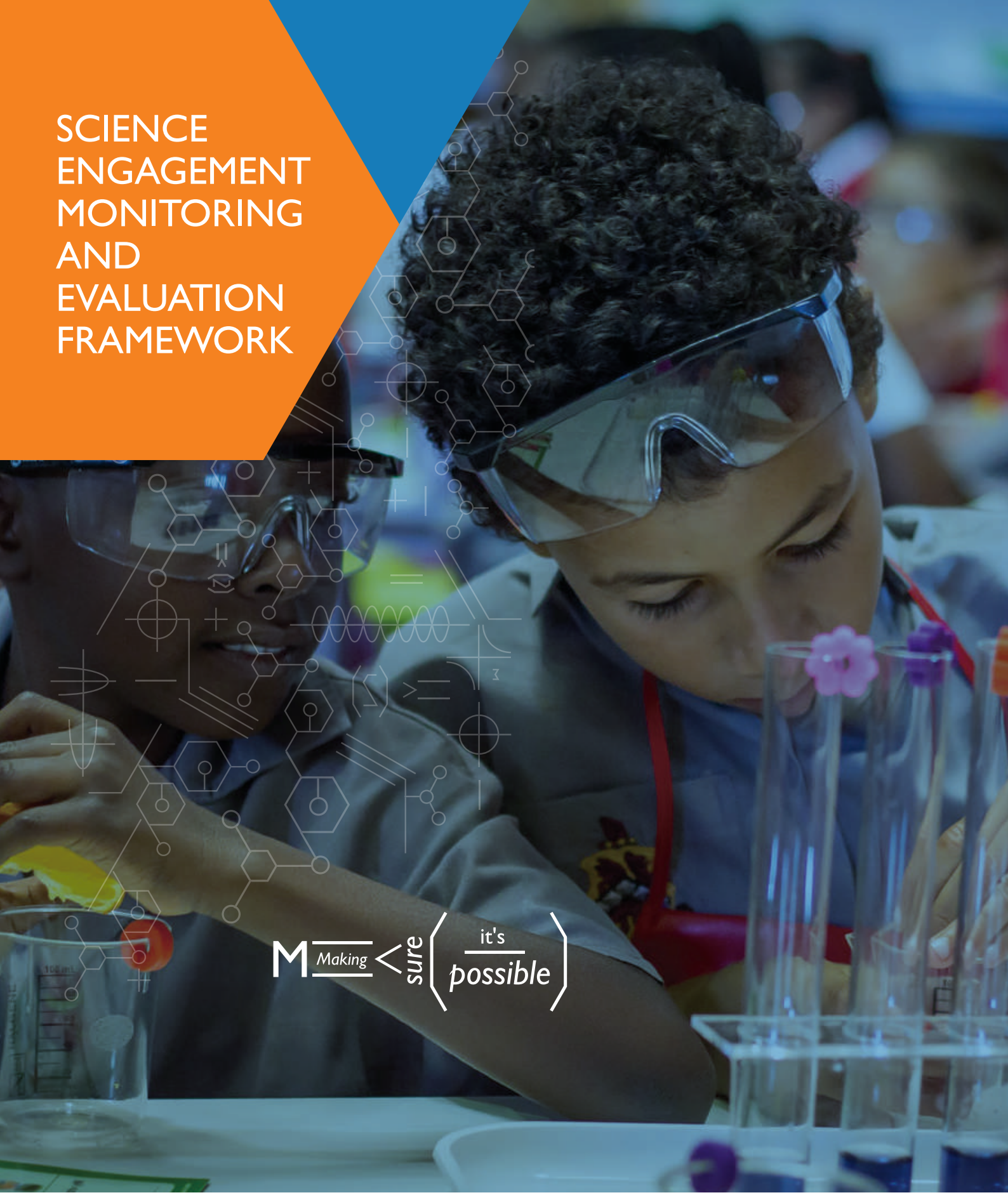
SCIENCE ENGAGEMENT MONITORING AND EVALUATION FRAMEWORK



science & innovation
Department:
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REPUBLIC OF SOUTH AFRICA

2030 NDP

PREFACE TO THE SCIENCE ENGAGEMENT MONITORING AND EVALUATION FRAMEWORK

The Department of Science and Innovation (DSI) undertakes programmes and projects to bring improvements to the country and its citizens. The DSI leads a science engagement programme that seeks to develop a society that is knowledgeable about science, scientifically literate and able to form independent opinions on science issues.

As indicated by the Framework for Managing Programme Performance Information (National Treasury, 2007) and the National Evaluation Policy Framework (Department of Planning, Monitoring and Evaluation, 2011), government expects us to consistently assess the progress we are making towards attaining the goals of our science engagement programme. Further, such assessment has to be carried out systematically. Hence the adoption of the Science Engagement Monitoring and Evaluation Framework, which uses a set of performance indicators to enable us to establish whether, and to what extent, the programme is realising its intentions.

Of course, such progress will be determined through evaluation studies, and to avoid a haphazard approach, the Framework guides us on the types of evaluations and the frequency with which they are to be carried out. At the same time, we are mindful of the fact that success in this endeavour is dependent on the availability of data on projects implementing the science engagement programme. It is a process that can never be easy to manage, given that implementation of the science engagement programme is a multi-institutional responsibility, with stakeholders and role players coming from different walks of life.

It is for this reason that the Framework requires the establishment of the Science Engagement Information Management System, through which data from various sources will be captured and organised to support a system-wide performance measurement of the DSI-led science engagement programme.

The adoption and application of the Science Engagement Monitoring and Evaluation Framework is another important milestone in institutionalising in the measurement of public attitudes to science in South Africa, an important science engagement policy intent of the 2019 White Paper on Science, Technology and Innovation.

PHIL MJWARA
DIRECTOR-GENERAL

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LIST OF ABBREVIATIONS

ACRONYM	DESCRIPTION
APP	Annual Performance Plan
DPME	Department of Planning, Monitoring and Evaluation
DSI	Department of Science and Innovation
HSRC	Human Sciences Research Council
M&E	Monitoring and Evaluation
MEF	Monitoring and Evaluation Framework
NDP	National Development Plan
NRF	National Research Foundation
SAASTA	South African Agency for Science and Technology Advancement
SEIMS	Science Engagement Information Management System
SES	Science Engagement Strategy
STEMI	science, technology, engineering, mathematics and innovation
STEM	science, technology, engineering and mathematics
TOC	Theory of Change

GLOSSARY

Annual performance plan **–** Sets out what an institution intends doing in the upcoming financial year and during the Medium Term Expenditure Framework period (National Treasury, 2010).

Baseline **–** The performance recorded in the year prior to the planning period (National Treasury, 2010). The baseline shifts each year, with each year's performance becoming the following year's baseline (National Treasury, 2007).

Data **–** In the context of this Framework, refers to any information that is collected about a project implementing the science engagement programme, and that can be used to measure the performance of the programme against indicators in the Logframe.

Evaluation **–** The systematic and objective assessment of an ongoing or completed project, programme or policy, taking in its design, implementation and results. The aim of an evaluation is to determine the relevance and fulfilment of objectives, development efficiency, effectiveness, impact and sustainability (PSC, 2008).

Monitoring **–** Ongoing, systematic collection of data on specified indicators that aims to keep management and the main stakeholders of a development intervention informed regarding progress with the intervention, the achievement of objectives and the use of allocated funds (PSC, 2008).

Performance indicator **–** A particular characteristic or dimension used to measure intended changes. Performance indicators are used to observe progress and to measure results (USAID, 2009).

Performance information **–** Data collected on a project implementing the science engagement programme, which can be used to determine progress being made towards achieving the intentions of the programme.

Performance targets **–** Predetermined levels of performance that an institution, programme or project seeks to achieve over a period.

Project **–** Initiative in which resources are expended in pursuit of shaping the society envisioned by the science engagement programme (Gittinger, 1984).

Programme **–** When not referring to a branch of the Department of Science and Technology, a programme is a portfolio of multiple projects that are managed and coordinated as one unit in order to achieve beneficial outcomes for the organisation (Independent Consulting Bootcamp, 2017).

Programme-level monitoring and evaluation **–** In the context of this Framework, refers to the monitoring and evaluation that is carried out within the science engagement programme, focusing on projects implementing the Science Engagement Strategy.

Science **–** Encompasses systematic knowledge spanning natural and physical sciences, engineering sciences, medical sciences, agricultural sciences, mathematics, social sciences, technology, all aspects of the innovation chain, and indigenous knowledge (DST, 2015).

Science communication **–** The use of appropriate skills, media, activities and dialogue to produce one or more of the following personal responses to science: awareness, interest, enjoyment, opinion formation and understanding (Burns, O'Connor and Stocklmayer, 2003).

Science engagement **–** An overarching term that covers all aspects of public engagement with science, science communication, science literacy and science outreach and awareness (DST, 2015).

Strategic Plan **–** Sets out an institution's policy priorities, programmes and project plans for a five-year period as approved by its executive authority, within the scope of available resources (National Treasury, 2010).

System-level monitoring and evaluation **–** Monitoring and evaluation that focuses on the overall success of the science engagement programme in achieving its objectives.

EXECUTIVE SUMMARY

The Department of Science and Innovation (DSI) leads the science engagement programme. This national programme, which is guided by the Science Engagement Strategy (2015), seeks to develop a society that is scientifically literate, knowledgeable about science and critically engaged with it. Implementation of the programme takes place through a series of projects that are outlined in the Science Engagement Strategy Implementation Plan (2017). Funding allocated to the DSI and its entities for implementing the programme is incorporated in the National Treasury's Estimates of National Expenditure (ENE).

Government is expected to track progress being made towards achieving the objectives of any project or programme on which public funds are spent. Some government-wide policy frameworks have been adopted to guide such tracking processes, namely the Framework for Managing Performance Information (National Treasury, 2007) and the National Evaluation Policy Framework (DPME, 2011). However, a system specifically designed to track progress with the implementation of the science engagement programme is needed; hence the development of this Science Engagement Monitoring and Evaluation Framework (MEF). The Science Engagement MEF is a set of systematic guidelines for establishing whether, and to what extent, the science engagement programme is realising its intentions.

The Science Engagement MEF uses the Theory of Change (Figure 3, p 6) to articulate how the science engagement programme aims to realise its ultimate impact, and how progress towards this end can be determined. The Logframe (Appendix A, p 17) is used to identify a number of success indicators that the programme will use from time to time to measure its progress. These indicators are arranged according to performance information concepts – namely, inputs, activities, outputs, outcomes and impact – which are explained in Figure 2 (p 3). Figure 2 is based on the Framework for Managing Performance Information (National Treasury, 2007) and the National Evaluation Policy Framework (DPME, 2011).

For the success indicators in the Logframe to provide a useful measure of success, baseline values need to be established for each indicator. The MEF indicates how baselines for indicators are to be determined. No meaningful monitoring and evaluation is possible unless project performance data is collected, processed and archived in an accessible manner. The MEF addresses this need by providing guidelines for coordinating the collection of data from the various stakeholders involved in implementing the science engagement programme. This includes the setting up and management of the Science Engagement Information Management System that will be hosted by the South African Agency for Science and Technology Advancement (SAASTA).

The implementation of the science engagement programme does not take place in isolation from government-wide

and departmental planning environments. The National Development Plan (NDP) as well as the strategic planning processes of the DSI and its entities must be taken into consideration, as they are expected to inform the MEF's evaluation questions. This is particularly the case when seeking to establish the contribution of the science engagement programme to the NDP and the DSI's strategic outcomes-oriented goals. In light of this, some analysis of the interface between the MEF, the NDP and the DSI's strategic planning processes has been made.

Dedicated evaluation studies will be conducted to establish the progress being made by the science engagement programme. The MEF identifies five different types of evaluation, and provides their rationale and the frequency with which they will be conducted. The MEF concludes by distinguishing the roles and responsibilities of key stakeholders in making sure that meaningful evaluation takes place. The stakeholders in question are the DSI, SAASTA, the Human Sciences Research Council (HSRC), the entities of the DSI and a network of other institutions that are involved in the collaborative effort to implement the science engagement programme.

1. INTRODUCTION

1.1 Science Engagement Strategy

In January 2015, the Department of Science and Innovation (DSI) adopted the Science Engagement Strategy (SES). The SES seeks to develop a society that is knowledgeable about science, scientifically literate and capable of forming opinions about science issues. These primary intentions are to be realised by pursuing the following four strategic aims:

Strategic Aim 1: To popularise science as attractive, relevant and accessible in order to enhance scientific literacy and awaken interest in relevant careers.

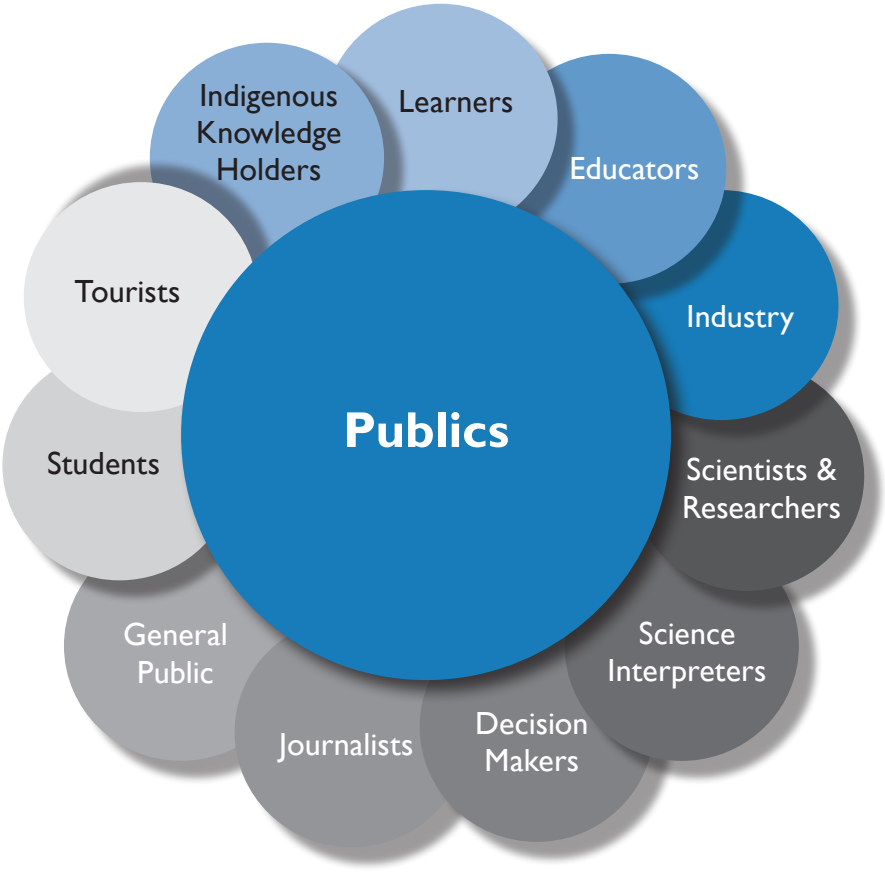
Strategic Aim 2: To develop a critical public that actively engages with and participates in the national science and technology discourse to the benefit of society.

Strategic Aim 3: To promote science communication that enhances science engagement in South Africa.

Strategic Aim 4: To profile South African science and scientific achievements domestically and internationally, demonstrating their contribution to national development and global science and thereby enhancing their public standing.

Further to the SES, the DSI adopted the SES Implementation Plan in March 2017. The Plan outlines the enabling systems that need to be established and projects that need to be undertaken in pursuit of the strategic aims. These projects, which collectively constitute the science engagement programme, target the 11 publics that are identified in Figure 1 below.

FIGURE 1: PUBLICS TARGETED BY THE SCIENCE ENGAGEMENT PROGRAMME



The SES identifies several key areas in which interventions are required to enable these projects to produce their expected outcomes among their target publics, and ultimately to succeed in developing the scientifically literate, knowledgeable and participative society the science engagement programme aims for. One of the key interventions required is the establishment of a coordinated and systematic approach to monitoring and evaluation – hence the development of the Science Engagement Monitoring and Evaluation Framework (MEF).

1.2 Science Engagement MEF

The Science Engagement MEF is a set of guidelines for establishing whether, and tracking the extent to which, the DSI-led science engagement programme is realising its intentions (as outlined in par. 1.1 above). The MEF sets out the structures, processes and tools required for the effective monitoring and evaluation (M&E) of the programme, as guided by associated activities and implementation parameters put forward in the SES Implementation Plan. The MEF comprises high-level guidelines, offering a point of reference that can be drawn upon when designing customised approaches towards the M&E of particular projects, especially with regard to the following:

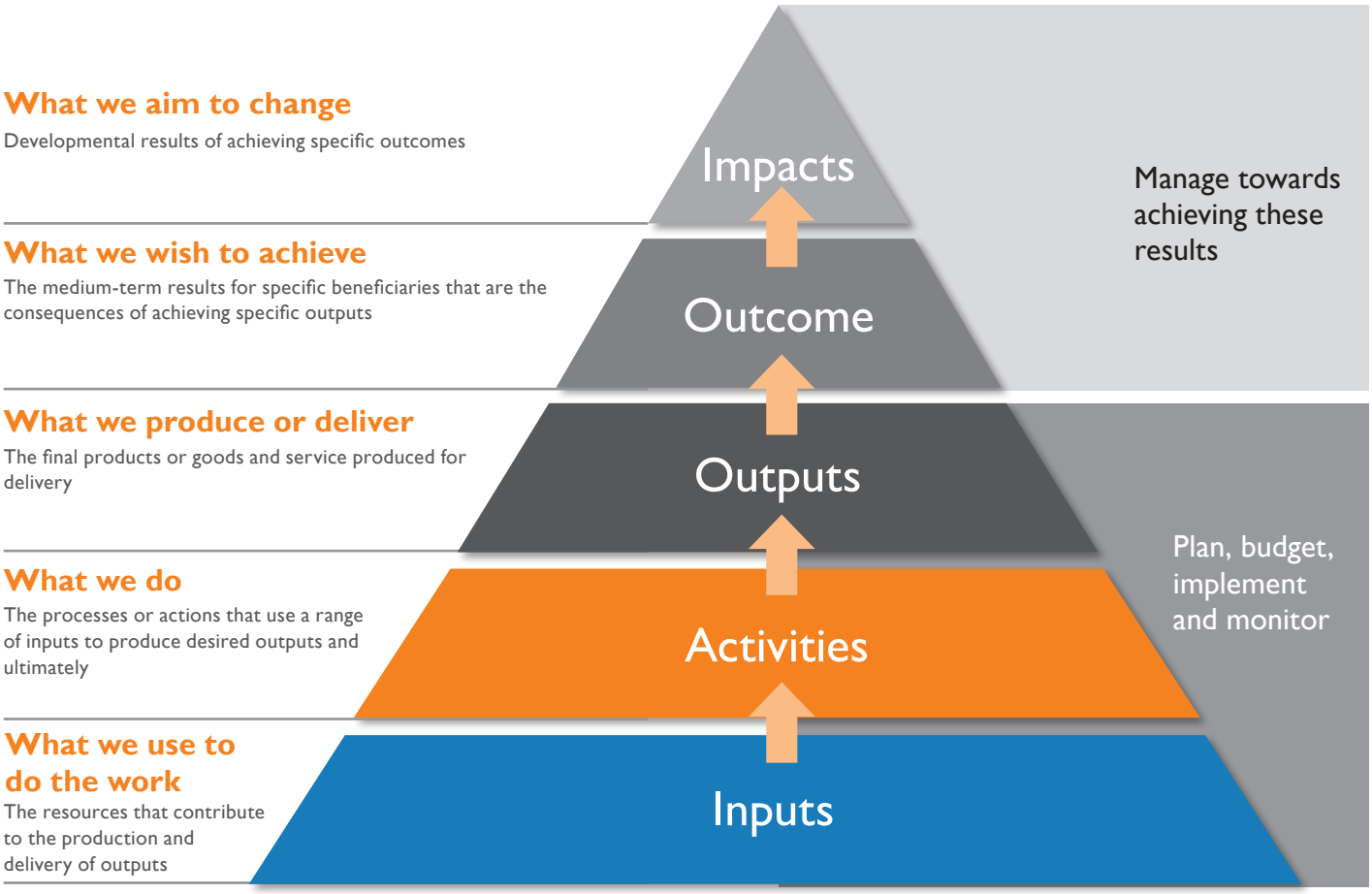
- The Theory of Change (TOC).
- Performance indicators.
- Integration of M&E and planning processes.
- Determination of relevant M&E studies.
- Delineation of roles and responsibilities of relevant actors.

1.3 Macro-policy environment

The government of the Republic of South Africa requires that assessments be made to establish whether the investments being made through programmes or projects are meeting their intentions. Accordingly, the National Treasury and the Department of Planning, Monitoring and Evaluation have respectively published the Framework for Managing Performance Information (2007) and the National Evaluation Policy Framework (2011). In addition to articulating the importance of programme/project monitoring and evaluation, the two Frameworks standardise M&E nomenclature in the context of government-led or supported programmes, as well as provide guidance on how to structure performance information in a way that indicates how the government is using available resources to deliver on its mandate.

The Science Engagement MEF is based on the key principles and concepts of the government-wide M&E systems outlined in Figure 2.

FIGURE 2: KEY PERFORMANCE INFORMATION CONCEPTS (DPME, 2011)



2. ESTABLISHING CHANGES BROUGHT ABOUT BY THE SCIENCE ENGAGEMENT PROGRAMME

The two big questions about the science engagement programme are, firstly, how the programme seeks to develop a society that is knowledgeable about science, critically engaged and scientifically literate; and secondly, how to establish whether and to what extent the programme is succeeding. The MEF uses the Theory of Change (Figure 3) to address the first question, and the Logframe (Appendix A) to address the second.

2.1 Theory of Change

The science engagement Theory of Change (TOC), based on Rogers (2014), explains how the science engagement programme will produce a series of results that collectively contribute to achieving the envisioned society. The TOC is depicted in Figure 3. The diagram uses solid and broken arrows to connect various steps, thus illustrating progress towards the ultimate goal of the science engagement programme. The solid arrows represent the logical sequence in which things have to happen, as well as the direct influence of each preceding step on the step that follows it, while the broken arrows represent the indirect influence that each preceding step may have on one or more of the steps that follow it.

As illustrated by Figure 3, the science engagement TOC has five steps, which are outlined below to provide a picture of how the programme will bring about the envisioned society.

Step 1: Provides an overview of the science engagement programme, which comprises a series of projects that are outlined in the SES Implementation Plan. These projects have defined market segments, namely the 11 target publics: learners, educators, students, scientists and researchers, journalists, science interpreters, tourists, decision-makers, indigenous knowledge holders, industry, and the general public.

Step 2: Sheds some light on the implementation approach adopted by the science engagement programme. What is important to note here is the identification of the target beneficiaries of each project in the SES Implementation Plan. Because some projects benefit more than one target public, the target publics that need to benefit from the same projects have been grouped together. As can be seen in Figure 3, this approach has led to three broad groupings of target publics, with some projects that need to benefit everyone, and others that target selected publics.

Step 3: Outlines the short-term outcomes of the science engagement programme. Here, "short-term" refers here not to the period within which they are expected to be accomplished, but to the fact that they are the first expected results of the programme. They can also be understood as preconditions for the medium-term outcomes outlined in Step 4. At this stage, the purpose of selective targeting of publics by the projects becomes apparent, given that it leads to four different short-term outcomes:

(a) All target publics will participate in various projects that make them aware and keep them abreast of key developments in science and technology. From the SES implementation perspective, these are projects meant to raise general science awareness, including profiling South African science, technology and innovation.

(b) The science engagement programme will create opportunities for all target publics to participate in science dialogues. Different types of platform will be created in different parts of the country. Examples

of such platforms, as outlined in the SES Implementation Plan, are science cafés, town hall meetings and public lectures.

(c) A group of selected publics (learners, students, educators, scientists/researchers, journalists, science interpreters and indigenous knowledge holders) will be equipped with basic skills for communicating science. Relevant projects in the SES Implementation Plan include formal training in science communication. Further to this, the science engagement programme will identify and adopt appropriate tools for communicating science to the people. Among the tools identified by the SES Implementation Plan are mainstream media, social media, exhibits, music and drama.

(d) The science engagement programme will give special attention to the youth in order to contribute to the building of the STEM (Science, Technology, Engineering and Mathematics) human capital pipeline. Accordingly, learners, students, educators, scientists and researchers will work together to inculcate a culture of science among the youth. In terms of the SES Implementation Plan, a school-based science engagement initiative will be rolled out, STEM career awareness campaigns will be deepened, and a national mentorship programme will be established to allow science professionals to support youth participation in STEM.

Step 4: Outlines the medium-term outcomes of the science engagement programme. 'Medium-term' refers not to the time required to achieve them, but to the fact that they are the intermediate results of the programme, expected between the first results and the ultimate outcome or impact. The medium-term outcomes (Step 4) result from the attainment of the short-term outcomes (Step 3) as follows:

(a) If all target publics participate in projects that make them aware and keep them abreast of key developments in science and technology (Step 3), South Africans' perceptions about science will improve (Step 4). When science becomes popular in this way, Strategic Aims 1 (excluding its youth development element, which is treated as a standalone outcome in the TOC) and 4 of the SES will have been realised.

(b) If science dialogue opportunities or platforms are created for all target publics (Step 3), citizens will actively participate in science discourse (Step 4). Strategic Aim 2 of the SES will thus have been achieved.

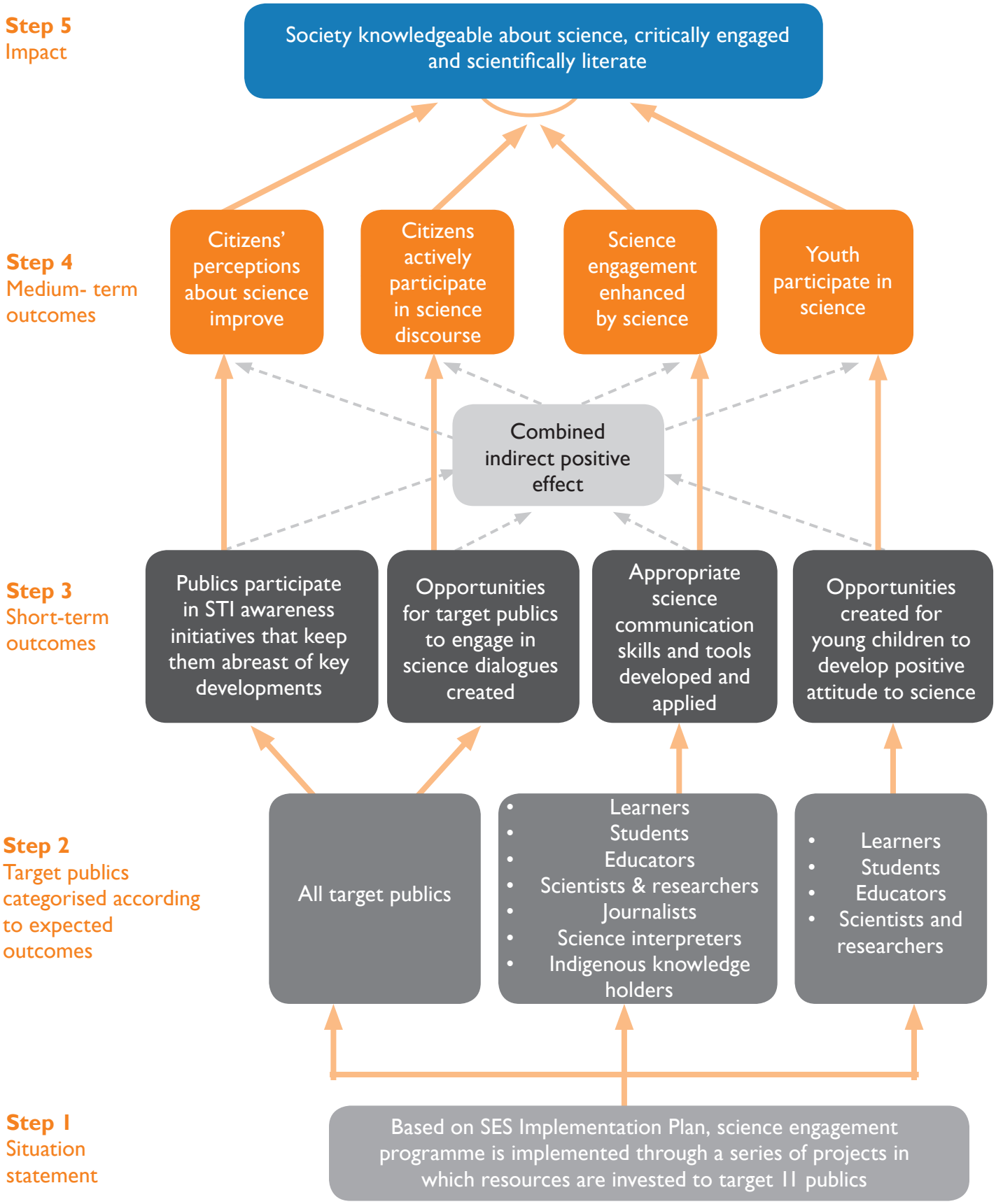
(c) If learners, students, educators, scientists and researchers, journalists, science interpreters and indigenous knowledge holders possess basic science communication skills (Step 3), and if appropriate science communication tools are used throughout the science engagement programme (Step 3), the entire programme will be enhanced (Step 4). Strategic Aim 3 of the SES will thus have been achieved.

(d) If the young children develop positive attitudes towards science (Step 3), more of the country's youth will participate in science (Step 4) in the following ways, among others:
   (i) Choosing the gateway subjects of Mathematics and Physical Science in Grade 10.
   (ii) Participating in extra-curricular science, technology, engineering, mathematics and innovation (STEMI) activities.
   (iii) Pursuing post-school STEM studies, and ultimately STEM careers.
   (iv) As young STEM professionals, providing mentorship and coaching to learners and students.

(e) It is assumed that there will be some interaction between the programme's short-term outcomes. Through this interaction, the short-term outcomes (Step 3) will have a positive indirect effect on the medium-term outcomes (Step 4).

Step 5: This is the long-term outcome, or impact, of the science engagement programme. This impact would result from the combined effect of the medium-term outcomes outlined in Step 4. The medium-term outcomes are all based on the strategic aims of the Science Engagement Strategy. Once achieved, these outcomes would collectively deliver a society that is knowledgeable about science, critically engaged and scientifically literate.

FIGURE 3: SCIENCE ENGAGEMENT THEORY OF CHANGE



2.2 Logframe

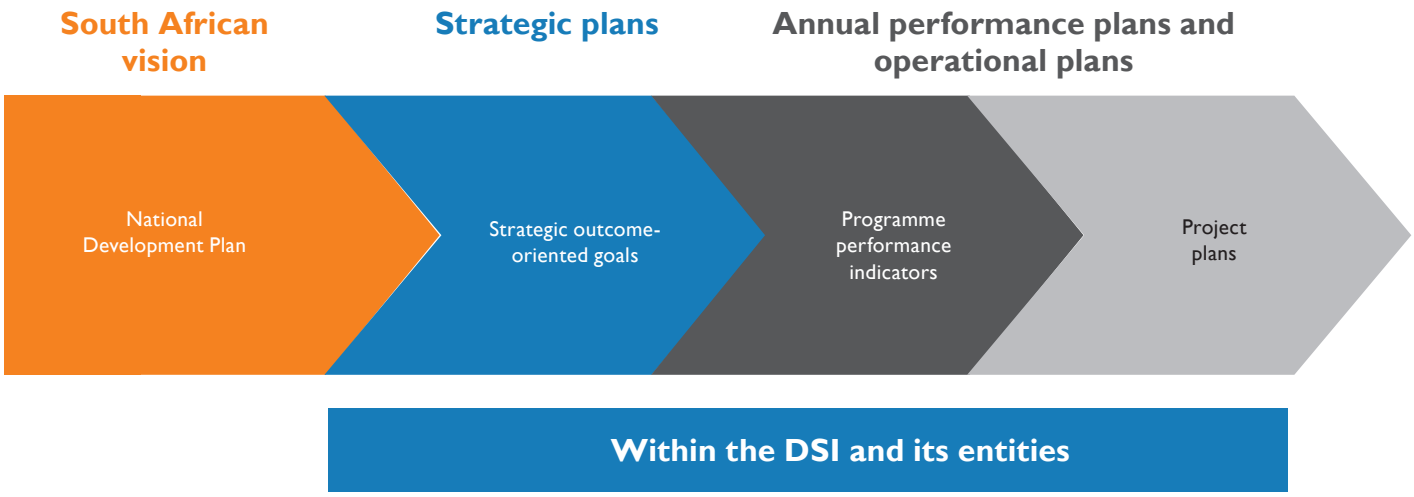
With the TOC (Figure 3) having articulated how the science engagement programme will deliver the envisioned society, the next crucial question is how to tell whether and to what extent the programme is making progress towards this end. The Logframe (Appendix A, p 17) provides a set of success indicators that will be used to measure this progress. The indicators are presented in five interconnected levels, in alignment with the five key performance information concepts illustrated in Figure 2 (p 3).

For each performance information concept (input, activity, output, outcome and impact) in the Logframe, there are success indicators that will be used to assess the progress being made. This assessment will be conducted throughout the trajectory towards the envisioned society, as illustrated by the TOC, therefore making it necessary to establish linkages between the TOC and the Logframe. In this regard, the second column of the Logframe (Appendix A) provides a TOC statement that links up with the success indicators associated with each performance information concept.

3. INTERFACING THE MEF WITH RELEVANT PLANS AND PLANNING PROCESSES

The implementation of the science engagement programme does not take place in isolation from national and departmental development imperatives. These imperatives, as well as some planning processes (both institutional and project planning), have a bearing on the MEF. Figure 4 below depicts the development and planning dynamics that affect the Science Engagement MEF.

FIGURE 4: DEVELOPMENT DYNAMICS SURROUNDING THE SCIENCE ENGAGEMENT PROGRAMME



3.1 National development planning imperatives

In 2012, South Africa launched the National Development Plan (NDP). The NDP is a plan to unite South Africans, unleash the energies of its citizens, grow an inclusive economy, build capabilities and enhance the capability of the state and leaders working together to solve complex problems (Presidency, 2012). Put simply, the NDP describes the envisioned society South Africa aims to have achieved by 2030. It makes sense to look beyond the actual outcomes of the SES when assessing the difference the science engagement programme is making in the country. In this regard, the programme's contribution to realising the objectives of the NDP needs to be assessed. The NDP will therefore, depending on the type of evaluation being conducted according to this MEF, inform some of its evaluation questions. Refer to Table 1 (p 13) for various types of evaluation.

3.2 Planning processes

Institutional planning processes that are of relevance to the MEF take place at the following two levels:

(a) Strategic planning

The institutions in question here are the DSI and its entities. These institutions, as required by the National Treasury, develop five-year strategic plans that set out their policy priorities, programmes and project plans. The strategic plan focuses on strategic outcome-oriented goals for the entire institution, as well as the objectives of each of the institution's main service delivery areas. Service delivery areas in government departments are "branches" or "programmes", and the different entities use different names. In this context, the relationship between strategic planning and the MEF is as follows:

(i) The strategic outcome-oriented goals – as in the case of the country's vision explained in par. 3.1 above – will inform the research questions when the evaluation seeks to establish the contribution of the science engagement programme to the policy priorities of the relevant department or entities.

(ii) The implementation of the five-year strategic plan takes place through annual performance plans (APPs) that each institution develops. The APPs set out what each institution intends doing in the upcoming financial year and during the Medium Term Expenditure Framework period, organising its objectives according to service delivery areas. "Promotion of public engagement on science" is one of the objectives of the DSI's Programme 4 (Research Development and Support) service delivery area. Since the APP sets out performance targets and indicators for each objective, the indicators for the objective of "promotion of public engagement in science" will be sourced from the Logframes (Appendix A) in this MEF. The same approach will be used when it comes to codifying performance indicators within the DSI and its entities.

As and when there is reconfiguration of the Government strategic planning process, necessary adjustments will be effected on subsection 3.2 of the MEF.

(b) Project planning

The SES Implementation Plan outlines projects which will be pursued to lead collectively to the realisation of the society envisioned by the SES. A standard project planning process will be followed in the DSI-led science engagement programme. To this end, a certain level of organisation is necessary.

(i) Prior to venturing into the implementation stage, a strategy needs to be developed for each project or collective of projects, where feasible. The project strategy will outline the goals and objectives, as well as explain the approaches the project will adopt in pursuit of its intentions. Using Figure 3 and Appendix A as a guide, an appropriate project TOC and Logframe will be developed for the project business plan.

(ii) Performance data to be collected on projects will be made known in advance and be factored into the project plans and implementation process. The science engagement programme coordinator, SAASTA, will from time to time indicate the type of data to be collected at various stages of the project cycle.

(iii) A customisable generic project strategy template will be developed and adopted through a participatory process led by the DSI.

iv) Projects that preceded the MEF will need to be realigned according to this project strategy template.

(v) Restraint needs to be exercised in adopting new projects that are not part of the SES Implementation Plan. The adoption of any such projects should be based on their relevance to the short and medium-terms outcomes of the TOC or their contribution to the Implementation Plan. Experience has shown unsolicited proposals to be the main source of inconvenience in this regard.

4. PERFORMANCE DATA MANAGEMENT

Progress being made by the science engagement programme towards the envisioned society will be effectively measured if performance targets are set for each indicator in the Logframe (Appendix A) and if the current level of performance (or baseline) is known. On the other hand, effective performance measurements will depend on the availability of reliable data on projects implementing the science engagement programme. The necessary systems should therefore be put in place.

4.1 Baseline values and performance targets

Indicators in the Logframe (Appendix A) alone do not provide a complete barometer of progress towards the society envisioned by the science engagement programme. There are two more variables that are needed to complete the performance measurement criteria:

(a) Baselines

The baseline is the performance recorded in the year prior to the planning period (National Treasury, 2010). The difference between the baseline and the performance of the subsequent year determines whether progress is being made or not. Some of the indicators in the Logframe (Appendix A) are related to projects that preceded the SES, while some projects are completely new. Either way, a two-pronged approach will be used.

(i) A baseline study will be conducted in cases where projects related to indicators in Appendix A existed before the introduction of the SES.
(ii) A zero baseline value will be assumed in cases where no projects existed before the introduction of the SES, as well as in cases where available data on existing projects is considered unreliable.

(b) Performance targets

Over a specified period (for example, a year), the results to be achieved in terms of the indicators in Appendix A will be quantitatively or qualitatively specified. The specified target for indicators being tracked will depend on the enabling environment and will vary from time to time, taking all relevant factors into consideration. The selection of performance indictors to be tracked and the setting of their targets will be a participative process facilitated by the DSI, involving SAASTA as the national coordinator and the DSI entities. This approach will facilitate the codification of science engagement indicators within the DSI and its entities referred to in par. 3.2(a) above. The Logframe presents up to 60 indicators across the five key performance information concepts from which indicators will be selected for tracking. Generally, the plethora of performance indicators presented in the Logframe is meant to assist continuous data collection, which is necessary for the determination of changes in the local science engagement landscape.

4.2 Evidence-based performance management

Given the plethora of performance indicators in Appendix A, multiple methods of data collection and processing will be used. The reliability of data will be enhanced through the following measures:

(a) In all instances, appropriate evidence will have to be provided. This will include qualitative and quantitative evidence that from time to time is considered acceptable as a means of verifying the reliability of the performance data provided for each indicator.

(b) A standard operating procedure will be adopted for performance data processing between the national coordinator and third parties involved in implementing the science engagement programme.

4.3 Performance data management systems

The implementation of the DSI-led science engagement programme is a multi-stakeholder initiative. Within the science centre community alone, for example, there are more than 30 centres involved in the programme. The data required for measuring science engagement performance in terms of the indicators in Appendix A is generated or collected by such stakeholders. The most challenging aspect of this process will be gathering the collected data in one place, and in a format that is useful to subsequent processes, as well as enabling the necessary manipulation of data to take place seamlessly. To meet this challenge, the MEF puts the following mechanisms in place:

(a) Reporting arrangements

SAASTA, in its capacity as the coordinator of the DSI-led science engagement programme, will set up the necessary systems to enable the collection of data by stakeholders involved in implementing the programme. It is not ideal for the MEF to prescribe the format of data collection, as this will be adjusted from time to time based on the continuous improvement principle and the possibly evolving nature of the variables being measured.

(b) Science Engagement Information Management System

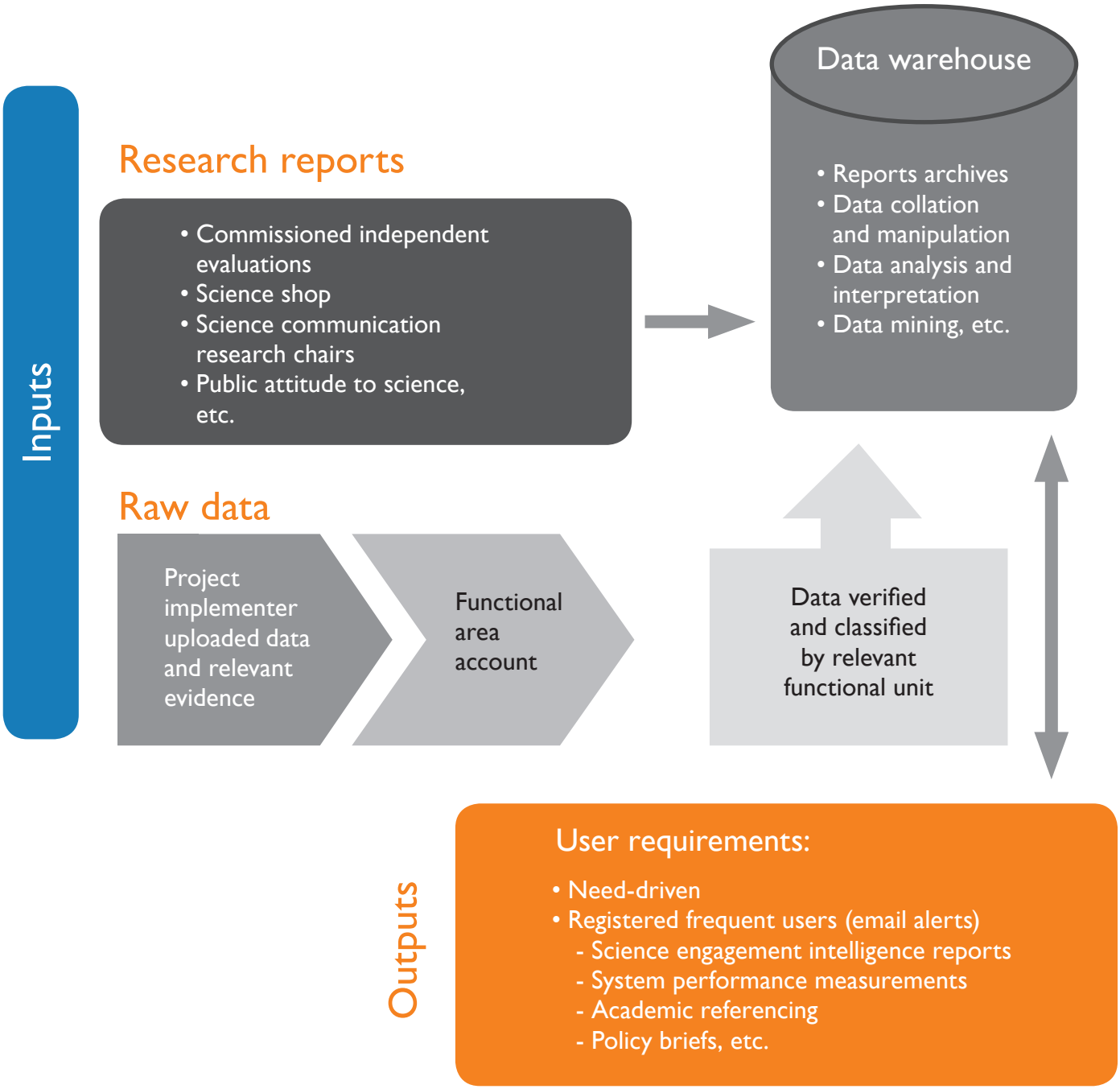
The Science Engagement Information Management System (SEIMS) is a database of raw and processed information required for measuring the performance of the science engagement programme and related assessments. Figure 5 below depicts the SEIMS architecture, including related processes. In terms of its envisaged basic structure, the SEIMS would do the following:

(i) Comprise a data warehouse which would serve as a central repository.

(ii) Include two primary sources of data (inputs), namely: (i) research studies that would be conducted from time to time, which would be archived directly into the data warehouse; and (ii) raw data that would originate from stakeholders involved in implementing the programme. While the SEIMS would allow the uploading of raw data and supporting evidence, such data would remain in a "suspense account" until verified by the relevant functional unit at SAASTA, after which it would be entered into the data warehouse.

(iii) Allow public access to classified stored data under specified user arrangements. Data from the warehouse would be used for different purposes, in some instances resulting in reports or documents that, based on strict criteria, could be selected for archiving in the warehouse under relevant classifications.

FIGURE 5: SCIENCE ENGAGEMENT INFORMATION MANAGEMENT SYSTEM ARCHITECTURE



5. TYPES OF EVALUATION

Progress made in the implementation of the SES and by the programme towards the envisioned society, as well as the programme's contribution to national and departmental policy priorities, will measured through evaluation studies. Table 1 below presents five types of evaluation study that will be conducted in this regard, including the frequency with which they will take place and the rationale for each evaluation. The five evaluations will take place under two broad categories (namely, input-activities-outputs and outcomes), based on the relationship between rationale for the evaluation and the Logframe (Appendix A).

TABLE 1: SYSTEM-LEVEL EVALUATIONS OF THE SCIENCE ENGAGEMENT PROGRAMME

LOGFRAME LOCATION	DEFINITION	RATIONALE	FREQUENCY
	Process evaluation	To determine – • progress in the execution of the SES Implementation Plan; • the effectiveness and efficiency of the systems put in place for the implementation of the programme.	Three-year interval
	Public attitudes to science	To establish the change being made (impact) by the science engagement programme in terms of realising the envisaged society.	Five-year interval
	Science engagement impact on youth development	To establish the extent to which the science engagement programme is contributing to national youth policy development imperatives and the building of the STEM human capital development pipeline.	Six-year interval
	Impact beyond science engagement programme intentions	To assess the developmental role of the science engagement programme in the context of the NDP and strategic outcomes-oriented goals.	Six-year interval
	Country comparison study	To establish how South Africa is doing compared to selected countries on the basis of defined criteria on science engagement issues.	10-year interval

6. ROLES AND RESPONSIBILITIES

If any meaningful monitoring and evaluation of the science engagement programme is to take place, it is important that the roles and responsibilities of the key stakeholders be clarified. Table 2 below lists the key stakeholders in science engagement monitoring and evaluation and what is expected of them.

TABLE 2: MEF RESPONSIBILITY MATRIX

INSTITUTIONS	ROLES/RESPONSIBILITIES
Department of Science and Innovation	• Sets system-level performance targets • Commissions system-level evaluations • Facilitates a participative process to determine system-level performance targets
South African Agency for Science and Technology Advancement	• Hosts and manages SEIMS • Coordinates data collection from stakeholders involved in implementing the science engagement programme • Conducts programme-level monitoring and evaluation
Human Sciences Research Council	• Conducts system-level research (see Table 1 above)
DSI entities and other implementing partners	• Collect data according to the format prescribed by SAASTA • Cooperate with any evaluation process as and when advised to do so

7. REFERENCES

Burns, TW, O'Connor, JO & Stocklmayer, SM. Science Communication: A Contemporary Definition. Public Understanding of Science 2003, 12:183.

Department of Science and Technology (DST). 2015. Science Engagement Strategy.

Department of Science and Technology (DST). 2017. Science Engagement Strategy Implementation Plan.

Gittinger, JP. 1984. Economic Analysis of Agricultural Projects. World Bank Economic Institute. Retrieved on 10 December 2016 from https://web.stanford.edu/group.

National Treasury. 2010. Framework for Strategic Plans and Annual Performance Plans.

National Treasury. 2007. Framework for Managing Performance Information.

Department of Performance Monitoring and Evaluation (DPME). 2011. National Evaluation Policy Framework.

Presidency of South Africa. 2012. National Development Plan, Vision 2030.

Independent Consulting Bootcamp. Accessed on 15 January 2018. http://www.independent-consulting-bootcamp.com.

Public Service Commission (PSC). 2008. Basic Concepts in Monitoring and Evaluation.

Rogers, P. 2014. Theory of Change: Methodological Briefs-Impact Evaluation No. 2 (No. innpub747).

USAID. 2009. Glossary of Evaluation Terms.

APPENDIX A: SCIENCE ENGAGEMENT PROGRAMME LOGFRAME

INPUT LOGFRAME

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	RESOURCES	PERFORMANCE MEASUREMENT
Inputs (Resources used to produce and deliver outputs)	Projects in which resources are invested	Partnerships established	Number of partnerships (domestic and international) established and sustained in the implementation of the programme over a specified period of time
		Funding invested	Level of funding invested (irrespective of source) in the science engagement programme as a proportion of science and technology expenditure by national vote over a specified period of time
		Infrastructure used	Number of designated and non-designated science engagement infrastructures accessed or used over a specified period of time
		Human resources used	Number of science communicators who participated in the programme (including scientists who are not full-time science communicators) over a specified period of time
			Number of science communication and related job opportunities created by the programme over a specified period of time

ACTIVITY LOGFRAME

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	ACTIONS/ PROCESSES	PERFORMANCE MEASUREMENT
Activities (Actions or processes that use inputs to produce outputs and ultimately outcomes)	SES Implementation Plan (outlines measures to create capacity to deliver the science engagement programme)	Enabling legislative framework established	The National Research Foundation (NRF) Act amended within three years of adoption of the SES Implementation Plan to incorporate the science engagement mandate
			An incremental plan to capacitate SAASTA to deliver on its new mandate adopted by the DSI and NRF within a year of the amendment of the NRF Act and fully implemented five years thereafter
		Sustainable funding model established	A science engagement funding model adopted within three years of adopting the SES Implementation Plan and incrementally implemented over a three-year period thereafter An efficient and effective science engagement grant funding management system established within two years of adopting the SES Implementation Plan and fully implemented 12 months thereafter
		Coherent programme institutional arrangement established and maintained	A campaign for the adoption of common system-wide science engagement performance indicators by key stakeholders started within six months of the adoption of the MEF and completed 18 months thereafter
			A forum of the DSI and its entities on science engagement established with clear terms of reference within six months of the adoption of the MEF, and meeting annually thereafter
			A national science engagement forum comprising organisations that are part of the science engagement programme institutional arrangement established within 24 months of the adoption of the MEF and thereafter meet biennially
		Making public engagement a condition for awarding NRF research grants	NRF grant conditions amended within 24 months of the amendment of the NRF Act to make public engagement mandatory for grant-holders

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	ACTIONS/ PROCESSES	PERFORMANCE MEASUREMENT
		Incorporating science engagement outreach into Continuing Professional Development (CPD) for STEM professionals	Agreement reached between the DSI and at least three professional bodies for the incorporation of STEM professionals' engagement with the public into their CPD models within three years of the adoption of the SES Implementation Plan
		Collaborations established between the DST and provincial education departments	Collaboration agreements signed between the DSI and individual provincial departments of education within three years of the adoption of the SES Implementation Plan
		Accredited Science Communication qualifications established	NQF exit level 8 programme on basic science communication skills development established at a historically disadvantaged university within three years of the adoption of the SES Implementation Plan
		Access to science engagement infrastructure enhanced	Development support framework for science centres adopted within three years of the adoption of the SES Implementation Plan and incrementally implemented over a five-year period thereafter
		Integrated approach for promoting science through the media developed	A feasible model of mass media campaign developed and implemented by 2020/21
		Identified programme risks addressed	Annual risk management plan for the science engagement programme developed and implemented
		Science engagement performance management system established	SEIMS established and operational within three years of the adoption of the MEF
		Collaboration established with media institutions on the creation of science journalism workplace experience opportunities	Partnership science journalism internship established with mainstream and/or community media organisations within two years of the adoption of the SES Implementation Plan, with predetermined annual intake of interns
		Mass participation science promotion events decentralised	Provincial science festivals model adopted within three years of the adoption of the SES Implementation Plan, and rolled out incrementally thereafter over a period of five years

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	ACTIONS/ PROCESSES	PERFORMANCE MEASUREMENT
		Ongoing surveillance of global and local scientific developments	Responsive public engagement activities conducted around major scientific phenomena as and when they occur locally and internationally (including international and local observances)

OUTPUT LOGFRAME

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	PRODUCTS OR GOODS AND SERVICES	PERFORMANCE MEASUREMENT
Outputs (Final products or goods and services produced for delivery)	Publics' participation in exciting awareness activities that keep them abreast of key science developments	Participants in science engagement initiatives	Increase in number of participants in the science engagement programme over a specified period of time (taking into consideration all target publics of the SES)
		Science for decision-makers initiative	Annual science event hosted by the DSI for the parliamentarians
		Integrated science engagement initiatives	National Science Week and science festivals conducted annually, achieving a geographic spread aligned to prevailing service delivery (municipal) boundaries
		Sector-specific awareness initiatives	DSI priority areas mainstreamed in all integrated science engagement initiatives as and when they are conducted
		Targeted awareness campaign on research, development and innovation-enabling instruments	At least one interaction conducted annually with the target publics in each existing local public university to promote research, development and innovation enabling instruments
	Opportunities for target publics to engage in science dialogues exist	Promotion of citizen-based science	Number of citizen-centred dialogues conducted and geographic coverage over a specific period of time
			Number of public participants in online public social science initiatives over a specified period of time
			Number of public seminars conducted over a specified period of time

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	PRODUCTS OR GOODS AND SERVICES	PERFORMANCE MEASUREMENT
		Supported conferences	Designated conferences conducted as scheduled, and support provided for public participation in such conferences as per adopted plan
	Appropriate skills and communication tools developed and adopted respectively	Continuous training provided to designated publics	Number of science communicators and relevant support staff who participated in training interventions over a specified period of time
			Number of participants in the science communication internship project over a specified period of time
		Relevant competitions conducted	Geographic spread and level of target publics' participation over a specified period
		Media used to promote science engagement	Extent of reach of different types of media used over a specified period of time
			Extent of diversity of science topics and/or messages communicated through the media over a specified period of time
	Youth develop positive attitude towards science	STEM career awareness campaign conducted	Number of interactions over a defined period of time
			Types of interactions over a defined period of time
		School-based science engagement initiative rolled out to schools	Extent of geographic spread and level of target public participation over a defined period time
		Science activities for children rolled out	
		STEM human capital capacity development policy interventions popularised	At least one interaction conducted annually with the target publics in each existing local public university to promote existing STEM human capital capacity development policy interventions
		Complementary learning and teaching support materials related to DST priority areas produced and distributed	Range of science topics and fields covered, as well as distribution coverage of the learning and teaching support materials over a specified period of time

OUTCOME LOGFRAME

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	INTERMEDIATE RESULTS	PERFORMANCE MEASUREMENT
Outcomes (Medium-term results that are the consequence of achieving specific outputs)	Citizens' perceptions about science improve	Identified behaviour changes among target publics	Level of influential technology adoption and awareness by various target publics with each survey conducted
			Level of science reporting in mass media over a specified period of time
			Level of public engagement in science topics through social media over a specified period of time
			Level of take-up of STEM subjects and post-school STEM studies by learners and school leavers (who benefitted from the science engagement programme), respectively, over a specified period of time
			Extent of interest of citizens in accessing sources of science information with each survey conducted
	Active citizen participation in science discourse	Citizen participation in science dialogues	Number of participants and science dialogue interactions over a specified period of time
		Citizen participation in public hearings on science policy issues	Number of publics who participated in science and technology policy public hearings or related activities as and when these are conducted and measured over a specific period of time
	Science engagement enhanced by science communication	Appropriate skills and tools to communicate science	Level of participation of science communicators in skills enhancing initiatives in basic and other forms of science communication over a specified period of time
			Level of participation of science communicators in science engagement activities over a specified period of time
			Extent of use of various forms of science communication mediums in the science engagement programme over a specified period of time

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	INTERMEDIATE RESULTS	PERFORMANCE MEASUREMENT
	Youth participate in science	STEM subject take-up by learners and students	Proportion of programme beneficiaries enrolled for STEM subjects and post-school STEM study fields over a specified period of time
		Level of learner participation in STEMI Olympiads and competitions	Level of learners' participation in STEMI Olympiads and competitions according to the country's demographic profile over a specified period of time
		State of science clubs at schools	Number of existing and active science clubs over a specified period of time
		Youth participation in STEM careers	Proportion of learners who benefited from the youth into science initiatives pursue STEM careers on completion of their post-school STEM studies
		Level of young scientists' participation in youth mentoring and coaching	Level of interest in voluntary mentoring and coaching of STEM learners and students by young scientists (up to 35 years of age) with each survey conducted

IMPACT LOGFRAME

PERFORMANCE INFORMATION CONCEPTS	TOC LINKING STATEMENTS	DEVELOPMENTAL/ LONG-TERM RESULTS	PERFORMANCE MEASUREMENT
Impact (Developmental results of achieving outcomes)	Society knowledgeable about science, critically engaged and scientifically literate	Change in citizens' scientific literacy	Level of scientific literacy among citizens with each survey conducted
		Change in citizens' confidence in science	Extent of confidence in science among citizens with each survey conducted
		Citizens' knowledge level of science in general and of specific science areas	Level of citizens' general knowledge of science and knowledge of DSI selected priority areas with each survey conducted
		Change in citizens' attitudes to and/or perceptions of science	Level of public perception of science in general and specific science topics with each survey conducted

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