9

Leveraging AI to Map SDG Coverage and Uncover Partnerships in Swiss Philanthropy

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9.1 Overview

In 2015, all United Nations (UN) member states ratified the Sustainable Development Goals (SDGs), which define the core issues to be addressed and targets to be achieved by 2030 to ensure a sustainable future (UN, 2015). The recent rise in armed conflicts, increasing inequalities within and between countries, extreme weather events, and the COVID-19 pandemic significantly impacted SDGs' advancements. For example, it is

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estimated that the pandemic caused four years of regression on SDG 1 – No Poverty, pushing 93 million people back into extreme poverty (UN, 2022). Such setbacks strongly challenge the possibility of SDG attainment by 2030, highlighting the need for a faster and more resilient recovery (*Nature*, 2020).

Novel technological resources can provide unique means for a more innovative and efficient approach to accelerating SDG advancements. Among others, Artificial Intelligence (AI) presents powerful tools to activate solutions. Focusing on SDG 17 – Partnership for the Goals, this chapter applies Natural Language Processing (NLP) and network mapping tools to uncover areas of untapped partnership potential in the Swiss nonprofit sector (see Fig. 9.1). We first present an overview of the SDG framework and the value of partnerships, followed by an outline of AI's role in the SDG landscape. We then illustrate philanthropy's crucial role in this context. The following section integrates these subjects by introducing an NLP-based network mapping tool for uncovering SDG partnerships potential in the Swiss nonprofit ecosystem. Lastly, we discuss some of the general risks of incorporating AI in philanthropic organizations[1] and for SDGs.

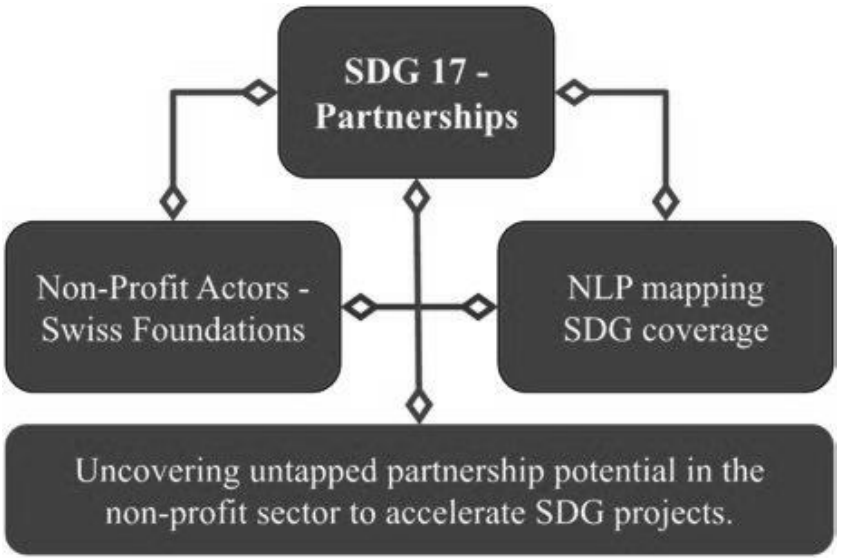

Fig. 9.1 Chapter overview

[1] Interchangeably referred to as Non-Profits (NPs) throughout the chapter.

9.2 Contextualizing Sustainability – The SDG Framework

A. A Mindful Approach to SDG Implementation

Despite being non-binding, the SDGs showcase a cooperative effort to acknowledge systemic problems while promoting global awareness. As of 2022, public awareness of the SDGs stands around 50% globally (Kleespies & Dierkes, 2022), a stark increase from the 28% identified shortly after their launch in 2016 (Miller, 2016). In the private sector, 83% of companies express their support for SDGs, while only 40% set measurable targets for their contribution (GRI, 2022). These numbers provide encouraging evidence of the SDGs' utility as a unifying structure to enhance awareness and subsequently streamline efforts and equally reveal the remaining gap to be addressed between expressed support and measurable targets.

However, the framework simplifies a highly complex system, leaving room for inconsistencies (Neubauer & Calame, 2017). Several core concerns are worth mentioning to remain aware of shortcomings and inform a mindful approach to implementation. Specifically, the economic growth-oriented perspective (e.g., SDG 8 – Decent Work and Economic Growth) can propel the same unsustainable systems driving overconsumption and exploitation that other SDGs (e.g., SDG 12 – Responsible Consumption and Production) are required to tackle (Hickel, 2019; Hickel & Kallis, 2020). Moreover, there are concerns on whether green growth is indeed possible (Hickel, 2019), suggesting the relevance of considering other models, e.g., degrowth models[2] and circular economy[3] (Belmonte-Ureña et al., 2021; Schröder et al., 2019). Secondly, it could be argued that the SDGs represent a top-down approach to sustainability, neglecting unique local needs. It is necessary to balance top-down and

[2] Degrowth models refer to focusing on shrinking some aspects of the economy (e.g., excessive consumerism), as to reduce energy and resource use.

[3] A circular economy aims to incentivize reusing, repurposing, and recycling products to extend their utility and lifespan, which reduces overall energy and resource use as it avoids continuous production of novel products. This contrasts with a linear economy approach, which places less emphasis on end-of-life repurposing.

bottom-up approaches, for example, by carrying out field research to specifically address local needs, regardless of the context (i.e., high- or low-income countries). Additional concerns revolve around the validity of the SDGs' metrics, as inconsistencies in data collection and definitions of indicators remain prevalent (Mair et al., 2018; Swain, 2018).[4]

Nonetheless, the introduction of the SDGs has led to significant advancements and success stories. For instance, in the context of SDG 17 – Partnership for the Goals, UN Human Rights, in partnership with the Danish social enterprise Specialisterne, developed an AI algorithm to enhance human rights analysis (OHCHR, 2021). This resulted in the Universal Human Rights Index,[5] a platform providing detailed information on regional human rights issues and their linkages to the 169 targets of the 2030 Agenda, which allows actors to find concrete and locally specific solutions for SDG projects. This example showcases both the utility of AI and a successful partnership within the SDG framework.[6]

B. The Synergistic Value of Partnerships

Multi-stakeholder partnerships represent a key resource for effective SDGs implementation and resilient post-pandemic recovery. This is captured by SDG 17, the UN acknowledging that "[t]op-down, short-term, single-sector approaches generally cannot deliver long-lasting impact – the system is too complex" (UN DESA, 2020). Specifically, target 17.17 addresses multi-stakeholder partnerships, strongly encouraging cross-sector and cross-environment collaborations. At a macro level, multi-stakeholder partnerships represent a structural backbone of the general SDGs framework (see Fig. 9.2) and provide an underlying structure to advance all other SDGs. At a micro-level, the goals enhance action coherence in a given domain (see Fig. 9.2). Merging the macro and micro levels, it becomes evident that the added value of partnerships is

[4] For further reading on ideological perspectives on the SDG framework, see Bendell, 2022; Neubauer & Calame, 2017.

[5] Universal human rights index – human rights recommendations (n.d.). Available at: https://uhri.ohchr.org/en/

[6] More SDG success stories can be found in UN's Bringing Data to Life 2022 report. Available at: https://unstats.un.org/sdgs/report/2022/SDG2022_Flipbook_final.pdf

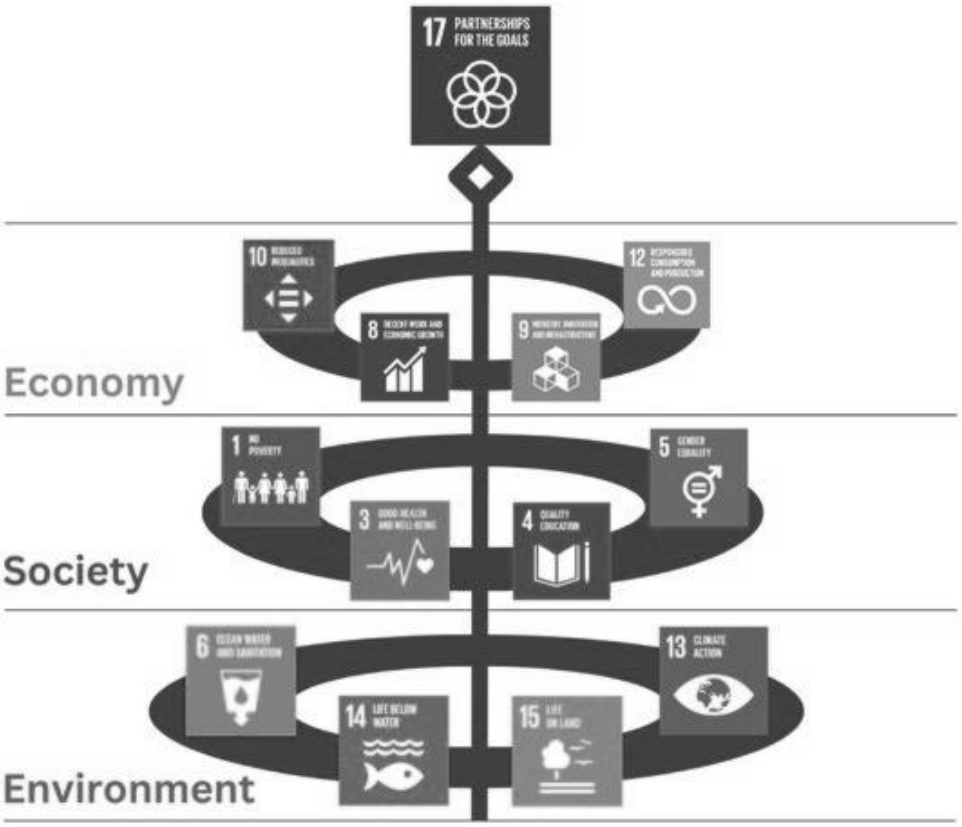

Fig. 9.2 Overview of the role of sustainable development goal 17 as the structural backbone of the sustainable development goals. (Note: adapted from UN DESA (2020, p. 10))

synergistic: the result is greater than the sum of the parts, a concept captured as "Collaborative Advantage" and "Partnership Delta" in the UN's Partnership Guidebook which can be visualized in Fig. 9.3 (UN DESA, 2020, p. 34). The same report highlights ten benefits of partnerships (see Fig. 9.4 for a summary of each). Finally, with an estimated funding gap of 2.5 trillion per year (in addition to current expenditure) to meet the SDGs by 2030 standing at USD (SECO, 2020), unlocking areas of untapped potential in terms of novel partnerships and their pooled finances is imperative.

C. System Mapping

A prerequisite to partnership formation is having a clear map of actors' aligned interests. This alignment relies on the condition that all stakeholders involved clearly communicate their activities, interests, and

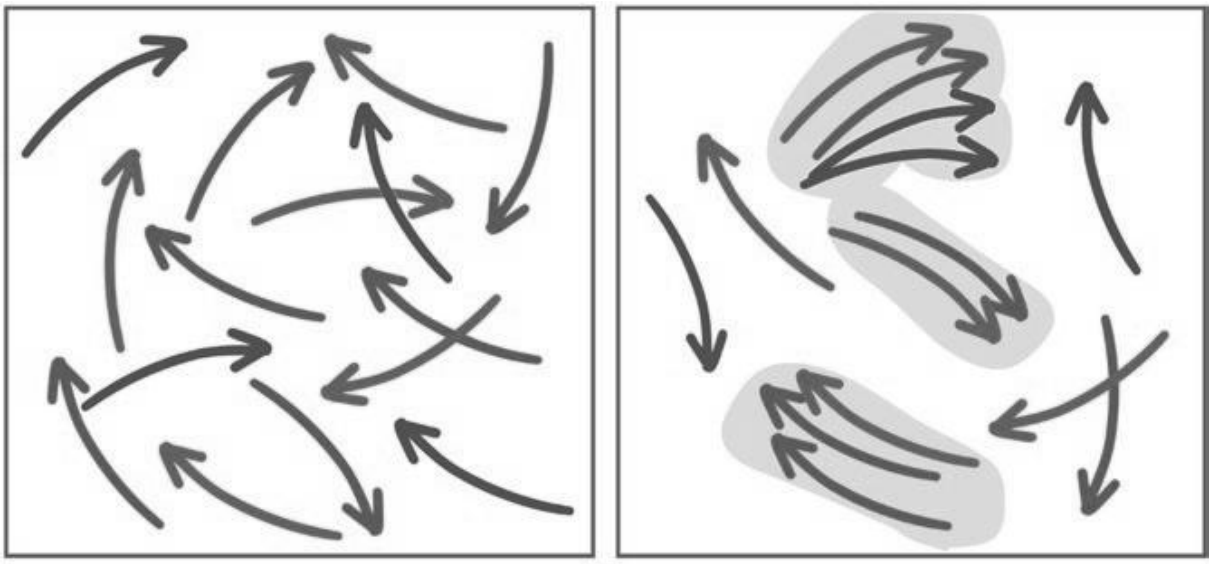

Fig. 9.3 Action incoherence versus action coherence. (Note: adapted from (UN DESA, 2020, p. 12))

1 Complementarity	2 Standards	3 Innovation	4 Critical Mass	5 Holism
Bringing together essential complementary resources.	Creating collective procedures and norms; disseminating standardised knowledge.	Combining diverse resources, thinking, approaches; novel solutions.	Collectively providing sufficient weight of action and emboldening of actors.	Holistic, locally informed, and context-appropriate nuanced approaches.
6 Shared Learning	**7 Shared Risk**	**8 Synergy**	**9 Scale**	**10 Connection**
Mechanisms for ongoing and adaptable collective learning and capability-building.	Co-investments; collectively sharing thus reducing financial or other forms of risk.	Aligning programmes and sharing resources to leverage synergies.	Scaling up delivery-capacity across geographical or cultural barriers.	Networking, connecting, building relationships; pro-social interactions.

Fig. 9.4 Overview of the benefits of partnerships. (Note: adapted from (UN DESA, 2020, p. 35))

objectives through unified SDG terminology, subsequently allowing for easy identification of and connection with similar actors. However, lack of visibility (especially for smaller agents), inconsistencies in the ways in which SDGs activities are communicated about (e.g., vocabulary used), and reliance on human-based search and connection-making constrain the system's ability to find aligned partners**.** To reduce current inefficiencies, data-driven methods can improve network visibility, diminish communication inconsistencies, and forego reliance on human-initiated searches, which are limited by the system's complexity. Such methods can also circumvent limitations caused by geographical disconnections and language barriers (e.g., across countries or within a multilingual country), further expanding the pool of possibilities for partnership formation. However, for AI tools to work in this context, access to big digital data – which is not uniform across the globe, a fact referred to as the global digital divide (i.e., between data-rich and data-poor countries) – is necessary. This divide implies that data-driven approaches to finding aligned actors currently work only in countries with extensive data availability and a solid digital infrastructure.

9.3 The Landscape of AI for SDGs

AI for social good and sustainability is a rapidly expanding field providing algorithms for aiding, accelerating, and monitoring progress toward sustainable goals (Palomares et al., 2021). AI's contribution to the SDGs (AI4SDG) can be categorized into two overarching strategies:

- *AI4SDG-A*[7]*:* using AI to develop solutions addressing SDG targets (e.g., problem-solving, measuring impact),
- *AI4SDG-B:* using AI to track and map SDGs coverage and progress in a certain sector.

The first strategy (AI4SDG-A) benefits from extensive research efforts to map various use cases for dissemination. McKinsey Global Institute

[7] For easier reference later in the text, we labelled the two distinct approaches with -A and -B.

(2018) found 160 use cases across 10 SDG-related social impact domains (e.g., crisis response, health, justice), yet not all domains receive equal AI support. For instance, more than 29 use cases were found for SDG 3 – Good Health and Well-being, while only four were related to SDG 16 – Peace, Justice and Strong Institutions (for a non-exhaustive list of examples, see Fig. 9.5). Importantly, with AI4SDG-A implementations rising and expanding across the three major SDG domains (Economy, Society, Environment), emerging evidence suggests that using AI for SDGs is not always beneficial. Vinuesa et al. (2020) document that AI can positively enable progress towards 134 out of 169 SDG targets while simultaneously inhibiting the remaining 59 targets (primarily those belonging to SDG 1 – No Poverty, 4 – Quality Education, and 10 – Reduced Inequalities). Environment is the most positively impacted category, with 93% of targets being enhanced by AI tools. In contrast, society could see the most harmful effects (38% of targets exhibiting negative interactions), partly due to biases in datasets (e.g., different social groups being represented by more or less complete data). Both the unbalanced coverage across sectors and the contrasting impact across targets are partially caused by the unequal data availability for each segment, which also explains why Health and Environment are more covered compared to Society (Google, 2019). As such, both because of biases and

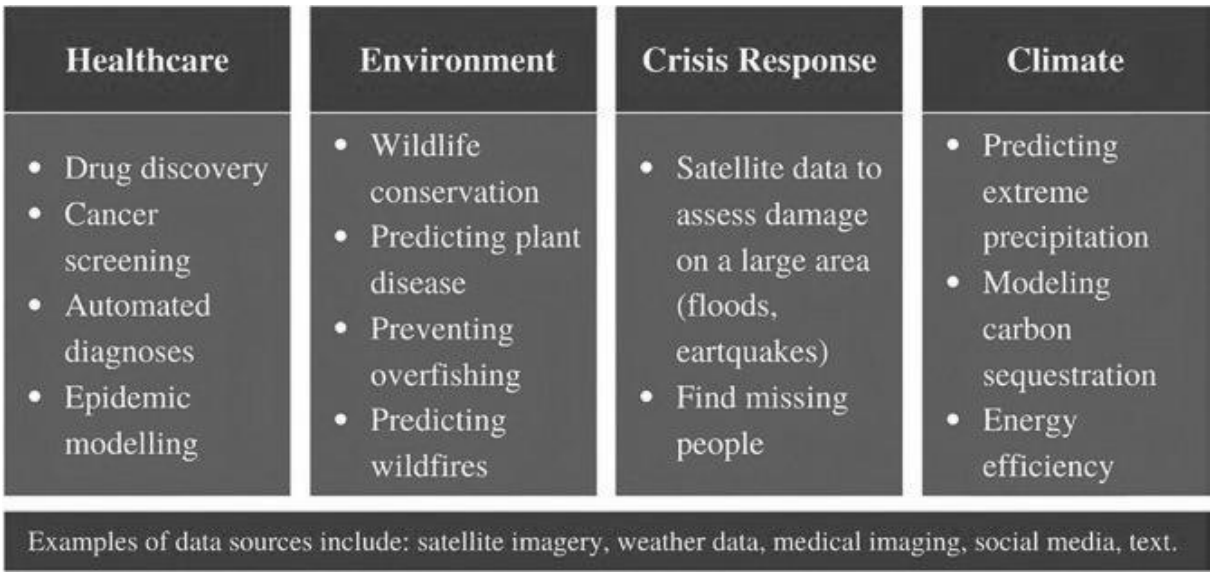

Fig. 9.5 Examples of AI4 sustainable development goal use cases

because of unbalanced data availability, AI is not currently adequate for all SDG targets.[8]

Alongside AI4SDG-A, efforts are being made to track and map SDG coverage and progress (strategy AI4SDG-B), providing a data-driven panoramic view of SDG advancements, critical for monitoring and strategic planning purposes. Across sectors and goals, the consistency and reliability of data on measured targets are uneven, creating a scarcity of consistent information and impairing SDGs-tracking (Dang & Serajuddin, 2020). Instead, what is common to all SDG projects are their reliance on human-produced communication and reporting, generating large quantities of easily traceable text. Natural Language Processing (NLP) – a type of AI – facilitates large-scale text processing to extract patterns of information, thus representing an ideal methodology for the AI4SDG-B strategy to improve the traceability and quantifiability of SDG activities greatly. It is important to mention that NLP AI4SDG-B methods are not free of pitfalls and biases, given that they depend on vocabulary specificity, which is not always precise nor consistent, in turn impacting tracking reliability for different goals.

Regarding current state-of-the-art NLP methods for SDG tracing, Wulff et al. (2023) proposed a robust labelling system that merges and fine-tunes seven other systems trying to address their biases and false positives.[9] Today, this tool represents the most comprehensive SDGs text processing method and stands behind the analyses presented in Sect. 9.5.

A. AI 4 SDG17

The first 16 SDGs are traceable to different extents with NLP algorithms across various bodies of text regardless of the text's source (Wulff et al., 2023). Despite advancements in mapping SDG coverage and a good overall assessment of the first 16 SDGS, SDG 17 lacks specificity and traceability. A potential cause is a lack of specific vocabulary used to describe SDG 17, which impacts its classification. Parallelly, in the context of AI4SDG-A (projects targeting SDG 17 itself), less than 5% of

[8] For more information on the general role of AI in sustainability, alongside opportunities and challenges, see Kar et al., 2022; Nishant et al., 2020.

[9] This labelling system is openly accessible through the text2sdg R package (Meier et al., 2021).

projects in Oxford's AI4SDGs database included a tag for SDG 17 (Nasir et al., 2023), suggesting this goal receives less attention compared to others. In sum, SDG 17 faces two challenges: (1) data-driven insights addressing its advancement remain elusive due to insufficient language specificity, and (2) emerging evidence suggests it is less prioritized (at least explicitly) in projects compared to other goals.

A novel AI approach used to map the interactive SDGs landscape and propose optimized data-driven partnerships can potentially address both issues. Despite the lack of an AI-driven strategy for SDG 17, efforts to track and enhance partnerships do exist. Examples include the UN Partnership Platform[10] – the most notable global registry of voluntary commitments of multi-stakeholder partnerships, the SDG Platform, and the AIforGood Network, among others.[11] These platforms and registries offer valuable resources for understanding existing types of partnerships, insights into implemented projects, and the different contributions of various stakeholders. Nonetheless, we identify limitations as well. The UN's Partnership Platform requires manual registration of already established partnerships (thus being a retroactive registry) and does not feature future-oriented recommendations regarding advantageous potential partnerships. The reliance on human input and lack of future-oriented applicability could be overcome through automated tools.

As discussed in Sect. 9.2, partnerships represent both the backbone and the catalyzer for SDGs advancement through action coherence and collaborative advantage. The lack of traceability, quantifiability, and optimization surrounding SDG 17 impedes both progress assessment and collaborative strategic planning. Consequently, an effort to quantifiably measure multi-stakeholder partnerships needs to be developed in addition to already-existing NLP approaches, with implications for enhancing system mapping capabilities. This approach contrasts with a manual and retroactive human registry of already established partnerships (e.g., the case of the UN Partnership Platform), expanding the possibilities to identify relevant partners.

[10] https://sdgs.un.org/partnerships/browse

[11] Examples inclusive Sustainable Development Solutions Network, World Business Council for Sustainable Development, SDG Impact Finance Platform, SDG Hub, SDG Pioneer Programme, SDG Collaboration Platform.

9.4 Philanthropy for the SDGs

Since the SDGs' adoption, Philanthropic Organizations (POs) have been playing an increasingly important role in supporting the advancement of the 2030 Agenda, aligning their objectives, operations, and grant strategies to the goals with the intent of accelerating their implementation. The SDGs Philanthropy Platform (SDGPP) aims to help the philanthropic sector meaningfully engage with the SDGs. It estimates the potential to unlock USD 651 billion in philanthropic giving by 2030, contributing to the current annual funding gap of USD 2.5 trillion (SECO, 2020).

Philanthropy's relationship with the SDGs goes beyond financial contributions (Charities Aid Foundation, 2019). While the SDGs provide an important framework through which POs can align their work with civil society, governments, and the private sector, POs' unique flexibility, value-driven approach, and independence allows them to contribute to the 2030 Agenda on multiple fronts (UN DESA, n.d.-a). As advocates, POs can raise awareness of the importance of integrating SDGs in programming efforts and the benefits of adopting a long-term focus. As innovators and risk takers, they can test new ideas and attempt innovative approaches, which is often not possible through traditional funding sources (e.g., the case of private businesses), yet crucial to address the interconnected and complex challenges of SDGs. Lastly, as impact drivers, they can catalyze change in spaces unreachable by governments, incentivize collective action, and lead the creation of multi-stakeholder partnerships by providing funds to kick-start initiatives with the potential of attracting market capital.

As Sect. 9.2 exemplifies, SDG 17 embodies the international recognition of partnerships as a tool vital to accelerating SDG implementation and highlights the urgent need to overcome barriers to collaboration. POs, with their multi-level engagement and privileged position as independent entities at the intersection of industry, government, and academia, are uniquely positioned to lead the formation of innovative partnerships for the attainment of the SDGs. Whether partnering with nonprofit organizations (NPOs), fellow POs, corporations or government agencies, the act of merging resources to advance social well-being

is a central feature of the history of POs and one increasingly recognized as essential for effective philanthropy (Stanford Social Innovation Review, 2015). From the Rockefeller and Ford Foundations partnership to fuel the Green Revolution in the twentieth century to the Vaccine Alliance's key partnerships with the Bill and Melinda Gates Foundation to support mass vaccination programs and the more recent World Health Organization (WHO) Foundation's "Go Give One" campaign, examples showcasing the leveraging power of philanthropic partnerships for development are numerous. The SDGs, in particular SDG 17, have only reinvigorated this long-standing philanthropic tradition of collaboration (United Nations Partnerships for SDGs platform, n.d.); after all, the notion of partnership is not new to the philanthropic sector. Nonetheless, among the multiple actors involved in advancing the SDGs, POs are those leveraging the power of partnerships the least. Today, only 0.7% of UN-registered SDG partnerships involve POs (UN DESA, n.d.-b).

Moreover, multiple efforts have facilitated philanthropic partnerships. An example is the SDGPP 2.0, a partnership between the UN Development Program (UNDP) and Worldwide Initiatives for Grantmaker Support (WINGS), which aims to revitalize efforts to "cataly[z]e and unlock philanthropy's potential through multi-stakeholder partnerships" (SDG Philanthropy Platform, n.d.). While valuable in mobilizing big philanthropic capital, these large-scale initiatives do little to leverage smaller POs' potential adequately.[12] Specifically, while well-established foundations (e.g., the Bill and Melinda Gates Foundation) possess the financial resources, visibility, and network connections necessary to leverage partnerships' synergistic power successfully, smaller non-profit actors often do not. As a result of this gap, the potential of these smaller POs remains untapped. This untapped potential particularly impacts the implementation of local-level SDG targets and minority causes, as these smaller actors are characterized by a unique local perspective and bottom-up approach, embodying the very essence of the SDGs'

[12] Community foundations (CF) represent an example of a small philanthropic actor. Despite the different operational approaches taken by CF in different geographies, what unites their efforts is the proactive stance to bring the SDGs to the local level. Specifically, when it comes to the SDGs, the work of community foundations revolves around three core elements: alignment (local and national), dissemination of education and tools, and fostering community engagement.

mantra "leave no one behind." It is crucial to allow these actors to capitalize on "collaborative advantage" and "partnership delta," with the NLP network mapping approach presented in Sect. 9.5 being an essential step in this direction.

Notably, POs are not the principal stakeholders advancing sustainable development. On the contrary, they are part of a wide ecosystem comprising private and public companies, governments, international organizations, and civil society organizations (CSOs). Indeed, the SDGs have enabled diverse stakeholders to act, leading to success stories and projects contributing to the estimated annual USD 3.3 to 4.5 trillion needed to achieve the SDGs by 2030 (UNSDG, 2018). Despite the "noise" surrounding many of these SDGs stakeholders, examples of and insights on the philanthropic sector's targeted efforts towards the SDGs remain limited, despite POs representing a valuable player in the SDGs ecosystem.

A. Case Study on Swiss Philanthropy

Swiss philanthropy represents an ideal context to study the use data-driven methods for SDGs-partnership recommendations. Home to a philanthropic sector that generates a positive annual net growth of approximately 1% and counting over 10,000 active foundations within its territory, Switzerland has been building a strong philanthropic tradition (Eckhardt et al., 2020). As rankings demonstrate, the country's strong economy, political stability, and legal frameworks for foundations contribute to the sector's growth. Within the European context, in 2021, Switzerland ranked 6th in the number of foundations and 5th in terms of POs by population (Philea, 2021). At the international level, metrics have indicated how Swiss philanthropy extends its action well beyond its borders, scoring 4.75/5 in the Global Philanthropy Environment Index (Indiana University Lilly Family School of Philanthropy, 2018) and 4.5/5 in the Philanthropic Environment Cross-Border Flows score (Indiana University Lilly Family School of Philanthropy, 2020). Notably, Switzerland also hosts multiple UN offices, financial institutions, and other nonprofit organizations, creating an environment favorable to forming multi-sector partnerships for SDG acceleration.

Despite Switzerland's vibrant philanthropic sector and commitment to the SDGs, creating successful philanthropic partnerships is a complex task, particularly for smaller POs. Failure to align priorities, limited knowledge of the market and area of intervention, and mismatched communication[13] are only some of the elements hindering the philanthropic sector's ability to fully capitalize on the benefits of partnerships. To this end, our work develops an open-access digital tool that relies on NLP techniques allowing for a dynamic inspection of the multi-level complexities of the Swiss philanthropic landscape.

9.5 Mapping SDG-Alignment of the Swiss Philanthropic Ecosystem

Aiming to develop a novel AI methodology tailored explicitly to uncovering POs' SDG 17 potential, we matched text data from 10,755 Swiss philanthropic organizations (equally referred to as nonprofits or NPs hereafter) to SDG lexicons. Additionally, we performed the same for Swiss public companies (for-profits, FPs hereafter) listed on the Swiss Stock Exchange to compare NPs and FPs ecosystems and investigate whether there are any structural differences between the connectivity of the two sectors. To this end, we fed mission statements (hereafter MSs) of NPs and annual reports (hereafter ARs) of FPs into an NLP algorithm for SDG labelling (Meier et al., 2021), then we connected organizations to SDGs based on matching text using network-based Machine Learning. Given their shared SDG alignment, we identify potential connections between within-sector actors. Overall, this approach constitutes a new AI4SDG-B methodology to paint a landscape of sector-specific SDG alignments and strategies. It serves both as an intuitive partnership matcher within current sector dynamics and as a potent tool for proposing alternative partnership modalities to align heterogeneous stakeholders based on their SDG relationships.

[13] The presence of three official languages in Switzerland - German, French, and Italian - may represent a language barrier limiting communication amongst different cantons.

A. Results

SDG labelling results indicate that only 4% of Swiss NPs use SDG vocabulary in their MSs (see Fig. 9.6a), while 60% of public FPs communicate with SDG-aligned vocabulary in their ARs (see Fig. 9.6b). For those NPs and FPs using SDG vocabulary, only 2.2% of the entire word sample for each sector matched SDG language (see Fig. 9.6a, b). These observations reveal that, in Switzerland, although the philanthropic sector is less SDG-centric than public companies, sustainability-oriented messages represent a small fraction of their reporting (i.e., vocabulary coverage) for both types of organizations.

As previously mentioned, AI efforts to track and map SDG coverage and progress (strategy AI4SDG-B) depend on NLP tools, which have inherent limitations when vocabulary coverage is low. Mapping SDG 17 proved particularly challenging in previous efforts (Wulff et al., 2023) as well in our sample. We find that, out of the matched SDG words (535 for NPs and 478 for FPs), a staggering minority were connected to SDG 17 (2.4% for NPs and 2.9% for FPs). Thus, instead of mapping language specific to SDG 17 itself (which would show which organizations already consider partnerships in their activities), we sought to understand how the remaining SDGs interact as a proxy for mapping possible partnerships.

To obtain a landscape view of how each sector is organized around SDG achievement and discover to which extent analyzing shared SDG communication could constitute a fruitful strategy for finding potential partnership alignments, we built bipartite networks for each sector. This task entailed connecting each actor (NPs and FPs independently) to one

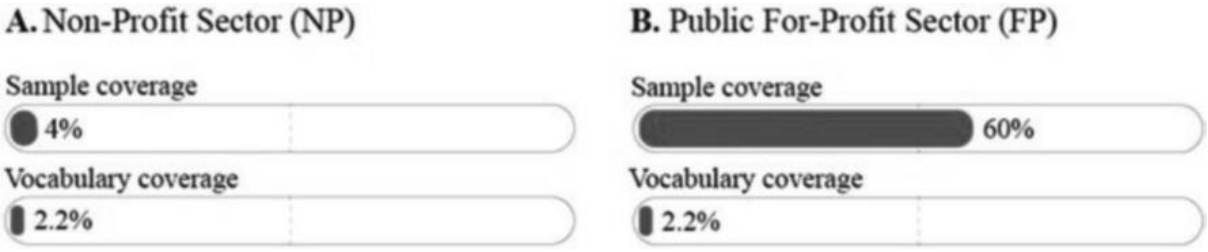

Fig. 9.6 Sample and vocabulary coverage in the non-profit and for-profit sectors

or multiple SDGs based on the words they use in their MSs or ARs, mapping all existing links (see Fig. 9.7a, b).

This approach proved both visually insightful and analytically promising for understanding the status of SDG alignment and the potential for SDG partnerships in both sectors. The NP network presents less SDG connectivity than the FP network, as shown by network density (level of network interconnectivity) (0.08 and 0.19, respectively, per Fig. 9.7a, b), highlighting the two sectors' different sustainability approaches. More precisely, NPs are preferentially connected to one specific SDG (cluster organization), as opposed to FPs, which tend to form intricate inter-SDG webs (network organization). Concerning links to SDG 17 itself, very few NPs and FPs are directly connectable to it (1.1% and 3.5% respectively), gesturing concomitantly at two explanations: (1) the challenge to track partnerships solely using NLP; and, more importantly, (2) that the present stakeholders might not value nor consider the importance of partnership in their activities in the first place (and thus not use words related to it in their communication).

To further understand the nature of each sector's SDG engagement, we explore the potential of each (NP and FP) to engage in uni- or

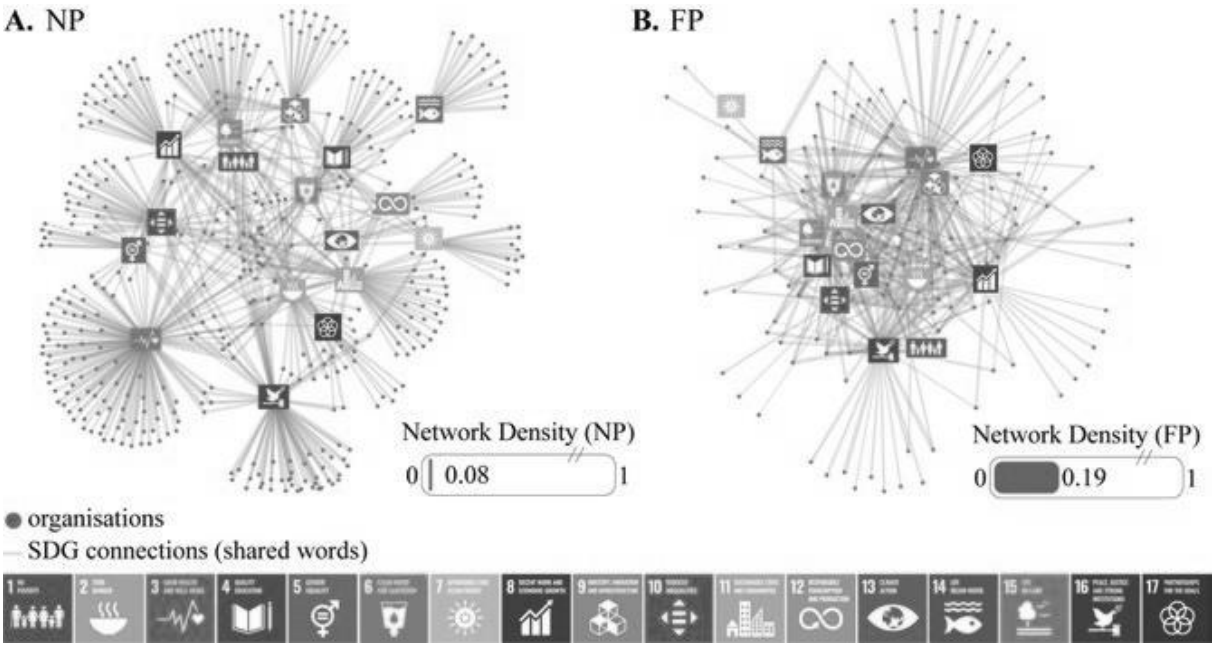

Fig. 9.7 Sustainable development goals network connections of the non-profit and for-profit sectors

multi-dimensional SDG contributions. The data showed that 73.6% of analyzed NPs align to a single goal (see Fig. 9.8a), while the inverse is true in the FP sector, with 71.4% of organizations being connected to multiple SDGs (see Fig. 9.8b), reflecting the resulting pattern already shown by network density analysis. Interestingly, the single-SDG nature of NPs could indicate that POs have narrower purpose schemes, but these do not necessarily hamper their potential for SDG partnership formation. Indeed, two types of partnerships are needed to attain SDG 17: intra- and inter-SDG, i.e., within single-SDG collaboration and between multiple SDG collaborations. As Figs. 9.7 and 9.8 show, NPs seem to be better suited for intra-SDG partnerships, allowing for focused and deep SDG action and collaboration (based on cluster organization). In contrast, FPs appeared to adopt a more inter-SDG approach and could be better at designing work plans and engaging in partnerships that tackle several SDGs simultaneously (based on network organization). Importantly, the uneven SDG alignment profiles and connectivity strategies of NPs and FPs, likely reflective of the inherent characteristics of each sector (resources, target populations, etc.), suggest the existence of different strategies afferent to each sector for tackling sustainability matters, also implying that different stakeholders can fulfil multiple SDG roles. Understanding the SDG strategies of each sector is fundamental to effectively leveraging SDG 17. As such, the insights derived from this approach can guide each sector to establish partnerships in accordance with their

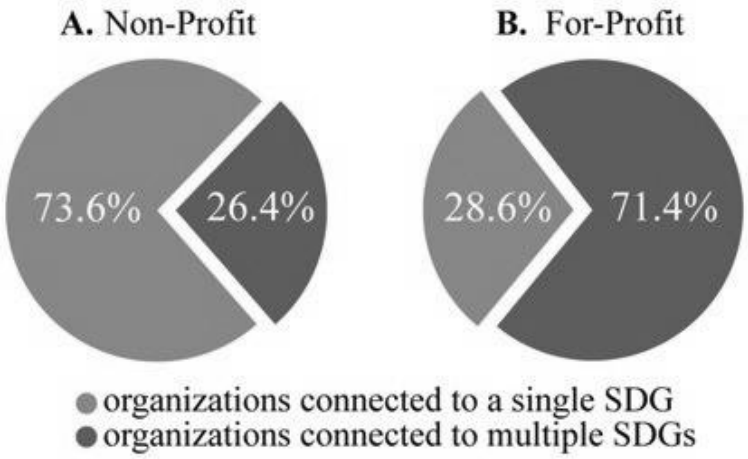

Fig. 9.8 Aggregate percentage of single- vs multi-sustainable development goals connection for each organization by sector

current SDG strategies and propose alternative ways of collaboration different from each sector's default. In both scenarios, network analysis could be instrumental in identifying advantageous connections.

Focusing hereafter on POs, we illustrate our proposed methodology's capacity for identifying precise partnership suggestions. For simplicity, and to demonstrate the point, we chose SDG 3 – Good Health and Well-being as our primary focus, given it is the most richly connected goal.

Consistent with previous findings, an SDG 3-focused analysis indicated that most NPs are single SDG-oriented (67.5%, Fig. 9.9a). The network structure visually showcases the SDG 3 community and potential paths for collaboration (see Fig. 9.9b). The light-green network represents those organizations that only connect to SDG 3 and could join forces for a unique purpose. In contrast, the dark-green network portrays actors who could collaborate on multiple targets given their multi-SDG connectivity. Importantly, similarly with the higher network density of the FP sector, the SDG 3 NP landscape seems to be in the developing stages of higher inter-network ramifications compared to other goals.

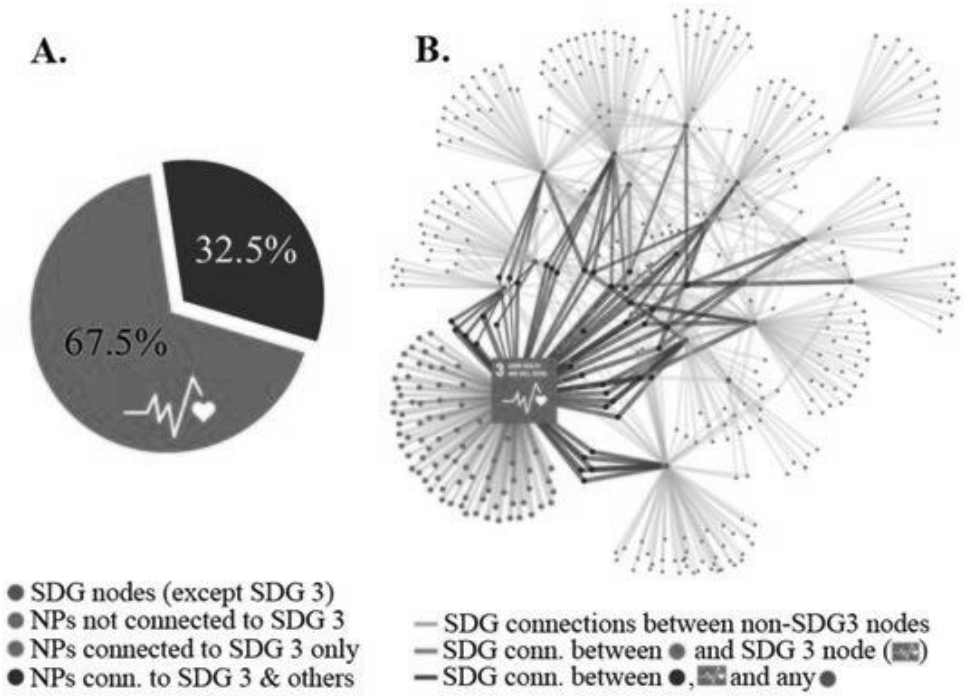

Fig. 9.9 Intra- vs inter-sustainable development goal 3 nonprofit network connections. (Notes: A. Proportion of NPs aligning to SDG 3 both uniquely (light green) or in combination with other SDGs (dark green); B. Network highlighting connections of SDG3 aligned NPs)

This result implies that NPs could adapt their activity and partnership strategies to increase overall network connectivity.

While the network view facilitates a rapid overview of the SDG 3 centric NP landscape, to further identify precise multi-SDGs partnerships with SDG 3 as a common goal, we analyzed the most frequent co-occurrences of SDGs combinations (see Fig. 9.10). The results show that common co-goals include, for example, SDG 2 – Zero Hunger and SDG 16 – Peace, Justice, and Strong Institutions, expanding the possibility of engaging in inter-goal sustainability projects.

B. Discussion

This methodological and analytical approach is a starting point for considering the role of AI beyond SDG solutions (i.e., approach AI4SDG-A) and into AI solutions for SDG coverage (AI4SDG-B). We

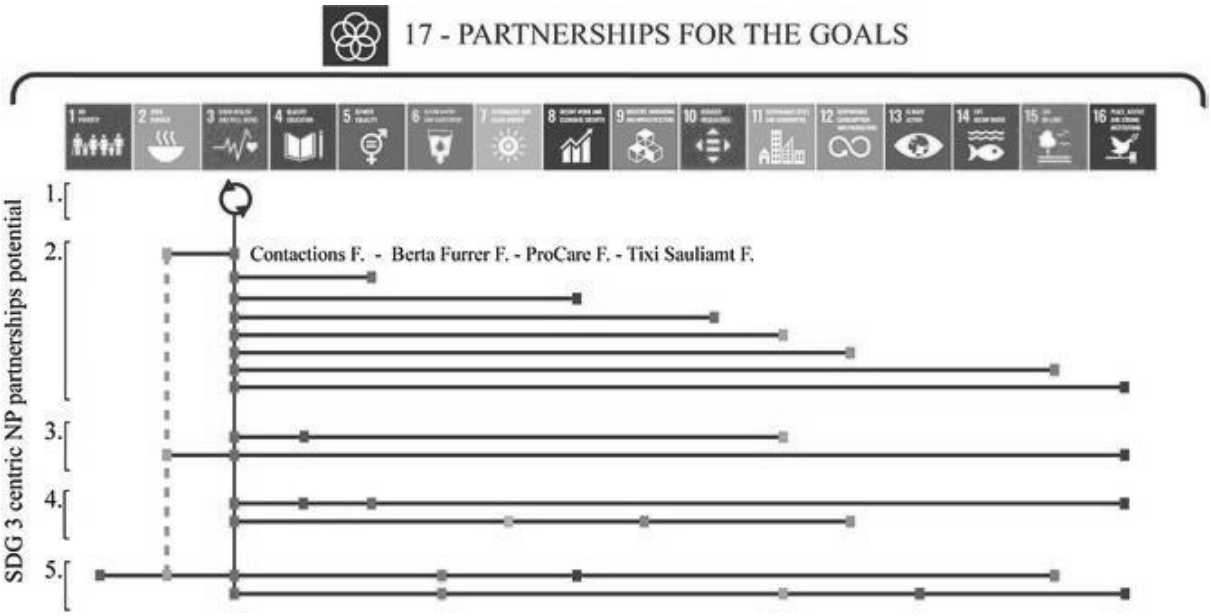

Fig. 9.10 Schematic of most abundant non-profit sustainable development goal 3-centric potential partnerships links. (Notes: 1 – intra-SDG potential connections, i.e., NPs connected to just SDG3 (from Fig. 9.9 – light green). 2 – dual inter-SDG connections, e.g., between SDG 2 and 3. The text in line exemplifies a few of the many foundations that share SDG 2 and 3 in their vocabulary. 3, 4, 5 – inter-SDG connections between more than two goals (3, 4, 5 respectively). Horizontal lines – connections between SDG 3 and other SDGs. Vertical lines – foundations that are connected to SDG 3 and share another SDG (e.g., SDG 2) also present partnership potential (grey dashed line))

present an AI approach for discovering new action plans for Partnership Formation (SDG 17) within a single goal (intra-SDG) or multi-goal (inter-SDG).

Mapping the SDG alignment of the Swiss philanthropic ecosystem led to several insights into its status with the broader philanthropic network and within the for-profit sector. These insights stand to inform partnership formation towards SDG achievement both by POs independently and in collaboration with FPs. We find that the philanthropic ecosystem's SDG network connectivity is low, making space for beneficial data-driven partnership suggestions. Additionally, Swiss NPs appear to have action strategies mainly focusing on a single SDG (see Fig. 9.8a), although inter-SDG foundations exist and could act as bridges. Finally, focusing our data exploration on understanding SDG 3 philanthropic alignment, we discovered network patterns indicating potential bridging points for uniting forces on SDG 3 and with other SDGs (see Fig. 9.10).

Of particular interest, the NP sector rarely describes itself in the sustainability lexicon, given that only a minority of organizations use SDG vocabulary in their MSs (4%, Fig. 9.6a), and even when they do, only 2.2% of the total text represents SDG words. This lack of SDG terminology use could constitute an entry-level problem for foundations to discover each other's SDG alignments and impede partnership formation.[14] Consequently, AI systems based on NLP mapping on their main descriptions and MSs might not always be the optimal approach for accurate mapping. However, it still represents an improvement compared to the baseline.

Future AI directions should go beyond NPs' MSs and explore, for example, the specific missions they are executing by considering their specific activities. This higher resolution of specific activity domains would lead to project-specific partnership suggestions. However, few POs systematically report their specific activities, even less so in a vocabulary that matches the SDG lexicon. A change in communication paradigm and efforts to align and standardize communications, both within and

[14] It is also possible that the Swiss philanthropic ecosystem isn't necessarily geared towards sustainability more generally. However, in a parallel analysis we ran on NP and FP communication content, generally the primary message they deliver centers on an SDG-aligned purpose.

beyond philanthropy, would greatly enhance NLP efficiency; a necessary first step would be to foster digitization and action reporting among POs (as of today, only 30% of POs have websites[15]). Lastly, POs could adopt similar strategies as FPs, not just by increasing SDG-specific communication, but also by incorporating SDG target metrics (e.g., as up to 40% of FPs provide those (GRI, 2022), whereas the same cannot be stated for POs).

Overall, this NLP approach represents a cost-efficient and automated system mapping of SDG stakeholders (in this case, applied in the context of Swiss nonprofits), based on which finding and building multi-stakeholder partnerships with aligned actors can be greatly facilitated. Whereas this chapter maps the NP and FP sectors independently for comparison purposes, it can be equally applied at the intersection of multiple sectors to find cross-sector collaborations, fully embodying target 17.17's aim.

A. Methods and Limitations

The data sources for the analysis[16] consist of mission statements (MSs) from 10,755 NPs and annual reports (ARs) from 231 FPs listed on the Swiss stock exchange. Text was collected from organizations' websites or online databases. To map SDG content in text data, we used the text2sdg R package (Meier et al., 2021). This approach successfully mapped 4% of 10,755 NPs (432) and 60% of 231 FPS (140), sample used for subsequent analyses. The innovative aspect of this approach to specifically aid SDG 17 through AI is brought by network analytics (see Figs. 9.7, 9.9, and 9.10), which allows for SDG partnership potential system mapping and intuitive visualizations of SDG-matched actors.

While bypassing several methodological limitations brought by SDG classification systems, namely for tracking SDG 17, this proposed analytical approach inherits the SDG mapping and classification biases intrinsic to the training data used in text2sdg (Meier et al., 2021). In

[15] Analysis performed on our scraped data sample, from the Stiftungschweiz repository (https://stiftungschweiz.ch/)

[16] The full methodology and its limitations, alongside the code used and output data, can be found at https://osf.io/vr5j7

addition, the datasets for NPs and FPs are unequal – there is a bigger NP sample size and there are differences in text length between MSs and ARs. However, our results do not reflect potential biases caused by such dataset imbalances given that the larger sample of NPs did not result in a denser network, and the smaller size of MSs' text length did not result in a different vocabulary coverage. Secondly, using MSs could bias results due to their permanent nature – they are formulated at the creation point of a NP and are rarely updated. To account for this possible lexicon limitation between pre- and post-2015 MSs (timestamp of SDG formulation), we compared the sample coverage of foundations created only after 2015 with the entire sample without finding significant differences (Sample Coverage of 5.4% post-2015 compared to 4% for the whole sample), indicating the overall reliability and utility of this approach independent of the permanent MSs' nature. Lastly, the current approach does not account for all fundamental factors determining successful partnerships, e.g., human dynamics or value structures. Overall, this research constitutes proof-of-concept work laying the foundation for AI-based partnership-recommendation systems.

9.6 Risks of AI in Philanthropy and SDGs

Despite POs' early and continued investment in AI,[17] the relationship between the two is somewhat paradoxical. While POs are important funders of AI, with contributions to Artificial Intelligence, Machine Learning, and Data Science technology (AIMS) philanthropy amounting to USD 2.6 billion in 2021, the extent to which POs adopt the technology remains limited (Herzog et al., 2021). The underuse of AI in the nonprofit sector is widespread, as the sector continues to possess one of the lowest AI usages (Google, 2019; Herzog et al., 2021). The limited knowledge and use of AI, especially amongst smaller POs, translates to

[17] Philanthropy played a key role in the initial development of AI. In 1956 the Rockefeller foundation gave a grant of USD 7'500 to support a conference in Dartmouth, US, now widely recognized as the birthplace of modern AI. Moreover, the first recorded usage of the term "Artificial Intelligence" can be found in a grant application that was made for the conference (Rockefeller Philanthropy Advisors, 2019).

these actors operating below their full potential, including supporting the SDGs. AI can play an essential role in enhancing POs' contribution to the SDGs, both in terms of SDG targeting (AI4SDG-A) and SDG coverage (AI4SDG-B). As such, uncovering why POs remain hesitant to adopt AI and providing tangible risk-mitigation efforts is necessary to contribute to the sector's digitalization and the overall SDGs advancement. For instance, in the Swiss philanthropic ecosystem, over twelve different concerns were raised by POs, among which data privacy, AI explainability, corruption detection, and job displacement (Della Giovampaola et al., 2023), however most of those concerns remain without adequate risk mitigation plans in place.

Multiple issues are halting POs' decision to integrate AI into their systems and operations. Firstly, given the largely for-profit nature of the tech sector, most AI software is designed to extract maximum profit from digital data. Often this entails the collection and the long-term holding and handling of digital data. Such practices, particularly in vulnerable humanitarian settings, can be dangerous and lead to discrimination, polarization, and what has been referred to as "techno-colonialism" (Madianou, 2019). Buolamwini and Gebru (2018) and Whittaker et al. (2019) show, respectively, how commercially available facial recognition algorithms are less accurate in their recognition of women with darker skin tones and have greater difficulty in the identification of people with disabilities when these individuals use assistive technologies, such as wheelchairs. The lack of diversity in training datasets is part of the cause. This lack of diversity, in turn, can increase inequality within societies, having a large impact on peace (SDG 16) and stability (SDG 17) (Gupta et al., 2021). Cyber-attacks and data breaches, which are often directed at humanitarian organizations (such as the 2022 cyber-attack conducted against the International Committee of the Red Cross (ICRC, 2022)), further heighten these risks. As such, "collect little and destroy as soon as possible" is seen as a far more suitable modus operandi for safeguarding sensitive data (Bernholz & Reich, 2017). However, creating and managing such tailored infrastructure requires vast resources mostly unavailable to POs.

Available data quality is another main issue. Databases of POs' activities and strategies are frequently unavailable, incomplete, inaccurate, and

contain irrelevant data (known as "data deserts"). These shortcomings can severely hinder POs' ability to leverage AI's power and can heighten bad practices in worst-case scenarios (Kanter & Fine, 2020). Decision-making informed by ill-adapted AI technologies can dangerously magnify and reinforce pre-existing inequalities and biases (O'Brien, 2022). This increase in inequality can heighten exclusion and discrimination, particularly against minority groups, countering the overall objective of the 2030 Agenda of a more equitable and sustainable world. Uneven data availability also widens the gap between unequal levels of support provided to different SDGs. For example, the increased use of AI to address health (SDG 3) and climate issues (SDG 13) is, in part, due to the vast amount of data available, as opposed to Peace and Justice (SDG 16), an issue area more complex to capture with data (Google, 2019). Given this SDG data gap, POs may focus primarily on issues benefiting from sufficient data availability to ensure adequate impact. Overall, data collaboratives and comprehensive outcomes represent timely yet efficient solutions to address the problem of "data deserts" (Kanter & Fine, 2020).

Even before being treated, digital data presents multiple difficulties. Data ownership, data quality, and data type (i.e., sensitive or personal data) are some of the most recurring issues. Philanthropy is centered around the voluntary giving of private resources, whose ownership is largely clear and undisputed. By contrast, digital data is contested property (Bernholz & Reich, 2017). Who is the "true" owner? The person whose information is involved, the company providing the software collecting the data, or the platform on which the data is collected? Despite the question of data ownership remaining unanswered, the phenomena of "data philanthropy"[18] – the donation of data from private companies for socially beneficial purposes – and "data-raising" – efforts to get people to give their data for a cause – are gaining traction (Bernholz, 2021; Lev Aretz, 2019; Taddeo, 2016, 2017).

Even if unintentional, divulgating misinformation is another important yet often overlooked risk that may derive from using AI to address social problems. Many factors may fuel the production of misinformation,

[18] The term was reportedly coined by World Economic Forum CTO Brian Behlendorf during a spontaneous conversation at the 2011 World Economic Forum (Lev Aretz, 2019).

including language and biases, particularly as these technologies are primarily developed and fabricated in the "Global North." Misinformation generated by human-machine communication can be at odds with the widely respected humanitarian imperative of "do not harm" and raises important issues around responsibility and supervision. Moreover, one must not forget that AI needs to experiment to learn. In the humanitarian sphere, this may again be severely at odds with the "do no harm" principle, leaving the use of such technology at a crossroads (Coppi et al., 2021).

In addition to these more tangible risks, POs also raise ethical concerns when discussing their reluctance to incorporate AI. Despite the multiple ethical frameworks and principles for AI proposed in the last decade, much disillusionment appears to surround these frameworks, and POs question their adequacy in catering to the needs of the nonprofit sector. One important step to boost the sector's confidence in AI is greater "explainability" of algorithms, also known as "explainable AI", to target algorithmic opacity (Coppi et al., 2021). Additionally, incorporating AI in a sector that, since inception, revolves around human welfare may have a vaster impact. The sector's resistance to AI may not only derive from the limited knowledge and resources available to operate this technology, but also from a fear of alienation. The delegation of tasks from humans to machines can be seen as unnatural and inadequate by many sector professionals, who may view it as diluting their efforts. Sharing successful case studies and establishing adequate frameworks to strengthen transparency and accountability in the use of AI in humanitarian contexts might attenuate this fear.

It is hard to predict the positive and negative impact that technology can and will have on philanthropy. However, what cannot be ignored is how technology democratizes philanthropy. By increasing the connectivity between the receiver and the giver, improving efficiency and transparency, and widening operations reach, AI has much to offer to the philanthropic sector and vice versa. Moreover, when considering the risks that may accompany the incorporation of AI in POs, one must not forget that the underuse of AI can also be considered a misuse in itself (Floridi et al., 2018). The tool presented in this chapter aims to provide a risk-free alternative on how technology can be an SDG achievement enhancer. Specifically, it seeks to initiate and enhance an agent's ability to identify and visualize possible aligned actors to enhance partnership visibility. The

tool itself does not present any inherent risks or dangers, as it does not handle sensitive data and does not aim to provide an AI4SDG-A type solution with ethical implications for human or planetary well-being (e.g., an algorithm predicting cancer subtypes with evident consequences for human health). Instead, it makes use of public data, and no inherent risks caused by possible data biases can be identified, with the main consequence of biased "word-classifiability" being that some potential partnership connections will not be identified.

9.7 Conclusion

This chapter approaches sustainability using the SDG framework, engaging in a balanced discourse of the framework itself, followed by the crucial yet underleveraged role of SDG 17. We present the landscape of AI for SDGs, focusing on AI for SDG 17. We also highlight the crucial role of POs as value-driven players engaging in promoting activities geared towards SDG attainments and emphasize small POs as underrepresented actors. A conclusion of the chapter's findings is presented in Fig. 9.11.

Together, an underleveraged goal and a set of underrepresented actors present significant growth potential. We focus on Swiss philanthropic organizations to illustrate how an AI NLP tool can be used to uncover potential partnerships among NPs and FPs, illustrating the role of AI for SDG 17 itself – method which is translatable in other national or international contexts both in non-profit and for-profit ecosystems. Overall, the untapped growth potential can be uncovered through this network mapping approach, which helps connect stakeholders with SDGs. This cost-efficient approach increases the visibility of aligned actors in a complex system, for which partnership potential would otherwise be more difficult to trace. Lastly, we present a general overview of possible risks associated with AI in the context of POs, while noting that this specific AI4SDG-B approach we propose does not present any inherent risks. Future work could examine how action purposes, moral values, or target populations influence SDG alignment, which could inform potential partnerships based not only on shared interest alignment but also on other factors, leading to a multi-dimensional integrative approach.

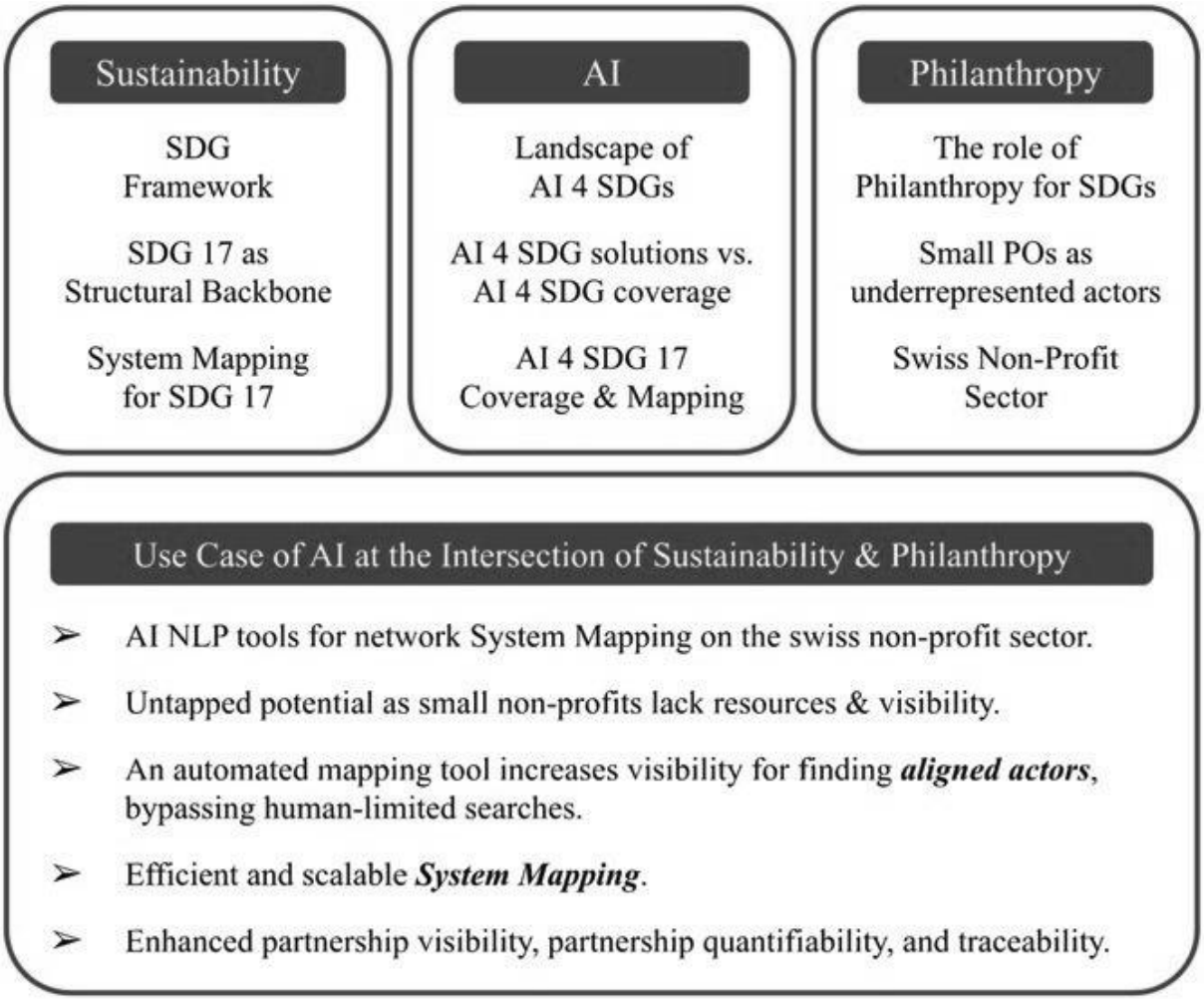

Fig. 9.11 Visual chapter summary

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