ANNEXURES
Annexure A: Prioritisation Instrument Developed for the NATMAP 2050 – Goal Achievement Matrix

This section serves to illustrate the goal achievement matrix (GAM) and its function as an instrument to assess and prioritise identified transport projects that align with the strategic transport policy, goals, and objectives of the NATMAP 2050.

The GAM was developed to assist with assessing and prioritising transport projects and programmes that have been generated as a result of the outcomes of the development phases of the NATMAP 2050, in line with the strategic policy, goals and objectives identified for the NATMAP 2050; and, as an output, sets out a programme of implementation of the NATMAP 2050 identified transport projects in terms of a five-year short-term development plan, a medium-term development plan and, a long-term development plan for South Africa.

The GAM utilises internationally accepted multi-criteria analysis (MCA) and pairwise comparison matrix (PWC) methodologies to assess and analyse the NATMAP 2050 identified projects.

The GAM also incorporated a strategic stakeholder participation process whereby stakeholders were asked to assist with the weighting of the NATMAP 2050 goals and objectives, which formed the basis for assessing and prioritising the NATMAP 2050 identified projects.

This section illustrates and unpacks the different components that contribute to the GAM in terms of its criteria, process and function (refer to Figure A-1).

The aim of the NATMAP 2050 GAM model is to assist with producing a strategic development programme of projects that are ranked in terms of how well identified projects and programmes are aligned with the NATMAP 2050 goals and objectives, as well as in terms of implementation timeframes (short-, medium-, and long-term).

The important GAM components can be summarised as follows:

- **The NATMAP 2050 goals and objectives (input)**
- **Project alignment (input and output)**
  - Pairwise comparison website (NATMAP stakeholder participation)
  - Multi-criteria analysis model
- **Goal achievement matrix setup (input and output)**

Each of the GAM components is discussed fully in the Phase 4 report of the NATMAP 2050.
The following goals and objectives were derived from the NATMAP 2050 terms of reference to be utilised within the GAM as a performance measurement for identifying, analysing and prioritising projects:

1. **To provide integrated land use and transport solutions**
   - Integrated land use and transport solutions will typically meet the NDSF objectives and will be in support of national strategic/priority transportation and development corridors.

2. **To promote economic development**
   - The facilitation of development through increasing GDP and wealth creation and the promotion of cost savings by reducing the cost of production and distribution of raw materials.

3. **To promote rural development, giving priority to presidential nodes**
   - Creating linkages between rural nodes or inaccessible areas and main economic centres.

4. **To maximise the utilisation of existing infrastructure facilities**
   - The maximisation of existing infrastructure usage through adequate funding for maintenance and efficiencies through proper management and operation practices.

5. **To maximise the economic return on investment in transport**
   - The maximisation of economic return on investment through the minimisation of transport cost and delays (time), the elimination of bottlenecks on transport infrastructure and operations and the meeting of user demands.

6. **To promote the integration of transport infrastructure and services**
   - The integration of modes (seamless transfer) across provincial boundaries and across international boundaries to neighbouring states.

7. **To minimise the impact on the environment and reduce the carbon footprint of transport**
   - The minimisation of environmental impact through the promotion of public passenger transport, the choosing of optimal transport modes and the use of energy sources that emit low levels of carbon.

8. **To provide energy-efficient transport, using energy sources that are sustainable in the long term**
   - The minimisation of environmental impact through the promotion of public passenger transport, the choosing of optimal transport modes and the use of energy sources that emit low levels of carbon and renewable energy resources.

9. **To provide affordable transport to end users, operators and the government**
   - The promotion of the affordability of transport through reductions in subsidy burden, the promotion of efficient funding mechanisms, a user pay principle, etc.

10. **To provide transport that is equitable to all stakeholders**
    - The provision of transport that is suitable to all stakeholder groups, including persons with disabilities and different income groups, operators, regions and provinces.

11. **To develop transport infrastructure that meets international standards and that is technologically sustainable**
    - The promotion of the use of new and more efficient technologies such as modern rolling stock, infrastructure, systems, intelligent transport solutions, and energy-efficient solutions.

To prioritise projects/strategies with a mix of both competing and aligned project objectives for transport and communications into a unified list of projects, a project evaluation methodology was sought that can take into account a number of qualitative and quantitative aspects simultaneously and that can accommodate changes in planning emphasis and project life cycle implications over time (refer to Figure A-2).
Multi-criteria analysis (MCA) can be defined as follows:

"Utility analysis (Multi-Criteria Analysis - MCA) is in effect a semi-quantitative means of ‘trading off’ the effects of implementing any given scheme, that is, the relative desirability of achieving a given set of goals and objectives and the degree to which this target system is fulfilled, are combined to give a measure of how far each scheme will go in meeting all or any of the goals and objectives, and so provides the answer to the question of effectiveness of the scheme. The distinguishing feature of utility analysis is that it can handle financial, quantitative and qualitative effects simultaneously. Consequently, all of the impacts or effects of a project which can be envisaged can be included in the analysis."

JV Baxa
Evaluation of Transportation Projects, 1981, CSIR

Therefore it becomes essential also to compare the importance of these individual goals and objectives vertically. To do this successfully and transparently, a NATMAP 2050 stakeholder participation survey was conducted based on a pairwise comparison matrix methodology.

A pairwise comparison matrix assesses the NATMAP goals and objectives and determines their relative weights based on a preferential response exercise (pairwise comparison website stakeholder participation survey) and serves as input to the MCA.

The NATMAP 2050 goals and objectives have different levels of importance when compared to one another (in other words when looked at vertically), depending on the country’s action agenda (for example, the Goal and Objective Number 9: Provide Affordable Transport can, at this point, be seen as more important than, say, Goal and Objective Number 8: Provide Energy Efficient Transport).

After initial scaling, the following NATMAP 2050 goals and objectives weighting results were calculated based on the weighted average of the representative sample responses. With reference to the goals and objectives, Figure A-3 illustrates the result of the NATMAP 2050 stakeholder participation survey.

Figure A-4 provides a simplified schematic representation of the goal achievement matrix model developed for the NATMAP 2050.

In terms of the GAM model output, each NATMAP 2050 identified project is given a score (GAM model score) as a result of the GAM model’s evaluation criteria. The GAM model score is an indication of the extent to which the project aligns with the NATMAP 2050 goals and objectives. The GAM model score is a value between 0 and 100, with 100 meaning either full compliance with all the NATMAP 2050 goals and objectives, or an exempted project, and 0 meaning no compliance with any of the NATMAP 2050 goals and objectives.

The GAM model score for each project can be used to compare projects within the different development programme periods (i.e. in the short, medium and long term), as follows:

- Within a specific infrastructure category (e.g. infrastructure – rail freight), a project with a higher score can be given first priority (in case of budget constraints), as it is deemed to be better aligned with the NATMAP goals and objectives.
- Projects within the same development programme period but under different infrastructure categories can also be compared to each other as one of the decision-making criteria when two alternative projects are compared to each other.

After the GAM model has evaluated each NATMAP 2050 project from the NATMAP 2050 GAM model registry database, the GAM model provides a result report that provides details of each NATMAP 2050 identified project, including information about the project such as project name, project description, project cost, as well as a model score that demonstrates how well an identified project performed in terms of the NATMAP 2050 goals and objectives.
FIGURE A-4: NATMAP 2050 GAM MODEL