The AIMS-Templates: Documenting the multidimensional sustainability of AI systems

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Abstract

Artificial intelligence (AI) systems impact society, the environment, and the economy. Documenting them is a prerequisite to understanding and assessing such impact. Additionally, real-world AI systems are highly complex: they may consist of multiple models and datasets, may be embedded into a software application, and may run on different hardware structures. Existing documentation practices do not sufficiently mirror this complexity or focus only on specific aspects of the possible impact of such a system.

To close this gap, we propose the *AI through the lens of Multidimensional Sustainability Templates* (AIMS-Templates). The framework of multidimensional sustainability, i.e., acknowledging that sustainability has a social, environmental, and economic dimension, thereby allows us to cover all relevant areas of impact of an AI system. The AIMS-Templates consist of three sub-templates, covering the AI system, the AI model, and the dataset, and were developed in an iterative process including feedback from practitioners and from applying it in two use cases. They are designed for any type of AI model and dataset, for internal and external use, and with a focus on feasibility. In addition to presenting the AIMS-Templates, we discuss first learnings from using them in practice. As such, the AIMS-Templates are a concrete proposal for achieving the often-called-for greater transparency of AI systems and a basis to understand their potential positive impact for sustainability.

Keywords

Documentation, Transparency, Multidimensional Sustainability, AI system, AI model, dataset, social impact, environmental impact, economic impact

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1 Introduction

Artificial Intelligence (AI) systems have an impact in various domains of society, the environment, and the economy [13, 16, 22, 23, 25, 29, 35]. Assessing their actual impact is of critical importance to ensure that such systems are overall beneficial. A prerequisite in this endeavor is documenting the AI system, and creating transparency about it. Additionally, real-world AI systems are increasingly complex: an AI system may consist of several AI models, may be trained on different datasets, may be embedded into an app through which it collects additional data, and may be running on different types of infrastructure.

Current documentation practices do not sufficiently mirror this complexity nor do they cover all relevant aspects of impact of an AI system: they focus either on individual parts of an AI system such as the AI model [26] or dataset [11], or are specific to a particular area of impact [18]. Other templates are designed with a focus on regulatory compliance [12, 21].

To close this gap, we present the *AI through the lens of Multidimensional Sustainability Templates* (AIMS-Templates), documentation templates that allow documenting the complexity of a real-world AI system. At the same time, the templates cover the possible impact of an AI system on society, the environment, and the economy, made possible by applying the framework of multidimensional sustainability.

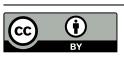
The AIMS-Templates consist of three sub-templates that cover the AI system, model, and dataset individually. These sub-templates include general information for each of these three elements as well as aspects of social, environmental, and economic impact, clustered along the three dimensions of sustainability. The AIMS-Templates are designed for organizations that develop AI systems and can be used both for internal or external documentation purposes. In addition, documentation is not restricted to a particular type of AI model or a specific dataset. We also put an emphasis on the feasibility of the templates, considering the trade-off between details to document and time spent filling the templates.

1.1 Structure of the paper

In Section 2, we present the background and related work of the AIMS-Templates. This is followed by an explanation of the development process of the templates as well as a detailed description of what the templates document in Section 3. We discuss the scope of the templates, challenges when implementing them, first learnings from using the templates in practice, and the possibility to use them as part of an impact assessment in Section 4. The conclusion of the paper is presented in Section 5.

2 Background and related work

In this section, we cover work on the sustainability of AI as well as on documentation practices. If work is integrated in our templates, we briefly discuss it, while we explain its integration in the next section.



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2.1 Sustainability of AI

The first internationally recognized definition of sustainability goes back to the Brundtland Report, which states that "sustainable development seeks to meet the needs and aspirations of the present without compromising the ability to meet those of the future" [30]. Importantly, the report also emphasizes that sustainability has a social, environmental, and an economic dimension, commonly referred to as *multidimensional sustainability*. The framework of multidimensional sustainability offers a comprehensive perspective that can also be applied to understand the social, environmental, and economic impact of AI systems[1], as introduced by van Wynsberghe [38]. In her work, van Wynsberghe additionally distinguished between sustainability *of* AI or AI *for* sustainability. The former refers to the discussion of the sustainability aspects of AI systems, for example, energy use and emissions during training or the material use of the hardware infrastructure behind it; the latter refers to the fact that AI systems can be used for tasks that contribute to sustainability, for example, to support the monitoring of biodiversity. Following this distinction, the focus of the AIMS-Templates is on the sustainability *of* AI.

There are few practical works which use a multidimensional sustainability perspective for AI. A key work and – at the time of writing this paper – the only work we know that operationalizes multidimensional sustainability of AI, is the SCAIS (sustainability criteria and indicators for AI systems) framework [34]. In their work, Rohde et al. suggest 19 assessment criteria for the sustainability of an AI system, covering not only the three sustainability dimensions but also organizational aspects of the organization behind the AI system. Each of these criteria is thereby operationalized by one or more indicators and is mapped to the life-cycle of an AI system. In addition to academic work [34], the associated project *SustAIn*[2] provides an online tool for self-assessment that can be utilized by organizations using or developing AI systems. The result of this assessment gives a first idea of how their AI system performs w.r.t. the proposed sustainability criteria of the SCAIS framework.

The SCAIS framework is one of the academic contributions that played an important role when designing the AIMS-Templates as we will describe below. Nevertheless, it is important to understand that our templates have a different scope. First, the SCAIS framework was developed for supervised models, while our templates are applicable to any type of AI model. Also, our templates focus more heavily on technical aspects and therefore on collecting the specific details about an AI system. However, these differences are not surprising if we acknowledge that the SCAIS framework is developed with the purpose of assessing AI systems w.r.t. sustainability while the AIMS-Templates provide only a first step towards an assessment, which is a neutral overview of an AI system.

2.1.1 Social sustainability. AI systems are susceptible to biases, which can lead to unfair and potentially discriminatory outputs that can have severe negative effects on individuals [2, 29]. For example, AI systems have been shown to incorrectly accuse people of welfare fraud, in combination with exhibiting racial bias [3, 31], or to unjustly assign a higher risk of recidivism based on race [32]. Additionally, such systems are often based on non-interpretable AI models and can therefore produce outputs that are hard to explain [13, 27]. These are only two of the aspects commonly discussed under the umbrella term of "social impact" of AI systems and are therefore of importance in the discussion of social sustainability. Using the operationalization of social sustainability of the SCAIS framework [34], the relevant criteria of an AI system are: 1) transparency and accountability; 2) non-discrimination and fairness; 3) technical reliability and human supervision; 4) self-determination and data protection; 5) inclusive and participatory design; and 6) cultural sensitivity.

2.1.2 Environmental sustainability. AI systems are increasingly scrutinized for their use of natural resources and for causing additional greenhouse gas emissions, further accelerating climate change. Scholars have investigated their energy use and related emissions during training and inference [23, 24], their water consumption [19], and their use of raw materials [4, 9], among others. Drawing on the SCAIS framework [34], aspects of environmental sustainability are 1) energy consumption; 2) CO_2 and GHG emissions; 3) sustainability potential in application; as well as 4) embodied and shared resource consumption.

Regarding the *measurement* or *calculation* of energy consumption and associated emissions for AI models, there are several off-the-shelf tools available. Examples of such tools are *Code Carbon*[3], the *Carbon Tracker*[4], the *Experiment Impact Tracker*[5], or the online tool *ML CO2*[6]. Emissions of an AI model can also be estimated from data about the training process of a model, using the following formula [22]:

$$C = P * T * I \tag{1}$$

where P refers to the power consumption of the hardware, T to the training time, and I to the carbon intensity of the energy grid. For general-purpose AI (GPAI) models, the online emission calculator *Ecologits*[7] provides a way to estimate emissions based on the length of the input prompt. Additional information about the environmental impact of GPAI models is provided by [17] and their interactive overview.[8]

2.1.3 Economic sustainability. Collecting, cleaning, and labeling large datasets for model training can involve the often exploitative and low-paid work of data workers [16, 25]. Another consideration of the economic impact of AI systems is publicly sharing AI models and datasets: since AI models can require long training and large amounts of data, unequal access to these resources can hinder smaller organizations developing their own AI systems. Making models and datasets openly available is therefore one step to counteract such imbalanced market access [34]. These are only two examples of how AI systems can impact the economy. Drawing on the SCAIS framework [34], relevant aspects of economic

[1] By "AI system", we refer in this work to the combination of AI model and dataset.
[2] https://sustain.algorithmwatch.org/en/about-us/about-the-sustain-project/
[3] https://codecarbon.io/
[4] https://carbontracker.info/
[5] https://github.com/Breakend/experiment-impact-tracker
[6] https://mlco2.github.io/impact
[7] https://huggingface.co/spaces/genai-impact/ecologits-calculator
[8] https://app.powerbi.com/view?r=eyJrIjoiZjVmOTI0MmMtY2U2Mi00ZTE2LTk2MGYtY2ZjNDMzODZkMjlmIiwidCI6IjQyNmQyYThkLTljY2QtNDI1NS04OTNkLTA2ODZhMzJjMTY4ZCIsImMiOjF9

sustainability are 1) market diversity and exploitation of innovation potential; 2) distribution effect in target market; as well as 3) working conditions and jobs.

2.2 Documentation

Documenting AI systems is an important step to create transparency about them and has both value within the organization developing AI systems and for external stakeholders. For example, it can be a key document in the process of on-boarding new staff to the development team, it can support external auditors in assessing the impact of an AI system, or help other development teams to re-use an AI system that was made publicly available.

Common documentation approaches focus on individual parts of an AI system, i.e, the AI model [1, 5, 26] or the dataset [11, 14, 33]. Model cards [26], a well-known framework for documenting AI models, suggest a standardized framework to create a short description of the most relevant aspects of an AI model. Such cards cover model details, information about the intended use of the model, factors that may determine model output, as well as metrics for evaluation. In addition, they contain information about the evaluation and training data, on conducted quantitative analyses, ethical considerations of the model, as well as caveats and recommendations. The datasheet [11] framework is similarly well known but aims to summarize relevant aspects of a dataset. Such a sheet covers the motivation behind dataset creation, its composition and collection process, dataset use, and maintenance. Different to the model card framework, the authors formulate a question for each of the covered aspects, instead of providing a description. Both of these frameworks are important contributions to document AI systems. However, they only cover parts of an AI system, which is different to our template. Also, while they do include aspects clustered in the AIMS-Templates under social sustainability as well as some of the relevant questions on economic sustainability, they do not concern environmental aspects of an AI model or dataset.

Others documentation templates cover the complete AI system but focus on a specific aspect of AI systems, such as environmental impact [18] or the compliance of an AI system [12, 21]. The documentation framework that is most relevant to the AIMS-Templates is TechOps [21], a framework for the documentation of AI systems in accordance with the EU AI Act [8]. This framework covers the full AI system and provides separate sub-templates for the AI application, the AI model, and the dataset. It covers both technical and non-technical aspects and lists them together with the applying regulation. In addition to general information covered in these sub-templates, some of the aspects that we document in the AIMS-Templates under embedding and hardware are discussed by TechOps, as well as some sustainability aspects but with limited coverage of the environmental dimension. Also, TechOps contains sections only relevant for compliance, such as the EU AI Act-based risk classification (application template), and declarations of conformity (all templates). The critical difference between TechOps and the AIMS-Templates is the goal: while TechOps aims for compliance, our goal instead is a comprehensive documentation of the different impacts of an AI system. Additionally, the AIMS-Templates integrate environmental sustainability considerations to a much wider extent.

2.2.1 Assessment. Assessing an AI system is a step that often follows after a system and its impacts are properly documented. In this regard, we already mentioned the SCAIS framework, providing a comprehensive, although high-level, assessment framework for AI systems [34]. However, most of the aspects of multidimensional sustainability are difficult to quantitatively assess and compare across different AI systems and also strongly depend on the application context. An exception to this is the energy use and associated emissions of a system, for which several benchmark and labeling practices exist [10, 15].

As part of the Impact AI project, the AIMS-Templates can be also part of an assessment method for AI systems. We describe some aspects of this assessment in Section 4.4.

3 The AIMS-Templates

In this section, we explain the two-step development process of the AIMS-Templates. Following that, we discuss the content of each of the three sub-templates and close with a note on how we document (the integration of) GPAI models.

3.1 Development process

The first version of the AIMS-Templates was assembled by consulting the model cards framework [26], the datasheet framework [11], and the SCAIS framework [34]. In addition to these three key works, we enriched the template with single aspects of the UNESCO Ethical Impact Assessment for AI systems [37], and more general literature on the sustainability of AI systems [35]. The form fields and associated prompts or questions that we extracted from this literature for our documentation framework were clustered into separate blocks, depending on whether they covered general information about the AI system or aspects of multidimensional sustainability. Regarding the included aspects of sustainability, we thereby started from the SCAIS framework [34]. Many of its sustainability criteria and indicators are part the AIMS-Templates, even if naming or mapping to a sustainability dimension may differ. Also, the first version of the AIMS-Templates consisted of only one template documenting general information about the AI system, the AI model, and the dataset, followed by the three dimensions of sustainability.

We tested this first version internally, interviewing a former co-worker on their AI project. Additionally, we received feedback from both academics with different disciplinary backgrounds and practitioners on the templates. On the one hand, such feedback was a fixed part of the development process and was possible through the transdisciplinary structure of the Impact AI project in which the AIMS-Templates was developed: while the research team combines interdisciplinary expertise, two NGOs are part of the overall project team with which we continuously exchange. These two organizations are *Greenpeace*[9] and *Economy for the Common Good*[10]. On the other hand, such feedback was received by consulting the research council of the Impact AI project, which consists of 11 members that span academia, civil society, and industry. In addition, we have already used the first version of the AIMS-Templates to document the AI system in two different use cases (see also Section 4.3 below),

[9] https://www.greenpeace.de/
[10] https://germany.econgood.org/

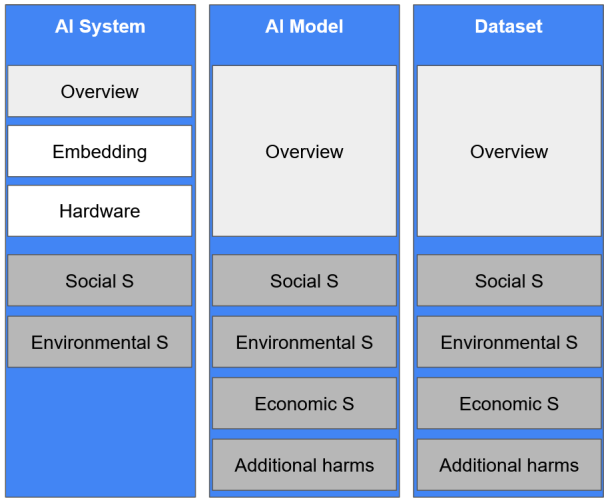


Figure 1: The structure of the AIMS-Templates: each of the three sub-templates consists of a general section (overview) and a sustainability section (sustainability abbreviated with S). The AI system template also covers the embedding of the AI system as well as the underlying hardware.

pointing us to additional friction points when using the templates in practice.

Overall, the different feedback channels were useful for improving both the structure and content of the AIMS-Templates. The revised version differs from the first version in the following three ways: first, the templates are more precise and place an even greater emphasis on technical aspects. To this end, we deleted many of the open text questions or replaced them with a closed question, added multiple choice options, and specified the format of the information to collect (e.g., a text, or a date in the format YYYY). Also, the revised templates include a more detailed collection of data on the hardware behind the AI system, as well as data to allow an estimation of energy use and emissions. Second, due to these changes, the revised version subsequently incorporates additional literature [2, 20, 21, 29]. Third, we split the revised version into three sub-templates, covering the AI system, the model, and the dataset, respectively. This modularization is also inspired by TechOps [21], and allows easier documentation in cases where an AI system contains more than one AI model or dataset. The revised version was internally tested and is currently used in an additional use case.

3.2 Description

The AIMS documentation templates consists of three sub-templates: 1) the AI system template; 2) the AI model template; and 3) the dataset template (see also Figure 1). The structure of each of the sub-templates is the same: the general part covers the main facts about the system, model, or dataset, followed by aspects of sustainability which are split by dimension (social, environmental, economic). Not all templates cover all sustainability dimensions and aspects that are part of these dimensions. The AI model and dataset templates end with a few open questions on additional harms. We describe details of each sub-template in the following sections.

For each harm covered in the templates, both its evaluation (e.g., "Did you evaluate the privacy of your model?") and possible mitigation strategies (e.g., "Did you apply any methods to improve the privacy of your model?") are covered. The questions are tailored to the specific risk and are supported by follow-up questions to clarify the details (e.g., "What were your results? Which measures?").

Also, the documentation templates regularly contains form fields to enter "additional information". When implementing the templates as an online questionnaire (see also Section 4.3), we additionally added upload fields so that organizations that fill the templates can upload additional material about their AI system.

The full version of the AIMS-Templates is available on Zenodo.[11]

3.2.1 AI system template. The *AI system template* is shown in Table 1. The first part of the template covers basic information about the AI system (section **Overview**). To this end, the template asks for a description of the AI system and the main steps in its development. The description is particularly relevant, as it is the basis to understand the overall structure of the AI system, including, how the AI models and datasets connect. This is followed by details on the embedding of the AI system, i.e., how the system is embedded into digital infrastructure such as an app or a website. The template covers both a general description of this embedding and its technical details, as well as questions about additional data that may be collected through the embedding, such as user access data. This question is motivated by the specific needs that the collection and processing of personal data may necessitate [7]. The overview also contains information on the hardware used to train and deploy the AI system. Here, the documented information depends on what type of infrastructure is used, i.e, whether it is local, remote, or a mix of both. For local hardware, the template collects the number and type of processors, the size of memory, the storage, as well as the share of renewable energy in the overall energy supply. Regarding remote hardware, the template asks about the provider of the server, number and type of processors, the size of memory, and the storage. Also, it collects power usage effectiveness (PUE) and water usage effectiveness (WUE), two parameters to understand the sustainability of servers. Finally, the template asks for their location, which can be used to determine the emissions of the computing infrastructure [22]. Lastly, the template collects information about hardware differences in training and deployment, as well as plans to update the infrastructure.

Social Sustainability covers first questions about the documentation of the AI system, as well as audit trails or other monitoring logs. All of these questions are part of the transparency aspect. The template also documents the safety and security aspects of the system, covering an evaluation of such aspects, a description of what the relevant safety and security aspects of the system in focus are, as well as possible mitigation measures. Under **Environmental Sustainability**, the template includes user statistics (average number of users and usages per month), which is important information to estimate energy consumption and emissions of the AI system: the cost of a single inference scales with the number of usages, meaning that even if the energy use of a single inference of a system is small, high usage numbers can lead to a large overall

[11] https://doi.org/10.5281/zenodo.21409709

Overview
1. Description and development
Description
Main steps development
2. Embedding
Description
Technical aspects
Additional data collection
3. Hardware
Description
Updates
Social Sustainability
1. Transparency
Documentation
Audit trails and other logs
2. Safety and Security
Evaluation
Mitigation measures
Environmental Sustainability
1. Complexity, energy use and emissions
Usage information
2. Natural resources
Decommissioning plans
Certificates

Table 1: Overview of the AI system template.

energy need [22]. Additionally, the template covers decommissioning plans for hardware once the AI system becomes obsolete and information about certificates on the sustainability of the hardware, e.g., the German environmental certificate Blauer Engel[12] or the Energy Star label[13]. The dimension of **Economic Sustainability** is not covered in this template and we explain the reasoning for this below (Section 4.1).

3.2.2 AI model template. An overview of the *AI model template* can be found in Table 2. The first part of the template addresses general information about the AI model (section **Overview**). First, the start date of model implementation and version number are collected. This is followed by technical details on the model, covering: the type of model, its architecture, the task of the model, the data it applies to, as well as programming languages and environments used to build it. The next aspect covers the training of the models and contains a form field for general information about model training as well as information about retraining. The template also collects information about the performance of the model. It covers the evaluation metrics used as well as possible benchmarking. Additionally, it asks about evaluation w.r.t. performance factors. The term "factors" originates from the model card framework, referring to "demographic or phenotypic groups, environmental conditions, technical attributes, or others" [26]. Finally, the template asks whether performance evaluation is continuous and how uncertainty and variability are taken into account when evaluating the model.

[12]https://www.blauer-engel.de/de/produktwelt/rechenzentren
[13]https://www.energystar.gov/about

Under **Social Sustainability**, the template first asks about the transparency of the model. Here, it covers both the interpretability of the model itself and the usage of methods to increase its transparency and explainability. The template also covers the aspect of non-discrimination, which includes the collection of information on evaluation through fairness metrics as well as methods for debiasing is collected. The third aspect is the privacy of the model, and the template is covering its evaluation as well as methods to improve it. Under **Environmental Sustainability**, several complexity measures for AI models are collected. Space complexity is covered by asking about storage, while time complexity is covered by FLOPS, runtime of model training, and runtime of model inference. The template then documents tracking of energy use and emissions; if such a tracking was done, the numbers should be provided here. If not, the template asks for details that would allow us to estimate energy consumption and emissions, based on the formula for emission estimation proposed in [22] (see also Section 2, Paragraph "Environmental Sustainability"). To this end, the template covers: training and inference time, carbon intensity of the training and inference hardware, and power consumption of the training and inference hardware. In addition, the template documents measures to reduce the complexity of the model. **Economic Sustainability** covers the aspect of sharing. Here, the template includes information about the public availability of the model, the citation and license details, a contact person, and its maintenance. Next, the template covers the usage of the AI model, specifically, other tasks and contexts the model could be used for, as well as out-of-scope applications that the organization developing the AI system could foresee. The last question under this dimension documents the compatibility of the model with software libraries and environments, as well as datasets.

Finally, the template covers **Additional Harms**, a section that was added to make sure that no harms are missed in the AI model template. It contains a general question about harms not yet discussed, one question about their mitigation, as well as a specific question on harms for GPAI models. For a detailed discussion of GPAI models, see Section 3.3.

3.2.3 Dataset template. Table 3 shows an overview of the *dataset template*. The first part of the template covers the collection of the dataset, including general information on the data collection, dataset sampling, information on possible labeling tasks, time frame of the collection, and purpose of the collection. Second, a detailed description of the dataset follows, covering data modality, description of its features, meaning of the instances, the label or target, dataset size, relation between instances and links to external sources, possible missing information, errors in the dataset, as well as possibly confidential or offensive information. Under processing, the template collects information about preprocessing applied to the dataset and how the dataset was split (both ratios and the method). Finally, it covers information about updates to the dataset, as well as how the dataset is stored.

Under **Social Sustainability**, the template documents the aspect of non-discrimination. While the first question is about the representativeness of the data, e.g., whether the distribution of training data reflects the distribution of the deployment data, the

Overview
1. Date and version
2. Description/Details
Type of model
Architecture
Task of model
Data
Languages and libraries
3. Training
Details model training
Retraining
4. Performance
Metrics and benchmarks
Factors
Uncertainty and variability
Social sustainability
1. Transparency
Interpretabiliy
Explainability methods
2. Non-discrimination
Evaluation (fairness metrics)
Methods for model debiasing
3. Privacy
Evaluation
Measures to improve privacy
Environmental sustainability
1. Complexity, energy use and emissions
Complexity measures
Tracking or estimation of emissions
Measures to reduce complexity
Economic sustainability
1. Sharing
Public availability
Citation, license
Contact person, maintaining
2. Usage
Use, incl. out-of-scope use
3. Compatibility
Compatibility
Additional Harms

Table 2: Overview of the AI model template.

Overview
1. Collection
General, sampling
Labeling
Time frame
Purpose
2. Description
Data modality
Description features
Meaning of instances
Label / target
Size
Relations and external sources
Missing information, errors, confidentiality or offensiveness
3. Processing
Preprocessing
Splits
4. Maintenance
Updates
Storage
Social sustainability
1. Non-discrimination
Representativeness
Methods for rebalancing
Sensitive features or proxies
Measures
2. Privacy
Evaluation
Measures
Environmental sustainability
1. Complexity, energy use and emissions
Complexity measures
Reduction of complexity
Economic sustainability
1. Sharing
Public availability
Citation, license
Contact person, maintaining
2. Usage
Use, incl. unwanted use
3. Compatibility
Compatibility
Additional Harms

Table 3: Overview of the dataset template

template also covers possible methods to ensure such representativeness. Additionally, a question about sensitive features or their proxies is posed, together with a question on how the organization developing the AI system made sure that this did not lead to bias. In addition, the template covers the privacy of the dataset. Here, both evaluation measures and possible mitigation strategies are included. In the **Environmental Sustainability** dimension, the template collects information about the complexity of the dataset, specifically space complexity as storage. In addition, measures are documented to reduce its complexity. Under **Economic Sustainability**, the template covers very similar aspects as the AI model template: information about sharing the dataset concerns its public availability, the citation and license details, a contact person, and its maintenance. Under usage, other contexts and tasks in which the dataset could be used as well as those in which it should *not* be used are covered. Lastly, compatibility addresses to which models, software libraries, and environments the dataset is compatible.

The section **Additional Harms** addresses additional harms of the dataset that are not yet discussed, including a question about their mitigation.

3.3 GPAI models

The EU AI Act defines a general-purpose AI (GPAI) model as "an AI model, including where such an AI model is trained with a large

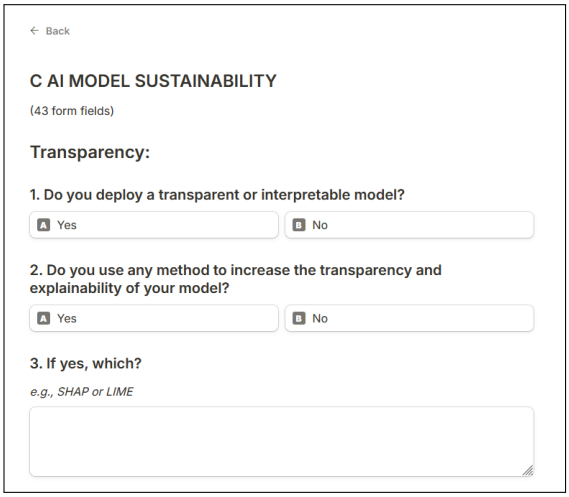


Figure 2: A screenshot from a part of the AI model template, implemented as online questionnaire in Tally. The screenshot shows the first three questions under the aspect of transparency.

amount of data using self-supervision at scale, that displays significant generality and is capable of competently performing a wide range of distinct tasks regardless of the way the model is placed on the market and that can be integrated into a variety of downstream systems or applications" (Article 3(63)) [8]. Examples of such models are the GPT-models by OpenAI or Gemini by Google [6].

Although our templates could also be filled for GPAI models, it is more likely that such a model is integrated (prompted) by the organization developing an AI system and filling the templates. To cover such a use of GPAI models, we therefore added specific sections to the AI model template that should only be filled in such cases. First, the name, number of prompts, and their average length is documented (Section **Overview**). Second, the length of each prompt is asked for (Section **Environmental Sustainability**). This data is needed to compute an estimate of the energy consumption and emissions created by the integration of the provided prompts into the AI system (see also Section 2.1, Paragraph "Environmental Sustainability"). Third, we added a section specific to the risks of GPAI models (Section **Additional Harms**). Specifically, the template provides a list of risks specific to GPAI models – extracted from the work by Solaiman et al. [35] – from which risks relevant to the AI system in focus should be selected. In addition, possible mitigation strategies are discussed.

4 Discussion

4.1 Scope of the AIMS-Templates

The templates maintain a strong focus on technical aspects. Although "softer" aspects -— such as information about the design process of the AI system, e.g., whether affected people were part of it -— are relevant for a comprehensive understanding of the impact of an AI system [34], this is not the focus of the templates. In the revised version, we emphasized this technical focus by cutting or replacing as many open questions as possible. Furthermore, we integrated some aspects of [21], which has a strong focus on the legal compliance of AI systems with the EU AI Act. However, documentation for legal compliance is not the focus of our work, and no statements about compliance of an AI system documented using the AIMS-Templates can be made.

In addition, we acknowledge that the AI system template does not cover any aspect of economic sustainability. This is due to the ambiguity of assigning some of the form fields. In the case of economic sustainability, we decided that sharing, use, and compatibility details are more relevant for the individual parts (model, dataset) than for the full AI system because it puts a stronger focus on their reusability. Furthermore, we acknowledge that the economic impact of an AI system additionally includes non-technical and further downstream aspects which are not the focus of the AIMS-Templates.

4.2 Challenges when designing the AIMS-Templates

When implementing the AIMS-Templates, we faced two key challenges. First, the templates are designed to be as agnostic as possible to the type of AI model and the dataset. To ensure this, we 1) framed the questions, even if most of them are closed, as generally as possible; 2) added open text fields to the templates for additional details; and 3) added some specific questions for the case of GPAI models. However, we acknowledge that this means potentially missing valuable information because it is not directly requested.

Second, the objective was also to design templates that cover all relevant details of an AI system but require only a reasonable time effort. This means that there is a trade-off between the level of detail covered in the templates and the time required to complete them. We approached this by incorporating as much feedback from practitioners as possible, and by prioritizing closed questions over open questions. The motivation behind balancing this trade-off was to also enable smaller organizations that develop AI systems to fill the AIMS-Templates.

4.3 First learning from using the AIMS-Templates in practice

The AIMS-Templates are part of the Impact AI research project. Being embedded in this project already allowed us to use the templates in two use cases. The first is an AI system that supports fact checkers by flagging potential misinformation. The second use case is an AI system that creates structured and interactive reports from large amounts of input data, with the aim to specifically support the discourse and opinion formation in large groups. In the following, we discuss two aspects of using the templates in practice: different approaches to filling the template and how these strategies compare, as well as first observations about the different sustainability dimensions.

On filling the templates. How the AIMS-Templates are filled, is a decision by those using the templates. When deploying the AIMS-Templates in the use cases described above, we did not fill them directly but conducted two interviews with interview questions that closely resembled the templates. The interviewee was a person responsible for the technical implementation of the AI system.

This interview strategy proved to be helpful for directly explaining the uncertainties that can exist about the templates and to better understand the answers to the templates (i.e., to the interview questions). However, it also posed some drawbacks. First, interviews not only required finding a time slot for both interviewer and interviewee, but also required recording, transcription, and filling in of the templates by the interviewer. Also, in some cases, not all information was available at the time of interview, which required sending follow-up emails to ask for the missing information. Second, an interview can appear quite repetitive if the AI system is complicated and questions need to be repeated (e.g., if there are several datasets).

For the use case we are currently investigating, we therefore implemented the revised AIMS-Templates as three independent online questionnaires using the software platform Tally[14]. This makes it possible for organizations that develop AI systems and that participate in our research to fill the templates at a time of their convenience. No more recording and transcription is necessary, and completed questionnaires can be downloaded directly from the software platform. Also, through the online questionnaire, we can determine the exact format of the answers, e.g., whether they should be in the format of a multiple choice or open text answer. In Figure 2, a screenshot of one of the implemented questionnaires is shown.

Sustainability dimensions. One observation we made when using the AIMS-Templates in practice was that organizations seem to have a clearer understanding of their impact in regards to social and economic sustainability compared to environmental sustainability. Although this does not mean that environmental sustainability is not a concern in their work or that there was no meaningful discussion, this is an interesting observation. There could potentially be two reasons for this: 1) environmental sustainability is a concern that is more relevant for large AI models such as GPAI models and that, more generally, came to public attention only in recent years, starting with the contribution of Strubell et al. [36]; 2) the two cases we investigated both have a strong focus on social topics, which may lead to stronger focus on the social aspects of their applications in general.

4.4 Impact assessment based on the AIMS-Templates

As part of the Impact AI research project, the AIMS-Templates is not only a documentation framework for AI systems. It is also integral to the Impact-AI-Method, an impact assessment method for AI systems. This method contains a set of assessment questions that are answered by drawing both on the AIMS-Templates and data collected during the additional interviews as part of the Impact-AI-Method. Most of the assessment questions that focus on the information provided by the AIMS-Templates are simple yes-no-questions, allowing for a straightforward analysis of the results (e.g., "Did the project deploy a transparent or interpretable model?"). However, for the overall assessment in the Impact-AI-Method, this does not hold: here, the majority of assessment questions are open and require deliberation to be answered. This assessment is aligned with the Principles for the Ethical Use of Artificial Intelligence in the United Nations System [28] and consists of 26 assessment criteria.

[14]https://tally.so/

5 Conclusion

Current documentation practices of AI systems consider only selected areas of impact or do not take the complexity of real-world AI systems into account. To close this gap, we presented the *AI through the lens of Multidimensional Sustainability Templates* (AIMS-Templates), a documentation framework that accounts for the complexities of real-world AI systems including their dependencies on hardware and embedding in digital infrastructure. Additionally, by using the angle of multidimensional sustainability, the templates can be used to document comprehensively the impact of an AI system on society, the environment, and the economy. The AIMS-Templates are intended for organizations that develop AI systems. It is not restricted to a specific type of AI model and is designed with practical applicability in mind. We already used the AIMS-Templates in practice. Future work will discuss the results from these use cases in-depth, including, how the design of the AIMS-Templates was useful to cover different types of AI systems.

We understand the AIMS-Templates as a contribution to the often-called-for greater transparency of AI systems and by incorporating a multidimensional sustainability perspective, the templates additionally provide a basis for assessing the impact of AI systems, including their possibly positive contribution towards greater sustainability.

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