No.

Dar es Salaam City Council

The United Republic of Tanzania

Dar es Salaam

Transport Policy and System Development

Master Plan

Technical Report 5

Master Plan Evaluation

June 2008

JAPAN INTERNATIONAL COOPERATION AGENCY

PACIFIC CONSULTANTS INTERNATIONAL

CONSTRUCTION PROJECT CONSULTANTS

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Table of Contents

Chapter 1 Multi Criteria Analysis

1.1 The Goal Achievement Matrix 1-1
1.1.1 Why Multi Criteria Analysis ? 1-1
1.1.2 Goal Achievement Matrix 1-2
1.1.3 Expanding project appreciation 1-4
1.1.4 GAM versus CBA 1-4
1.1.5 Conclusion 1-6

Chapter 2 GAM Framework

2.1 Building the GAM Framework 2-1
2.1.1 General approach 2-1
2.1.2 Integrated GAM evaluation concepts 2-7
2.2 Evaluation Results 2-9
2.2.1 Stepwise GAM 2-9
2.2.2 Consolidated GAM 2-16
2.3 Conclusions and recommendations 2-18

Chapter 3 Economic Evaluation of the Master Plan

3.1 Introduction 3-1
3.2 Vehicle Operating Costs 3-2
3.3 Value of Time 3-3
3.4 Shadow Pricing 3-3
3.5 Cost Benefit Analysis 3-4
3.6 Conclusions and Recommendations 3-9

Chapter 1 Multi Criteria Analysis

This Technical Report evaluates by means of a Multi Criteria Analysis (MCA) the wide range of recommendations, both infrastructure developments and soft projects, formulated in the Dar es Salaam Transport Policy and System Development Master Plan.

The MCA technology used is the Goal Achievement Matrix (GAM) because, as will be discussed, this approach allows reasoned prioritization of the recommendations, generating a ranking based on both of quantifiable and non-quantifiable evaluation criteria.

1.1 The Goal Achievement Matrix

1.1.1 Why Multi Criteria Analysis?

During the Dar es Salaam Transport Policy and System Development Master Plan, all recommended projects are evaluated by means of a Cost Benefit Analysis (CBA), an effective evaluation technique widely recognized to assess the contribution of the projects to long-term sustainable economic development. In that perspective, it is important to identify the costs and benefits without possible distortions generated by weighting or quantifying efforts for non-quantifiable variables[1].

However, as suggested in the EU Guide to Cost Benefit Analysis[2], the evaluation method also needs to include an analytical section to consider non-quantifiable variables in addition to economic and financial variables, part of the classic CBA. For these non-quantifiable variables, costs and benefits are "*…identified, quantified and given a realistic monetary value, if possible. If this* [quantification] *is difficult or impossible this costs and benefits should be quantified at least in physical terms for a qualitative appraisal.*"[3]

The growing number of high capital and long-term investment projects with substantial repercussions on economy and society incites the expansion of the traditional CBA-based evaluation with evaluation

[1] See for example, World Bank, *Sustainable Transport: Priorities for Policy Reform*" World Bank Policy Paper, Washington, D.C. (1996)

[2] See for a detailed description : *Guide to cost-benefit analysis of investment projects*, Evaluation Unit of DG Regional Policy, European Commission, 1987, revision

[3] *Guide to cost-benefit analysis of investment projects,* 1987, revision, p 31 (cit)

techniques that include the impacts of "external" influences as well as the possible effects of changes in critical conditions such as revenues, costs, implementation time, etc.

The Goal Achievement Matrix (GAM) is a Multi-Criteria Analysis (MCA) that allows assessing non-quantifiable conditions and changing the impact level of each variable by means of a variable weighting system.

1.1.2 Goal Achievement Matrix

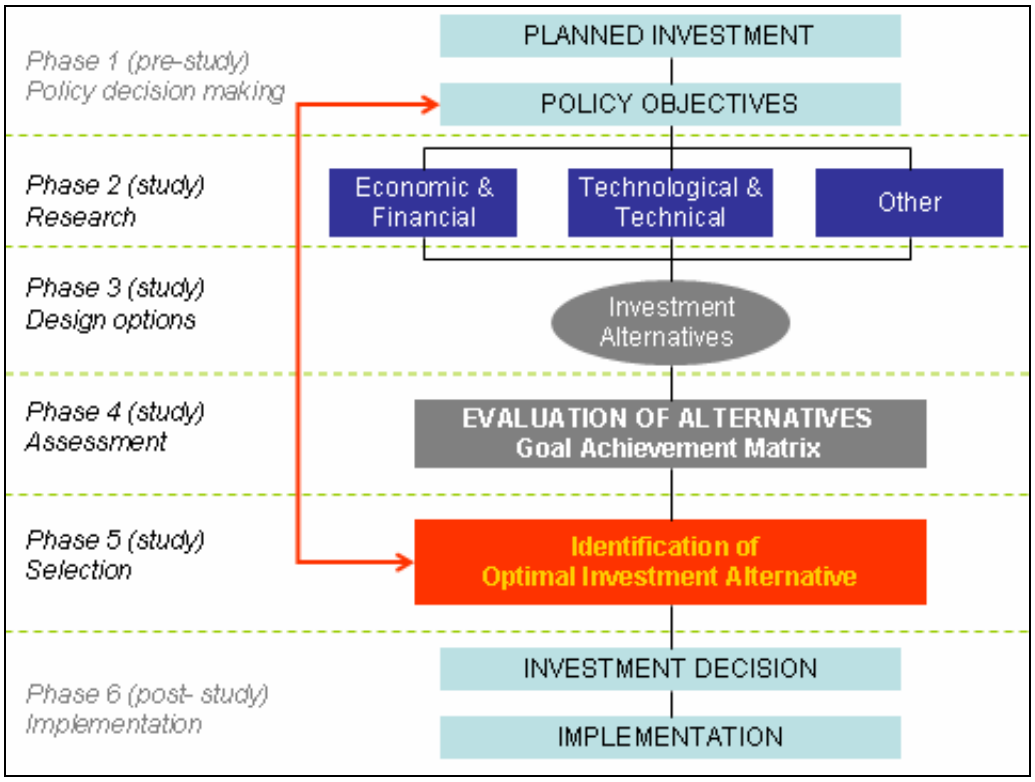
After evaluating costs and benefits, the EU guide for project evaluation recommends a review of non-quantifiable decision factors. The Goal Achievement Matrix (GAM), a multi-criteria analysis (MCA) tool developed in the sixties, is an appropriate method to assess these factors and generally accepted as a suitable process for evaluating large-scale investments.

Several countries use GAM as part of their strategic and investment planning, for example:

- *Queensland Transport Strategic Plan 1999-2003*; Corporate Strategy and Performance Branch, Corporate Governance Division, Queensland Transport.
- *Creating a Beautiful National Land with Safety and Vitality*; National Institute for Land and Infrastructure Management, Ministry of Land, Infrastructure and Transport, Japan (2001).
- *Tasman Highway Transport Planning Study - Hobart Airport to Esk Main Road*; Department of Infrastructure, Energy and Resources, Transport, State Government of Tasmania (1998).
- *City Development Strategy and City Assistance Program*; Kathmandu Metropolitan City, Nepal (2000, with financial support of the World Bank).
- *Transport Plan 2001-2002*; Westminster City Council - Department of Planning and Transportation; prepared by the London Bridges Engineering Group (2002).
- *Transportation Master Plan and Feasibility Study of Urban Transport Projects in Greater Cairo Region in the Arab Republic of Egypt Phase I & II*; Higher Committee for Greater Cairo Transport Planning Egypt, Japan International Cooperation Agency – JICA (2002).
- *West Bay Area Transport Study*; Urban Planning and Development Authority (UPDA), State of Qatar (2006)

GAM, and multi-criteria evaluation in general, is important part of the decision-making process when looking at the investment lifecycle from its conception to its implementation, see Figure 4.1.1[4].

[4] See for a detailed discussion of evaluation methods: Lichfield, N.; Kettle, P. and Whitbread, M.(1975) *Evaluation in the Planning Process*, Pergamon Press: Oxford; in Christopher Pettit and David Pullar (2001) *Planning Scenarios for the Growth of Hervey Bay*, Department of Geographical Sciences and Planning, The University of Queensland; e-paper on http://www.geocomputation.org/2001/papers (*cit*); and Tom Sager: *Rationality Types in Evaluation Techniques: the Planning Balance Sheet and the Goals Achievement Matrix*; in European Journal of Spatial Development, Jan 2003 number 2.



Source: Based upon Pettit & Pullar (2001)

Figure 1.1.1 GAM in the investment lifecycle

A large-scale (public) investment process consists of three main development stages each further separated in different phases. The first stage is the political process, in which a concrete investment supports the realization of public policy goals, a support expressed in a number of investment-related (policy) objectives.

The second stage is the study period during which experts investigate a wide range of issues, setting forth the conditions for realizing the proposed investment. The major categories define the quality of the proposed investment, namely financial and economic categories, technical and technological categories and others. During the study period, various development alternatives are proposed and evaluated on their contribution to achieving the set- forward policy objectives. In the third and final stage of the investment's process lifecycle, the realization of the project is decided.

Each of the three stages needs to confront a number of pitfalls, creating uncertainty about the chances of a successful implementation. A first issue relates to the evaluation of investment alternatives and the selection of a final investment. Although much accent continues to be put on using a normative evaluation technique, more in particular cost benefit analysis (CBA), it is increasingly questioned whether such number-based approach is sufficient to assess the contribution of an investment to overall economic growth and societal welfare.

1.1.3 Expanding project appreciation

Using classic CBA technology to evaluate the feasibility of investment projects offers helpful insights in the financial and economic value of these investments. CBA analyzes a wide variety of variables, including some environmental and societal impacts and thus allows distinguishing between different investment opportunities to recommend an "optimal" solution.

However, relying exclusively on the outcomes of the cost-benefit analysis is insufficient to make a reasoned decision because this requires the study of a range of external considerations in addition to economic and financial variables investigated in the classic CBA. The "… *project examiner should check that these kinds of costs have been identified, quantified and given a realistic monetary value, if possible. If this is difficult or impossible this costs and benefits should be quantified at least in physical terms for a qualitative appraisal.*"[5] The Guide therewith recognizes that CBA does not incorporate all relevant variables to allow a reasoned policy decision and advocates complementing the CBA with a multi-criteria analysis (MCA) technique that allows evaluating variables that "*...could not be included in the financial and economic analysis eg. social equity, environmental protection, equal opportunities.*" [6] According to the authors of the Guide, the MCA "*... methodology is particularly effective when the monetisation of costs and benefits is difficult or even impossible.*" [7]

The Goal Achievement Matrix evaluation technique (GAM) is a technique that integrates and complements traditional economic and financial evaluation into a comprehensive assessment of quantifiable and non-quantifiable variables. GAM incorporates intangible variables through the allocation of a scaled value therewith allowing its assessment via a calculated evaluation grid, therewith allowing a full-scale multi-dimensional comparison of different investments.

However, entirely replacing CBA by GAM or another multi-criteria evaluation method would be dangerous. Only using GAM for the evaluation could create reliability problems because there "*... is nothing in the GAM providing the planners with a foundation for questioning ... results and criticising ... allocation of public means.*" Economic principles are imperative as leading principle to avoid investments are guided by personal agendas[8]. It is, however, prudent and argued by many experts to combine the two evaluation techniques, thus maximizing the volume and quality of available information that enables decision-makers to achieve a reasoned decision under consensus conditions.

1.1.4 GAM versus CBA

The value of GAM is questioned by some experts who prefer using the cost benefit analysis methodology, arguing that GAM is "*... a reaction against the limitations of the CBA technique, namely that with CBA all costs and benefits are expressed explicitly in monetary terms, it fails to incorporate*

[5] *Guide to cost-benefit analysis of investment projects*, 1987, p 31 (cit)
[6] *Guide to cost-benefit analysis of investment projects*, 1987, p 36 (cit)
[7] *Guide to cost-benefit analysis of investment projects*, 1987, p 37 (cit)
[8] Tore Sager, *Rationality Types in Evaluation Techniques: the Planning Balance Sheet and the Goals Achievement Matrix*; in European Journal of Spatial Development, Jan 2003 number 2, p 9 cit

intangible items in the actual calculations of a study area, ..." [9]. Other experts argue that CBA provides detailed information on many monetary and quantifiable aspects of the proposed investment, but overlooks non-quantifiable and/or intangible elements that are relevant for the decision-making process.

For that reason, several experts recommend expanding the classic CBA analysis with a multi-criteria evaluation (MCA), for example the Goal Achievement Matrix, to compare the various alternatives against the policy objectives by investigating for each alternative the level their variables meet policy objectives.

The GAM process, as do other MCA techniques, allows weighting evaluation criteria to ensure that those considered most "important" receive a suitable and equitable appreciation. Weighting also permits sensitivity testing against one or more specific criteria and thus allows assessing the level to which any particular alternative contributes in achieving the objective(s). Because the GAM evaluation provides both quantified and qualified information the societal, political, implementation process, environmental and other non-tangible concerns strengthen the economic and financial arguments. With a combination of CBA and GAM, costs and (long-term) economic and financial benefits guide the decision but do not exclusively define it.

The discussion between using GAM or CBA concentrates on the question to what level citizens' needs should guide government policies, leading to two possible policy rationales[10]:

1. The economic rationale, and
2. The supportive rationale.

The economic rationale is a consistent approach to investments where the preference for one or another alternative is consistent with maximizing utility. It is a means-end thinking defined by economic and financial conditions, generally expressed in CBA-like evaluations. In this economic approach, (public) investments are decided solely upon the conditioned evaluation cycle where input generates a result and given a certain input available, a certain result is expected, for example maximizing welfare given a certain income distribution. The supportive rationale, on the contrary, rejects the cyclic principle of means-end analysis and introduces the notion of supportive selection, by which the final selection of an alternative is defined by the support it receives and could therefore be other than the "logical" best solution (as would be defined by the economic rationale). Supportive selection finds its origin in the belief of transparent and communicative governance in investment planning and project implementation.

An ongoing and controversial issue in the discussion between GAM and CBA relates to the ranking of alternatives, common practice in MCA-based project evaluation. The conflict originates from the

[9] Lichfield, N.; Kettle, P. and Whitbread, M.(1975) *Evaluation in the Planning Process*, Pergamon Press: Oxford; in Christopher Pettit and David Pullar (2001) *Planning Scenarios for the Growth of Hervey Bay*, Department of Geographical Sciences and Planning, The University of Queensland; e-paper on http://www.geocomputation.org/2001/papers (*cit*)

[10] See for a detailed discussion: Tore Sager 2003.

possibility in GAM and other MCA methods: *first*, to "prefer" certain decision-factors to others through the allocation of weights; and *second*, to allocate an ordinal value to non-quantifiable data. Both forms of "manipulation" are impossible in CBA that ranks the different alternatives according to an ordinal scale based upon quantified results. Critics of the GAM technique argue that such creative thinking that translates intangible parameters into a "quantifiable" scale reduces the validity of the evaluation because the evaluation method generates itself decisive information. The use of weights by which the impact of individual parameters are artificially altered further aggravates the "distortion". According to many critics, GAM is therefore unacceptably "creative", fabricating itself quantitative data and turning them into decisive information, ranked according to their importance prior to the actual evaluation via the multiplication of these "would-be quantified" data with "arbitrarily allocated" weights. These critics argue that the importance can only be determined after a logical consequence of perceiving differences between the various alternatives and not via a weighting and quantification of variables, putting intangible consequences at the same level of importance as quantified effects. According to the critics of MCA/GAM, the method is the opposite of numerical (formal) evaluation methods such as CBA that use mathematical algorithms to come to a final calculated recommendation without any distorting interventions.

Advocates of GAM (and other similar MCA techniques) argue that the approach loosens the means-end relationship of economic (welfare) theory applied in the CBA, and introduces more comprehensive intangible and/or non-quantifiable variables as well as distribution effects into the equation. They argue that an evaluation technique should be creative and not exclusively algorithm-based with results exclusively reached through mathematical manipulation. GAM and other non-formal evaluation methods (rank-weighting methods) are creative as they apply techniques that allow a qualitative differentiation between effects, incorporating arguments explicitly excluded in numerical evaluation methods, therewith challenging the economic rationale in the most radical way and giving more information to decision-makers to reach a more reasoned decision[11].

1.1.5 Conclusion

It should be clear from above discussion that relying solely upon the results of rank-weighting techniques comes at the price of paving the way for manipulating the results, and that relying solely upon the results of mathematical numerical (formal) evaluation methods increases the risks of excluding relevant parameters from the evaluation.

There is no best solution to evaluate investments and the best approach depends upon the specifications of requirements and objectives. As a principle guideline, incorporating CBA-type assessments into the GAM evaluation reduces the risk of data manipulation and expands the analysis with new data and sensitivity testing to identify boundaries of effects and enable a accurate balance of numerical results and non-quantifiable outcomes.

[11] Sager, 2003, p 22

The “Dar es Salaam Transport Policy and System Development Master Plan” aims for the maximum of information and the highest detail of comparison to allow decision-makers formulating reasoned and sustainable decisions on the project’s recommendations. For that reason, the recommendations of the underlying Study are investigated with GAM in addition to the classic CBA evaluation.

Chapter 2 GAM Framework

2.1 Building the GAM Framework

2.1.1 General approach

Determining the priority of projects recommended in the Dar es Salaam Transport Policy and System Development Master Plan is difficult because of major differences in scale and scope of the individual recommendations. The GAM evaluation therefore involved all experts of the Study Team who assisted in the identification of the criteria, the allocation of weights and the qualitative assessment of the recommended projects during the *Stepwise GAM*.

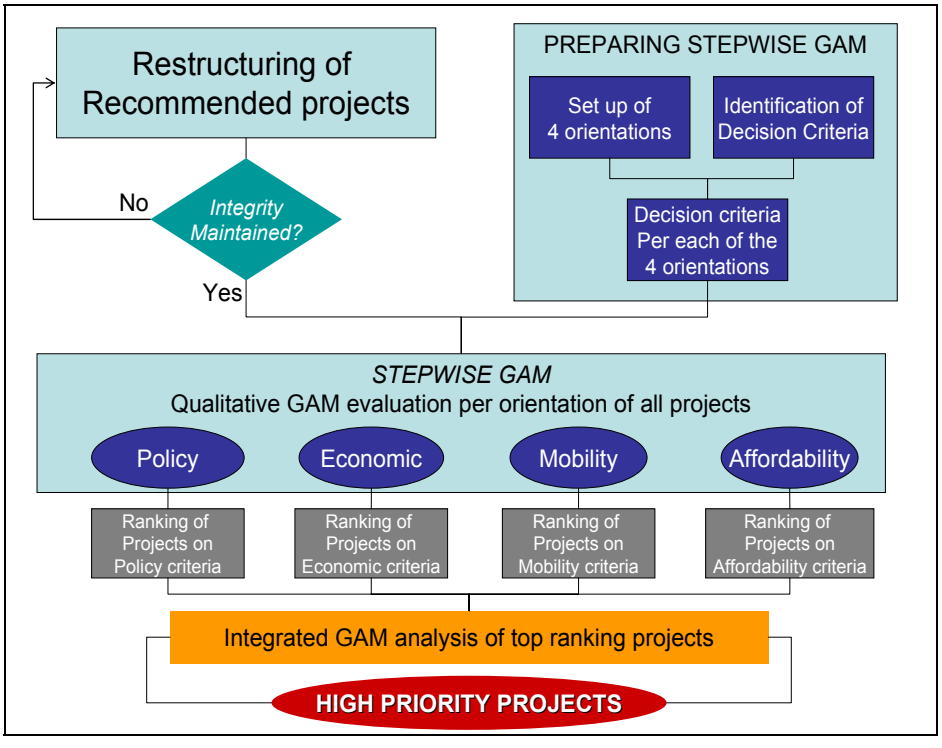


Figure 2.1.1 Approach of GAM Analysis

A first step to further facilitate and substantiate a comparative analysis includes rearranging the projects and combine where possible into groups based on causal relationships. A second step to

smoothen the analysis is the introduction of a stepwise evaluation process. The ranking and prioritizing using a single evaluation framework is difficult because the importance (priority) of individual investments / projects differs according to the stakeholders involved. For that reason, the GAM evaluation process includes in several steps, visualized in Figure 2.1.1.

The recommended projects are first evaluated via a qualitative appreciation (*Stepwise GAM*) by which the projects are appreciated and evaluated against a sets of decision criteria for 4 strategic orientations:

- *Upstream policy* arguments for ranking and prioritization of the recommendations that refer to the relationship of the proposed projects with the overall (transport) policy for Dar es Salaam and the aims and strategies of the principal stakeholders, in particular donor organizations, in terms of transport development in the city.
- *Economic development*; this evaluation concentrates on the concrete contribution of projects in strengthening future economic development of the city.
- *Mobility*; The mobility arguments look at the impact of the proposed projects on the city's transport system in creating a sustainable and integrated transport system.
- *Affordability*; The evaluation of projects according to affordability ranks and prioritizes projects in light of available investment budgets, donor contributions and other financial components.

The qualitative appreciation of the recommended projects against the criteria defining each orientation is by means of following evaluation scale:

Appreciation	Qualified value	Quantified value
Very positive	++	5
Positive	+	4
Neutral	=	3
Negative	-	2
Very negative	--	1

Once the stepwise evaluation completed an all projects ranked for each of the four orientations, the *Integrated GAM* analyses the most attractive projects in more detail using tangible and quantifiable values to achieve a final weighted ranking and reasoned prioritization.

(1) Upstream Policy

Despite some successes, progress has generally been slow in terms of administrative reforms and the establishment of a coherent and integrated transport policy and authority, capable of efficient and effective management and development of the transport system in Dar es Salaam.

The division of responsibilities and institutional duplication are far from begin solved and sustainable solutions to establish a balanced regulatory and institutional framework for managing the city's transport system are yet to be implemented.

The majority of stakeholders fully support the development of a sustainable transport system in Dar es Salaam to achieve sustainable and balanced economic development and social progress; to achieve international creditworthiness; and to reduce poverty. The proposed policy evaluation criteria, presented in Table 2.1.1, reflect this commitment.

Table 2.1.1 Policy Decision Criteria

Policy Decision Criteria
Improving the relationship between stakeholders
Improving regulatory framework
Contribution to institutional sustainability
Improving mobility of persons and goods
Policy Logic (relationship between transport infrastructure investments)
Policy benefits (coverage of transport policy objectives)
Complexity (decision making and implementation process)

The first three decision criteria assess the level to which the recommended projects contribute to improving the institutional and regulatory framework of the city's transport sector, a clear priority for all levels of decision-making. The next important policy criterion is the overall aim of public decision-makers to improve mobility of goods and people in Dar es Salaam. The three final decision factors evaluate the policy implications of the recommended investment in terms of their relationship with other ongoing investments and policy objectives as well as in terms of the complexity of the decision-making and implementation process.

(2) Economic benefits

The recommended projects take into account a wide range of objective, not always reflecting the economic rationale behind the proposed investment. The absence of accurate economic and financial information for several of the proposed projects does not allow using a detailed economic / financial evaluation for the purpose of prioritization. A qualitative appreciation of the possible economic and financial benefits remains therefore the single-best approach to assess of the economic value of each of the recommended projects. Wherever possible, the GAM analysis will use CBA-based results but in cases where this information is unavailable, the evaluation process uses alternative economic criteria, transformed into quantitative values. Table 2.1.2 lists key qualitative economic decision criteria according to evaluate the recommended projects.

Table 2.1.2 Economic Decision Criteria

Economic Decision Criteria
Capital investment
Expected direct benefits
Expected indirect benefits
Timing of expected benefits
Financial sustainability
Financial commitment

The first important criterion is the total amount of invested capital estimated for the realization of the project. Given existing budget limitations and IFI contributions, this criterion is undoubtedly a basic decision factor. The second two criteria look at the benefits the investment could generate. Given the divergence in projects, it is important not only to consider direct benefits such as NPV (for several projects this information is not available / relevant) but also to investigate the indirect benefits such as economic development, increasing access to transport for the poor, or more efficient operations. The time needed for the realization of a project is also a valuable economic decision criterion. The longer the construction / preparation period the further in the future revenues are expected, this compared to the present need of capital investments. The two final criteria appreciate the financial strength of the project in terms of sustainability (risk of changes in costs versus revenues) and in terms of successful and rapid implementation (level of financial commitment by all stakeholders and share of that commitment to total capital investment).

(3) Mobility benefits

One of the principal reasons for investing in the city's transport infrastructure is to improve mobility of people and goods. With the planned BRT, investments in the transport sector and infrastructure in Dar es Salaam are slowly orienting to achieving sustainable economic and personal mobility for all. The focus of attention also starts to consider institutional, organizational and regulatory reforms that increase the efficiency of transport and the effectiveness of transport management.

Mobility for Dar es Salaam thus means respectively:

- Reaching as much as possible persons and cargo per investment;
- Achieving transport efficiency improvements;
- Achieving policy efficiency improvements;
- Contribute to the development of modern public transport systems;
- Being cognizant of environmentally-friendly approaches;
- Meeting specific mobility demands for transport of the poor and less favored people; and
- Striving towards sustainable network development.

The evaluation of mobility focuses exclusively on the possible contribution to increasing the quality of movement of goods and persons and creating a sustainable transport network; for example, being integrated with BRT. Five key mobility criteria evaluate the recommended projects (Table 2.1.3).

Table 2.1.3 Mobility Decision Criteria

Mobility Decision Criterion
Level of increase in (motorized) person movement
Traffic flows improvements (elimination of bottlenecks, increase integration)
Improving conditions of non-motorized traffic
Strengthening public transport services
increasing accessibility to the transport system

The first criterion is the most relevant because it assesses to what level the recommended investments contribute to increasing mobility in terms of number of people (and volumes of cargo) that will be capable to travel. Increase person movement closely relates to improving traffic flows and efficiency of transport services. Given the important share of non-motorized traffic in the city, improvements here are also important to the overall functioning of the city's transport system as is the increase and improvement of public transport. Combined, these two modes of transport cover nearly 80% of all person movement. The last criterion refers to the explicit need to increase accessibility to transport of the poor in Dar es Salaam as means to access job opportunities.

(4) Affordability

Affordability of the investment is undoubtedly a key decision factor as it distinguishes projects between "wishful thinking" and "realistic investments". Sustainable mobility and transport services for all must be cost efficient; this implies maintenance of the existing infrastructure networks as well as a rational and timely development of new or improvement of existing infrastructures. To be sustainable, these investments should take into account fiscal constraints.

The preference of recommended projects should therefore apply two different perspectives. The first perspective is increasing the expertise on or the decision-making process for achieving affordability of transport infrastructure investments. The second perspective is sustainability based on investment costs versus expected benefits and in balance with the available budget.

Table 2.1.4 presents the affordability criteria used for the qualitative evaluation of the recommendations of the Master Plan.

Table 2.1.4 Affordability Decision Criteria

Affordability Decision Criteria
Size of the capital investment
Contribution to improved budgeting and planning
Maintenance of existing infrastructure
Relationship with Public Investment Plan

In practice, affordability constraints will require public decision makers to rationalize their transport sector development via improved coordination and planning as well as a stronger accent on generating revenues from infrastructure investments. Several strategic components link to this challenging approach, among them:

- Improving maintenance planning and budgeting should be a priority focus. Maintenance should in that context gain priority over reconstruction or new construction to prevent the deterioration of previous investments.
- Improvement of mobility along the core axes of the network should focus on providing more choice to transport users and reducing delays and costs at the main interconnecting points.

- Commercialization and privatization should be as strategic and practical tool to increase efficiency, supported with adequate legislation and regulation especially for guaranteeing transparency in accounting and accountability in respect of service levels.
- Cost recovery becomes a critical component for affordability and assumes increased commercialization of infrastructure management and utilization, with a particular focus on improving the management and implementation of instruments such as tolls, excise duties, registration fees, license fees, etc.

(5) Integrated GAM : quantitative evaluation of selected recommendations

The *Stepwise GAM* allowed ranking the recommended projects based on their benefits to policy-making and mobility and of their economic feasibility and affordability. The *Integrated GAM* will further investigate the top projects (priority projects) via a quantitative appreciation using quantifiable values. The Study Team jointly evaluated the quantitative outcomes and added a qualitative appreciation which contributed to the final appreciation and ranking of the projects.

Sensitivity testing guaranteed sustainable results of the integrated GAM evaluation by changing the weighting of the various decision criteria and recalculating the results to generate a new ranking. At the end, the average score (rank) of each project was calculated as a combination of the ranking during the stepwise GAM and the rankings obtained from the different sensitivity tests during the integrated GAM, leading to an objective final ranking of the priority projects.

The integrated GAM analysis used six quantifiable and non-quantifiable criteria shown in Table 2.1.5.

Table 2.1.5 Integrated GAM decision criteria

Decision Criterion	Calculated value
Size of the capital investment	Million US$
Total traffic demand	Passenger car unit (2 way volume)
Traffic flow improvement	Volume capacity ratio
Policy relevance	Relations to upstream policy/plan/project
Investment Benefits	total traffic in pcu / million US$ capital investment
Time to operations	Years

After a first calculation of scores without weighting the decision criteria sensitivity testing ensured sustainable results of the Integrated GAM. Sensitivity testing included changing the weight of the six decision criteria and recalculating the results for each of the projects, allowing therewith a new ranking. At the end, the definite results were the average rank of each of the selected projects. Table 2.1.6 presents the weights allocated to the different decision criteria and consists of a weighting for the basic evaluation and weights for three sensitivity tests, each emphasizing different decision factors. The basic evaluation accentuates the two dominant decision criteria when considering traffic flow improvement and policy relevance and considers to a lesser extent the benefits of the investment and the size of the capital investment, the volume of traffic and the affordability.

Table 2.1.6 Weighting of the decision criteria (basic and sensitivity tests)

Decision Criterion	Basic	Sensitivity		
Size of the capital investment	10%	17%	15%	12%
Total demand	10%	17%	15%	12%
Traffic flow improvement	30%	17%	21%	26%
Policy relevance	30%	17%	21%	26%
Investment benefits	10%	16%	14%	12%
Time to operations	10%	16%	14%	12%
Control	100%	100%	100%	100%

Sensitivity analysis evaluates the stability of the basic assessment by emphasizing different decision criteria as follows:

- The basic weighting concentrates on the mobility effects and policy relevance (traffic flow improvement, policy relevance);
- The first evaluation takes the average value for each criterion;
- The second and third weights each criterion as average between the weights as set in the 1st sensitivity assessment and the weights as allocated in the basic evaluation

2.1.2 Integrated GAM evaluation concepts

Some recommended projects encompass multiple activities (for example, in case of roads, feasibility study, final design and construction), can have overlapping goals or are inter-related. In order to facilitate the comparative analysis during the GAM analysis, the recommended projects are restructured and integrated wherever possible generating a total of 66 candidate projects (Table 2.1.7).

Table 2.1.7 GAM list of projects

Project No.	Project Name	Road Classification	Project Length (km)	Project Cost (Million Tshs)
101	New Bagamoyo Road Widening	1	17.0	81,371
102	Nelson Mandela Road Widening	1	12.9	59,290
103	Kigamboni Bridge and Access Road Improvement	1	8.1	130,116
104A	Inner Ring Road/Kawawa Road Development	1	3.6	16,882
104B	Inner Ring Road/Kawawa Road Development	1	2.8	6,339
105	Nyerere Road Widening	1	15.1	51,128
106	Outer Ring Road Development	1/2	30.3	91,120
107	BRT Phase 1 Corridor and Road Development	3	9.4	11,635
108	BRT Phase 1 Corridor and Road Development	2	5.4	21,743
109A	Gerezani Area Transport Enhancement	1	15.8	33,121
109B	Gerezani Area Transport Enhancement	1	2.6	5,973
110	Selander Bridge Bypass	2	7.2	30,411
111	Kigamboni Corridor Road Development	2	8.4	20,990
112	Tabata BRT Development	5	15.5	106,390
113	Flyover Installation	1	0.0	78,048
114	CBD Traffic Management	1/2/3	0.0	2,792
115A	Expressway (Wazo-Sam Nujoma)	4	17.8	50,545
115B	Expressway (Wazo-Sam Nujoma)	3	3.2	4,009
116	Expressway (Sam Nujoma-Airport)	4	21.8	2,047,993
117	Expressway (Sam Nujoma-Airport)	2	3.1	9,075
118	Expressway (Sam Nujoma-Airport)	2	3.4	9,776
119	Expressway (Airport-Kigamboni)	4	19.4	55,193
120	Mikocheni Road Widening	2	3.1	6,457
121	Haile Selassie Street Widening	2	5.0	10,666
122	Old Bagamoyo Road Widening	2	7.7	19,470
123	Mwinyjuma Road Widening	2	8.0	22,270
124	Shekilango Road Widening	2	5.3	19,183
125A	Kigamboni Road Development 7	1	16.0	69,008
125B	Kigamboni Road Development 8	1	8.1	25,743
126	United Nations Road Widening	2	3.7	7,839
127	Morogoro Road Bypass (North)	2	6.8	19,922
128	Morogoro Road Bypass (South)	2	5.8	17,497
129	Uhuru Street Widening	2	7.5	16,078
130	Kimanga/Tabata Road Widening	2	4.5	9,443
131	Tabata Road Development	2	6.6	19,236
132	Changombe/Tandika Road Widening	2	4.3	10,019
133	Mbagala/Tandika Road Widening	2	3.5	11,044
134	Mbagala Road Widening	2	7.0	14,555
135	Sam Nujoma Road Extension	2	2.6	5,426
136	Kibada Road Widening	2	26.1	61,154
137	Kigamboni Road Widening	1/2	18.8	46,748
138	Kigamboni Road Development 1	2	1.7	3,594
139	Kigamboni Road Development 2	2	3.4	9,782
140	Kigamboni Road Development 3	2	4.5	9,326

141	Kigamboni Road Development 4	2	6.6	13,765
142	Kigamboni Road Development 5	2	6.4	18,670
143	Kigamboni Road Development 6	1	12.0	34,352
144	Vijibweni Road Widening/Development	1	5.7	16,564
145A	New Bagamoyo Road Extension	1	4.9	17,083
145B	New Bagamoyo Road Extension	1	8.8	23,470
146	Upanda Road Improvement	2	1.7	6,070
148	Msasani Area Road Improvement	3	1.8	2,274
149	Regent Area Road Development	3	12.2	16,346
150	Old Bagamoyo Road Extension	3	12.7	18,335
151	Kinondoni Regional Road Development	3	104.0	131,164
152	Kinondoni Regional Road Development 2	3	53.7	70,289
153	Ilala Regional Road Development	3	75.3	98,238
154	Ilala Regional Road Development 2	3	27.3	36,364
155	Temeke Regional Road Development	3	93.2	119,057
156	Temeke Regional Road Development 2	3	47.7	64,100
157	Temeke Regional Road Development 3	3	23.8	32,002
158	Corridor and Road Development 3	3	24.0	33,588
159	Tandika Area Road Improvement	3	17.5	25,512
160	Industrial Area Road Improvement	3	7.2	8,861
161	Tabata Area Road Improvement	3	4.5	6,892
162	Flyover Installation (Phase2)	1	0.0	58,536
Total			933.7	4,209,932

Note: The number of road classification indicates; 1: Primary Arterial, 2: Secondary Arterial, 3: Tertiary Arterial, 4: Expressway, and 5: Others (Tabata BRT Development, dedicated for BRT).

The above list of represents combined recommendations for both the road network and public transport network, formulated in the Dar es Salaam Transport Policy and System Development Master Plan without preference or ranking and constitutes the basis for the GAM analysis.

2.2 Evaluation Results

2.2.1 Stepwise GAM

Before conducting GAM analysis, the baseline data of each evaluation criteria, including traffic volume for year 2015 and 2030, volume capacity ratio (for year 2030) and the amount of capital investment, are prepared for each project. The following table summarizes these baseline data of seven indicators, discussed above.

Table 2.2.1 Baseline Data of Evaluation Criteria by Project

Project No.	Project Name/Location	Project Length (km)	Capital investment (mil Tshs)	2015 average traffic volume (pcus/day)	2030 average traffic volume (pcus/day)	2015 volume capacity ratio	2030 volume capacity ratio	Investment Benefits (pcu/investment)	Time to operations (Year)	Policy Relevance
101	New Bagamoyo Road Widening	17.0	81,371	33,656	45,056	1.0	1.3	0.6	2.7	3.0
102	Nelson Mandela Road Widening	12.9	59,290	40,115	80,468	0.8	1.6	1.4	2.3	1.0
103	Kigamboni Bridge and Access Road Improvement	8.1	130,116	28,912	86,916	0.9	2.6	0.7	3.8	3.0
112	Tabata BRT Development	15.5	106,390	40,000	60,000	1.2	1.8	0.6	2.9	2.0
104	Inner Ring Road/Kawawa Road Development	6.4	23,221	28,833	64,023	0.9	1.9	2.8	1.6	2.0
105	Nyerere Road Widening	15.1	51,128	32,929	73,275	1.0	2.2	1.4	2.5	2.0
106	Outer Ring Road Development	30.3	91,120	19,725	46,394	0.8	2.0	0.5	4.0	2.0
107/108	BRT Phase 1 Corridor and Road Development	14.8	33,379	5,056	16,799	0.4	1.3	0.5	2.6	2.0
109	Gerezani Area Transport Enhancement	18.4	27,561	22,954	57,908	0.7	1.7	2.1	2.9	3.0
110	Selander Bridge Bypass	7.2	30,411	27,927	52,026	1.3	2.5	1.7	2.4	2.0
111	Kigamboni Corridor Road Development	8.4	20,990	1,440	2,159	0.1	0.1	0.1	1.8	3.0
113	Flyover Installation (Phase1)	0.0	78,048	25,000	50,000	0.7	1.5	0.6	6.0	3.0
114	CBD Traffic Management	0.0	2,792	10,000	20,000	0.6	1.2	7.2	1.1	3.0
115	Expressway (Wazo-Sam Nujoma)	21.0	54,553	0	15,846	0.0	0.2	0.3	3.1	1.0
116/117/118	Expressway (Sam Nujoma-Airport)	28.3	2,066,844	829	45,204	0.0	0.8	0.0	6.9	1.0
119	Expressway (Airport-Kigamboni)	19.4	55,193	7	29,814	0.0	0.5	0.5	2.9	1.0
120	Mikocheni Road Widening	3.1	6,457	5,771	18,107	0.3	0.9	2.8	1.3	1.0
121	Haile Selassie Street Widening	5.0	10,666	5,934	9,002	0.3	0.4	0.8	1.5	1.0
122	Old Bagamoyo Road Widening	7.7	19,470	17,417	26,420	0.8	1.3	1.4	1.8	1.0
123	Mwinyjuma Road Widening	8.0	22,270	7,224	20,965	0.3	1.0	0.9	1.8	1.0
124	Shekilango Road Widening	5.3	19,183	11,427	26,535	0.5	1.3	1.4	1.5	1.0
125	Kigamboni Road Development 7/8	24.1	94,751	6,703	21,146	0.3	0.8	0.2	3.4	1.0
126	United Nations Road Widening	3.7	7,839	12,889	24,890	0.6	1.2	3.2	1.4	1.0
127	Morogoro Road Bypass (North)	6.8	19,922	5,379	23,807	0.3	1.1	1.2	1.7	1.0
128	Morogoro Road Bypass (South)	5.8	17,497	11,107	27,335	0.5	1.3	1.6	1.6	1.0
129	Uhuru Street Widening	7.5	16,078	11,698	20,261	0.6	1.0	1.3	1.8	1.0
130	Kimanga/Tabata Road Widening	4.5	9,443	15,000	30,000	0.7	1.4	3.2	1.5	1.0
131	Tabata Road Development	6.6	19,236	10,001	25,852	0.5	1.2	1.3	1.7	1.0
132	Changombe/Tandika Road Widening	4.3	10,019	14,572	37,081	0.9	2.4	3.7	1.4	1.0
133	Mbagala/Tandika Road Widening	3.5	11,044	12,391	30,702	0.6	1.5	2.8	1.3	1.0
134	Mbagala Road Widening	7.0	14,555	18,324	32,185	0.9	1.5	2.2	1.7	1.0
135	Sam Nujoma Road Extension	2.6	5,426	11,018	16,220	0.5	0.8	3.0	1.3	1.0
136	Kibada Road Widening	26.1	61,154	3,337	18,342	0.2	0.9	0.3	3.6	1.0
137	Kigamboni Road Widening	18.8	46,748	1,290	17,657	0.1	0.9	0.4	2.9	1.0
138	Kigamboni Road Development 1	1.7	3,594	210	2,889	0.0	0.1	0.8	1.2	1.0
139	Kigamboni Road Development 2	3.4	9,782	103	11,740	0.0	0.6	1.2	1.3	1.0
140	Kigamboni Road Development 3	4.5	9,326	1,210	9,151	0.1	0.4	1.0	1.4	1.0
141	Kigamboni Road Development 4	6.6	13,765	0	13,013	0.0	0.6	0.9	1.7	1.0
142	Kigamboni Road Development 5	6.4	18,670	804	11,214	0.0	0.5	0.6	1.6	1.0
143	Kigamboni Road Development 6	12.0	34,352	2,672	18,302	0.2	1.1	0.5	2.2	1.0
144	Vijibweni Road Widening/Development	5.7	16,564	6,223	25,643	0.4	1.5	1.5	1.6	1.0
145	New Bagamoyo Road Extension	13.7	40,553	8,346	21,992	0.3	0.7	0.5	2.4	1.0
146	Upanda Road Improvement	1.7	6,070	6,662	22,979	0.3	1.1	3.8	1.2	1.0
148	Msasani Area Road Improvement	1.8	2,274	0	3,726	0.0	0.7	1.6	1.2	1.0
149	Regent Area Road Development	12.2	16,346	2,575	7,881	0.5	1.5	0.5	2.2	1.0
150	Old Bagamoyo Road Extension	12.7	18,335	4,412	4,912	0.8	0.9	0.3	2.3	1.0
151	Kinondoni Regional Road Development	104.0	131,164	2,678	7,979	0.3	0.9	0.1	6.3	1.0
152	Kinondoni Regional Road Development 2	53.7	70,289	3,080	9,801	0.3	0.9	0.1	3.7	1.0
153	Ilala Regional Road Development	75.3	98,238	2,199	9,889	0.2	0.9	0.1	4.8	1.0
154	Ilala Regional Road Development 2	27.3	36,364	3,038	6,427	0.6	1.2	0.2	2.4	1.0
155	Temeke Regional Road Development	93.2	119,057	233	1,862	0.0	0.1	0.0	5.7	1.0
156	Temeke Regional Road Development 2	47.7	64,100	120	4,853	0.0	0.8	0.1	3.4	1.0
157	Temeke Regional Road Development 3	23.8	32,002	1,838	7,602	0.3	1.4	0.2	2.2	1.0
158	Corridor and Road Development 3	24.0	33,588	3,498	9,581	0.6	1.8	0.3	2.2	1.0
159	Tandika Area Road Improvement	17.5	25,512	4,123	12,274	0.8	2.3	0.5	1.9	1.0
160	Industrial Area Road Improvement	7.2	8,861	4,476	10,560	0.8	2.0	1.2	1.4	1.0
161	Tabata Area Road Improvement	4.5	6,892	5,888	9,402	1.1	1.7	1.4	1.2	1.0
162	Flyover Installation (Phase2)	0.0	58,536	15,000	30,000	0.4	0.9	0.5	1.0	2.0
	Total	933.7	4,198,399	578,253	1,446,070	27.3	68.7	70.5	138.9	-

Note: The score of 'policy relevance' indicates; 3: when the project has significant relevance to the existing upstream policy and plan and its feasibility study is ready or committed. 2: when the project has moderate relevance to the existing upstream poly and plan, 1: the project is important as an element of the Master Plan, but need to follow other projects and/or wait for other requirements to be prepared.

Using six indicators and a weighting system of them, the GAM analysis scores and ranks each of the proposed projects in this study. First, six numerical evaluation factors, including size of the capital investment, total traffic demand, policy relevance, investment benefits and time to operations, for each project is prepared based on the traffic demand forecast and cost estimation. These numerical evaluation factors, then, are standardized in order to compare the scale among these factors. Using the initial weighting of the decision parameters, therewith assuming that traffic flow improvement and policy relevance have the highest priority, each project is scored by multiplying the weighting of

decision parameters and standardized evaluation factors. The score of each project is seen in Table 2.2.2. The GAM analysis also ranks the projects by different weighting of the criteria in order to test the sensitivity of the analysis as tabulated in Table 2.2.3 – Table 2.2.5

As shown in the result of the GAM analysis, some of the projects are always highly ranked and considered as the priority projects. These projects includes; Kigamboni Bridge and Access Road Improvement （Project No. 103）, CBD Traffic Management (114), BRT Phase 1 Corridor and Road Development (109), Tabata BRT Development (104), Gerezani Area Transport Enhancement (110), Inner Ring Road/Kawawa Road Development (105), and Changombe/Tandika Road Widening (132).

Table 2.2.2 Result of GAM Analysis (Base Case)

Project No.	Project Name/Location	Size of the capital investment (mil Tshs)	2015 average traffic volume (pcus/day)	2015 volume capacity ratio	Investment Benefits (pcu/investment)	Time to operations (Year)	Policy Relevance	Total
	Weighting	10%	10%	30%	10%	10%	30%	100%
114	CBD Traffic Management	0.026	0.000	0.106	0.473	0.097	0.768	1.471
101	New Bagamoyo Road Widening	-0.003	0.223	0.454	-0.053	-0.023	0.768	1.366
110	Selander Bridge Bypass	0.016	0.169	0.746	0.039	-0.004	0.309	1.275
109	Gerezani Area Transport Enhancement	0.017	0.122	0.182	0.070	-0.041	0.768	1.118
103	Kigamboni Bridge and Access Road Improvement	-0.022	0.179	0.333	-0.044	-0.106	0.768	1.108
112	Tabata BRT Development	-0.013	0.283	0.615	-0.052	-0.041	0.309	1.102
104	Inner Ring Road/Kawawa Road Development	0.018	0.178	0.331	0.123	0.057	0.309	1.016
105	Nyerere Road Widening	0.008	0.216	0.436	0.017	-0.008	0.309	0.978
113	Flyover Installation (Phase1)	-0.002	0.142	0.234	-0.046	-0.271	0.768	0.824
132	Changombe/Tandika Road Widening	0.023	0.043	0.396	0.198	0.073	-0.150	0.583
106	Outer Ring Road Development	-0.007	0.092	0.317	-0.056	-0.120	0.309	0.535
161	Tabata Area Road Improvement	0.025	-0.038	0.530	0.012	0.088	-0.150	0.465
102	Nelson Mandela Road Widening	0.005	0.284	0.298	0.011	0.008	-0.150	0.457
134	Mbagala Road Widening	0.022	0.079	0.351	0.079	0.052	-0.150	0.433
162	Flyover Installation (Phase2)	0.005	0.047	-0.021	-0.056	0.105	0.309	0.389
130	Kimanga/Tabata Road Widening	0.024	0.047	0.214	0.156	0.071	-0.150	0.362
111	Kigamboni Corridor Road Development	0.019	-0.080	-0.343	-0.089	0.041	0.768	0.316
122	Old Bagamoyo Road Widening	0.020	0.070	0.314	0.011	0.047	-0.150	0.311
126	United Nations Road Widening	0.024	0.028	0.127	0.156	0.077	-0.150	0.262
133	Mbagala/Tandika Road Widening	0.023	0.023	0.107	0.124	0.079	-0.150	0.206
160	Industrial Area Road Improvement	0.024	-0.052	0.306	-0.002	0.078	-0.150	0.204
135	Sam Nujoma Road Extension	0.025	0.010	0.050	0.141	0.085	-0.150	0.161
107/108	BRT Phase 1 Corridor and Road Development	0.015	-0.046	-0.072	-0.057	-0.012	0.309	0.136
150	Old Bagamoyo Road Extension	0.020	-0.052	0.296	-0.075	0.009	-0.150	0.047
159	Tandika Area Road Improvement	0.018	-0.055	0.250	-0.058	0.039	-0.150	0.043
124	Shekilango Road Widening	0.020	0.014	0.067	0.013	0.067	-0.150	0.031
128	Morogoro Road Bypass (South)	0.021	0.011	0.054	0.028	0.061	-0.150	0.024
129	Uhuru Street Widening	0.021	0.016	0.078	0.004	0.048	-0.150	0.017
146	Upanda Road Improvement	0.025	-0.031	-0.129	0.205	0.092	-0.150	0.012
131	Tabata Road Development	0.020	0.000	0.009	0.010	0.055	-0.150	-0.056
158	Corridor and Road Development 3	0.015	-0.061	0.151	-0.074	0.014	-0.150	-0.105
120	Mikocheni Road Widening	0.025	-0.040	-0.165	0.126	0.082	-0.150	-0.122
144	Vijibweni Road Widening/Development	0.021	-0.035	-0.086	0.026	0.062	-0.150	-0.162
154	Ilala Regional Road Development 2	0.014	-0.065	0.079	-0.083	0.002	-0.150	-0.204
149	Regent Area Road Development	0.021	-0.070	0.005	-0.058	0.013	-0.150	-0.239
123	Mwinyjuma Road Widening	0.019	-0.026	-0.106	-0.022	0.045	-0.150	-0.240
121	Haile Selassie Street Widening	0.023	-0.038	-0.159	-0.030	0.067	-0.150	-0.286
127	Morogoro Road Bypass (North)	0.020	-0.043	-0.181	-0.002	0.053	-0.150	-0.304
145	New Bagamoyo Road Extension	0.012	-0.015	-0.166	-0.054	0.002	-0.150	-0.372
157	Temeke Regional Road Development 3	0.015	-0.077	-0.111	-0.078	0.015	-0.150	-0.386
148	Msasani Area Road Improvement	0.026	-0.094	-0.402	0.034	0.091	-0.150	-0.496
140	Kigamboni Road Development 3	0.024	-0.083	-0.353	-0.019	0.071	-0.150	-0.509
143	Kigamboni Road Development 6	0.014	-0.069	-0.266	-0.054	0.014	-0.150	-0.511
125	Kigamboni Road Development 7/8	-0.008	-0.031	-0.175	-0.079	-0.076	-0.150	-0.519
139	Kigamboni Road Development 2	0.024	-0.093	-0.398	-0.001	0.079	-0.150	-0.540
138	Kigamboni Road Development 1	0.026	-0.092	-0.394	-0.033	0.092	-0.150	-0.551
152	Kinondoni Regional Road Development 2	0.001	-0.065	-0.163	-0.086	-0.097	-0.150	-0.560
142	Kigamboni Road Development 5	0.020	-0.086	-0.369	-0.049	0.056	-0.150	-0.579
141	Kigamboni Road Development 4	0.022	-0.094	-0.402	-0.022	0.055	-0.150	-0.591
136	Kibada Road Widening	0.004	-0.063	-0.265	-0.073	-0.091	-0.150	-0.638
137	Kigamboni Road Widening	0.010	-0.082	-0.347	-0.067	-0.037	-0.150	-0.673
119	Expressway (Airport-Kigamboni)	0.006	-0.094	-0.402	-0.054	-0.041	-0.150	-0.735
153	Ilala Regional Road Development	-0.010	-0.073	-0.239	-0.089	-0.178	-0.150	-0.739
115	Expressway (Wazo-Sam Nujoma)	0.007	-0.094	-0.402	-0.074	-0.053	-0.150	-0.767
151	Kinondoni Regional Road Development	-0.022	-0.069	-0.156	-0.092	-0.292	-0.150	-0.780
156	Temeke Regional Road Development 2	0.003	-0.093	-0.386	-0.091	-0.074	-0.150	-0.791
155	Temeke Regional Road Development	-0.018	-0.092	-0.387	-0.096	-0.245	-0.150	-0.987
116/117/118	Expressway (Sam Nujoma-Airport)	-0.749	-0.086	-0.391	-0.095	-0.335	-0.150	-1.806

Table 2.2.3 Result of GAM Analysis (Sensitivity Test 1)

Project No.	Project Name/Location	Size of the capital investment (mil Tshs)	2015 average traffic volume (pcus/day)	2015 volume capacity ratio	Investment Benefits (pcu/investment)	Time to operations (Year)	Policy Relevance	Total
	Weighting	17%	17%	17%	17%	16%	16%	100%
114	CBD Traffic Management	0.044	0.000	0.060	0.757	0.156	0.435	1.453
104	Inner Ring Road/Kawawa Road Development	0.031	0.302	0.188	0.196	0.091	0.175	0.984
110	Selander Bridge Bypass	0.027	0.288	0.422	0.063	-0.006	0.175	0.969
101	New Bagamoyo Road Widening	-0.006	0.380	0.257	-0.084	-0.037	0.435	0.945
112	Tabata BRT Development	-0.022	0.481	0.349	-0.083	-0.066	0.175	0.835
109	Gerezani Area Transport Enhancement	0.029	0.208	0.103	0.113	-0.066	0.435	0.821
105	Nyerere Road Widening	0.014	0.368	0.247	0.028	-0.013	0.175	0.818
132	Changombe/Tandika Road Widening	0.040	0.074	0.225	0.316	0.117	-0.085	0.686
103	Kigamboni Bridge and Access Road Improvement	-0.037	0.304	0.189	-0.070	-0.170	0.435	0.650
102	Nelson Mandela Road Widening	0.008	0.483	0.169	0.018	0.013	-0.085	0.607
130	Kimanga/Tabata Road Widening	0.040	0.081	0.121	0.250	0.113	-0.085	0.520
134	Mbagala Road Widening	0.037	0.134	0.199	0.127	0.084	-0.085	0.495
126	United Nations Road Widening	0.041	0.047	0.072	0.249	0.124	-0.085	0.448
133	Mbagala/Tandika Road Widening	0.039	0.039	0.061	0.199	0.126	-0.085	0.378
135	Sam Nujoma Road Extension	0.043	0.017	0.029	0.226	0.136	-0.085	0.365
161	Tabata Area Road Improvement	0.042	-0.065	0.300	0.019	0.140	-0.085	0.351
122	Old Bagamoyo Road Widening	0.034	0.119	0.178	0.018	0.075	-0.085	0.338
162	Flyover Installation (Phase2)	0.009	0.081	-0.012	-0.090	0.168	0.175	0.331
146	Upanda Road Improvement	0.042	-0.053	-0.073	0.327	0.148	-0.085	0.306
113	Flyover Installation (Phase1)	-0.004	0.241	0.132	-0.073	-0.433	0.435	0.298
106	Outer Ring Road Development	-0.012	0.156	0.180	-0.090	-0.191	0.175	0.218
160	Industrial Area Road Improvement	0.041	-0.088	0.174	-0.003	0.125	-0.085	0.162
128	Morogoro Road Bypass (South)	0.035	0.018	0.031	0.044	0.098	-0.085	0.141
124	Shekilango Road Widening	0.034	0.023	0.038	0.021	0.108	-0.085	0.139
120	Mikocheni Road Widening	0.042	-0.067	-0.094	0.202	0.131	-0.085	0.129
129	Uhuru Street Widening	0.036	0.028	0.044	0.006	0.077	-0.085	0.106
111	Kigamboni Corridor Road Development	0.033	-0.137	-0.195	-0.142	0.066	0.435	0.061
131	Tabata Road Development	0.034	0.001	0.005	0.016	0.088	-0.085	0.058
144	Vijibweni Road Widening/Development	0.036	-0.060	-0.049	0.042	0.099	-0.085	-0.017
107/108	BRT Phase 1 Corridor and Road Development	0.025	-0.079	-0.041	-0.091	-0.019	0.175	-0.030
159	Tandika Area Road Improvement	0.030	-0.094	0.142	-0.094	0.062	-0.085	-0.038
150	Old Bagamoyo Road Extension	0.035	-0.089	0.168	-0.121	0.014	-0.085	-0.078
123	Mwinyjuma Road Widening	0.032	-0.044	-0.060	-0.035	0.072	-0.085	-0.120
121	Haile Selassie Street Widening	0.039	-0.065	-0.090	-0.047	0.107	-0.085	-0.140
127	Morogoro Road Bypass (North)	0.033	-0.074	-0.103	-0.003	0.086	-0.085	-0.145
158	Corridor and Road Development 3	0.025	-0.104	0.086	-0.118	0.023	-0.085	-0.174
148	Msasani Area Road Improvement	0.045	-0.160	-0.228	0.054	0.145	-0.085	-0.229
149	Regent Area Road Development	0.036	-0.119	0.003	-0.093	0.021	-0.085	-0.237
154	Ilala Regional Road Development 2	0.023	-0.111	0.045	-0.132	0.003	-0.085	-0.258
145	New Bagamoyo Road Extension	0.020	-0.026	-0.094	-0.086	0.003	-0.085	-0.268
140	Kigamboni Road Development 3	0.040	-0.140	-0.200	-0.030	0.114	-0.085	-0.301
139	Kigamboni Road Development 2	0.040	-0.158	-0.226	-0.002	0.126	-0.085	-0.305
138	Kigamboni Road Development 1	0.044	-0.156	-0.223	-0.052	0.147	-0.085	-0.326
157	Temeke Regional Road Development 3	0.026	-0.130	-0.063	-0.125	0.025	-0.085	-0.353
141	Kigamboni Road Development 4	0.037	-0.160	-0.228	-0.034	0.089	-0.085	-0.382
143	Kigamboni Road Development 6	0.024	-0.117	-0.151	-0.087	0.023	-0.085	-0.393
142	Kigamboni Road Development 5	0.034	-0.147	-0.209	-0.078	0.090	-0.085	-0.395
125	Kigamboni Road Development 7/8	-0.014	-0.052	-0.099	-0.126	-0.121	-0.085	-0.499
137	Kigamboni Road Widening	0.016	-0.139	-0.197	-0.107	-0.059	-0.085	-0.570
152	Kinondoni Regional Road Development 2	0.001	-0.110	-0.092	-0.137	-0.155	-0.085	-0.579
136	Kibada Road Widening	0.007	-0.106	-0.150	-0.117	-0.146	-0.085	-0.598
119	Expressway (Airport-Kigamboni)	0.011	-0.160	-0.228	-0.086	-0.065	-0.085	-0.613
115	Expressway (Wazo-Sam Nujoma)	0.011	-0.160	-0.228	-0.118	-0.085	-0.085	-0.664
156	Temeke Regional Road Development 2	0.005	-0.158	-0.219	-0.145	-0.119	-0.085	-0.720
153	Ilala Regional Road Development	-0.017	-0.125	-0.135	-0.142	-0.285	-0.085	-0.789
151	Kinondoni Regional Road Development	-0.038	-0.117	-0.088	-0.147	-0.467	-0.085	-0.941
155	Temeke Regional Road Development	-0.030	-0.156	-0.219	-0.153	-0.392	-0.085	-1.035
116/117/118	Expressway (Sam Nujoma-Airport)	-1.273	-0.147	-0.221	-0.152	-0.536	-0.085	-2.415

Table 2.2.4 Result of GAM Analysis (Sensitivity Test 2)

Project No.	Project Name/Location	Size of the capital investment (mil Tshs)	2015 average traffic volume (pcus/day)	2015 volume capacity ratio	Investment Benefits (pcu/investment)	Time to operations (Year)	Policy Relevance	Total
	Weighting	15%	15%	21%	21%	14%	14%	100%
114	CBD Traffic Management	0.039	0.000	0.075	0.663	0.136	0.537	1.450
101	New Bagamoyo Road Widening	-0.005	0.335	0.318	-0.074	-0.032	0.537	1.079
110	Selander Bridge Bypass	0.024	0.254	0.522	0.055	-0.005	0.216	1.066
104	Inner Ring Road/Kawawa Road Development	0.028	0.267	0.232	0.172	0.080	0.216	0.994
112	Tabata BRT Development	-0.019	0.425	0.431	-0.073	-0.057	0.216	0.922
109	Gerezani Area Transport Enhancement	0.025	0.184	0.127	0.099	-0.058	0.537	0.914
105	Nyerere Road Widening	0.012	0.325	0.305	0.024	-0.012	0.216	0.870
103	Kigamboni Bridge and Access Road Improvement	-0.033	0.268	0.233	-0.061	-0.149	0.537	0.796
132	Changombe/Tandika Road Widening	0.035	0.065	0.277	0.277	0.102	-0.105	0.651
102	Nelson Mandela Road Widening	0.007	0.426	0.209	0.016	0.011	-0.105	0.565
134	Mbagala Road Widening	0.033	0.118	0.246	0.111	0.073	-0.105	0.475
130	Kimanga/Tabata Road Widening	0.035	0.071	0.150	0.218	0.099	-0.105	0.469
113	Flyover Installation (Phase1)	-0.003	0.213	0.164	-0.064	-0.379	0.537	0.467
126	United Nations Road Widening	0.036	0.041	0.089	0.218	0.108	-0.105	0.388
161	Tabata Area Road Improvement	0.037	-0.058	0.371	0.017	0.123	-0.105	0.384
162	Flyover Installation (Phase2)	0.008	0.071	-0.015	-0.078	0.147	0.216	0.349
122	Old Bagamoyo Road Widening	0.030	0.105	0.219	0.016	0.065	-0.105	0.330
133	Mbagala/Tandika Road Widening	0.035	0.034	0.075	0.174	0.110	-0.105	0.323
106	Outer Ring Road Development	-0.011	0.138	0.222	-0.079	-0.168	0.216	0.319
135	Sam Nujoma Road Extension	0.038	0.015	0.035	0.198	0.119	-0.105	0.300
146	Upanda Road Improvement	0.037	-0.047	-0.090	0.286	0.129	-0.105	0.211
160	Industrial Area Road Improvement	0.036	-0.078	0.214	-0.003	0.109	-0.105	0.173
111	Kigamboni Corridor Road Development	0.029	-0.121	-0.240	-0.124	0.058	0.537	0.139
124	Shekilango Road Widening	0.030	0.021	0.047	0.019	0.094	-0.105	0.106
128	Morogoro Road Bypass (South)	0.031	0.016	0.038	0.039	0.086	-0.105	0.104
129	Uhuru Street Widening	0.032	0.024	0.055	0.005	0.067	-0.105	0.078
120	Mikocheni Road Widening	0.037	-0.059	-0.116	0.177	0.114	-0.105	0.048
131	Tabata Road Development	0.030	0.000	0.006	0.014	0.077	-0.105	0.022
107/108	BRT Phase 1 Corridor and Road Development	0.022	-0.069	-0.051	-0.079	-0.017	0.216	0.022
159	Tandika Area Road Improvement	0.026	-0.083	0.175	-0.082	0.055	-0.105	-0.013
150	Old Bagamoyo Road Extension	0.030	-0.079	0.207	-0.106	0.013	-0.105	-0.039
144	Vijibweni Road Widening/Development	0.031	-0.053	-0.060	0.037	0.086	-0.105	-0.063
158	Corridor and Road Development 3	0.022	-0.092	0.106	-0.104	0.020	-0.105	-0.152
123	Mwinyjuma Road Widening	0.028	-0.039	-0.074	-0.031	0.063	-0.105	-0.157
121	Haile Selassie Street Widening	0.035	-0.057	-0.111	-0.041	0.094	-0.105	-0.186
127	Morogoro Road Bypass (North)	0.030	-0.065	-0.127	-0.002	0.075	-0.105	-0.195
149	Regent Area Road Development	0.032	-0.105	0.004	-0.082	0.019	-0.105	-0.238
154	Ilala Regional Road Development 2	0.020	-0.098	0.055	-0.116	0.003	-0.105	-0.241
145	New Bagamoyo Road Extension	0.018	-0.023	-0.117	-0.075	0.003	-0.105	-0.299
148	Msasani Area Road Improvement	0.039	-0.141	-0.282	0.047	0.127	-0.105	-0.314
157	Temeke Regional Road Development 3	0.023	-0.115	-0.078	-0.109	0.022	-0.105	-0.363
140	Kigamboni Road Development 3	0.036	-0.124	-0.247	-0.026	0.100	-0.105	-0.367
139	Kigamboni Road Development 2	0.035	-0.140	-0.279	-0.002	0.111	-0.105	-0.379
138	Kigamboni Road Development 1	0.039	-0.138	-0.276	-0.046	0.129	-0.105	-0.398
143	Kigamboni Road Development 6	0.021	-0.103	-0.187	-0.076	0.020	-0.105	-0.430
141	Kigamboni Road Development 4	0.033	-0.141	-0.282	-0.030	0.077	-0.105	-0.448
142	Kigamboni Road Development 5	0.030	-0.130	-0.259	-0.069	0.079	-0.105	-0.453
125	Kigamboni Road Development 7/8	-0.013	-0.046	-0.123	-0.111	-0.106	-0.105	-0.503
152	Kinondoni Regional Road Development 2	0.001	-0.097	-0.114	-0.120	-0.136	-0.105	-0.571
137	Kigamboni Road Widening	0.014	-0.123	-0.243	-0.093	-0.051	-0.105	-0.601
136	Kibada Road Widening	0.006	-0.094	-0.186	-0.102	-0.128	-0.105	-0.608
119	Expressway (Airport-Kigamboni)	0.010	-0.141	-0.282	-0.075	-0.057	-0.105	-0.651
115	Expressway (Wazo-Sam Nujoma)	0.010	-0.141	-0.282	-0.103	-0.074	-0.105	-0.695
156	Temeke Regional Road Development 2	0.005	-0.139	-0.270	-0.127	-0.104	-0.105	-0.741
153	Ilala Regional Road Development	-0.015	-0.110	-0.167	-0.124	-0.249	-0.105	-0.770
151	Kinondoni Regional Road Development	-0.033	-0.103	-0.109	-0.129	-0.408	-0.105	-0.887
155	Temeke Regional Road Development	-0.026	-0.138	-0.271	-0.134	-0.343	-0.105	-1.017
116/117/118	Expressway (Sam Nujoma-Airport)	-1.123	-0.129	-0.273	-0.133	-0.469	-0.105	-2.234

Table 2.2.5 Result of GAM Analysis (Sensitivity Test 3)

Project No.	Project Name/Location	Size of the capital investment (mil Tshs)	2015 average traffic volume (pcus/day)	2015 volume capacity ratio	Investment Benefits (pcu/investment)	Time to operations (Year)	Policy Relevance	Total
	Weighting	12%	12%	26%	26%	12%	12%	100%
114	CBD Traffic Management	0.031	0.000	0.092	0.568	0.117	0.665	1.474
101	New Bagamoyo Road Widening	-0.004	0.268	0.393	-0.063	-0.028	0.665	1.232
110	Selander Bridge Bypass	0.019	0.203	0.646	0.047	-0.004	0.267	1.179
109	Gerezani Area Transport Enhancement	0.020	0.147	0.157	0.085	-0.050	0.665	1.025
112	Tabata BRT Development	-0.015	0.340	0.533	-0.062	-0.049	0.267	1.014
104	Inner Ring Road/Kawawa Road Development	0.022	0.213	0.287	0.147	0.068	0.267	1.006
103	Kigamboni Bridge and Access Road Improvement	-0.026	0.214	0.289	-0.052	-0.128	0.665	0.962
105	Nyerere Road Widening	0.010	0.260	0.377	0.021	-0.010	0.267	0.925
113	Flyover Installation (Phase1)	-0.003	0.170	0.203	-0.055	-0.325	0.665	0.655
132	Changombe/Tandika Road Widening	0.028	0.052	0.343	0.237	0.087	-0.130	0.618
102	Nelson Mandela Road Widening	0.006	0.341	0.259	0.014	0.010	-0.130	0.499
134	Mbagala Road Widening	0.026	0.095	0.304	0.095	0.063	-0.130	0.452
106	Outer Ring Road Development	-0.008	0.110	0.275	-0.067	-0.144	0.267	0.433
161	Tabata Area Road Improvement	0.030	-0.046	0.459	0.014	0.105	-0.130	0.432
130	Kimanga/Tabata Road Widening	0.028	0.057	0.186	0.187	0.085	-0.130	0.413
162	Flyover Installation (Phase2)	0.006	0.057	-0.018	-0.067	0.126	0.267	0.371
126	United Nations Road Widening	0.029	0.033	0.110	0.187	0.093	-0.130	0.322
122	Old Bagamoyo Road Widening	0.024	0.084	0.272	0.013	0.056	-0.130	0.319
133	Mbagala/Tandika Road Widening	0.028	0.027	0.093	0.149	0.094	-0.130	0.261
111	Kigamboni Corridor Road Development	0.023	-0.097	-0.298	-0.106	0.050	0.665	0.238
135	Sam Nujoma Road Extension	0.030	0.012	0.044	0.169	0.102	-0.130	0.227
160	Industrial Area Road Improvement	0.029	-0.062	0.265	-0.002	0.093	-0.130	0.193
146	Upanda Road Improvement	0.030	-0.037	-0.111	0.245	0.111	-0.130	0.107
107/108	BRT Phase 1 Corridor and Road Development	0.018	-0.056	-0.063	-0.068	-0.014	0.267	0.084
124	Shekilango Road Widening	0.024	0.016	0.058	0.016	0.081	-0.130	0.065
128	Morogoro Road Bypass (South)	0.025	0.013	0.047	0.033	0.074	-0.130	0.061
129	Uhuru Street Widening	0.025	0.020	0.068	0.004	0.058	-0.130	0.045
159	Tandika Area Road Improvement	0.021	-0.066	0.217	-0.070	0.047	-0.130	0.018
150	Old Bagamoyo Road Extension	0.024	-0.063	0.257	-0.091	0.011	-0.130	0.008
131	Tabata Road Development	0.024	0.000	0.008	0.012	0.066	-0.130	-0.020
120	Mikocheni Road Widening	0.030	-0.048	-0.143	0.152	0.098	-0.130	-0.042
144	Vijibweni Road Widening/Development	0.025	-0.042	-0.074	0.032	0.074	-0.130	-0.116
158	Corridor and Road Development 3	0.017	-0.073	0.131	-0.089	0.017	-0.130	-0.126
123	Mwinyjuma Road Widening	0.023	-0.031	-0.091	-0.026	0.054	-0.130	-0.203
154	Ilala Regional Road Development 2	0.016	-0.078	0.068	-0.099	0.003	-0.130	-0.221
149	Regent Area Road Development	0.025	-0.084	0.005	-0.070	0.016	-0.130	-0.238
121	Haile Selassie Street Widening	0.028	-0.046	-0.137	-0.035	0.081	-0.130	-0.240
127	Morogoro Road Bypass (North)	0.024	-0.052	-0.157	-0.002	0.064	-0.130	-0.254
145	New Bagamoyo Road Extension	0.014	-0.018	-0.144	-0.064	0.002	-0.130	-0.340
157	Temeke Regional Road Development 3	0.018	-0.092	-0.097	-0.093	0.018	-0.130	-0.376
148	Msasani Area Road Improvement	0.032	-0.113	-0.349	0.040	0.109	-0.130	-0.411
140	Kigamboni Road Development 3	0.028	-0.099	-0.306	-0.022	0.086	-0.130	-0.444
139	Kigamboni Road Development 2	0.028	-0.112	-0.345	-0.001	0.095	-0.130	-0.466
143	Kigamboni Road Development 6	0.017	-0.083	-0.231	-0.065	0.017	-0.130	-0.475
138	Kigamboni Road Development 1	0.031	-0.110	-0.341	-0.039	0.110	-0.130	-0.480
125	Kigamboni Road Development 7/8	-0.010	-0.037	-0.152	-0.095	-0.091	-0.130	-0.515
142	Kigamboni Road Development 5	0.024	-0.104	-0.320	-0.059	0.068	-0.130	-0.521
141	Kigamboni Road Development 4	0.026	-0.113	-0.349	-0.026	0.066	-0.130	-0.525
152	Kinondoni Regional Road Development 2	0.001	-0.078	-0.141	-0.103	-0.116	-0.130	-0.568
136	Kibada Road Widening	0.005	-0.075	-0.230	-0.087	-0.110	-0.130	-0.627
137	Kigamboni Road Widening	0.012	-0.098	-0.301	-0.080	-0.044	-0.130	-0.642
119	Expressway (Airport-Kigamboni)	0.008	-0.113	-0.349	-0.065	-0.049	-0.130	-0.698
115	Expressway (Wazo-Sam Nujoma)	0.008	-0.113	-0.349	-0.088	-0.064	-0.130	-0.736
153	Ilala Regional Road Development	-0.012	-0.088	-0.207	-0.106	-0.214	-0.130	-0.757
156	Temeke Regional Road Development 2	0.004	-0.111	-0.334	-0.109	-0.089	-0.130	-0.770
151	Kinondoni Regional Road Development	-0.026	-0.083	-0.135	-0.110	-0.350	-0.130	-0.834
155	Temeke Regional Road Development	-0.021	-0.110	-0.335	-0.115	-0.294	-0.130	-1.006
116/117/118	Expressway (Sam Nujoma-Airport)	-0.899	-0.103	-0.339	-0.114	-0.402	-0.130	-1.987

2.2.2 Consolidated GAM

The projects are evaluated by consolidating several sets of GAM scores and rankings of each project that are produced by four sets of different weighting criteria, and the final ranking of the projects are proposed as shown in Table 2.2.6.

Some recommended projects encompass multiple activities (for example, in case of roads, feasibility study, final design and construction), can have overlapping goals or are inter-related. In order to facilitate the comparative analysis during the GAM analysis, the recommended projects are restructured and integrated wherever possible generating a total of 66 candidate projects.

Table 2.2.6 Result of Consolidated GAM Analysis

Project No.	Project Name/Location	Base Case Ranking	1st Sensitivity Ranking	2nd Sensitivity Ranking	3rd Sensitivity Ranking	Total Score	Overall Ranking
114	CBD Traffic Management	1	1	1	1	4	1
101	New Bagamoyo Road Widening	2	4	2	2	10	2
110	Selander Bridge Bypass	3	3	3	3	12	3
104	Inner Ring Road/Kawawa Road Development	7	2	4	6	19	4
109	Gerezani Area Transport Enhancement	4	6	6	4	20	5
112	Tabata BRT Development	6	5	5	5	21	6
103	Kigamboni Bridge and Access Road Improvement	5	9	8	7	29	7
105	Nyerere Road Widening	8	7	7	8	30	8
132	Changombe/Tandika Road Widening	10	8	9	10	37	9
102	Nelson Mandela Road Widening	13	10	10	11	44	10
134	Mbagala Road Widening	14	12	11	12	49	11
113	Flyover Installation (Phase1)	9	20	13	9	51	12
130	Kimanga/Tabata Road Widening	16	11	12	15	54	13
161	Tabata Area Road Improvement	12	16	15	14	57	14
126	United Nations Road Widening	19	13	14	17	63	15
106	Outer Ring Road Development	11	21	19	13	64	16
162	Flyover Installation (Phase2)	15	18	16	16	65	17
122	Old Bagamoyo Road Widening	18	17	17	18	70	18
133	Mbagala/Tandika Road Widening	20	14	18	19	71	19
135	Sam Nujoma Road Extension	22	15	20	21	78	20
111	Kigamboni Corridor Road Development	17	27	23	20	87	21
160	Industrial Area Road Improvement	21	22	22	22	87	22
146	Upanda Road Improvement	29	19	21	23	92	23
124	Shekilango Road Widening	26	24	24	25	99	24
128	Morogoro Road Bypass (South)	27	23	25	26	101	25
107/108	BRT Phase 1 Corridor and Road Development	23	30	29	24	106	26
129	Uhuru Street Widening	28	26	26	27	107	27
159	Tandika Area Road Improvement	25	31	30	28	114	28
120	Mikocheni Road Widening	32	25	27	31	115	29
131	Tabata Road Development	30	28	28	30	116	30
150	Old Bagamoyo Road Extension	24	32	31	29	116	31
144	Vijibweni Road Widening/Development	33	29	32	32	126	32
158	Corridor and Road Development 3	31	36	33	33	133	33
123	Mwinyjuma Road Widening	36	33	34	34	137	34
121	Haile Selassie Street Widening	37	34	35	37	143	35
149	Regent Area Road Development	35	38	37	36	146	36
154	Ilala Regional Road Development 2	34	39	38	35	146	36
127	Morogoro Road Bypass (North)	38	35	36	38	147	38
145	New Bagamoyo Road Extension	39	40	39	39	157	39
148	Msasani Area Road Improvement	41	37	40	41	159	40
157	Temeke Regional Road Development 3	40	44	41	40	165	41
140	Kigamboni Road Development 3	42	41	42	42	167	42
139	Kigamboni Road Development 2	45	42	43	43	173	43
138	Kigamboni Road Development 1	46	43	44	45	178	44
143	Kigamboni Road Development 6	43	46	45	44	178	45
125	Kigamboni Road Development 7/8	44	48	48	46	186	46
141	Kigamboni Road Development 4	49	45	46	48	188	47
142	Kigamboni Road Development 5	48	47	47	47	189	48
152	Kinondoni Regional Road Development 2	47	50	49	49	195	49
137	Kigamboni Road Widening	51	49	50	51	201	50
136	Kibada Road Widening	50	51	51	50	202	51
119	Expressway (Airport-Kigamboni)	52	52	52	52	208	52
115	Expressway (Wazo-Sam Nujoma)	54	53	53	53	213	53
153	Ilala Regional Road Development	53	55	55	54	217	54
156	Temeke Regional Road Development 2	56	54	54	55	219	55
151	Kinondoni Regional Road Development	55	56	56	56	223	56
155	Temeke Regional Road Development	57	57	57	57	228	57
116/117/118	Expressway (Sam Nujoma-Airport)	58	58	58	58	232	58

2.3 Conclusions and recommendations

The evaluation of 66 proposed projects on the basis of a multi-criteria analysis to measure multiple performance of the projects allowed to get a clear insight in terms of the quality of each project. In spite many limitations due to the absence of more detailed information, the GAM evaluation allowed to clearly distinguish the priority projects.

Considering the budgetary constraints (assuming the total investment of about 700 billion Tshs up to 2015 can be mobilized for transport infrastructure project), the priority projects up to 2015 are selected as listed in Table 2.3.1.

Table 2.3.1 Short-list of Priority Project up to 2015

Project No.	Project Name/Location	Road Classification	Project Length (km)	Project Cost (mil Tshs)	Note
101	New Bagamoyo Road Widening	1	17.0	81,371	Excluding project cost of BRT buses
103	Kigamboni Bridge and Access Road Improvement	1	8.1	130,116	
104A	Inner Ring Road/Kawawa Road Development	1	3.6	16,882	
104B	Inner Ring Road/Kawawa Road Development	1	2.8	6,339	
105	Nyerere Road Widening	1	15.1	51,128	Excluding project cost of BRT buses
106	Outer Ring Road Development	1/2	30.3	91,120	
107	BRT Phase 1 Corridor and Road Development	3	9.4	11,635	
108	BRT Phase 1 Corridor and Road Development	2	5.4	21,743	
109A	Gerezani Area Transport Enhancement	1	15.8	21,588	Excluding project cost of BRT buses
109B	Gerezani Area Transport Enhancement	1	2.6	5,973	Excluding project cost of BRT buses
110	Selander Bridge Bypass	2	7.2	30,411	
111	Kigamboni Corridor Road Development	2	8.4	20,990	
112	Tabata BRT Development	4	15.5	106,390	Excluding project cost of BRT buses
113	Flyover Installation	1	0.0	78,048	4 intersections: Tazara, Ubungo, Mwenge, Kawawa-Nyerere
114	CBD Traffic Management	1/2/3	0.0	2,792	7 Signalized Intersections
120	Mikocheni Road Widening	2	3.1	6,457	
132	Changombe/Tandika Road Widening	2	4.3	10,019	
		Total	148.6	693,002	

Source: JICA Study Team

Some of the projects scores high marks in the GAM analysis but fail to be selected as the priority projects and vice versa. The reasons to select (not to select) the priority projects are summarized below.

(i) Mikocheni Road Widening (Project No. 120): this project is selected as one of the priority projects since it is considered as a part of the Selander Bridge Bypass Project (Project No. 110).

(ii) Kigamboni Corridor Road Development (Project No. 111): this is selected as the priority project since it is considered as an essential project to generate the urban development within the urban growth boundary of Kigamboni.

2030 ROAD DEVELOPMENT PLAN

Project No. (lanes)	Length (km) Widening	New Construction	Project No. (lanes)	Length (km) Widening	New Construction	Project No. (lanes)	Length (km) Widening	New Construction	Project No. (lanes)	Length (km) Widening	New Construction	Project No. (lanes)	Length (km) Widening	New Construction	Project No. (lanes)	Length (km) Widening	New Construction	Project No. (lanes)	Length (km) Widening	New Construction
101 (6)	17.0	---	109B (4)	2.6	---	118 (4)	---	2.6	127 (4)	0.8	6.0	137 (4)	18.8	---	146 (4)	1.1	0.6	157 (2)	1.9	21.9
102 (6)	12.9	---	110 (4)	5.9	1.3	119 (4)	---	19.4	128 (4)	1.9	3.9	138 (4)	1.7	---	148 (2)	1.8	---	158 (2)	14.2	9.8
103 (6)	---	8.1	111 (4)	8.4	---	120 (4)	1.5	1.6	129 (4)	6.1	1.4	139 (4)	---	3.4	149 (2)	9.8	2.4	159 (2)	12.8	4.7
104A (6)	3.6	---	112 (BRT)	---	15.5	121 (4)	5.0	---	130 (4)	4.5	---	140 (4)	---	4.5	150 (2)	6.1	6.6	160 (2)	5.4	1.8
104B (4)	2.8	---	113	Flyover		122 (4)	7.7	---	131 (4)	4.8	1.9	141 (4)	---	6.6	151 (2)	104.0	---	161 (2)	1.9	2.6
105 (6)	15.1	---	114	CBD Traffic Management		123 (4)	8.0	---	132 (4)	4.3	---	142 (4)	---	6.4	152 (2)	53.7	---			
106 (4)	10.0	20.4	115A (4)	---	17.8	124 (4)	5.3	---	133 (6)	3.5	---	143 (4)	---	12.0	153 (2)	75.3	---			
107 (2)	3.5	5.9	115B (2)	1.6	1.6	125A (6)	---	16.0	134 (4)	6.3	0.7	144 (4)	2.8	3.0	154 (2)	21.5	5.8			
108 (4)	4.8	0.6	116 (4)	0.1	22.5	125B (4)	---	8.0	135 (4)	1.1	1.5	145A (6)	4.9	---	155 (2)	93.2	---			
109A (6)	15.8	---	117 (4)	---	3.1	126 (4)	2.8	0.9	136 (4)	26.1	---	145B (4)	8.8	---	156 (2)	14.2	33.5	TOTAL	647.6	286.3

Urban Growth Boundary

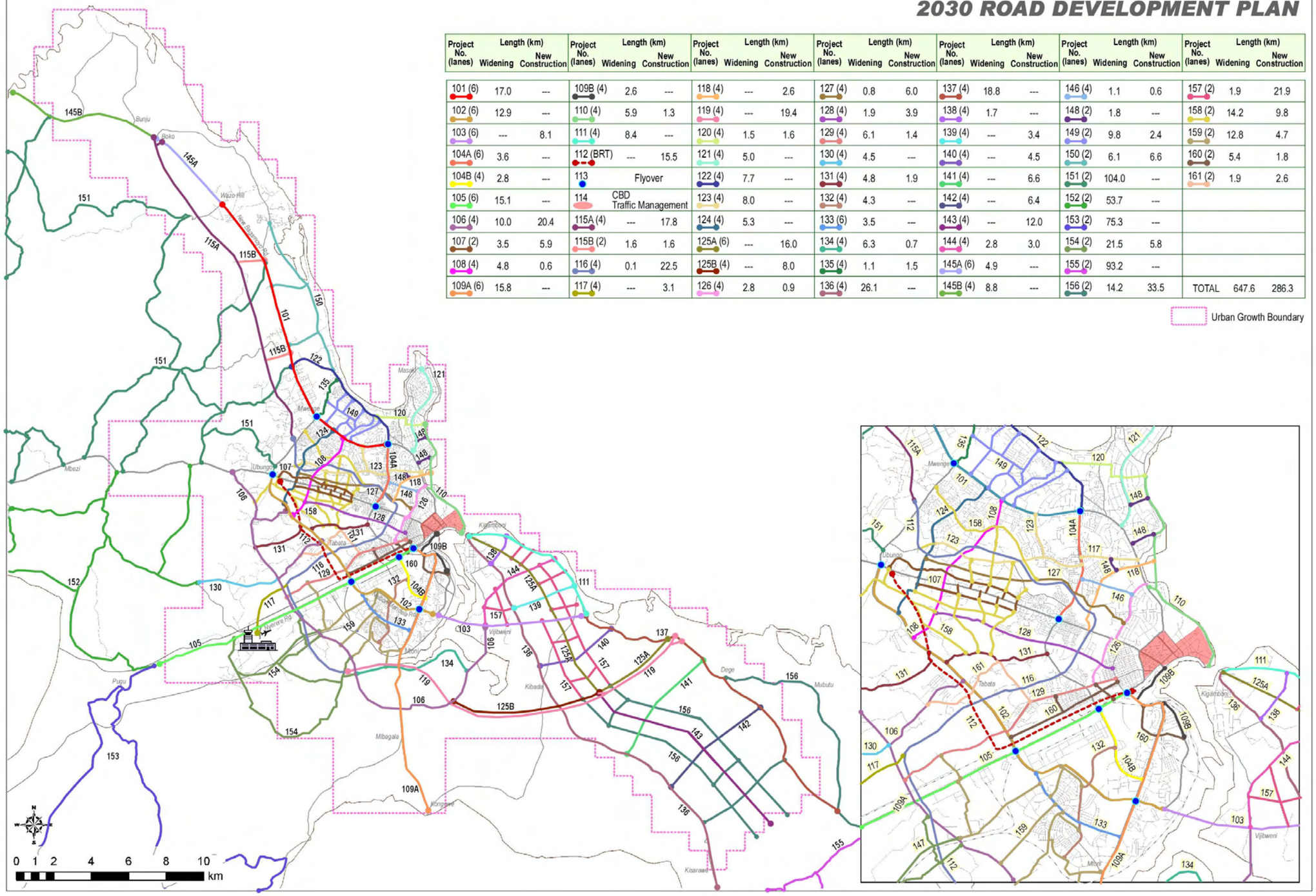


Figure 2.3.1 Project Location Map

Chapter 3 Economic Evaluation of the Master Plan

3.1 Introduction

The main purpose of this chapter is to show an overall economic performance of the proposed Master Plan as a whole from a view point of national welfare. Economic analysis of individual component projects was not made for prioritizing purpose, while GAM analysis suggests the priority of the proposed projects as discussed in the chapter 2 of this technical report.

Economic evaluation of the Master Plan is conducted by means of a Cost Benefit Analysis (CBA). The Cost Benefit Analysis (CBA) is a means-end assessment defined by economic circumstances and where the investment is decided upon the conditioned evaluation cycle where input generates a result. As far as components are quantifiable, the CBA incorporates creative thinking by which less-tangible parameters are translated into "quantifiable" decision parameters. Whatever the level of creativity, the CBA upholds the principle that a final calculated findings can only be made on the basis of numerical evaluation that uses mathematical algorithms without any distorting interventions.

The CBA is an effective evaluation technique not only for a feasibility study (the economic analysis is commonly used to evaluate alternatives in a feasibility study), but also for understanding the effect of different development scenarios at the level of master plan. Because it is recognized that provision of quality transport systems (proposed in the Master Plan) plays a crucial role in long-term sustainable economic development of the country, it is important to identify the costs and benefits without possible distortions generated by weighting or quantifying efforts for non-quantifiable variables[1].

The CBA in this chapter was made by comparing the case "With the Master Plan" and the case "Without the Master Plan". The principle of the evaluation is based on the classic evaluation methodology with "Discounted cash flow", and "Conversion of the market prices to the economic prices".

For each case, a set of economic evaluation indicators; namely, economic internal rate of return (EIRR), net present value (NPV), and benefit/cost (B/C) ratio was computed.

[1] See for example, World Bank, *Sustainable Transport: Priorities for Policy Reform*" World Bank Policy Paper,

3.2 Vehicle Operating Costs

Saving of vehicle operating cost (VOC) is one of the most important items to be measured in the economic analysis. In order to estimate precise VOC values, types of the vehicles in Dar es Slaam are categorized into the eight groups: Motorcycle, Passenger Car (Sedan), 4WD (Jeep), Pickup, Mini Bus, Bus, Short Body Truck, and 3 axle truck. In each group, a typical (representative or popular) model available in the market is selected referring the car dealers in Dar es Salaam and the relevant study reports.

Prices of VOC component items were studied at car-dealers, petroleum stations, and petroleum companies in Dar es Salaam in addition to the research on tax regulations, statistic yearbooks and recent relevant reports. The prices in the market are converted into the economic prices for the economic analysis purpose. Table 3.3.1 summarizes the unit vehicle operating cost as of year 2007 by vehicle type in the financial prices.

Spare parts costs are also consulted with car dealers, owners and drivers in Dar es Salaam and summarized in the Table 3.3.2.

Table 3.3.1 Unit Cost of Vehicle Operating Cost by Vehicle Types (Financial Price) as of 2007

	Motor Cycle	Passenger Car	4WD (Jeep)	Pickups	Mini-Bus	Bus	Short-body Truck	3 axle truck
Representative Vehicle	Suzuki TF-125	Toyota Corolla	Toyota PRADO	Toyota Hilux	Toyota Hiace	Toyota Coaster	Toyota Dyna	SCANIA
New Vehicle Price (000 Tsh) without Tax		20,000	40,000	25,000	27,000	48,000	30,000	
New Vehicle Price (000 Tsh) with Tax	4,500	31,100	60,000	37,000	40,000	72,000	45,000	
Used Vehicle Price	1,500	8,350	30,000	20,000	25,000	35,000	27,000	55,000
Service Life (yrs)	10	12	12	10	10	10	12	14
Hours Driven per Year								
Kilometers Driven per Year	15,000	25,000	30,000	39,000	40,000	70,000	40,000	86,000
Life time running kilometers	150,000	300,000	360,000	390,000	400,000	700,000	480,000	1,204,000
Tire Cost (Unit)	40,000	80,000	145,000	90,000	90,000	250,000	250,000	
Required number of Tire (incl Spare)	2	5	5	5	5	7	7	11
Set Price of Tire (Tsh)	80,000	400,000	725,000	450,000	450,000	1,750,000	1,750,000	0
Running Kilometers	20,000	40,000	50,000	50,000	40,000	50,000	50,000	50,000
Tire Cost/1000 km								
Fuel Type used	Petrol	Petrol	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Fuel Costs (Tsh/L)	1,480	1,480	1,400	1,400	1,400	1,400	1,400	1,400
Fuel Consumption Rate (km/l)	45	12	10	12	10	5	7	5
Oil Costs (Tsh/L)	5,000	5,000	4,500	4,500	4,500	4,500	4,500	4,500
Distance between oil changes	5,000	10,000	10,000	7,500	7,500	8,000	9,000	10,000
Annual Maintenance cost - spare parts	45,000	258,000	498,000	296,000	400,000	720,000	373,000	0
Crew Cost (000TSh/year)	0	0	1,200	1,200	1,800	1,800	1,000	1,000

Source: JICA Study Team

Table 3.3.2 Spare Parts Cost

	Motor Cycle	Passenger Car	4WD (Jeep)	Pickups	Mini-Bus	Bus	Short-body Truck	3 axle truck	Trailer
Vehicle Price (000 Tsh)	4,500	31,100	60,000	37,000	40,000	72,000	45,000		
Spare Parts Rate (%)	1.00	0.83	0.83	0.80	1.00	1.00	0.83	0.83	0.83
Spare Parts Cost	45	258	498	296	400	720	374	0	0

Source: JICA Study Team

Washington, D.C. (1996)

3.3 Value of Time

A value of time for each vehicle type was estimated based on the household interview survey (HIS) and traffic count (occupancy rates) which was conducted in this Master Plan Study in June and July 2007. Based on the HIS, wage income brackets are distributed to the users of different types of vehicle. Applying the adjustment factors: vehicle occupancy rates and the Consumer Price Index, the time value of each vehicle is estimated as shown in Table 3.4.1.

Table 3.4.1 Value of Time by Type of Vehicle

Items	Unit	Passenger Car	Bus	Truck	Trailer
Average Monthly Income (A)	Tshs/person	679,833.4	223,993.4	231,562.7	142,679.7
Monthly Working Hours (B)	hr/month	186.0	186.0	186.0	186.0
Average Hourly Income (C:A/B)	Tshs/hour	3,654.1	1,204.0	1,244.6	766.9
Adjustment factor (D)		0.5	0.5	0.5	0.5
Average hourly income after adjustment (E: C*D)	Tshs/hour	1,827.0	602.0	622.3	383.4
Vehicle Occupancy (F)	person	1.9	29.0	3.0	3.0
Time Value by Vehicle in 2007 (E*F)	Tshs/hr	3,507.9	17,472.7	1,867.0	1,150.3
Total Time Value per Vehicle	USD/hr	2.76	13.74	1.47	0.90
Total Time Value per person	USD/hr		0.47		

Note: The adjustment factor is applied assuming that the home-based work, school, non-home-based business trips account for 50% of the total trips.

Source: JICA Study Team

3.4 Shadow Pricing

For the economic analysis, all project costs and benefits should be valued at their opportunity costs to the economy. For this purpose, international prices (border prices) are taken to be the most appropriate measures of opportunity cost. It should be noted that price distortion intentionally caused by imposition, limited opportunity, etc needs to be adjusted.

Application of conversion factor

Theoretically, shadow pricing exercise requires a large number of data and information such as historical data of foreign (currency) exchange, taxes, wages of various industries, price data of exporting and importing goods as well as those in the domestic market, etc. Since it was not easy to obtain such information in a limited study period, a standard conversion factor (SCF) was prepared as a compatible tool to convert the financial prices to the economic prices Tanzania. SCF allows for the general distortion between international and domestic process that is caused by import duties, taxes, subsidies and other non-price distortions to the whole economy.

In the economic analysis, all the costs are classified into the items of trade goods, non-trade goods and transfer items. It is assumed that trade goods are equivalent to the foreign currency portion, and aggregation of non-trade goods stands for the local currency portion. Transfer item means the portion of taxes.

The conversion of the financial prices of trading goods to the economic prices was made deducting the

tax portions, while a standard conversion factor (SCF) was applied to the portion of non-trade goods.

For trading goods:

- fuel prices (gasoline and diesel): custom duty, additional tax and VAT are deducted and for lubricant price custom duty, specific tax and VAT are deducted.
- vehicle prices: tax amounts, custom duty, specific tax, VAT, are deducted and for the tire costs custom duty and VAT are deducted.
- For tax, conversion factor of 0.00 is applied.
- land acquisition and compensation: a standard conversion factor is applied.

Standard Conversion Factor (SCF)

The standard conversion factor is an index, which converts domestic prices to border prices by adjusting the distortion of prices in the domestic market. SCF is estimated as follows:

$$SCF = \frac{M + X}{(M + Tm) + (X - Tx + Sx)}$$

where:

M	:	Total value of import (CIF)
X	:	Total value of export (FOB)
Tm	:	Total value of import duty
Tx	:	Total value of export duty
Sx		Total value of export subsidy

Source: Japan International Corporation Agency (JICA)

3.5 Cost Benefit Analysis

(1) Project Benefits

1) Estimation of the benefits

The economic benefits generated by the implementation of the Master Plan are identified as follows:

Savings to those BRT users who would have used to use buses, cars and other transport on roads, savings composed of:

- Personal travel time saving
- Vehicle operating cost saved by the reduction of number of public transport, taxis and passenger cars

Savings to those passengers remaining on roads that would continue to use other public transport means, taxis and cars on roads, because of increased speeds and capacities on roads

- Personal travel time
- Vehicle operating cost saved by the reduction of number of public transport, taxis and passenger cars

2) Savings

The quantified economic benefits of saving in vehicle operating costs and saving in vehicle time costs are defined as the difference of these costs when comparing "With Master Plan" and "Without Master Plan".

(2) Project Costs

1) Project Costs

Preliminary project costs in terms of financial prices are estimated first based on the recent experiences in Tanzania. In estimating the costs in this study, price contingency, interest during construction and commitment charge are excluded.

Table 3.5.1 shows a summary of the overall financial project costs. Assuming that proportion of the foreign currency portion and local currency portion is even (50:50), and applying to the Standard Conversion Factor at 0.869, the economic cost of all the projects is estimated at 3,923,404 million Tshs.

Table 3.5.1 Economic Cost of the Project

Financial Cost (million Tshs)	Foreign	Local*SCF	Economic Cost (million Tshs)	Economic Cost (million USD)
4,198,399	2,099,200	1,824,204	3,923,404	3,086

Source: JICA Study Team

2) Operation and Maintenance Cost

The road maintenance work is divided into two categories, i.e., (i) routine maintenance work and (ii) periodic maintenance work. The costs required for each type of maintenance work are estimated as described hereinafter.

Routine Maintenance Cost

The average annual routine maintenance cost spend by the TANROADS in the past years is roughly estimated at Tshs 3,784,000 per km for a 4-lane asphalt pavement road.

Periodic Maintenance Cost

The pavement design for the project is made covering a life period of 15 years after completion of the project so as to reasonably reduce the initial investment. In this study, an overlay with 7 cm of asphalt concrete is planned to conduct at 15 years intervals after completion of the project. The required cost of the overlay is estimated at 29,000 Tshs/m2.

Overall Maintenance Cost

Assuming that the periodic maintenance by overlay will be made at appropriate intervals to cope with the increased traffic volume, the overall maintenance cost is estimated at 0.99% of the project cost.

Table 3.6.2 Cost by the Project

Project No.	Project Name	Road Classification	Project Length (km)	Project Cost (MTshs)
101	New Bagamoyo Road Widening	1	17.0	81,371
102	Nelson Mandela Road Widening	1	12.9	59,290
103	Kigamboni Bridge and Access Road Improvement	1	8.1	130,116
104A	Inner Ring Road/Kawawa Road Development	1	3.6	16,882
104B	Inner Ring Road/Kawawa Road Development	1	2.8	6,339
105	Nyerere Road Widening	1	15.1	51,128
106	Outer Ring Road Development	1/2	30.3	91,120
107	BRT Phase 1 Corridor and Road Development	3	9.4	11,635
108	BRT Phase 1 Corridor and Road Development	2	5.4	21,743
109A	Gerezani Area Transport Enhancement	1	15.8	21,588
109B	Gerezani Area Transport Enhancement	1	2.6	5,973
110	Selander Bridge Bypass	2	7.2	30,411
111	Kigamboni Corridor Road Development	2	8.4	20,990
112	Tabata BRT Development	5	15.5	106,390
113	Flyover Installation	1	0.0	78,048
114	CBD Traffic Management	1/2/3	0.0	2,792
115A	Expressway (Wazo-Sam Nujoma)	4	17.8	50,545
115B	Expressway (Wazo-Sam Nujoma)	3	3.2	4,009
116	Expressway (Sam Nujoma-Airport)	4	21.8	2,047,993
117	Expressway (Sam Nujoma-Airport)	2	3.1	9,075
118	Expressway (Sam Nujoma-Airport)	2	3.4	9,776
119	Expressway (Airport-Kigamboni)	4	19.4	55,193
120	Mikocheni Road Widening	2	3.1	6,457
121	Haile Selassie Street Widening	2	5.0	10,666
122	Old Bagamoyo Road Widening	2	7.7	19,470
123	Mwinyjuma Road Widening	2	8.0	22,270
124	Shekilango Road Widening	2	5.3	19,183
125A	Kigamboni Road Development 7	1	16.0	69,008
125B	Kigamboni Road Development 8	1	8.1	25,743
126	United Nations Road Widening	2	3.7	7,839
127	Morogoro Road Bypass (North)	2	6.8	19,922
128	Morogoro Road Bypass (South)	2	5.8	17,497
129	Uhuru Street Widening	2	7.5	16,078
130	Kimanga/Tabata Road Widening	2	4.5	9,443
131	Tabata Road Development	2	6.6	19,236
132	Changombe/Tandika Road Widening	2	4.3	10,019
133	Mbagala/Tandika Road Widening	2	3.5	11,044
134	Mbagala Road Widening	2	7.0	14,555
135	Sam Nujoma Road Extension	2	2.6	5,426
136	Kibada Road Widening	2	26.1	61,154
137	Kigamboni Road Widening	1/2	18.8	46,748
138	Kigamboni Road Development 1	2	1.7	3,594
139	Kigamboni Road Development 2	2	3.4	9,782
140	Kigamboni Road Development 3	2	4.5	9,326

141	Kigamboni Road Development 4	2	6.6	13,765
142	Kigamboni Road Development 5	2	6.4	18,670
143	Kigamboni Road Development 6	1	12.0	34,352
144	Vijibweni Road Widening/Development	1	5.7	16,564
145A	New Bagamoyo Road Extension	1	4.9	17,083
145B	New Bagamoyo Road Extension	1	8.8	23,470
146	Upanda Road Improvement	2	1.7	6,070
148	Msasani Area Road Improvement	3	1.8	2,274
149	Regent Area Road Development	3	12.2	16,346
150	Old Bagamoyo Road Extension	3	12.7	18,335
151	Kinondoni Regional Road Development	3	104.0	131,164
152	Kinondoni Regional Road Development 2	3	53.7	70,289
153	Ilala Regional Road Development	3	75.3	98,238
154	Ilala Regional Road Development 2	3	27.3	36,364
155	Temeke Regional Road Development	3	93.2	119,057
156	Temeke Regional Road Development 2	3	47.7	64,100
157	Temeke Regional Road Development 3	3	23.8	32,002
158	Corridor and Road Development 3	3	24.0	33,588
159	Tandika Area Road Improvement	3	17.5	25,512
160	Industrial Area Road Improvement	3	7.2	8,861
161	Tabata Area Road Improvement	3	4.5	6,892
162	Flyover Installation (Phase2)	1	0.0	58,536
Total			933.7	4,198,399

Note: The number of road classification indicates; 1: Primary Road, 2: Secondary Road, 3: Tertiary Road, 4: Expressway, and 5: Others (Tabata BRT Development, dedicated for BRT).

Source: JICA Study Team

(3) Cost Benefit Analysis

Based on the economic costs and benefits, their annual flows are estimated as shown in Table 3.6.3 and the economic evaluation results are summarized in Table 3.6.4. All three indicators of the economic evaluation ensure economic feasibility of the project investment: 41% EIRR, 3.87 B/C Ratio and sufficient positive NPV. It should be noted that the revenue generated from the expressway is excluded.

Table 3.6.4 Result of Cost Benefit Analysis

Indicator	Result
Net Present Value (in Tshs, at discount rate of 12%)	2,703,552 million Tshs
EIRR	40.7%
B/C (at discount rate of 12%)	3.87

Source: JICA Study Team

Table 3.6.3 Annual Flow of Cost and Benefit

Year	Investment Cost (in billion Tshs)			Vehicle Operating Cost (in billion Tshs)								Travel Time (in billion Tshs)								Travel Time (in billion Tshs)		Benefit (in billion Tshs)				B-C
	Initial Investment	O&M	Total	(Without)				(With)				(Without)				(With)				(Without)	(With)					
				Car	Truck	Trailer	Total	Car	Truck	Trailer	Total	Car	Truck	Trailer	Total	Car	Truck	Trailer	Total	Bus	Bus	VOC Saving	Time Saving	Time Saving (Bus)	Total	
2008	15	0	15																							-15
2009	62	1	63																							-63
2010	86	2	88																							-88
2011	61	2	63																							-63
2012	75	3	78																							-78
2013	77	4	81																							-81
2014	91	5	96																							-96
2015	101	6	107	339	103	17	458	270	82	13	365	513	36	4	553	209	15	1	226	314	161	93	327	154	574	468
2016	116	7	123	360	104	18	483	290	84	14	388	562	38	4	604	227	15	2	244	328	165	94	359	163	616	494
2017	142	8	150	383	106	19	508	312	86	15	413	615	40	4	659	247	16	2	265	342	169	95	394	173	662	512
2018	180	10	190	407	108	20	535	334	88	17	440	673	42	5	720	269	17	2	287	357	174	96	432	183	711	522
2019	172	12	184	433	109	22	564	359	91	18	468	737	44	5	786	292	17	2	312	372	178	96	474	194	765	581
2020	193	14	207	460	111	23	594	386	93	20	498	807	46	6	858	317	18	2	338	388	183	96	521	206	822	616
2021	189	15	204	489	113	25	627	414	96	21	531	883	48	7	938	345	19	3	366	405	187	96	571	218	885	681
2022	183	17	201	519	115	27	661	445	98	23	566	967	50	7	1,024	375	19	3	397	423	192	95	627	231	953	752
2023	200	19	220	552	117	28	697	477	101	25	603	1,058	52	8	1,119	408	20	3	431	441	197	94	688	244	1,026	806
2024	214	21	235	587	119	30	736	513	104	27	643	1,159	55	9	1,222	443	21	3	468	460	202	93	755	258	1,106	870
2025	303	24	327	624	120	33	777	550	106	29	686	1,269	57	10	1,336	482	22	4	507	480	207	91	828	273	1,192	865
2026	303	27	330	663	122	35	820	591	109	31	731	1,389	60	11	1,459	524	23	4	550	501	213	89	909	288	1,286	956
2027	290	30	320	704	124	37	866	635	112	34	780	1,520	63	12	1,595	569	24	4	597	523	218	86	998	304	1,388	1,068
2028	290	33	323	749	126	40	915	681	115	36	833	1,664	66	13	1,743	619	24	5	648	545	224	82	1,095	321	1,499	1,176
2029	290	36	326	796	128	43	967	732	118	39	889	1,822	69	14	1,905	673	25	5	703	569	230	78	1,202	339	1,619	1,293
2030	290	39	328	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,421
2031		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2032		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2033		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2034		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2035		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2036		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2037		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2038		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2039		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2040		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2041		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2042		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2043		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
2044		39	39	846	130	46	1,022	786	121	42	949	1,995	72	16	2,083	731	26	6	763	593	235	72	1,319	358	1,750	1,711
	867	75	942	1,936	417	100	2,453	1,681	357	87	2,125	3,785	184	28	3,998	1,448	71	11	1,530	1,548	698	328	2,468	850	3,646	2,704

Source: JICA Study Team

3.6 Conclusions and Recommendations

Major quantifiable economic benefits derived from the proposed project are mainly comprised of savings in vehicle operating cost and travelers time cost. The project EIRR for the base case results in 41％. In addition to these quantitative benefits, unquantifiable benefits may also suggest the importance of improving the road/public transport network, in terms of poverty alleviation and improved quality of life and conformability.

From these results, it is considered that the projects formulated in the Master Plan Study are economically feasible and its implementation may contribute to accelerating the economic growth in the Dar es Salaam region.