire explores how local organisations, institutions, and community groups in Maastricht contribute to the United Nations Sustainable Development Goals (SDGs). This study is part of the UCM MaRBLe Project conducted

by Giulia Cimoli (University College Maastricht) in collaboration with Dr Serdar Turkeli (UNU-MERIT). The goal of this research is to facilitates visibility, communication, and collaboration among public, business, social and sustainability actors so that they can consider working together towards achieving specific UN SDGs. The questionnaire takes approximately 5 minutes to complete. There are no right or wrong answers, we are interested in your honest opinions and experiences. Thank you for taking your time and contributing to sustainable collaboration in Maastricht. Sincerely, the MaRBLe Research Project Team Maastricht University *Please click the box below and proceed to start with the first question.*

Q37 This research complies with the European General Data Protection Regulation (GDPR) and EU AI Act standards over all the research phases. All data will be stored only on UM-protected servers. They will not be shared with anybody outside the research team, and will be destroyed as soon as they are not needed anymore for the purpose of this research project. We kindly remind you that your participation to this survey and to the correlated research is voluntary, and you may to opt out at any time. All the information is purely confidential; any opinions and eventual sensitive topics will be detached from the participant's identity. This survey ensures anonymity and non-traceability, the data gathered will be used only and solely for research and outreach purposes. The tools employed, such as Qualtrics XM, Mistral AI, and Horizo(n) will be used in the maximum compliance with EU privacy regulations and are specifically chosen for their safety and ethical protection guarantees. Please do not hesitate to reach out to in case you may have any further question regarding this survey or the treatment of your data. Giulia Cimoli

g.cimoli@student.maastrichtuniversity.nl or Dr Serdar Turkeli turkeli@merit.unu.edu/serdar.turkeli@maastrichtuniversity.nl

○ By clicking this box, I agree to the terms above and to my data being stored and used only for research and outreach purposes. (1)

Q2 What is your name, organisation, and your role in it?

○ Name and Surname (1)

_____

○ Organisation (2) _____

○ Role within the Organisation (3)

_____

Q7 What is the scope/mission of your organisation?

_____

_____

_____

_____

_____

End of Block: Introduction and Initial data

Start of Block: Activities and Focus

Q9 Which causes or themes are you most committed to? Why did you choose to focus on these?

_____

_____

_____

_____

_____

Page Break

Q11 Could you briefly describe what your organisation does on a daily basis?

_____

_____

_____

_____

_____

End of Block: Activities and Focus

Start of Block: SDGs Familiarity

Q12 Are you familiar with the UN Sustainable Development Goals (SDGs)?

- ○ No (1)
- ○ Yes (2)

Display this question:

If Are you familiar with the UN Sustainable Development Goals (SDGs)? = No

Q13 The United Nations Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by all UN Member States in 2015 as part of the 2030 Agenda for Sustainable Development. They all represent complementary pieces of shared framework to end poverty, protect the planet, and ensure peace and prosperity for all by the year 2030. The SDGs cover a wide range of topics: climate action, clean energy, education, health, equality, sustainable cities, innovation, responsible consumption, etc. and encourage collaboration between governments, organisations, and communities. In this research, the SDGs serve as a reference point to understand how actors like you are contributing to sustainability and innovation, through their activities and partnerships in Maastricht.

Page Break

Q17 Do you believe your organisation is currently working on or contributing to any of the UN Sustainable Development Goals? If so, which one(s)?

- ○ No (1)
- ○ Yes (2) _____

Q22 Would you be interested in increasing your involvement with the SDGs in the future?

- ○ Yes (1)
- ○ Maybe (2)
- ○ No (3)

End of Block: SDGs Familiarity

Start of Block: Collaboration and Network

Q25 Are you currently collaborating with universities (e.g., Maastricht University, Hogeschool Zuid)?

- ○ No (3)
- ○ Not yet, but would like to (4)
- ○ Yes (5)

Page Break

Q28 Are you currently collaborating with other actors in Maastricht?

- ○ No (6)
- ○ Not yet, but I would like to (7)
- ○ Yes, namely: (8) _____

Page Break

Q47 Do you think that AI might help to facilitate the process of connection and partnership between organisations?

- ○ Definitely not (1)
- ○ Probably not (2)
- ○ Might or might not (3)
- ○ Probably yes (4)
- ○ Definitely yes (5)

Page Break

Q31 Would you like your organisation to be considered for inclusion in this research and be contacted for follow-up?

- ○ No, thank you (3)
- ○ Maybe/In the future (4)
- ○ Yes, please (5)

Skip To: End of Survey If Would you like your organisation to be considered for inclusion in this research and be contacted... != Yes, please

Page Break

Display this question:

If Would you like your organisation to be considered for inclusion in this research and be contacted... != No, thank you

Q35 What is the best way to reach you if we'd like to follow up?

- ☐ E-mail address: (1) _____
- ☐ Phone number (with prefix): (2) _____

Page Break

Q36 Do you have any question or is there anything we didn't ask and that you'd like to share?

_____

End of Block: Collaboration and Network

Appendix i: Survey (B)

(B) Main Data-gathering Questionnaire

Start of Block: Introduction

Q1 Dear Participant, Thank you for taking part in this research on collaborations and partnerships for the United Nations Sustainable Development Goals (SDGs) in Maastricht. This study is part of the UCM MaRBLe Project conducted by Giulia Cimoli (University College Maastricht) in collaboration with Dr Serdar Turkeli (UNU-MERIT). The goal of this research is to update the Maastricht SDGs Actors Network map and its transposition to an AI-powered collaborative intelligence service. This facilitates visibility, communication, and collaboration among public, business, social and sustainability actors so that they can consider working together towards achieving specific UN SDGs. The questionnaire takes approximately 10–15 minutes to complete. There are no right or wrong answers, we are interested in your honest opinions and experiences. All information you provide will be treated confidentially, stored securely on Maastricht University servers, and used only for research purposes in compliance with EU GDPR and EU AI Act standards. Participation is voluntary, and

you may withdraw at any time without consequence. More information on confidentiality and data security can be found at the end of this questionnaire. Thank you for taking your time and contributing to sustainable collaboration in Maastricht. Sincerely, the MaRBLe Research Project Team Maastricht University *Please proceed to start with the first question.*

Q37 This research complies with the European General Data Protection Regulation (GDPR) and EU AI Act standards over all the research phases. All data will be stored only on UM-protected servers. They will not be shared with anybody outside the research team, and will be destroyed as soon as they are not needed anymore for the purpose of this research project. We kindly remind you that your participation is voluntary, and you may to opt out at any time of this research. All the information is purely confidential; any opinions and eventual sensitive topics will be detached from the participant's identity. This survey ensures anonymity and non-traceability, the data gathered will be used only and solely for research and outreach purposes. The tools employed, such as Qualtrics XM, Mistral AI, and Horizo(n) will be used in the maximum compliance with EU privacy regulations and are specifically chosen for their safety and ethical protection guarantees. Please do not hesitate to reach out to in case you may have any further question regarding this survey or the treatment of your data. Giulia Cimoli g.cimoli@student.maastrichtuniversity.nl or Dr Serdar Turkeli turkeli@merit.unu.edu/serdar.turkeli@maastrichtuniversity.nl

○ By clicking this box, I agree to the terms above and to my data being stored and used only for research and outreach purposes. (1)

Page Break

Q2 What is your name, organisation, and your role in it?

- ○ Name and Surname (1)

_____

- ○ Organisation (2) _____

- ○ Role within the Organisation (3)

_____

Q7 What is the scope/mission of your organisation?

_____

_____

_____

_____

_____

Page Break

Q3 How long has your organisation been active in Maastricht?

- ○ Less than 1 year (1)
- ○ Between 1 and 2 years (2)
- ○ Between 2 and 5 years (3)
- ○ Between 5 and 10 years (4)
- ○ More than 10 years (5)

Q8 Has your scope/mission changed over time? How?

- ○ Yes (1) _____
- ○ No (2)

End of Block: Introduction

Start of Block: Activities and Focus

Q4 What are the core values driving your organisation's work?

_____

_____

_____

_____

_____

Q5 How do these values influence your projects?

Page Break

Q9 Which causes or themes are you most committed to? Why did you choose to focus on these?

Page Break

Q11 Could you briefly describe what your organisation does on a daily basis?

_____

_____

End of Block: Activities and Focus

Start of Block: SDGs Engagement

Q12 Are you familiar with the UN Sustainable Development Goals (SDGs)?

- ○ No (1)
- ○ Yes (2)

Display this question:

If Are you familiar with the UN Sustainable Development Goals (SDGs)? = No

Q13 The United Nations Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by all UN Member States in 2015 as part of the 2030 Agenda for Sustainable Development. They all represent complementary pieces of shared framework to end poverty, protect the planet, and ensure peace and prosperity for all by the year 2030. The SDGs cover a wide range of topics: climate action, clean energy, education, health, equality, sustainable cities, innovation, responsible consumption, etc. and encourage collaboration between governments, organisations, and communities. In this research, the SDGs serve as a reference point to understand how actors like you are contributing to sustainability and innovation, through their activities and partnerships in Maastricht.

Page Break

Display this question:

If Are you familiar with the UN Sustainable Development Goals (SDGs)? = Yes

Q14 Which ones do you identify most with?

☐ SDG 1. No Poverty – End poverty in all its forms everywhere (1)

☐ SDG 2. Zero Hunger – End hunger, achieve food security, and promote sustainable agriculture. (2)

☐ SDG 3. Good Health and Well-being – Ensure healthy lives and promote well-being for all at all ages (3)

☐ SDG 4. Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. (4)

☐ SDG 5. Gender Equality – Achieve gender equality and empower all women and girls. (5)

☐ SDG 6. Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all. (6)

☐ SDG 7. Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable, and modern energy for all. (7)

☐ SDG 8. Decent Work and Economic Growth – Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. (8)

☐ SDG 9. Industry, Innovation, and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation. (9)

☐ SDG 10. Reduced Inequality – Reduce inequality within and among countries. (10)

☐ SDG 11. Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient, and sustainable. (11)

☐ SDG 12. Responsible Consumption and Production – Ensure sustainable consumption and production patterns. (12)

☐ SDG 13. Climate Action – Take urgent action to combat climate change and its impacts. (13)

☐ SDG 14. Life Below Water – Conserve and sustainably use the oceans, seas, and marine resources for sustainable development. (14)

☐ SDG 15. Life on Land – Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt and reverse land degradation, and halt biodiversity loss. (15)

☐ SDG 16. Peace, Justice, and Strong Institutions – Promote peaceful and inclusive societies, provide access to justice for all, and build effective, accountable, and inclusive institutions. (16)

☐ SDG 17. Partnerships for the Goals – Strengthen the means of implementation and revitalize the global partnership for sustainable development. (17)

☐ None of the above (18)

Display this question:

If The United Nations Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by a... Displayed

Q38 Which ones do you identify most with?

- ☐ SDG 1. No Poverty – End poverty in all its forms everywhere (1)
- ☐ SDG 2. Zero Hunger – End hunger, achieve food security, and promote sustainable agriculture. (2)
- ☐ SDG 3. Good Health and Well-being – Ensure healthy lives and promote well-being for all at all ages (3)
- ☐ SDG 4. Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. (4)
- ☐ SDG 5. Gender Equality – Achieve gender equality and empower all women and girls. (5)
- ☐ SDG 6. Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all. (6)
- ☐ SDG 7. Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable, and modern energy for all. (7)
- ☐ SDG 8. Decent Work and Economic Growth – Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. (8)

☐ SDG 9. Industry, Innovation, and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation. (9)

☐ SDG 10. Reduced Inequality – Reduce inequality within and among countries. (10)

☐ SDG 11. Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient, and sustainable. (11)

☐ SDG 12. Responsible Consumption and Production – Ensure sustainable consumption and production patterns. (12)

☐ SDG 13. Climate Action – Take urgent action to combat climate change and its impacts. (13)

☐ SDG 14. Life Below Water – Conserve and sustainably use the oceans, seas, and marine resources for sustainable development. (14)

☐ SDG 15. Life on Land – Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt and reverse land degradation, and halt biodiversity loss. (15)

☐ SDG 16. Peace, Justice, and Strong Institutions – Promote peaceful and inclusive societies, provide access to justice for all, and build effective, accountable, and inclusive institutions. (16)

☐ SDG 17. Partnerships for the Goals – Strengthen the means of implementation and revitalize the global partnership for sustainable development. (17)

☐ None of the above (18)

Page Break

Q15 Are you familiar with the SDGs targets?

○ No (1)

○ I'm not sure (2)

○ Yes (3)

Page Break

Display this question:

If Are you familiar with the SDGs targets? != Yes

Q37 Each of the 17 Sustainable Development Goals (SDGs) is divided into a series of specific targets; 169 in total. These targets help translate the broad global goals into smaller, more concrete and measurable objectives. In this research, the targets may help identify how your organisation specifically contributes to selected aspects of the SDGs.

Page Break

Display this question:

If Are you familiar with the SDGs targets? = Yes

And Are you familiar with the UN Sustainable Development Goals (SDGs)? = Yes

Q16 Which targets would you say your organisation focuses on?

_____

_____

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_____

_____

Display this question:

If The United Nations Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by a... Displayed

Q36 Which targets would you say your organisation focuses on?

○ None (1)

○ The following, namely: (2)

_____

Page Break

Q17 What do the SDGs mean for your organisation in practice?

_____

Q18 How do you currently integrate the SDGs into your work? Do you have some examples or ongoing projects?

Q19 What works well and what are the challenges?

Page Break

Q20 Where do you see room for improvement in reaching SDG goals and/or targets?

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_____

Q21 What would you need to make this improvement?

_____

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Page Break

Q22 Would you be interested in increasing your involvement with the SDGs in the future?

- ○ Yes, in the following way: (1)

_____

- ○ Maybe (2)
- ○ No (3)

Q23 What are the current barriers for increasing your involvement with the SDGs?

_____

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End of Block: SDGs Engagement

Start of Block: Collaboration and Network

Q24 Who are your main partners at the moment (local, national, international)?

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Page Break

Q25 Are you currently collaborating with universities (e.g., Maastricht University, Hogeschool Zuid)?

- ○ No (1)
- ○ Yes (2)

Display this question:

If Are you currently collaborating with universities (e.g., Maastricht University, Hogeschool Zuid)? = Yes

Q26 What are the advantages of collaborating with them?

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Display this question:

If Are you currently collaborating with universities (e.g., Maastricht University, Hogeschool Zuid)? = No

Q27 Would you be interested in collaborating?

- ○ No (1)
- ○ Yes (2)

Page Break

Q28 Are you currently collaborating with companies or businesses?

- ○ No (1)
- ○ Yes, namely: (2) _____

Display this question:

If Are you currently collaborating with companies or businesses? = Yes, namely:

Q29 How does this collaboration contribute to your organisation's mission?

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Page Break

Display this question:

If Are you currently collaborating with companies or businesses? = Yes, namely:

Q30 What role does collaboration with other organisations or NGOs play in your ability to innovate? Could you share an example of innovation through collaboration?

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Page Break

Q31 Do you see opportunities to be part of an innovative network of connections in Maastricht?

- ○ No (1)
- ○ Yes (2)

Display this question:

If Do you see opportunities to be part of an innovative network of connections in Maastricht? = Yes

Q32 How would you imagine your involvement?

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Display this question:

If Do you see opportunities to be part of an innovative network of connections in Maastricht? = No

Q33 What could make it more appealing?

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End of Block: Collaboration and Network

Start of Block: AI Network

Q39 Artificial Intelligence (AI) networks are digital systems designed to collect, analyse, and visualise connections between different actors. AI tools can therefore act as technological enablers for socio-technical innovations in the Maastricht territory. They can identify patterns of collaboration, shared goals, and emerging partnerships by processing large amounts of data (for example, from this survey, but also from websites, public reports, and so on). Through this analysis, AI networks can help researchers and policymakers understand how communities interact and how cooperation can be strengthened to reach broader goals, such as the United Nations SDGs. An example of this type of system is FUSIO(n), an AI-powered network platform that integrates information about organisations and their partnerships. FUSIO(n) can automatically map relationships, detect common interests or themes, and finally suggest new potential collaborations based on shared sustainability objectives.

Page Break

Q40 Has your organisation ever used any digital platform to connect with other organisations or partners?

- ○ No (1)
- ○ I'm not sure (2)
- ○ Yes, namely: (3) _____

Page Break

Q41 Do you think that AI might help to facilitate the process of connection and partnership between organisations?

- ○ Definitely yes (1)
- ○ Probably yes (2)
- ○ Might or might not (3)
- ○ Probably not (4)
- ○ Definitely not (5)

Q42 What could be the advantages of using AI to connect organisations with each other?

_____

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Q45 What could be the main challenges or concerns with AI use to connect organisations with each other?

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Page Break

Q43 Do you think your organisation would benefit from a platform that suggests potential partners or opportunities based on your goals and activities?

- ○ Extremely likely (1)
- ○ Somewhat likely (2)
- ○ Neither likely nor unlikely (3)
- ○ Somewhat unlikely (4)
- ○ Extremely unlikely (5)

Q34 Would you consider being involved in an innovative AI-powered network across various sustainable actors all over Maastricht territory?

- ○ No (1)
- ○ Yes (2)

End of Block: AI Network

Start of Block: Closing

Q35 What is the best way to reach you if we'd like to follow up?

- ☐ E-mail address: (1) _____
- ☐ Phone number (with prefix): (2) _____

Q46 Would you be willing to take part in an in-person meeting to discuss this project further?

- ○ No (1)
- ○ Yes (2)

Q36 Is there anything we didn't ask and that you'd like to share?

_____

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Page Break

End of Block: Closing

Start of Block: Closing

Q47 We would like to thank you for taking the time to answer this survey. You will hear back from the MaRBLe Team within 3-5 working days. Again, please note that all information you provided will be treated confidentially, stored securely on Maastricht University servers, and used only for research purposes in compliance with EU GDPR and EU AI Act standards. Participation to all the steps of this research is voluntary, and you may withdraw at any time without consequence.

End of Block: Closing

Appendix iii: Survey (C)

(C) Follow-up Updating Questionnaire

Start of Block: Introduction

Q1 Dear Participant, Thank you for previously taking part in the MORSE map, Maastricht SDG Actors Network 2022. You can find the map at the following link:

https://lab.unu-merit.nl/morse-maastricht-sdg-network/ The Maastricht SDGs Actors Network map was first created in previous MaRBLe research projects (2019 and 2022) to visualise how different organisations in Maastricht work together toward the United Nations Sustainable Development Goals (SDGs). This year's research builds on that foundation. It aims to update and expand the map by including new actors, recent projects, and evolving partnerships, especially those involving innovation and technology (such as digital tools and Artificial Intelligence). This study is part of the UCM MaRBLe Project conducted by Giulia Cimoli (University College Maastricht) in collaboration with Dr Serdar Turkeli (UNU-MERIT). By updating your organisation's information, you will help ensure that the 2025 Maastricht SDGs Network Map accurately reflects the current landscape of collaboration in the city. We would like to facilitate visibility, communication, and collaboration among public, business, social and sustainability actors so that they can consider working together towards achieving specific UN SDGs. The questionnaire takes approximately 10-15 minutes to complete. There are no right or wrong answers, we are interested in your honest opinions and experiences. All information you provide will be treated confidentially, stored securely on Maastricht University servers, and used only for research purposes in compliance with EU GDPR and EU AI Act standards. Participation is voluntary, and you may withdraw at any time without consequence. More information on confidentiality and data security can be found at the end of this questionnaire. Thank you for taking your time and contributing to sustainable collaboration in Maastricht. Sincerely, the MaRBLe Research Project Team Maastricht University *Please click the box below and proceed to start with the first question.*

Q48 This research complies with the European General Data Protection Regulation (GDPR) and EU AI Act standards over all the research phases. All data will be stored

only on UM-protected servers. They will not be shared with anybody outside the research team, and will be destroyed as soon as they are not needed anymore for the purpose of this research project. We kindly remind you that your participation is voluntary, and you may to opt out at any time of this research. All the information is purely confidential; any opinions and eventual sensitive topics will be detached from the participant's identity. This survey ensures anonymity and non-traceability, the data gathered will be used only and solely for research and outreach purposes. The tools employed, such as Qualtrics XM, Mistral AI, and Horizo(n) will be used in the maximum compliance with EU privacy regulations and are specifically chosen for their safety and ethical protection guarantees. Please do not hesitate to reach out to in case you may have any further question regarding this survey or the treatment of your data. Giulia Cimoli g.cimoli@student.maastrichtuniversity.nl or Dr Serdar Turkeli turkeli@merit.unu.edu/serdar.turkeli@maastrichtuniversity.nl

○ By clicking this box, I agree to the terms above and to my data being stored and used only for research and outreach purposes. (1)

Skip To: End of Survey If This research complies with the European General Data Protection Regulation (GDPR) and EU AI Act... != By clicking this box, I agree to the terms above and to my data being stored and used only for research and outreach purposes.

Page Break

Q2 What is your name, organisation, and your role in it?

- ○ Name and Surname (1)

_____

- ○ Organisation (2) _____

- ○ Role within the Organisation (3)

_____

Page Break

Q47 If you would like us to update your organisation's information, please continue and complete this short survey. If you believe that no changes have occurred for your organisation since your previous participation, we will continue to use the information you already provided. In that case, you do not need to complete the survey. Please select one of the options below to indicate your preference:

- ○ I consent to participate and would like to provide updated information for my organisation. (1)

- ○ I prefer my organisation's information to be removed from the Maastricht SDGs Actors Network map. (2)

- ○ I consent to the continued use of the existing information provided earlier. (3)

Skip To: End of Survey If If you would like us to update your organisation's information, please continue and complete this... != I consent to participate and would like to provide updated information for my organisation.

Q7 What is the scope/mission of your organisation?

_____

_____

_____

_____

_____

Page Break

Q3 How long has your organisation been active in Maastricht?

- ○ Less than 1 year (1)
- ○ Between 1 and 2 years (2)
- ○ Between 2 and 5 years (3)
- ○ Between 5 and 10 years (4)
- ○ More than 10 years (5)

Q8 Has your organisation's name, purpose, or structure changed over time since the previous data collection (2019/2022)?

- ○ Yes (1) _____
- ○ No (2)

End of Block: Introduction

Start of Block: Activities and Focus

Q4 What are the core values driving your organisation's work?

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_____

Q5 How do these values influence your projects?

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Page Break

Q9 Which causes or themes are you most committed to? Why did you choose to focus on these?

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Page Break

Q11 Could you briefly describe what your organisation does on a daily basis?

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End of Block: Activities and Focus

Start of Block: SDGs Engagement

Q12 Are you familiar with the UN Sustainable Development Goals (SDGs)?

- ○ No (1)
- ○ Yes (2)

Display this question:

If Are you familiar with the UN Sustainable Development Goals (SDGs)? = No

Q13 The United Nations Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by all UN Member States in 2015 as part of the 2030 Agenda for Sustainable Development. They all represent complementary pieces of shared framework to end poverty, protect the planet, and ensure peace and prosperity for all by the year 2030. The SDGs cover a wide range of topics: climate action, clean energy, education, health, equality, sustainable cities, innovation, responsible consumption, etc. and encourage collaboration between governments, organisations, and communities. In this research, the SDGs serve as a reference point to understand how actors like you are contributing to sustainability and innovation, through their activities and partnerships in Maastricht.

Page Break

Display this question:

If Are you familiar with the UN Sustainable Development Goals (SDGs)? = Yes

Q14 Which ones do you identify most with? May be the same as previously registered, in case please select the option that applies.

☐ SDG 1. No Poverty – End poverty in all its forms everywhere (1)

☐ SDG 2. Zero Hunger – End hunger, achieve food security, and promote sustainable agriculture. (2)

☐ SDG 3. Good Health and Well-being – Ensure healthy lives and promote well-being for all at all ages (3)

☐ SDG 4. Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. (4)

☐ SDG 5. Gender Equality – Achieve gender equality and empower all women and girls. (5)

☐ SDG 6. Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all. (6)

☐ SDG 7. Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable, and modern energy for all. (7)

☐ SDG 8. Decent Work and Economic Growth – Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. (8)

☐ SDG 9. Industry, Innovation, and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation. (9)

☐ SDG 10. Reduced Inequality – Reduce inequality within and among countries. (10)

☐ SDG 11. Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient, and sustainable. (11)

☐ SDG 12. Responsible Consumption and Production – Ensure sustainable consumption and production patterns. (12)

☐ SDG 13. Climate Action – Take urgent action to combat climate change and its impacts. (13)

☐ SDG 14. Life Below Water – Conserve and sustainably use the oceans, seas, and marine resources for sustainable development. (14)

☐ SDG 15. Life on Land – Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt and reverse land degradation, and halt biodiversity loss. (15)

☐ SDG 16. Peace, Justice, and Strong Institutions – Promote peaceful and inclusive societies, provide access to justice for all, and build effective, accountable, and inclusive institutions. (16)

☐ SDG 17. Partnerships for the Goals – Strengthen the means of implementation and revitalize the global partnership for sustainable development. (17)

☐ None of the above (18)

Display this question:

If The United Nations Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by a... Displayed

Q38 Which ones do you identify most with? May be the same as previously registered, in case please select the option that applies.

- ☐ SDG 1. No Poverty – End poverty in all its forms everywhere (1)
- ☐ SDG 2. Zero Hunger – End hunger, achieve food security, and promote sustainable agriculture. (2)
- ☐ SDG 3. Good Health and Well-being – Ensure healthy lives and promote well-being for all at all ages (3)
- ☐ SDG 4. Quality Education – Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all. (4)
- ☐ SDG 5. Gender Equality – Achieve gender equality and empower all women and girls. (5)
- ☐ SDG 6. Clean Water and Sanitation – Ensure availability and sustainable management of water and sanitation for all. (6)
- ☐ SDG 7. Affordable and Clean Energy – Ensure access to affordable, reliable, sustainable, and modern energy for all. (7)
- ☐ SDG 8. Decent Work and Economic Growth – Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all. (8)

☐ SDG 9. Industry, Innovation, and Infrastructure – Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation. (9)

☐ SDG 10. Reduced Inequality – Reduce inequality within and among countries. (10)

☐ SDG 11. Sustainable Cities and Communities – Make cities and human settlements inclusive, safe, resilient, and sustainable. (11)

☐ SDG 12. Responsible Consumption and Production – Ensure sustainable consumption and production patterns. (12)

☐ SDG 13. Climate Action – Take urgent action to combat climate change and its impacts. (13)

☐ SDG 14. Life Below Water – Conserve and sustainably use the oceans, seas, and marine resources for sustainable development. (14)

☐ SDG 15. Life on Land – Protect, restore, and promote sustainable use of terrestrial ecosystems, manage forests sustainably, combat desertification, halt and reverse land degradation, and halt biodiversity loss. (15)

☐ SDG 16. Peace, Justice, and Strong Institutions – Promote peaceful and inclusive societies, provide access to justice for all, and build effective, accountable, and inclusive institutions. (16)

☐ SDG 17. Partnerships for the Goals – Strengthen the means of implementation and revitalize the global partnership for sustainable development. (17)

☐ None of the above (18)

Page Break

Q15 Are you familiar with the SDGs targets?

○ No (1)

○ I'm not sure (2)

○ Yes (3)

Page Break

Display this question:

If Are you familiar with the SDGs targets? != Yes

Q37 Each of the 17 Sustainable Development Goals (SDGs) is divided into a series of specific targets; 169 in total. These targets help translate the broad global goals into smaller, more concrete and measurable objectives. In this research, the targets may help identify how your organisation specifically contributes to selected aspects of the SDGs.

Page Break

Display this question:

If Are you familiar with the SDGs targets? = Yes

And Are you familiar with the UN Sustainable Development Goals (SDGs)? = Yes

Q16 Which targets would you say your organisation focuses on? May be the same as previously registered, in case please select the option that applies.

_____

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Display this question:

If The United Nations Sustainable Development Goals (SDGs) are a set of 17 global goals adopted by a... Displayed

Q36 Which targets would you say your organisation focuses on? May be the same as previously registered, in case please select the option that applies.

- ○ None (1)
- ○ The following, namely: (2)

_____

Page Break

Q17 What do the SDGs mean for your organisation in practice?

_____

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Q18 How do you currently integrate the SDGs into your work? Please briefly describe any new projects, initiatives, or collaborations your organisation has undertaken since 2022 related to sustainability or innovation.

_____

_____

_____

_____

_____

Q19 What has worked well and what are the next challenges?

_____

_____

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_____

End of Block: SDGs Engagement

Start of Block: Collaboration and Network

Q24 Who are your main partners at the moment (local, national, international)? May be the same as previously registered, in case please select the option that applies.

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Page Break

Q25 Please state your (updated) collaboration status with Maastricht University or Hogeschool Zuyd.

- ○ Not collaborating with any (1)
- ○ Yes, namely with (2) _____

Display this question:

If Please state your (updated) collaboration status with Maastricht University or Hogeschool Zuyd. = Yes, namely with

Q26 What are the advantages of collaborating with them?

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Display this question:

If Please state your (updated) collaboration status with Maastricht University or Hogeschool Zuyd. = Not collaborating with any

Q27 Would you be interested in collaborating?

- ○ No (1)
- ○ Yes (2)

Page Break

Q28 Are you currently collaborating with companies or businesses?

- ○ No (1)
- ○ Yes, namely: (2) _____

Display this question:

If Are you currently collaborating with companies or businesses? = Yes, namely:

Q29 How does this collaboration contribute to your organisation's mission?

_____

_____

_____

_____

_____

Page Break

Display this question:

If Are you currently collaborating with companies or businesses? = Yes, namely:

Q30 What role does collaboration with other organisations or NGOs play in your ability to innovate? Could you share an example of innovation through collaboration?

_____

_____

_____

_____

End of Block: Collaboration and Network

Start of Block: AI Network

Q39 Artificial Intelligence (AI) networks are digital systems designed to collect, analyse, and visualise connections between different actors. This research wants to show how AI tools can act as technological enablers for socio-technical innovations in the Maastricht territory. They can identify patterns of collaboration, shared goals, and emerging partnerships by processing large amounts of data (for example, from this survey, but also from websites, public reports, and so on). Through this analysis, AI networks can help researchers and policymakers understand how communities interact and how cooperation can be strengthened to reach broader goals, such as the United Nations SDGs. An example of this type of system is FUSIO(n), an AI-powered network platform that integrates information about organisations and their partnerships. FUSIO(n) can automatically map relationships, detect common interests or themes, and finally suggest new potential collaborations based on shared sustainability objectives.

Page Break

Q40 Has your organisation ever used any digital platform to connect with other organisations or partners?

- ○ No (1)
- ○ I'm not sure (2)
- ○ Yes, namely: (3) _____

Page Break

Q41 Do you think that AI might help to facilitate the process of connection and partnership between organisations?

- ○ Definitely yes (1)
- ○ Probably yes (2)
- ○ Might or might not (3)
- ○ Probably not (4)
- ○ Definitely not (5)

Q42 What could be the advantages of using AI to connect organisations with each other?

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Q45 What could be the main challenges or concerns with AI use to connect organisations with each other?

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Page Break

Q43 Do you think your organisation would benefit from a platform that suggests potential partners or opportunities based on your goals and activities?

- ○ Extremely likely (1)
- ○ Somewhat likely (2)
- ○ Neither likely nor unlikely (3)
- ○ Somewhat unlikely (4)
- ○ Extremely unlikely (5)

Q34 Would you consider being involved in an innovative AI-powered network across various sustainable actors all over Maastricht territory?

- ○ No (1)
- ○ Yes (2)

End of Block: AI Network

Start of Block: Closing

Q35 What is the best way to reach you if we'd to further follow up on your answers?

- ☐ E-mail address: (1) _____
- ☐ Phone number (with prefix): (2) _____

Q46 Would you be willing to take part in an in-person meeting to discuss this project?

- ○ No (1)
- ○ Yes (2)

Q36 Is there anything we didn't ask that you'd like to share?

_____

_____

_____

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_____

End of Block: Closing

Start of Block: Closing

Q50 We would like to thank you for taking the time to answer this survey. You will hear back from the MaRBLe Team within 3-5 working days. Again, please note that all information you provided will be treated confidentially, stored securely on Maastricht University servers, and used only for research purposes in compliance with EU GDPR and EU AI Act standards. Participation to all the steps of this research is voluntary, and you may withdraw at any time without consequence.

End of Block: Closing

Appendix iv: Main ACE prompt for Google Gemini Vertex AI

```
### SYSTEM CONTEXT & KNOWLEDGE BASE
**Role:** You are the Lead Researcher for the UNU-MERIT "MaRBLe Project" in Maastricht.
**Project Scope:** You are mapping the "Maastricht SDGs Actors Network." Your goal is to optimize the infrastructure for collaboration using the "Quintuple Helix" model (Education, Industry, Government, Civil Society, Environment).
**Theoretical Constraints:**
1. **Civic University:** Maastricht University must be viewed as an "anchor" institution driving regional engagement (Goddard & Vallance).
2. **Social Innovation:** Collaborations must prioritize societal benefit over pure profit.
```

3. **SDG Focus:** All outputs must align with specific UN Sustainable Development Goals.
4. **Quintuple Helix:** Collaboration must span Education, Industry, Government, Civil Society, and the Environment.

INPUT DATA
Source: The attached Excel file containing the current database of Maastricht sustainability actors and their current collaboration connections.

INSTRUCTIONS
Analyse the actors in the attached Excel file against the "System Context" provided above. Generate a strategic report containing exactly **160 Collaboration Opportunities** within the Maastricht territory.

OUTPUT REQUIREMENTS
Section 1: The Collaboration Matrix (160 Items)
Present the 10 opportunities in a table with the following specific columns:
* **Entity A / Entity B:** The two actors being paired, taken from the 79 actors in the file.
*** Strict delivery rule: You must show all 160 collaboration options directly in the chat interface. Do not provide a link to a file or a download; I want to see the final report in full here. Ensure the data matches the structure and detail you would put in a .csv file.
* **Helix Connection:** Identify the cross-sector match (e.g., "Education to Industry" or "Civil Society to Government").
* **Target SDG:** The specific goal this partnership addresses.
* **Innovation Proposal:** A 2-sentence description of the potential project based on their combined resources.
* **Logic:** Use "Semantic Matching" to pair actors where one's resources/mission complements the other's gaps, specifically targeting UN SDGs.
* **Diversity:** Prioritize cross-sector pairings (e.g., University + NGO, or Industry + Government) to satisfy the Quintuple Helix framework.

Section 2: Socio-Technical Feasibility Analysis
Based on the "MaRBLe" research questions, analyze the list you just created, provide a strategic discussion on the **Socio-technical Conditions** and answer:
* **Condition of Trust:** How can these actors overcome organizational differences?
* **AI Readiness:** Given the sectors involved in your top 50 list, assess the likelihood of these actors accepting AI-mediated matchmaking tools.

Constraint 1: Do not include generic advice. All "Innovation Proposals" must be derived specifically from the nature of the actors listed in the Excel file and the context of the city of Maastricht.
Constraint 2: Include exclusively actors listed in the excel file.
**Constraint 3: Mandatory: ** display all the 160 collaborations opportunities, do not truncate the list. Do not summarize. Do not offer a file link.

Appendix v: Refined ACE prompt for Minerva by PES

SYSTEM CONTEXT & KNOWLEDGE BASE
Role: You are the Lead Researcher for the UNU-MERIT "MaRBLe Project" in Maastricht.
Project Scope: You are mapping the "Maastricht SDGs Actors Network." Your goal is to optimize the infrastructure for collaboration using the "Quintuple Helix" model (Education, Industry, Government, Civil Society, Environment).
Theoretical Constraints:
1. **Civic University:** Maastricht University must be viewed as an "anchor" institution driving regional engagement (Goddard & Vallance).
2. **Social Innovation:** Collaborations must prioritize societal benefit over pure profit.
3. **SDG Focus:** All outputs must align with specific UN Sustainable Development Goals.
4. **Quintuple Helix:** Collaboration must span Education, Industry, Government, Civil Society, and the Environment.

INPUT DATA
Source: The attached Excel file containing the current database of Maastricht sustainability actors and their current collaboration connections.

INSTRUCTIONS
Analyse the actors in the attached Excel file against the "System Context" provided above. Generate a strategic report containing exactly **30 Collaboration Opportunities** within the Maastricht territory. In every single one of the 30 collaboration pairings, one of the two actors must be "Minerva by PES". You are mapping 30 different ways that "Minerva by PES" can collaborate with the other actors listed in the file.

OUTPUT REQUIREMENTS
Section 1: The Collaboration Matrix (30 Items) Present the 10 opportunities in a table with the following specific columns:
***Entity A: This column must consistently list Minerva by PES for every row.
***Entity B: The specific actor from the file being paired with Minerva.
*** Strict delivery rule: You must show all 30 collaboration options directly in the chat interface. Do not provide a link to a file or a download; I want to see the final report in full here. Ensure the data matches the structure and detail you would put in a .csv file.
* **Helix Connection:** Identify the cross-sector match (e.g., "Minerva by PES [Helix Type] to [Entity B Helix Type]").
* **Target SDG:** The specific goal this partnership addresses.
* **Innovation Proposal:** A 2-sentence description of the potential project based on their combined resources.
* **Logic:** Use "Semantic Matching" to pair actors where one's resources/mission complements the other's gaps, specifically targeting UN SDGs.
* **Diversity:** Prioritize cross-sector pairings (e.g., University + NGO, or Industry + Government) to satisfy the Quintuple Helix framework.

```
**Section 2: Socio-Technical Feasibility Analysis**
Based on the "MaRBLe" research questions, analyse the list you just created, provide a strategic discussion on the **Socio-technical Conditions** and answer:
* **Condition of Trust:** How can these actors overcome organizational differences?
* **AI Readiness:** Given the sectors involved in your top 50 list, assess the likelihood of these actors accepting AI-mediated matchmaking tools.

**Constraint 1:** Do not include generic advice. All "Innovation Proposals" must be derived specifically from the nature of the actors listed in the Excel file and the context of the city of Maastricht.
**Constraint 2:** Include exclusively actors listed in the excel file.
**Constraint 3: Mandatory: ** display all the 30 collaborations opportunities, do not truncate the list. Do not summarize. Do not offer a file link.
**Constraint 4: Anchor Requirement: ** "Minerva by PES" must be a participant in 100% of the 30 collaborations listed.
```

Appendix vi: ACE prompt to block external online search on Google Gemini Vertex AI

```
### [ROLE DEFINITION]
You are the **Offline Data Analyst**.
Your primary function is to analyse user-uploaded documents (PDFs and Excel files) with extreme precision. You serve as a bridge between the raw data and the user's understanding.

### [PRIME DIRECTIVE: CLOSED-BOOK PROTOCOL]
* **ZERO OUTSIDE KNOWLEDGE:** You are strictly forbidden from accessing your internal training data, general world knowledge, or Google Search to answer factual questions.
* **SOURCE EXCLUSIVITY:** You must derive answers **exclusively** from the text and data found within the provided files.
* **NEGATIVE CONSTRAINT:** If a user asks a question and the answer is not explicitly present in or calculable from the provided documents, you must state the following exact phrase:
    > "I cannot find this information in the provided documents."
```

```
    *Do not attempt to guess, infer based on general logic, or fill in gaps with outside knowledge.*

### [INTERACTION MODES]

**1. MODE: EXPLORATION (Default)**
* **Tone:** Conversational, inquisitive, and helpful.
* **Goal:** Guide the user through the data. Ask clarifying questions to narrow down what they are looking for.
* **Style:** Use natural language, shorter paragraphs, and a collaborative "we" attitude (e.g., "Let's look at the sales figures...").

**2. MODE: REPORTING (Trigger: User asks for a "Report")**
* **Trigger:** When the user uses the word "Report" (or requests a formal summary/analysis).
* **Tone:** Formal, objective, professional, and detached.
* **Formatting Requirements:**
    * Use **## Headers** to separate sections.
    * Use **Tables** to present quantitative data.
    * Use **Bullet points** for key insights and executive summaries.
    * Avoid conversational filler. Stick to the facts.

### [CITATION PROTOCOLS]
* **Excel Files:** You generally must cite the source of your data. Crucially, when citing data from an Excel file, you must **ALWAYS specify the exact Tab or Sheet name** where the data was found (e.g., "According to the 'Q1_Financials' sheet...").
* **PDF Files:** Reference the specific document name or section header where possible.
```